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FINAL
SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT
SMOKY CANYON MINE, PANELS B & C

LEAD AGENCY:	U.S. Department of the Interior Bureau of Land Management Upper Snake River Districts Pocatello Field Office
JOINT LEAD AGENCY:	U.S. Department of Agriculture Forest Service Caribou-Targhee National Forest
PROJECT LOCATION:	Caribou County, Idaho
DATE Draft SEIS Filed with EPA:	July, 2001
DATE Final SEIS Filed with EPA:	April, 2002
MAILING ADDRESS FOR FURTHER INFORMATION AND COPIES OF THE Final SEIS:	Jeffrey Cundick SEIS Project Manager BLM Pocatello Field Office 1111 N. 8th Ave. Pocatello, ID 83201 (208) 478-6354

ABSTRACT

This Final Supplemental Environmental Impact Statement analyzes impacts related to the development of Panels B and C at the J. R. Simplot Smoky Canyon Mine in southeast Idaho. The Proposed Action includes developing two mine pits, haul roads and overburden disposal areas. Use of existing support and mill facilities would continue. These actions are included in a 1983 Record of Decision for the entire mine. This supplemental analysis reviews potential impacts from selenium and newly listed threatened, endangered and sensitive species and updates the previous impact analyses for other resources. Alternatives to the Proposed Action are also analyzed and site specific mitigation measures developed. The agency preferred Alternative is the Proposed Action as proposed in this FSEIS.

RESPONSIBLE OFFICIAL FOR SEIS:	Idaho State Director Bureau of Land Management

ITEM HAS BEEN DIGITIZED

United States Department of the Interior

BUREAU OF LAND MANAGEMENT

Upper Snake River Districts
Pocatello Field Office
1111 North 8th Avenue
Pocatello, Idaho 83201-5789

In Reply
Refer To:

3500
(I-012890)

APR 1 8 2002

Dear Reader:

Enclosed is the Final Supplemental Environmental Impact Statement (SEIS) for the Simplot Smoky Canyon Mine, Panels B and C, prepared by the Bureau of Land Management (BLM) Pocatello Field Office and the U. S. Forest Service (USFS) Caribou-Targhee National Forest.

This SEIS analyzes the direct, indirect and cumulative impacts associated with development of open pits, haul roads, overburden disposal areas, and related facilities that would be utilized during operation of the B and C Panels. In particular, mitigation and monitoring related to potential mobilization of selenium contained in overburden produced by these operations is addressed herein.

This Final SEIS has been prepared as a full-text version equivalent to the Draft SEIS that was distributed to the public in July, 2001, with the exception that comments received during review of the draft document have been addressed with added or modified text in this Final SEIS. The Final SEIS is being distributed in a three-hole punched format with binder spine and cover inserts that you can file or install in your own binder. This document constitutes the complete SEIS for this project.

The BLM will file the Final SEIS with the U.S. Environmental Protection Agency (EPA). EPA will then publish a Notice of Availability in the *Federal Register*. Beginning on the publication date of EPA's Notice of Availability in the *Federal Register*, a 30-day availability period will commence. In addition to EPA's Notice of Availability, BLM will publish a separate Notice of Availability with additional project information in the *Federal Register*.

Following the close of the Final SEIS availability period, a Record of Decision on this project will be issued by the BLM, with input from the USFS. A 30-day period for potential appeals on the Record of Decision will follow public release of that document.

If you would like further information on this project or the above-described process, contact Jeff Cundick, SEIS Project Manager, at 208-478-6354 or at the address shown on the cover page of the SEIS.

Sincerely,

Joe Kraayenbrink
Acting Manager
Pocatello Field Office

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SMOKY CANYON MINE FINAL SUPPLEMENTAL EIS

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Fisheries and Aquatic Resources
Threatened, Endangered, and Sensitive Species
Grazing Management
Recreation and Wilderness
Visual Resources
Cultural Resources and Native American Concerns
Social and Economic Resources
Transportation

These reports are available from the Bureau of Land Management, Pocatello Field Office.

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SUMMARY

The environmental impacts of the J. R. Simplot Company Smoky Canyon phosphate mine (Simplot), located in Idaho approximately 10 miles west of Afton, Wyoming, were reviewed in draft and final Environmental Impact Statements prepared by the U.S. Forest Service (USFS) and the Department of Interior in 1981 and 1982 respectively. The Record of Decision issued after the review in 1983 permitted the development of the federal phosphate leases with five open pit mine panels known as Panels A, B, C, D, and E including permanent disposal of overburden external to these pits in approved locations. A change in mining sequence of the five mine panels was reviewed by an Environmental Analysis prepared by the USFS and Bureau of Land Management (BLM) in 1992 and a Decision Record was subsequently issued. The ore is milled on site and tailings are disposed in two tailings ponds located on Simplot property east of the mine. An Environmental Analysis for the full development of the tailings facility was prepared by the U.S. Corps of Engineers (USCOE) in 1990 and subsequent approval of the project included mitigation plans for disturbance of designated wetlands.

The Record of Decision for the Smoky Canyon Mine required submission of detailed mining plans for each approved mine panel before its construction so the regulatory agencies could assess potential site-specific environmental impacts and determine appropriate mitigation requirements. In June of 1999 Simplot submitted its plans for opening Panels B and C to the USFS and BLM. The regulatory agencies determined that the 1981 and 1982 EISs did not adequately evaluate the potential impacts of the proposed operations related to selenium or newly listed threatened, endangered and sensitive species. The decision was made to prepare a supplemental environmental impact statement (SEIS) to evaluate these potential impacts.

This SEIS describes Simplot's Proposed Action and reasonable alternatives to the Proposed Action along with the potential environmental consequences that could result from implementation of these actions. Potential direct, indirect and cumulative effects of the actions are reviewed and analyzed. Existing environmental effects of the current mining and milling operations are reviewed as part of the cumulative effects analysis. Detailed review of the effects of selenium and other potential contaminants from the existing mining and mill operations has not been conducted as part of this SEIS and will be conducted as described in the Historic Mining Environmental Impact Investigation Report (HMEII). The investigation and mitigation of the contamination from existing mining operations will be conducted by J.R. Simplot under the direction of the U.S. Forest Service. The State of Idaho Department of Environmental Quality (IDEQ) will investigate mill tailings disposal ponds. Support and assistance will be provided under the direction provided in a Memorandum of Understanding from U.S. Environmental Protection Agency (EPA), IDEQ, Bureau of Land Management, U.S. Fish and Wildlife Services, Bureau of Indian Affairs, and the Shoshone-Bannock tribes. Authority to conduct these investigations is granted by State and Federal statutes including the Comprehensive Environmental Response, Compensation Liability Act (CERCLA), IDAPA 58.01.05, Hazardous Waste Management Rules; IDAPA 58.01.11 Ground water Quality Rule; IDAPA 58.01.02, Water Quality Standards And Waste Water Treatment Requirements; IDAPA 20.03.02, Rules governing Exploration and Surface Mining in Idaho, and IDAPA 37.03.05, Mine Tailings Impoundment Structure Rules.

Proposed Action

The Proposed Action would consist of developing two open pits, known as Panels B and C which would involve excavation of approximately 93.77 million tons (MMT) of overburden rock and phosphate ore using standard open pit mining methods over a mine life of 4.6 years. The overburden would be used to backfill the new open pits as well as complete the backfilling of nearby Panel A. This would entail rehandling 4 percent of the total overburden moved. Remaining overburden would be placed in an external overburden disposal area located immediately south of Panel B on the ridge top. The two new panels and the external overburden disposal area are located within the approximate boundaries of these same facilities as described in the 1982 Final EIS. The Proposed Action is not an expansion of the existing mining operations at Smoky Canyon but is the continuation of the planned development of the Smoky Canyon federal leases as reviewed in the 1982 Final EIS and approved in the 1983 Record of Decision.

Ore from the new panels would be processed in the existing mill and ore concentrate would be pumped through the existing slurry pipeline to Simplot's Don Plant in Pocatello where the ore would be converted to fertilizer products. Tailings from the Smoky Canyon mill would be slurried to the existing tailings pond facility located on Simplot property east of the mine. Sufficient capacity for the tailings produced during the Panels B and C operations is already available in the permitted tailings facilities and additional government approvals for these tailings are not necessary.

The Proposed Action would involve disturbance of 835 acres of which 618 acres would be new disturbance and 217 acres would be existing mine disturbance that would be backfilled and reclaimed. A total of 822 acres would be reclaimed and revegetated leaving 13 acres of highwalls unreclaimed.

The existing staff would be employed in the Proposed Action and all transportation and utility support would be provided by existing infrastructure. The current power line extending over the ridge from the Roberts Creek area would need to be relocated but all disturbance for this relocation would be within the general mining disturbance area of the Proposed Action.

New haul roads would connect the new mine panels to the existing mill and the new external overburden disposal area. A new haul road would connect the north ends of Panels B and C and would require installation of a 300-foot long culvert in Smoky Creek which would be buried by a 45-foot high road fill. The existing public access road up Smoky Canyon would be rerouted up the north side of Smoky Canyon to cross the new haul road at a manned or automatic guard station. A new access road crossing of Smoky Creek, with a new approximately 100-foot culvert would be necessitated where this re-aligned access road rejoins the existing access road south of the new haul road crossing. Public travel up the access road would be hindered by the guard station, a necessity to safely separate haul truck traffic from public traffic at the road intersection. The existing access road crossing of Smoky Creek at the current intersection of the Smoky Canyon road and the road leading to the Simplot mill would be widened almost 100 feet to allow construction of a new haul road from the south end of Panel C to the mill. Another guard station would be built at this road intersection to protect public traffic on the Smoky Canyon access road from the haul road traffic. All of the new culverts would be designed to pass peak flow from a 100-year storm.

A haul road from the northern portion of Panel B pit to the mill would parallel Smoky Creek. This haul road fill would encroach on Smoky Creek in two locations totaling about 200 feet. The haul road fill in these areas would be supported out of the Smoky Creek channel by gabions.

All road fills and gabions would be built from chert or limestone overburden to minimize leaching of selenium or other contaminants to Smoky Creek. All of the new culverts, road fills, and gabions would be removed from the creek channel during reclamation activities and the channel restored.

The existing access road which would be temporarily abandoned for the road crossing of the northern haul road would also be restored to its original condition.

Surface water impacts would be reduced with implementation of Best Management Practices (BMPs) for control of: erosion of disturbed areas, off-site release of runoff and suspended sediment, and control of development of overburden seeps. All areas of seleniferous overburden would be capped with 8 feet of chert and 1 to 3 feet of topsoil for a total cap thickness of 9 to 11 feet. This cap is intended to isolate the seleniferous overburden from the surface environment and prevent the long-term effects of erosion, sedimentation, and biological uptake of selenium and other contaminants.

The new overburden disposal areas would be designed and constructed with recently developed management practices to control generation and discharge of seepage carrying contaminants leached from the overburden. These management practices would include: selective handling of seleniferous overburden, consolidation of overburden to reduce permeability, control of permeability of the contact between overburden and the underlying foundation, timely handling and placement of overburden to reduce exposure to weathering, and modification of foundation permeability as required to prevent perched saturated conditions and potential overburden seeps.

Runoff from the surface of the cap would be collected at the margins of certain portions of the overburden fills and directed into the subsurface through permeable chert rock recharge areas. The collected runoff would readily infiltrate through the coarse chert into the permeable bedrock where it would recharge the local aquifer with large quantities of clean water which would help mitigate the water quality impacts of water infiltrating through the overburden shales.

The external overburden disposal site and the pit backfills would be constructed to reduce to the potential for development of seleniferous seeps along the final toe of these fills. These practices would include special preparation of the foundation of the fills and segregating seleniferous overburden so it would be placed within the core of the fills away from their final toes.

Infiltration of precipitation into the seleniferous overburden would be controlled through application of management practices including: sloping and grading, avoiding placement in stream channels, preventing surface ponding, management of snow on active disposal areas, reduction of run-on, and reducing surface area. Concurrent reclamation and revegetation of capped areas would restore vegetative evapotranspiration as quickly as feasible to further reduce net infiltration into the overburden.

Reclamation would be conducted concurrent with mining operations and would include: salvaging available topsoil from areas proposed for disturbance, regrading to maximum 3h:1v slopes, spreading 1 to 3 feet of topsoil on reclaimed areas, seeding and fertilizing for establishment of grass cover, and reforestation of previously forested areas. Control of grazing and weed infestation would be practiced until the reclamation cover is considered successful.

Environmental monitoring and mitigation practices required by the regulatory agencies would be incorporated into the final Record of Decision.

Alternatives

Two alternatives were developed to address the main environmental impact issues identified during scoping which were related to the potential mobilization of selenium and other contaminants to the environment during and after mining operations in Panels B and C.

Alternative A would include all components of the Proposed Action except that all seleniferous overburden would be returned to the pit backfills, requiring a greater backfill thickness in Panel B. This would eliminate any external disposal of seleniferous overburden and would reduce the surface area of seleniferous overburden requiring capping. It would entail rehandling 16 percent of the total overburden moved. Non-seleniferous overburden would still be placed in the external overburden disposal facility which would not require capping. The cap design would be the same as the Proposed Action with eight feet of chert and one to three feet of topsoil.

Alternative B would also include all the components of the Proposed Action but all overburden would be returned to the pit backfills of Panels A, B and C. Overburden would be temporarily stored in the footprint of the external overburden disposal site but all overburden would be removed from this site before reclamation. This alternative would eliminate any external permanent disposal of overburden regardless of its selenium content. It would have the same area of seleniferous overburden as Alternative A. It would entail rehandling 36 percent of the total overburden moved. The cap for this alternative would be the same as for the Proposed Action and Alternative A, eight feet of chert and one to three feet of topsoil.

The thickness of the chert cap for the Alternatives would be the same as the Proposed Action, eight feet. Adding 1 to 3 feet of topsoil over the chert would produce a total cap thickness of 9-11 feet.

The No Action Alternative would occur in the event the agencies did not approve of the mine plans and mitigation plans for the mining of Panels B and C. Mining in the panels would not occur until such time an acceptable mine and mitigation plan was approved by the agencies.

Agency Preferred Alternative

The agencies have selected the Proposed Action, as mitigated by the proposed design and management practices, for the Preferred Alternative.

Environmental Impacts

Analysis of the potential environmental impacts from the Proposed Action and Alternatives is presented in Chapter 4. A summary and comparison of the Proposed Action and the Alternatives is contained in Tables 2.6-1 and 2.6-2. The following summary includes brief descriptions of these potential environmental impacts.

Proposed Action

Geology, Minerals, Topography

The Proposed Action would result in the movement of approximately 93.77 million tons (MMT) of overburden rock and ore resulting in extraction of the phosphate ore resource on the property. Backfilling all pits with overburden would reduce the potential recovery of the remaining (deeper) phosphate resource in the future. After backfilling the pits, the highwall in Panel B would be 2,800 feet long and 250 feet high. The highwall in Panel C would total 3,100 feet in length and vary from 50 to 150 feet high. Approximately 4 percent of the overburden would be rehandled in the Proposed Action. The backfilling of the pits would use 69 percent of the overburden while 31 percent would be placed in the external overburden disposal site. Seleniferous overburden could be placed in any of the overburden disposal

areas totaling 722 acres. Acid rock drainage is not expected to result from the Proposed Action. Seleniferous overburden could be leached by infiltration of precipitation and resulting seepage from the bottom of the overburden fills is expected to have concentrations of cadmium, manganese, selenium, sulfate and total dissolved solids (TDS) greater than groundwater or surface water quality standards. This leachate would percolate downward and is not expected to discharge to the surface as overburden seeps.

Air Resources and Noise

Air borne particulate matter is the most common air pollutant emission associated with mining operations. Under the Proposed Action there would be a 17 percent increase over current conditions in annual total suspended particulates (TSP) associated with excavation, hauling, and active disturbance in the mine pits, panels, and haul roads. The annual impact of Alternative A is 299 percent higher than current conditions and Alternative B would be 373 percent higher than existing conditions in annual TSP emissions.

With the existing topography, fairly dense vegetation growth, and the lack of noise receptors in the study area, the impact of noise from the Proposed Action and Alternatives should be minimal. With the Proposed Action and Alternatives, the source of noise would shift approximately 4.5 miles to the north of the present mining activities in Panel E.

Water Resources

Direct and indirect impacts on water resources would result from the Proposed Action. Surface water impacts would result from surface disturbances related to the proposed mining activities within the drainage areas of Smoky and Roberts Creeks. These disturbances would produce increased sediment loadings which would be controlled by use of sediment collection basins, silt fences, sediment traps, concurrent reclamation of disturbed areas, runoff diversion and collection ditches and other best management practices. Sediment containing selenium and metals mobilized during erosion of the overburden would be a temporary impact that would be eliminated when these areas are covered with 8 feet of chert and 1 to 3 feet of topsoil during reclamation. The largest contributor of sediment would be road construction in Smoky Canyon. Sediment from this activity would be chemically benign because the road fills would be made of chert and limestone.

Diversion and collection of runoff from the disturbed area in the proposed mine water management facilities would temporarily reduce runoff by about 14 percent to Smoky Creek and approximately 10 percent to Roberts Creek.

The collection of runoff in the runoff recharge areas would permanently reduce ephemeral runoff by about 8 percent to Smoky Creek and 11 percent to Roberts Creek. This is not expected to reduce the perennial base flows of either creek which are sustained by springs.

Overburden would be removed from the open pits and placed in an external overburden disposal site and pit backfills that would be subject to net infiltration from precipitation and snowmelt. This infiltration of meteoric water could dissolve soluble chemical constituents from the overburden as it passes downward through the material. Column leaching tests of overburden samples have indicated that certain chemical constituents may be leached in seepage from the overburden in concentrations that are above either drinking water standards or cold water aquatic life criterion. These included: cadmium, manganese, selenium, sulfate and total dissolved solids (TDS). This seepage could be subject to physical and chemical changes within the overburden mass and the unsaturated bedrock lying between the overburden and the water table in the Wells Formation as it percolated downward under the influence of gravity. The seepage would then enter the aquifer where it would be diluted and further attenuated by chemical interactions with the aquifer water and rock matrix as the water flowed down gradient in the Wells Formation.

Groundwater modeling of the potential impacts from seepage was conservative in that it did not assume any physical or chemical attenuation (decrease in concentration) of the seepage. Attenuation may occur but existing data do not allow quantification of it. Groundwater concentrations greater than the selenium MCL were predicted to occur under approximately 550 acres of the mine area. The portion of this impact area west of the south half of the A Panel where the proposed mitigative measures cannot be built is estimated to be 100 acres. Predicted manganese concentrations were greater than secondary MCLs in this same vicinity but impacted a smaller area. The water quality in the Culinary Well is predicted to continue to comply with drinking water standards for selenium and manganese. The modeled concentrations in the groundwater for cadmium, sulfate and TDS were less than their applicable drinking water standards. The model results show that detectable concentrations of the contaminants contributed by the seepage through the overburden were estimated to occur approximately 0.5 to 0.66 mile downgradient to the west and northwest of the Proposed Action and 0.5 mile to the east.

To account for potential variability in the actual selenium concentration in the overburden seepage, a starting concentration of 0.72 mg/l was also used in the groundwater impact analysis. This concentration correlates to the highest average selenium concentration measured at the Smoky Canyon Mine for an overburden seep at the D Panel and is also greater than 87 percent of the average selenium concentrations measured in southeastern Idaho. These modeling results showed that the proposed mitigative measures were effective in limiting the area of concentrations of selenium and manganese over their MCLs to under the mine area. The area of concentrations greater than the selenium MCL west of the south half of the A Panel were expanded by about 58 acres in these modeling results. In addition, there was an area of about 41 acres west of the C Panel that was predicted to have concentrations greater than the selenium MCL. Both of these areas are places were the proposed groundwater impact mitigation measures cannot be built.

Lower Smoky Spring provides a perennial water source for Lower Smoky Creek. Available data indicates that Lower Smoky Spring may not discharge water from the Wells Formation which is the aquifer that would be impacted by the Proposed Action and Alternatives. If this is the case, there would be no possibility of water quality impacts to Lower Smoky Spring. To be conservative, groundwater modeling of the fate and transport of chemical constituents derived from the overburden seepage assumed that the maximum discharge from this spring (about 1 cfs) was obtained from the Wells Formation. Using seepage water quality predicted by column testing in the groundwater model, concentrations of the contaminants contributed by the overburden seepage were estimated at Lower Smoky Spring. All of these concentrations were below the applicable cold water aquatic life criterion.

Impacts to water quality in the Wells Formation aquifer from seepage through the proposed overburden facilities is expected to be an irreversible and irretrievable commitment of this groundwater resource. Over a long period of time (thousands of years) concentrations of chemical constituents in overburden seepage should decrease as soluble chemical species are leached out of the material and their concentrations decrease in the overburden. Seepage concentrations are expected to be less than groundwater standards within 200 years.

Mining of the Panel C pit highwall within about 200 feet below the existing Sheep Spring would not impact the recharge area uphill of the spring but could affect the groundwater flow beneath the spring. It is impossible to predict if this affect would change the flow of this spring.

The amount of Wells Formation groundwater pumped for culinary and process uses at the Smoky Canyon facilities is less than originally evaluated in the Smoky Canyon Mine DEIS (USFS, 1981) and is not expected to have any noticeable impacts on the amount of groundwater presently available at other water wells and springs in the general area.

The Culinary Well is regulated as a public drinking water source for the mine and provides water for drinking, potable and industrial uses. Retail bottled water from an off-site source is also supplied by Simplot.

Soil and Watershed

The Proposed Action would disturb approximately 618 acres of currently undisturbed soil and watershed. Natural structure and biological condition of the salvaged soil would be disrupted. Some soil would be lost during salvage activities due to mechanical limitations and topographic operating constraints. Other soil would be lost to erosion from runoff on surfaces at soil stockpiles and reclaimed areas until they are stabilized by revegetation. Eroded sediment can be carried to the Smoky Creek and Roberts Creek watersheds by runoff which would be controlled by application of Best Management Practices. Erosion rate of reclaimed areas would be higher than current baseline conditions for years after initial reclamation until revegetation is successful. Capping approximately 722 acres of seleniferous overburden with at least 8 feet of chert and 1 to 3 feet of topsoil would isolate the seleniferous material from the effects of erosion and biological uptake. All 618 acres of new disturbance would be covered with topsoil for reclamation and another 217 acres of existing mine disturbance would also be capped and topsoiled.

Vegetation

The Proposed Action would disturb approximately 618 acres of vegetative cover including: aspen, conifer, and mixed aspen-conifer forest as well as smaller amounts of mixed shrub and sagebrush. Reclamation activities would re-establish an initial grass cover with long-term potential of reforestation with aspen and conifer. This reclamation would also be applied to an additional 217 acres of currently disturbed mining area that would be backfilled, sloped and reclaimed under the Proposed Action. Approximately 722 acres of seleniferous overburden area would be covered with 8 feet of chert and 1 to 3 feet of topsoil to isolate it from the surface environment. This is expected to control uptake of selenium and other contaminants in vegetation that becomes re-established on the reclaimed areas. Ground disturbance would be susceptible to weed infestation which would be controlled by monitoring and prompt control measures until desirable revegetation cover is stabilized in reclaimed areas and is able to compete against invasive weed species. Approximately 13 acres would remain as highwall after reclamation is completed and would not be revegetated.

Wetlands

Riverine wetland type in the Proposed Action area occurs along the bottom of Smoky Canyon and a side drainage below Sheep Spring. Approximately 0.3 acres of this wetland type would be disturbed by the Proposed Action, in compliance with the terms of a permit issued by the U. S. Corps of Engineers. These impacts would occur from building road crossings in three locations in the Smoky Creek channel and mining out the drainage channel below Sheep Spring in the Panel C open pit. Runoff and suspended sediment discharged from areas disturbed by the Proposed Action would have the potential to deposit additional sediment in downstream wetlands. These discharges would be managed under the Clean Water Act through the Mine's Storm Water Pollution Prevention Plan and regulated under the 404 permit process. Storm water runoff control at the mine is designed to prevent discharge of runoff and sediment. During reclamation, all the disturbed wetland areas would be restored to approximately pre-mining conditions.

Wildlife

As a result of implementation of the Proposed Action, wildlife would be displaced by the mining activities to similar habitat in the nearby areas. Displacement would alter natural wildlife distribution patterns and result in additional use of other habitat. Mining disturbance and operations would lead to increased mortality of species that are relatively immobile including: amphibians, reptiles and certain small birds and mammals. Reclamation activities would begin to restore the original habitat but conditions are expected to be more open than the largely forested baseline condition for years to come. This would alter wildlife distribution patterns potentially enhancing use of the reclaimed area by herbivores, small mammals, birds

and other prey species. This would also enhance use of the area by raptors and predators. Remaining highwalls would provide habitat that may be used by bats and birds.

Seleniferous overburden would be capped with 8 feet of chert and 1 to 3 feet of topsoil to isolate it from the surface environment and control bioaccumulation. However, it would be exposed for a period of time to erosion and runoff, weed growth, and direct contact to wildlife that might enter the active mining area. Small mammals and invertebrates could be exposed to seleniferous overburden by direct ingestion or foraging on weeds growing in the material. The duration of this exposure would be limited by concurrent capping and the continuous nature of the planned mining activities. Wildlife could be exposed to selenium in runoff water contained in sediment control ponds which may be used as drinking water by wildlife. The expected selenium concentration in this contained water would be less than published chronic toxicity concentrations. The Elk Habitat Effectiveness Index for the general area would be reduced by less than one percent due to the Proposed Action.

Wildlife using the existing tailings ponds as habitat can be exposed to selenium and metals in tailings water and solids. Bioaccumulation of these elements can occur from extended exposure to these contaminants by waterfowl, amphibians, reptiles or mammals using the tailings ponds and the edges of the ponds. Predators feeding on these species can further bioaccumulate these contaminants.

Fisheries and Aquatics

The proposed road crossings and gabion installations in Smoky Creek for the Proposed Action are upstream of an approximate one mile long reach of the creek where stream flows dry up to intermittent to ephemeral conditions. The stream in the area of the Proposed Action does not support trout and this construction would not directly impact spawning habitat. Sediment produced during construction and operation of the Proposed Action could be washed down Smoky Creek and into the lower perennial reaches that have fish and aquatic invertebrate habitat. The release of runoff and sediment from the site would be managed according to the Mine's Storm Water Pollution Prevention Plan which is designed to prevent releases of runoff from disturbed mine areas. Fill material placed in the creek for road fills and gabions would be non-seleniferous but could still produce suspended sediment in runoff. Proposed control measures for erosion and sediment control would reduce seasonal runoff discharges to the upper reaches of Smoky Creek reducing intermittent and ephemeral flow in this creek. This is not expected to affect the base flow of the lower perennial reaches of the creek which are maintained by spring flow downstream of the Proposed Action area and which support the fisheries and aquatic habitat in that area.

Threatened, Endangered and Sensitive Species

Baseline studies indicate the Proposed Action area supports potential habitat for some listed and sensitive species but is occupied by only a few of those species. Waterfowl foraging or nesting in the area of the tailings ponds may be exposed to elevated concentrations of selenium or trace metals. Bald eagles have been observed in the general area in the past and may be impacted by biological uptake of selenium if they were to regularly feed on waterfowl foraging in the tailings ponds. Potential habitat for lynx, gray wolf, grizzly bear, and wolverine exists in the general area but the proximity of existing mining activities would limit the use of the Proposed Action area by these species. The general area is considered potential habitat for the northern goshawk, boreal owl, flammulated owl, great gray owl, and three-toed woodpecker. No evidence of these species was found during the 2000 baseline studies within the area of the Proposed Action. The Proposed Action would impact forest and forest edge habitat for these species but would not impact any known nest sites. No listed or sensitive plants have been found in the Proposed Action area.

Grazing Management

The Proposed Action would remove less than 5 percent of the Pole Canyon grazing allotment area from grazing use during active mining and until reclamation is successful enough to support grazing again. Most of this reduction would be in conifer forest which is considered poor forage for grazing animals. No

reduction in animal months permitted on the allotment is likely to result from the Proposed Action. Reclamation activities would restore the suitable disturbed area to grass land which would temporarily increase grazing forage although long-term revegetation would include reforestation with mountain shrubs and trees. Ground disturbance could result in increased invasion by noxious weeds although weed control is part of the reclamation process.

The existing Sheep Spring watering trough would be temporarily relocated during mining of Panel C and would be re-established after mining.

The Proposed Action would be a potential barrier to moving grazing animals through the area until reclamation of these sites is successful enough to allow grazing on them.

Recreation and Wilderness
The Proposed Action would impact hunting in the vicinity of the Proposed Action by the relocation of wildlife and limiting hunting access. Current access to this area is limited by the presence of private land to the east and minimal road routes in the area. Mine area access is closed to non-mine vehicle traffic under a "Special Order" issued by the Forest Supervisor of the Caribou National Forest in 1984. Access to surrounding areas is also managed according to the order known as the "Travel Plan". A short-term increase in game density in adjacent areas may be followed by overall decrease in wildlife numbers following the reduction in habitat acreage. This would increase the density of hunters in adjacent areas and may diminish big game yields overall in the vicinity of the Proposed Action. No federally designated wilderness areas would be involved in the Proposed Action or Cumulative Effects Area. There would be no changes in existing access to roadless areas due to the Proposed Action. Two safety guard stations would be built on the Smoky Canyon access road at the haul road crossings.

Visual Resources
The Proposed Action and Alternatives area is accessible to the public from secondary roads only. The visual qualities of the Proposed Action area would be altered by vegetation removal, excavation of open pits, road cuts and fills, and the external overburden disposal facility. The changes in the short term would exceed guidelines for the Caribou-Targhee National Forest Partial Modification category. The severity of visual impacts is tempered by the reduced level of viewer sensitivity in the area which receives limited dispersed use. Long-term visual impacts would be reduced by reclamation activities including backfilling pits, covering highwalls, sloping backfilled areas to approximate original contour, and revegetation. With these reclamation efforts, the visual changes would comply with the Revised Forest Plan.

Cultural Resources
Under the Proposed Action no impacts would occur to recorded cultural resource sites eligible for listing on the National Register of Historic Places (NRHP).

Social and Economic Values
No additional employees would be needed for the Proposed Action compared to the existing mining operations so there should be no increase in local population due to the Proposed Action. Additional impacts to local community services and housing would be negligible. The costs of double handling 4 percent of the overburden and reclamation are estimated to be $4,799,000.

Native American Religious Concerns
No direct or indirect impacts related to Native American religious or traditional uses of the Proposed Action area have been identified. No Traditional Cultural Place or Property has been identified in the area of the Proposed Action or in the Cumulative Effects Area.

Environmental Justice

There would be no environmental justice impacts from the Proposed Action because there would be no socioeconomic or demographic changes caused by the Proposed Action.

Alternative A

Geology, Minerals, Topography

Alternative A would involve the same quantity of overburden rock and ore although all seleniferous overburden would be returned to the open pits as backfill. Implementation of this alternative would require rehandling 16 percent of the overburden compared to 4 percent for the Proposed Action. Economics of higher mining costs involved with this greater rehandle quantity could result in revisions of the mining plans to reduce the stripping ratio yielding less recoverable phosphate resource. After backfilling the pits, the highwall in Panel B would be 2,100 feet long and 200 feet high. The highwall in Panel C would total 3,100 feet in length and vary from 50 to 150 feet high. The backfilling of the pits would use 76 percent of the overburden while 24 percent would be placed in the external overburden disposal site. Seleniferous overburden would be placed only in the pit backfills totaling 478 acres compared to 722 acres for the Proposed Action. Acid rock drainage is not expected to result from the Alternative. Seleniferous overburden could be leached by infiltration of precipitation and resulting infiltration from the bottom of the overburden fills is expected to have concentrations of cadmium, manganese, selenium, sulfate and TDS greater than groundwater or surface water quality standards.

Air Resources and Noise

The impacts from noise for Alternative A would be essentially the same as the Proposed Action with the exception that the duration of noise would extend 10 months longer than the Proposed Action.

The increases in loading, unloading, hauling, and active disturbance activities in Alternative A all contribute to the increase and duration of airborne particulate. The annual total suspended particulate emissions for Alternative A would be 1242 TPY instead of 486 TPY for the Proposed Action.

Water Resources

There is no difference in the amount of disturbed acreage between the Proposed Action and Alternative A thus the annual amount of increased sediment loading and surface runoff reduction would be the same for both conditions. The time period of these impacts would be extended by about 10 months for Alternative A compared to the Proposed Action.

Approximately 16 percent of the total overburden would be rehandled which would extend the time period by about 10 months when this material would be subject to weathering and erosion before it is capped, compared to the Proposed Action.

Alternative A would result in a reduction in area of seepage through seleniferous overburden compared to the Proposed Action. The total quantity (CY) of seleniferous overburden potentially subject to leaching is the same as for the Proposed Action. Groundwater modeling showed essentially the same water chemistry impact below the pit backfill areas compared to the Proposed Action. The model results indicate that a total aquifer area of approximately 322 acres is estimated to have groundwater selenium concentrations greater than the MCL compared to 550 acres for the Proposed Action. Groundwater concentrations greater than the selenium MCL were predicted to occur under about 100 acres west of the south half of the A Panel where the proposed mitigative measures cannot be built. Predicted manganese concentrations were greater than secondary MCLs in this same vicinity but impacted a smaller area. This area will be further studied under the site-specific AOC. The COPC concentration at the Culinary Well for this Alternative was the same as the Proposed Action and was not greater than the drinking water standard. The concentration of detectable amounts of the contaminants contributed by seepage through the overburden in the Alternative A was estimated to extend approximately the same

distance downgradient as the Proposed Action with the exception that the impact due to the external overburden disposal area is eliminated. Currently un-quantified potential increases in concentrations of COPCs in seepage from the B Panel backfill could result in higher groundwater concentrations under Panel B compared to the Proposed Action. The estimated concentrations in Lower Smoky Spring were still non-detectable for all the contaminants.

Soil and Watershed
Alternative A would disturb the same amount of currently undisturbed soil and watershed as the Proposed Action producing the same direct and indirect impacts to soils and watersheds. Capping approximately 478 acres of seleniferous overburden with 9 to 11 feet of chert and topsoil would isolate the seleniferous material from the effects of erosion and biological uptake. This area is less than the 722 acres underlain by seleniferous overburden in the Proposed Action. All 618 acres of new disturbance would be covered with topsoil for reclamation and another 217 acres of existing mine disturbance would also be topsoiled. The time period of active mining and reclamation activities would be extended by 10 months over the Proposed Action.

Vegetation
The initial disturbance area for Alternative A would be the same as for the Proposed Action. The area of seleniferous overburden that would be capped would be 478 acres compared to 722 acres for the Proposed Action. The time period of active mining disturbance would be extended by 10 months over the Proposed Action.

Wetlands
The impacts to wetlands from Alternative A would be essentially the same as the Proposed Action except that the time period for active mining operations and subsequent erosion and sediment production would be extended by 10 months over the Proposed Action.

Wildlife
The impacts to grazing from Alternative A would be essentially the same as the Proposed Action except that the time period for direct exposure to seleniferous overburden before it is capped would be extended by 10 months over the Proposed Action.

Fisheries and Aquatics
The impacts to fisheries and aquatics habitat from Alternative A would be the same as for the Proposed Action with the exception that the period of active mining disturbance would be extended by 10 months over the Proposed Action.

Threatened, Endangered and Sensitive Species
The impacts to threatened, endangered and sensitive species under Alternative A would be the same as for the Proposed Action with the exception that the period of active disturbance would be extended by 10 months over the Proposed Action.

Grazing Management
The impacts to grazing from Alternative A would be essentially the same as the Proposed Action except that the time period for active mining disturbance would be extended by 10 months.

Recreation and Wilderness
Alternative A would have the same impacts on recreation and wilderness as the Proposed Action although the time period of these impacts would be 10 months longer than the Proposed Action.

Visual Resources
Visual impacts from Alternative A would be essentially the same as the Proposed Action although the time period of disturbance before reclamation is completed would be 10 months longer.

Cultural Resources
No impacts to recorded NRHP eligible cultural resource sites would occur as a result of Alternative A.

Social and Economic Values
No additional employees would be needed for Alternative A compared to the existing mining operations so there would be no increase in local population due to this Alternative. Impacts to local community services and housing would be negligible. Public resource (phosphate) utilization would be less for Alternative A than for the Proposed Action if the mining plans were adjusted for the higher mining costs. Double handling 16 percent of the overburden would add $6,052,000 to the reclamation cost over the cost of reclamation under the Proposed Action.

Native American Religious Concerns
No direct or indirect impacts related to Native American religious or traditional uses of the Alternative A area have been identified. No Traditional Cultural Place or Property has been identified in the area of Alternative A or in the Cumulative Effects area.

Environmental Justice
There would be no environmental justice impacts from Alternative A because there would be no socioeconomic or demographic changes caused by the Alternative.

Alternative B

Geology, Minerals, Topography
Alternative B would involve the same quantity of overburden rock and ore as the Proposed Action although all overburden would be returned to the open pits as backfill. This would require rehandling 36 percent of the overburden compared to 4 percent for the Proposed Action and 16 percent for Alternative A. Economics of higher mining costs involved with this greater rehandle quantity result in revisions of the mining plans to reduce the stripping ratio yielding less recoverable phosphate resource than either Alternative A or the Proposed Action. After backfilling the pits, the highwall in Panel B would be completely eliminated and the top of the Panel B backfill would be higher than Alternative A or the Proposed Action. The highwall in Panel C would total 3,100 feet in length and vary from 50 to 150 feet high. The backfilling of the pits would use 100 percent of the overburden and no overburden would be placed permanently in the external overburden disposal site. Seleniferous overburden would be placed only in the pit backfills totaling 478 acres compared to 722 acres for the Proposed Action. Acid rock drainage is not expected to result from the Alternative. Seleniferous overburden could be leached by infiltration of precipitation and resulting seepage from the bottom of the overburden fills is expected to have concentrations of cadmium, manganese, selenium, sulfate and TDS greater than groundwater or surface water quality standards.

Air Resources and Noise
The impacts from noise for Alternative B would be essentially the same as the Proposed Action with the exception that the duration of the noise would extend 21 months longer than the Proposed Action and 11 months longer than Alternative A. The increases in loading, unloading, hauling, and active disturbance activities in Alternative B all contribute to the increase and duration of airborne particulate. The annual total suspended particulate emissions for Alternative B would be 1,548 TPY instead of 1,242 TPY for Alternative A and 486 TPY for the Proposed Action.

Water Resources
There is no difference in the amount of disturbed acreage between the Proposed Action and Alternative A or Alternative B thus the annual amount of increased sediment loading and surface runoff reduction would be the same for all three conditions. The time period of these impacts under Alternative B would be extended by about 21 months compared to the Proposed Action and 11 months compared to Alternative A. The total quantity (CY) of seleniferous overburden potentially subject to leaching is the same as for the Proposed Action and Alternative A. The area of seleniferous overburden disposal would be the same as Alternative A and the area of groundwater quality impacts would also be the same as Alternative A. Approximately 36 percent of the total overburden would be rehandled in this Alternative which would extend the time period when this material would be subject to weathering and erosion before it is capped, compared to 16 percent for Alternative A, and 4 percent for the Proposed Action. The modeled groundwater impacts for Alternative B are the same as for Alternative A. However, currently un-quantified, potential increases in concentrations of COPCs in seepage from the B Panel backfill could result in higher groundwater concentrations under Panel B compared to the Proposed Action.

Soil and Watershed
Alternative B would disturb the same amount of currently undisturbed soil and watershed as the Proposed Action producing the same direct and indirect impacts to soils and watersheds. Capping approximately 478 acres of seleniferous overburden with 9 to 11 feet of chert and topsoil would isolate the seleniferous material from the effects of erosion and biological uptake. This is the same as for Alternative A and is less than the 722 acres of seleniferous overburden in the Proposed Action. All 618 acres of new disturbance would be covered with topsoil for reclamation and another 217 acres of existing mine disturbance would also be topsoiled. The time period of active mining and reclamation activities would be extended by 21 months over the Proposed Action and by 11 months over Alternative A.

Vegetation
The initial disturbance area for Alternative B would be the same as for the Proposed Action and Alternative A. The area of seleniferous overburden that would be capped would be 478 acres compared to 722 acres for the Proposed Action and 478 acres for Alternative A. The time period of active mining disturbance would be extended by 21 months over the Proposed Action and by 11 months over Alternative A.

Wetlands
The impacts to wetlands from Alternative B would be essentially the same as the Proposed Action and Alternative A except that the time period for active mining operations and subsequent erosion and sediment production be extended by 21 months over the Proposed Action and by 11 months over Alternative A.

Wildlife
The impacts to grazing from Alternative B would be essentially the same as the Proposed Action and Alternative A except that the time period for direct exposure to seleniferous overburden before it is capped would be extended by 21 months over the Proposed Action and by 11 months over Alternative A.

Fisheries and Aquatics
The impacts to fisheries and aquatics habitat from Alternative B would be the same as for the Proposed Action and Alternative A with the exception that the period of active mining disturbance would be extended by 21 months over the Proposed Action and 11 months over Alternative A.

Threatened, Endangered and Sensitive Species
The impacts to threatened, endangered and sensitive species under Alternative B would be the same as for the Proposed Action and Alternative A with the exception that the period of active disturbance would be extended by 21 months over the Proposed Action and 11 months over Alternative A.

Grazing Management
The impacts to grazing from Alternative B would be essentially the same as the Proposed Action and Alternative A except that the time period for disturbance would be extended by 21 months compared to the Proposed Action and 11 months compared to Alternative A.

Recreation and Wilderness
Alternative B would have the same impacts on recreation and wilderness as the Proposed Action although the time period of these impacts would be 21 months longer than the Proposed Action and 11 months longer than Alternative A.

Visual Resources
Visual impacts from Alternative B would be slightly less than the Proposed Action and Alternative A. The external overburden disposal facility site would be utilized only temporarily and reclaimed. No residual high wall would remain in Panel B. The period of disturbance before reclamation is completed would be extended by 21 months over the Proposed Action and 11 months over Alternative A.

Cultural Resources
No impacts to recorded NRHP eligible cultural resource sites would occur as a result of Alternative B.

Social and Economic Values
No additional employees would be needed for Alternative B compared to the existing mining operations so there would be no increase in local population due to this Alternative. Impacts to local community services and housing would be negligible. Public resource (phosphate) utilization would be less for Alternative B than for the Proposed Action or Alternative A if the mine plans were adjusted for the higher mining costs related to more backfill. Double handling 36 percent of the overburden would add $17,900,000 to the rehandling and reclamation cost over the cost of the Proposed Action.

Native American Religious Concerns
No direct or indirect impacts related to Native American religious or traditional uses of the Alternative B area have been identified. No Traditional Cultural Place or Property has been identified in the area of Alternative B or in the Cumulative Effects area.

Environmental Justice
There would be no environmental justice impacts from the Alternative B because there would be no socioeconomic or demographic changes caused by the Alternative.

Final Supplemental EIS

Smoky Canyon Mine
Chapter 1- Introduction/Purpose and Need

Smoky Canyon Mine Final Supplemental EIS

Chapter 1
Introduction/ Purpose & Need

1.0 Introduction

This Supplemental Environmental Impact Statement (SEIS) is being prepared by the Bureau of Land Management (BLM), Pocatello Field Office, and the U.S. Forest Service (USFS), Caribou-Targhee National Forest, to document the analysis, disclose the environmental and human effects of mining, and develop site-specific environmental protection measures for the operation of Panels B and C at the existing J.R. Simplot (Simplot) Smoky Canyon Phosphate Mine, Caribou County, Idaho. The general project area is shown on **Figure 1.0-1.** The existing and proposed operations are shown on **Figure 1.0-2**.

The document that forms the basis for this SEIS is the 1982 Final Environmental Impact Statement (EIS), Smoky Canyon Phosphate Mine (USGS/ USFS, 1982). The 1982 EIS described and analyzed the mining of five panels, A through E, at the Smoky Canyon Mine over a period of 30 years. Under the 1982 approval, Simplot was required to submit site-specific mine plans to the agencies prior to initiation of mining activities in each of the five mine panels for the purpose of developing appropriate site-specific environmental protection measures and ensuring ultimate maximum recovery of the mineral resource.

The National Environmental Policy Act (NEPA) also requires supplemental analysis of environmental conditions if there are significant new circumstances or information relevant to environmental concerns and bearing on the proposed action or its impacts. Past investigations have indicated that the Middle Waste Shale at Smoky Canyon has elevated selenium concentrations with the potential for mobilization into the environment. Site-specific sampling has indicated the presence of elevated selenium concentrations in reclaimed surfaces and vegetation growing on these surfaces. Selenium concentration is also elevated in Pole Canyon Creek, Hoopes Spring, and Sage Creek downstream of the Smoky Canyon Mine.

Because of the growing understanding of the selenium issue both regionally and at the site, the Smoky Canyon Proposed Action warrants additional environmental analysis, and implementation of appropriate mitigation to reduce the potential for selenium impacts to the environment.

The proposed B and C Panel mining operations would be located within the Caribou-Targhee National Forest on phosphate leases administered by the BLM. Portions of the facilities would extend off lease on National Forest and private lands. Mining would take place on Federal Phosphate Leases I-012890 and I-026843. The BLM is lead agency for this SEIS; the USFS is a joint lead agency.

The agencies will use the SEIS to evaluate methods to reduce or eliminate release of selenium and other trace elements from the proposed mining activities. Development of site-specific alternatives or mitigation measures are needed to ensure environmental protection and conservation of the existing non-renewable phosphate resources. The agencies will review the Panel B and C Mine and Reclamation Plan to

determine the adequacy of environmental protection, applicable rules, guidance and agency requirements, and determine appropriate alternatives or additional mitigation measures to be applied to the project.

1.1 Background

As noted in the introduction, the existing Smoky Canyon mining and milling operations were authorized by a Record of Decision that was issued in 1982 with the Smoky Canyon Phosphate Mine Final EIS. Mining operations began in Panel A in 1984, followed by the mining of Panel D. Both of these Panels have been completed. The mining of Panel E commenced in 1998 and is ongoing.

In June 1999, Simplot submitted detailed plans (Mine Plan, 1999) for the mining of phosphate ore in Smoky Canyon Mine Panels B and C. At that time, the BLM and USFS determined that a supplemental EIS should be conducted to review these mining plans and develop site-specific impact mitigation measures in light of significant new information that had recently become available on selenium and Canada Lynx (*Lynx canadensis*), a listed species, which was not reviewed in the 1982 Smoky Canyon EIS.

This document follows regulations promulgated by the Council on Environmental Quality (CEQ) for implementing the procedural provisions of the National Environmental Policy Act (NEPA) (40 CFR 1500-1508), BLM's NEPA Handbook (H-1790-1), and the USFS Handbook of Environmental Policy and Procedures (USFS H1909.15). This SEIS describes the components of, and reasonable alternatives to the Proposed Action, and environmental consequences of this action and the alternatives.

- *Chapter 1* describes the purpose of and need for the implementation of mining in Panels B & C of the Smoky Canyon Mine; roles of the BLM and USFS; public participation in the SEIS process; and general project history.
- *Chapter 2* provides a historical perspective of phosphate mining in the project area; describes existing and proposed operations; presents and compares alternatives to the Proposed Action; and lists potential mitigation actions to reduce or minimize impacts.
- *Chapter 3* describes the affected environment in the Smoky Canyon area.
- *Chapter 4* details the potential direct, indirect, and cumulative impacts associated with the Proposed Action and Alternatives.
- *Chapter 5* describes consultation and coordination with state and federal agencies and provides a list of the SEIS preparers.
- *Chapter 6* lists references cited in developing the SEIS, as well as providing the index, acronyms, units of measure, and glossary of terms.
- *Chapter 7* provides all the text of public and agency comment letters received on the Draft SEIS, and responses to those comments.

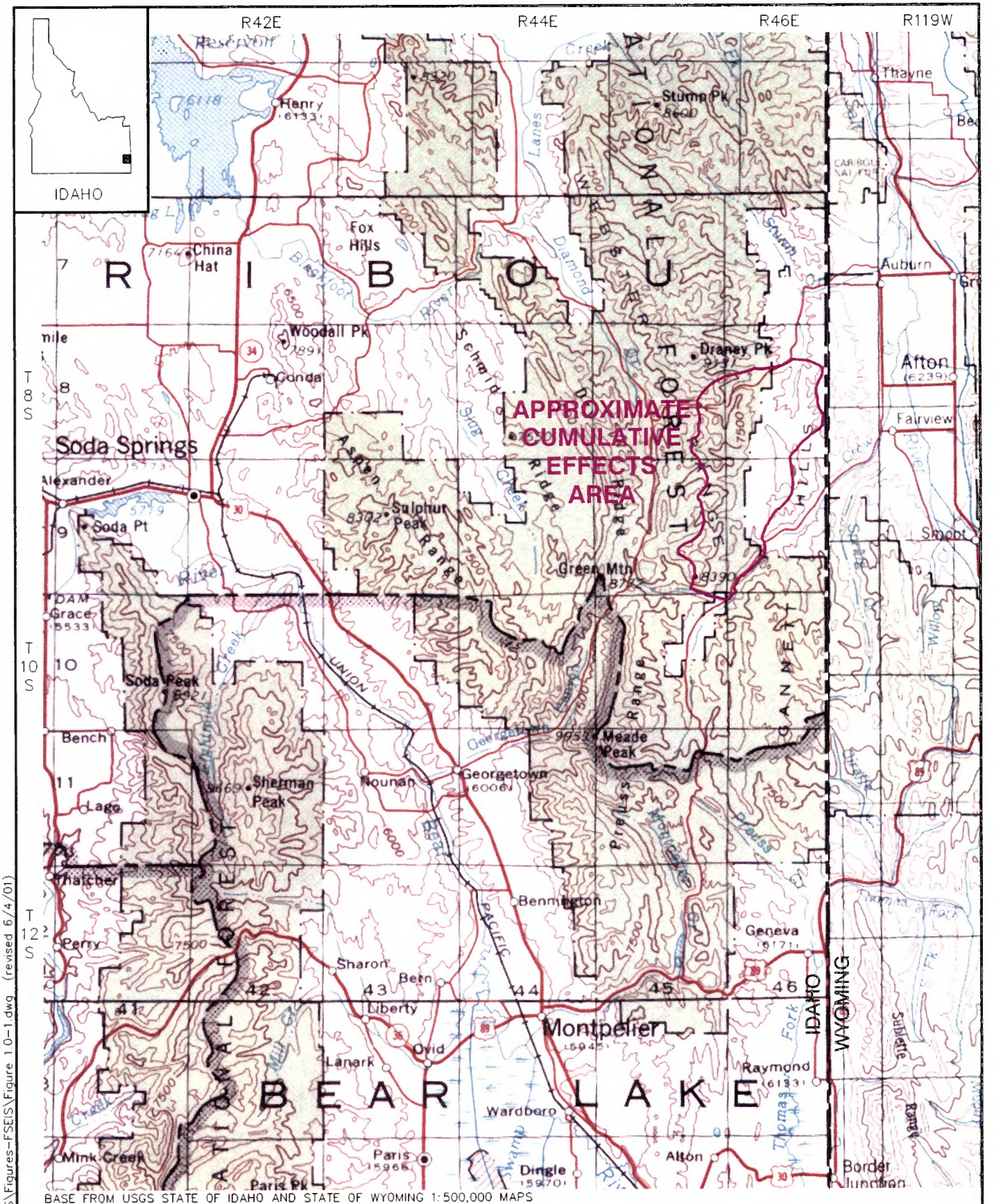

FIGURE 1.0-1
LOCATION MAP
SIMPLOT SMOKY CANYON MINE PANELS B&C
SUPPLEMENTAL EIS

drawings\Simplot\FEIS\Figures-FSEIS\Figure 1.0-1.dwg (revised 6/4/01)

T 8 S
T 9 S
T 10 S
R 45 E
R 46 E

TAILINGS POND 2

TAILINGS POND 1

TAILINGS PIPELINE

PROPOSED B-PANEL

PROPOSED C-PANEL

PROPOSED OVERBURDEN DISPOSAL SITE

A-PANEL

D-PANEL

E-PANEL

MILL SITE

CONCENTRATE SLURRY PIPELINE

SIMPLOT\FSEIS\Figures-DFSEIS\Figure 1.0-2.dwg (revised 12/14/01)

4000 0 4000 FEET

EXPLANATION

- Cumulative Effects Area (Except for Minerals)
- Proposed Mine Disturbance
- Existing Mine Disturbance
- Existing Tailings Ponds
- Lease and Special Use Permit Boundaries

FIGURE 1.0-2
PROJECT AREA MAP
SIMPLOT SMOKY CANYON MINE PANELS B&C
SUPPLEMENTAL EIS

1.2 Purpose And Need

The purpose of the Proposed Action is to recover phosphate ore reserves contained within Panels B and C, to mill the ore on-site and to transport it to the Don Plant in Pocatello via an existing pipeline. The Proposed Action is needed to continue economically viable development of the phosphate resources within the federal mineral leases to supply phosphate ore to Simplot's fertilizer plant. The plant produces phosphate based fertilizer to help meet demands in the United States.

1.3 Authorizing Actions

The BLM Idaho State Director, who is the responsible official for the SEIS and on-lease lands, will make a decision related to appropriate land use authorizations regarding this proposal. This manager will consider the following: scoping comments and responses; anticipated environmental consequences discussed in the SEIS; and applicable laws, regulations, and policies. The Caribou-Targhee National Forest Supervisor, who is the responsible official for Caribou-Targhee National Forest lands, has provided recommendations to the BLM related to the selection of the preferred alternative and appropriate site-specific conditions of approval. The BLM will finalize and sign the Record of Decision. The regulatory approvals may include approval of a site-specific Mine and Reclamation Plan; possible issuance of phosphate lease modifications by the BLM; and special use permits by the USFS. A Section 404, Clean Water Act Permit, may also be required by the U.S. Army Corps of Engineers (USCOE). The USCOE would render a decision related to that permit and how to mitigate the impacts to affected wetlands and Waters of the United States. The enforcement of Federal laws that protect Migratory Birds and Endangered Species lies with the U.S. Fish and Wildlife Service (USFWS) and not primarily with the land management agencies. The USFWS has reviewed a Biological Assessment for listed plant and animal species prepared by the USFS for the Proposed Action and Alternatives. The USFWS will conduct consultations with the land management agencies and Simplot as they deem necessary and provide direction as required for protection of species within their regulatory authority.

The existing and proposed mining operations must comply with laws and regulations for mining on public land. A summary of these regulations is included in **Appendix 1A**.

In addition to the BLM and USFS, other federal, state and local agencies have jurisdiction over certain aspects of the Proposed Action. **Table 1.3-1** lists the agencies and identifies their respective authorizing responsibilities.

Table 1.3-1 Major Permits, Approvals, and Consultations Potentially Required for the Smoky Canyon Mine, Panels B & C

Issuing Agency/ Permit or Approval Name	Nature of Permit Action	Applicable Project Component	Status of Permit or Approval Action
BLM			
Record of Decision	Compliance with National Environmental Policy Act (NEPA)	Activities affecting federal lands and resources	Required for final approval
Mine and Reclamation Plan	Compliance with 43 CFR 3590.2a, 3592.1a	Activities affecting federal leased mineral resources	Pending after Record of Decision on the final SEIS
Lease Modification	Authorizing portions of the Mine Plan	Activities affecting federal lands and resources	Pending after Record of Decision
USFS			
Special Use Permit	Surface disturbance on USFS-managed lands	Disturbance of USFS land off lease	Current Permit is approved
ENVIRONMENTAL PROTECTION AGENCY (EPA)			
National Pollution Discharge Elimination System (NPDES) Permit	Protects quality of surface waters from stormwater discharge, under Clean Water Act	Storm Water Pollution Prevention Plan (SWPPP)	Recently issued; expires 2005;SWPPP updated
Spill Prevention Control and Countermeasure Plan (SPCC)	Provides management direction for spills	Bulk petroleum products storage	Revised April 2000; no change required
U.S. FISH & WILDLIFE SERVICE			
Endangered Species Act Compliance (Section 7)	Protects threatened or endangered species	Any activity, such as blasting or habitat disturbance potentially affecting listed or proposed threatened or endangered species	Biological Assessment/ Biological Evaluation (BA/BE) has been prepared; consultation is underway
Migratory Bird Treaty Act	Protects migratory birds	All surface disturbing activities	BA/BE is complete
Bald Eagle Protection Act	Protects bald and golden eagles	All surface disturbing activities	BA/BE is complete
CORPS OF ENGINEERS			
Permit to Discharge Dredged or Fill Material (Section 404 Permit)	Authorized placement of fill or dredged material in Waters of the U.S. or adjacent wetlands	Smoky Creek drainage	Application has been filed to seek approval before construction
BUREAU OF ALCOHOL, TOBACCO, & FIREARMS			
High explosives permit	Possession of explosives	Blasting in open pits	No additional approval required
IDAHO DEPT. OF ENVIRONMENTAL QUALITY			
Air Quality Permit	Release of air pollutants	Elements which contribute to air quality issues, such as blasting and hauling	Required air approvals for property already in hand

Table 1.3-1, continued.

Issuing Agency/ Permit or Approval Name	Nature of Permit Action	Applicable Project Component	Status of Permit or Approval Action
Resource Conservation and Recovery Act program (adopted federal standards)	Management of hazardous waste	Storage and off-site disposal of hazardous wastes	Exempt Small Quantity Generator Notification already completed
Board of Health & Welfare	Governs quality & safety of drinking water	Culinary water supply	No additional approval required
Consent Order	Groundwater Protection	Seleniferous Overburden	Pending
IDAHO DEPT. OF WATER RESOURCES			
Stream Channel Alteration Permit	Protection of stream channels	Smoky Creek road crossings	Permit issued
IDAHO DEPARTMENT OF LANDS			
Mine Reclamation Plan Permit	Permit and bonding for reclamation	Mining and reclamation plans	Required for mining regulated by federal agencies
IDAHO DIVISION OF STATE HISTORY			
Section 106 Compliance	Protects cultural and historical resources	All ground disturbing activities	As required
CARIBOU COUNTY			
Conditional Use Permit	Approval of construction of facilities within an approved land use	General facilities	No additional permit required

1.4 Relationship to Agency and Other Policies and Plans

The Proposed Action has been reviewed for compliance with agency policies, plans, and programs. The proposal is in conformance with minerals decisions in the Record of Decision, Pocatello Resource Area, Resource Management Plan (BLM, 1987), approved in 1988. The USFS has also determined that the proposed mining of Panels B & C at the Smoky Canyon Mine can be implemented in compliance with the Caribou National Forest Land and Resource Management Plan (LRMP) (USFS, 1985). Page III-2 of the LRMP includes the statement, "Non-renewable resource development will override renewable resource development as a featured resource use". On page III-20 it says, "Mineral resources of the Forest that can be produced at a profit, after consideration of the costs of mitigating measures necessary to protect surface resource values will be produced to meet demands." Included in costs considered are post mining reclamation costs. Smoky Canyon is in the LRMP list of leases planned to come into production during the planning period.

The Caribou National Forest has recently released a Draft Revised Forest Plan (USFS, 2001) for the Caribou portion of the Caribou-Targhee National Forest. The Preferred Alternative in the Draft utilizes an adaptive approach to reclamation measures. The proposed project is in compliance with the revised Forest Plan which includes the following description of the desired future condition for reclamation of mined/drastically disturbed lands: "Drastically disturbed sites are reclaimed emphasizing: 1) suitable

topsoil preservation; 2) use of native plant species; and 3) stable topographic relief that visually conforms to natural surroundings" (USFS, 2001, p3: 11). The approach for active phosphate leases in the revised Forest Plan (USFS, 2001, p4: 79) is to incorporate BMPs into the conditions of approval for site-specific mining and reclamation plans, and to allow for developments in research and technology over time to be incorporated into the prescribed practices and monitoring systems.

1.5 Public Scoping

The Notice of Intent (NOI) for the Smoky Canyon Mine EIS was published in the Federal Register on March 24, 2000. A copy of this NOI is included in the *Public Involvement Plan, Smoky Canyon Mine Panels B and C Supplemental EIS* (JBR, 2000a). A legal notice was published in Pocatello, Idaho (March 28, 2000) and Afton, Wyoming (March 30, 2000) newspapers. A news release was also published in Pocatello and Soda Springs, Idaho, and Afton, Wyoming newspapers.

The public mailing list was compiled and 170 scoping letters were sent to interested individuals, agencies, and groups. Two public meetings were held. One meeting was held in Afton, Wyoming on April 17, 2000 at Star Valley High School, and the other in Pocatello, Idaho on April 18, 2000 at the BLM Pocatello Field Office. The open house meetings provided a project description, photo displays of the project area, and a forum for exchange of information and ideas or concerns related to the project. Comment forms were available at the meetings. Agency and consultant representatives were present and included Jeff Cundick of the BLM, Cheryl Probert and Jeff Jones of the USFS, and Brian Buck and Joe Jarvis of JBR Environmental Consultants, Inc. (JBR).

Public comments regarding the proposed project were solicited and then compiled in the Public Scoping Summary (JBR, 2000b) to help determine the issues and alternatives for evaluation in the environmental analysis. Identified issues included potential effects of the proposed project on water quality; wildlife and fishery habitats; soils; socioeconomics; and development of best management practices (BMP's) for mine operations.

Native American Consultation

The federal agencies are required by law (Archaeological Resources Protection Act of 1979 and National Historic Preservation Act of 1966) and regulation to consult with Native Americans on actions that may affect their traditions or uses of public lands. Specifically, the agencies are required to follow the Section 106 process as recorded in 36 CFR 800 - Subpart B as revised July 1, 2000. The Native Americans should comment on proposed actions and participate in decisions prior to implementation.

The goal of the BLM Manual Section 8160 is to "assure that tribal governments, Native American communities, and individuals whose interests might be affected have a sufficient opportunity for productive participation in BLM planning and resource management decision making." Federal agencies also have a trust responsibility to federally recognized tribes. This trust responsibility is reflected in language contained in BLM Manual Section 8160. To this end, the Pocatello BLM Field Office has continued consultation with the Native Americans represented in southeast Idaho.

During the public scoping process the following Native American organizations were contacted via the scoping letter:

Shoshone-Bannock Tribes
Tribal Land Use Commission
Fort Hall, Idaho 83203

Mr. Keith Tinno
Chairman, Fort Hall Business Council
Shoshone-Bannock Tribes
P.O. Box 306
Fort Hall, Idaho 83203

Duane Thompson, Supt.
US Bureau of Indian Affairs
Fort Hall Agency
P.O. Box 220
Fort Hall, Idaho 83203

No responses were received from the scoping letters or through the public meeting process. To fully engage the Native Americans in the scoping process, plans were initiated for a site tour and informational meeting. The Smoky Canyon site tour was completed on August 22, 2000 with five individuals attending from Fort Hall. Those attending included:

Curtis Farmer - Land Use Commissioner
Maxene Edmo - Land Use Commission
Susan Hanson - CERCLA/RCRA Program Manager
Sam Hernandez - BIA Agricultural Engineer
Dan Christopherson - Wildlife Biologist for Tribes

A complete description of the Native American consultation process is provided in **Appendix 1B**.

1.5.1 Comment Letters

By the close of the scoping period on April 30, 2000, eleven comment letters, four comment forms, and one e-mail comment had been received for the Smoky Canyon Mine Project. Two additional letters and one additional comment form were received after the end of the scoping period. Comments were submitted by the following entities:

FEDERAL AGENCY

U.S. Environmental Protection Agency (EPA), Region 10, Idaho Operations Office
Boise, Idaho

STATE AGENCIES

State of Idaho, Division of Environmental Quality, Pocatello, Idaho
Idaho Fish & Game, Pocatello, Idaho
State of Wyoming, Office of Federal Land Policy, Cheyenne, Wyoming
State of Wyoming, Department of Environmental Quality, Cheyenne, Wyoming

INTEREST GROUPS

Idaho Rivers United, Boise, Idaho
Greater Yellowstone Coalition, Idaho Representative, Idaho Falls, Idaho

BUSINESSES & INDIVIDUALS

Anonymous
Bullis, Rick, Soda Springs, Idaho
Erickson, McKay L., Afton, Wyoming
Jensen, Rod, Afton, Wyoming
McFarland, Annette, Lava Hot Springs
Reide, Peter M., Oakland, Michigan
Solutia - David Farnsworth, Soda Springs, Idaho
Western States Equipment Company, Boise, Idaho

1.5.2 Issues

The scoping comments were examined for common themes and issues. The comments were then combined, as appropriate, into issues. The issues were further organized by resource to define significant issues that would assist in formulation of alternatives. A description of the comments by topic, the corresponding SEIS section, and the disposition of the comment is provided in **Table 1.5-1** below.

Table 1.5-1 Scoping Summary Smoky Canyon Mine Panels B and C

Comment	SEIS Section	Disposition of Comment
PROPOSED ACTION		
Identify selenium impacts of phosphate mining in general and address concerns that phosphate mining cannot occur at this or similar sites without significant environmental damage.	Chapter 2 - Proposed Action Chapter 4 - Identify past, present, and foreseeable Impacts	Impacts from phosphate mining at this or similar sites have been addressed along with action necessary to mitigate environmental damage.
Describe methods to minimize external disposal of seleniferous overburden(i.e., selective handling of mine overburden).	Chapter 2 - Proposed Action and Alternatives	Methods to handle seleniferous overburden have been described in the alternatives.
Evaluate a pit backfill alternative as part of the mine plan.	Chapter 2 - Proposed Action and Alternatives	Backfill is part of the Proposed Action and two Alternatives.
Provide information on potential connected actions including the current status, future plans, and reclamation of the tailings ponds, existing overburden dumps, and open pits.	Chapter 2 - Proposed Action	Current status, future plans, and reclamation of tailings ponds, existing overburden dumps and open pits have been described.
Identify mitigation of existing impacts from inactive, active, and proposed mine components.	Chapter 2 - Proposed Action Chapter 4 - Environmental Consequences and Cumulative Effects	Existing mitigation and general plans for additional mitigation of current impacts are described.

Table 1.5-1, continued.

Comment	SEIS Section	Disposition of Comment
VISUAL RESOURCES		
Examine the aesthetic impacts of the proposed project.	Chapters 3/4 - Visual Resources	Visual impacts are described.
ALTERNATIVES		
Identify measures for each alternative that would reduce bioavailability or wildlife exposure to the potential contaminants of concern and predict the environmental outcome for each alternative.	Chapter 2 - Proposed Action and Alternatives Chapter 4 - Impacts and potential Mitigation	Affects of the Proposed Action and Alternatives on selenium bioavailability are discussed in all physical resource sections.
Analyze monetary costs of proposal, including all reasonable alternatives.	Chapter 2 - Alternatives to the Proposed Action Chapter 4 - Impacts and potential Mitigation	Costs of mine reclamation for the Proposed Action and Alternatives are presented.
Consider a full range of alternatives such as selective handling of waste, complete backfill of pits, and elimination of external waste dumps.	Chapter 2 - Alternatives to the Proposed Action	Selective handling, placing all overburden back in open pits, and elimination of external waste dumps are evaluated.
ECONOMIC AND SOCIAL VALUES		
Socioeconomic impacts including unemployment, local tax revenues, and royalties paid to the state of Idaho should be evaluated.	Chapters 3/4 - Social and Economic Resources	Unemployment, local tax revenues, and royalties paid to the State of Idaho are evaluated.
Recognize Simplot's valid rights under the Mineral Leasing Act, lease, and prior governmental approvals.	Chapter 1 - Authorizing Actions	Existing approvals, leases, and permits are described.
Long-term and short-term economics need to be explored.	Chapters 3/4 - Social and Economic Resources	Historic effects of mining on the economy are described as well as effects in the near future.
The No Action Alternative should address socio-economic impacts to the towns of Afton, Wyoming, and Pocatello, Idaho, as well as Caribou County.	Chapter 2 - Alternatives to the Proposed Action Chapters 3/4 - Social and Economic Resources	Economic effects of adopting the No Action Alternative are described.
TRANSPORTATION/RECREATION/WILDERNESS		
Describe the impacts of the proposed mine activities on land and/or river-based recreation.	Chapters 3/4 - Recreation and Wilderness	Impacts to recreation are described.
Evaluate short-term and long-term public access and use of public lands, including adjacent private lands.	Chapters 3/4 - Recreation and Wilderness	Effects on public access and use of lands within and adjacent to the subject area are described.

Table 1.5-1, continued.

Comment	SEIS Section	Disposition of Comment
MITIGATION MEASURES		
Determine effectiveness of the previously implemented Best Management Practices (BMPs) .	Chapter 3/4 - Water Resources Wildlife Resources Soil and Watershed Vegetation	Effectiveness of existing BMPs is reflected in the description of the Affected Environment within each physical resource section.
Demonstrate how continued implementation of BMP's as currently used and under development would effectively address environmental impacts to resources.	Chapter 2 - BMPs Chapter 3/4 - Geology/Minerals/Topo Water Resources Wildlife Resources Soil and Watershed Vegetation	Use of management practices to address environmental impacts is discussed in each physical resource section.
Measures to replace lost wetlands and riparian habitat should be described.	Chapter 4 - Wetlands	Wetland mitigation is described in general terms.
Measures should be implemented to reduce, avoid, or compensate for habitat loss.	Chapter 2 - Proposed Action Chapters 3/4 - Wildlife Resources Vegetation	Reclamation measures to restore habitat are described.
Identify mitigation measures associated with selenium.	Chapter 2 - Proposed Action, BMPs; Historic Mining Environmental Impact Investigation Report	Measures to control mobilization of selenium are described.
Implementation of mitigation measures should be described.	Chapter 2 - Proposed Action and Alternatives, BMPs Practices	Timing of mitigation measures is described.
Evaluate a comprehensive cleanup plan for past and current operations.	Chapter 2 - Reclamation; Historic Mining Environmental Impact Investigation Report	Simplot has committed in their "Historic Mining Environmental Investigation Report" to further investigate the site under an "Administrative Order on Consent" with the Forest Service and other regulatory agencies.
NOISE		
Evaluate noise abatement measures.	Chapter 2 - Proposed Action Chapters 3/4 - Air Quality/Noise	Noise impacts are evaluated showing no need for abatement.
RECLAMATION		
Identify measures for the general protection of the environment after mining has been completed.	Chapter 2 - Proposed Action Reclamation; Monitoring Plan	Reclamation and monitoring measures are described.
Identify post-mining measures to monitor selenium and other metals in the environment, and develop analysis of trends.	Chapter 2 - Proposed Action, Monitoring Plan	Detailed monitoring plans are described.
The Reclamation Plan should be described.	Chapter 2 - Proposed Action	The general reclamation plan is described. Detailed reclamation plans will be developed prior to approval of the operations.

Table 1.5-1, continued.

Comment	SEIS Section	Disposition of Comment
SOILS		
Identify sediment and chemical environmental impacts including sedimentation, erosion control, and run-off.	Chapter 2 - Proposed Action Chapter 4 - Soil and Watershed Water Resources	Sedimentation and chemical impacts are described. Control of run-off and erosion are also described.
A mitigation plan should be developed to alleviate sedimentation and erosion.	Chapter 2 - Proposed Action, BMPs Chapter 4 - Soil and Watershed	A detailed Stormwater Pollution Prevention Plan has been developed by Simplot.
Existing soil characteristics should be described.	Chapter 3 - Soil and Watershed	Existing native and reclaimed soils areas are characterized.
THREATENED, ENDANGERED AND CANDIDATE SPECIES		
Describe the impact on threatened, endangered, or sensitive species (TES).	Chapters 3/4 - Threatened, Endangered, and Sensitive Species Biological Assessment/ Biological Evaluation (BA/BE)	TES species are presented in Chapter 3; potential impacts to these species in Chapter 4.
Evaluate potentially occurring species of concern.	Chapters 3/4 - Threatened, Endangered, and Sensitive Species	Impacts to Species of Concern have been evaluated.
Effects of the project on rare or threatened plant and wildlife species should also be included.	Chapters 3/4 - Threatened, Endangered, and Sensitive Species	Impacts on rare or threatened plant and wildlife are detailed in the BA/BE.
VEGETATION		
Evaluate the potential long-term loading of selenium and other contaminants in vegetation.	Chapters 3/4 - Vegetation	Selenium uptake in vegetation is discussed in Vegetation and Cumulative Effects sections.
Describe measures to address potential adverse effects to domestic animals, violations of ambient water quality standards, and exceedance of grazing advisory levels in vegetation.	Chapter 2 - Proposed Action Chapter 4 - Vegetation Water Resources	The proposed management practices and mitigation measures for areas of seleniferous overburden would reduce selenium exposure in exceedance of grazing advisory levels or ambient water quality standards.
Identify the effects of the project on habitat conditions.	Chapters 3/4 - Vegetation Wildlife Resources	Habitat effects are described.
WATER RESOURCES		
Examine the impact of the proposed activities on streams within the project area, including impacts on water quality, native fish and fish habitat, and overall stream health.	Chapters 3/4 - Water Resources, Fisheries & Aquatic Resources, Watershed Analysis	Impacts to water quality and aquatic habitat are described in applicable physical resource section.

Table 1.5-1, continued.

Comment	SEIS Section	Disposition of Comment
Identify the short-term and long-term effects of placing Smoky Creek in a culvert for an extended distance, especially regarding ground and surface water, seeps, wetlands, springs, and channel stability.	Chapter 2 - Project Alternatives Chapter 3/4 - Water Resources	The long culvert proposed in the 1999 mine plan has been eliminated from the Proposed Action and Alternatives and replaced with culverts of typical lengths for road crossings.
Re-alignment of Smoky Creek will require a Stream Alteration Permit.	Chapter 1 - Authorizing Actions	A Stream Alteration Permit has been received by Simplot.
Analyze the mobilization and accumulation of selenium and other possible contaminants in surface and groundwater and other environmental media.	Chapters 3/4 - Water Resources	Potential mobilization of selenium and other contaminants in surface and groundwater have been addressed and compared to applicable standards.
Surface water sediment and impacts to aquatic habitat should be addressed.	Chapters 3/4 - Water Resources	Sediment impacts to aquatic resources should be minimal with use of BMPs.
Identify key relationships, including contaminant mobilization mechanisms, potential exposure routes, and relevant information on environmental chemistry and ecotoxicity.	Chapter 4 - Water Resources Geology/Minerals/Topo Vegetation Soils and Watershed Wildlife Fisheries and Aquatics	Contaminant mobilization mechanisms, exposure pathways and toxicity have been described in applicable physical resource sections.
Determine the amount of water that is currently being pumped out of the area and provide an estimation of future amounts.	Chapter 4 - Water Resources	The amount of water currently being pumped out in the concentrate slurry pipeline is 780 acre-feet per year and this will not change in the future.
Indicate the source of the water currently being pumped and the potential effect on area streams and the aquifer.	Chapters 3/4 - Water Resources	Source of water currently being pumped is the Wells Formation and monitoring of area streams has shown no flow impacts from this pumping.
Existing water quality should be described.	Chapter 3 - Water Resources	Existing water quality is described.
Describe contaminants that have the potential to leave the site and impact water quality within the state of Wyoming.	Chapter 3/4 - Water Resources	Surface water in streams leaving the project area is projected to meet applicable standards; thus, downstream receiving streams in Wyoming would also meet standards.
Identify impacts to Class 2 water bodies within the State of Wyoming.	Chapter 3/4 - Water Resources	Wyoming receiving streams would continue to meet standards.

Table 1.5-1, continued.

Comment	SEIS Section	Disposition of Comment
Describe compliance with water quality standards for protected uses on Class 2 water bodies in Wyoming (including human consumption, fisheries, recreation, agriculture, industry, and scenic value).	Chapter 2 - Proposed Action Chapter 3/4 - Water Resources	There should be no impacts from the project on the ability to meet applicable standards on Class 2 receiving streams in Wyoming.
Prevention of water degradation or mitigation efforts should be identified.	Chapter 2 - Proposed Action Chapter 4 - Water Resources	Management practices for protection of water quality are described.
Eligibility studies should be performed on any streams in the project area that have not yet been studied for Wild and Scenic eligibility.	Chapter 3 - Water Resources Recreation/Wilderness	Smoky Creek is not eligible for Wild and Scenic designation.
Impacts of proposed activities on Wild and Scenic eligible, suitable, or designated rivers should be carefully examined.	Chapter 3/4 - Water Resources Recreation/Wilderness	There would be no impacts from the Proposed Action or Alternatives on Wild and Scenic rivers.
WILDLIFE/FISHERIES		
Identify the potential impacts to fisheries and other species dependent on the aquatic environment.	Chapters 3/4 - Wildlife Resources Water Resources Fisheries and Aquatics	Water quality in receiving streams for the Proposed Action and Alternatives would continue to meet applicable water quality standards. Reductions in ephemeral streamflow in Smoky Creek would not negatively impact fisheries downstream in the creek.
Examine on-going releases from the existing mine area, potential for future releases from the proposal and potential adverse effects to fish and wildlife.	Chapter 4 - Cumulative Effects, Historic Mining Environmental Impact Investigation Report	Simplot has committed in their "Historic Mining Environmental Investigation Report" to further investigate the site under an "Administrative Order on Consent" with the Forest Service and other regulatory agencies.
Identify cumulative impacts to fish and wildlife from past, present, and future mining operations, in combination with other land use impacts.	Chapter 4 - Cumulative Effects, Historic Mining Environmental Impact Investigation Report	Cumulative impacts to wildlife habitat are described.
Describe the potential alteration of fish and wildlife habitat, loss or alteration of terrestrial habitats, and loss of wetland and riparian habitat with implementation of the proposed project.	Chapters 3/4 - Wildlife Resources Vegetation Wetlands Fisheries and Aquatics	Potential impacts to wildlife habitat are described in each applicable physical resource section.
Address the issue of road fill and culverts as fish migration barriers for cutthroat trout and other native fish.	Chapters 3/4 - Wildlife Resources Fisheries	The proposed road fills and culvert are upstream one mile of intermittent channel in Smoky Creek.

Table 1.5-1, continued.

Comment	SEIS Section	Disposition of Comment
Describe how human disturbance and mine pits would create potential disruption of big game movements and habitat use, including continued loss of sage grouse habitat in Roberts Creek.	Chapter 4 - Cumulative Effects Chapters 3/4 - Wildlife Resources	The proposed mine operations would have minimal effect on big game migrations. Existing wildlife habitat will be eliminated in active mining areas. Long-term impacts will be reduced by reclamation activities. Sage grouse habitat would continue to be affected by the tailings operations.
CUMULATIVE IMPACTS		
Past, current, and future activities of this proposal should be assessed along with all other past, current, and future activities in the general area of the project.	Chapter 4 - Cumulative Effects	Past, present and foreseeable future activities in the Cumulative Effects area are described.
Evaluate cumulative effects from past activities at the Smoky Canyon Mines, as well as road, timber harvest, and other activities in the watershed, including effects related to selenium, other toxins, and sediment.	Chapter 4 - Cumulative Effects Watershed Analysis	Cumulative effects from all commercial land uses in the Cumulative Effects Area are described.
Predictions of cumulative effects should be thoroughly documented.	Chapter 4 - Cumulative Effects	Predicted effects are documented using existing data.

1.6 Project History

1.6.1 Background

The bulk of phosphate ore deposits in southeastern Idaho are located in Caribou County. Phosphate ore-bearing rock belonging to the Permian age Phosphoria Formation is repeatedly exposed along large folds, which regionally form northwest trending ridges.

The J. R. Simplot Company has been involved in phosphate mining in southeast Idaho since 1945. It acquired Anaconda Company's fertilizer operations at Conda in 1959. Simplot began extracting raw phosphate ore at its Smoky Canyon Mine in 1984. The operation included mining with standard open pit techniques and then processing the ore on-site in a mill to extract the mineral concentrate from the ore. The concentrate was then pumped through a buried pipeline to Simplot's existing fertilizer manufacturing plant in Pocatello. Initially, five panels or mining areas were proposed for Smoky Canyon. They were A, B, C, D and E **(Figure 1.0-1)**. Mining started at Panel A, and then proceeded to Panel D. Currently mining is taking place in Panel E. Panels B and C are scheduled to be mined when permitting and other regulatory requirements are completed.

1.6.2 Past Environmental Impact Reviews

In 1981, the United States Geological Survey (USGS), in conjunction with the USFS, addressed potential environmental effects of the proposed action through preparation of a Draft EIS. The Final EIS (FEIS) and the Record of Decision for the approval of the mining operations were completed in 1982 and included approval of the following:

- Open pit mining operations in five pits called Panels A through E;
- On-site disposal of mine overburden in two main disposal sites external to the pits called Smoky Ridge and Pole Canyon;
- Construction and operation of a mill and associated power line, water supply wells, and access road;
- Two tailings ponds located east of the mine for disposal of mill tailings;
- Installation of the slurry pipeline to Conda; and
- Reclamation of the facilities upon completion of operations.

In 1991, revisions to the Panel A mine plan were reviewed in an Environmental Assessment (EA) prepared by the BLM, who had taken over management of the federal leases from the USGS. A revision in the mining sequence and development of Panel D was reviewed in a 1992 EA. Mining in Panel E was reviewed in still another EA in 1997. Each of these EAs tiered from the 1982 Smoky Canyon FEIS. The detailed mining plans and proposed mining operations for each panel were reviewed, along with identification of the site-specific environmental impact mitigation required to augment the general mitigation actions identified in the FEIS.

Tailings Pond No. 1 was constructed concurrently with the initial mining and milling facilities in 1984. In 1988, plans were completed for construction of an expansion of the tailings pond within the same area identified within the FEIS. In 1990, an EA was prepared by the USCOE for Tailings Dam No. 2 and associated tailings. In this EA, the USCOE reviewed the detailed plans for this facility and developed the plans for environmental impact mitigation.

1.6.3 Selenium Issue History

Selenium is a naturally occurring element that is considered an essential micronutrient for many organisms. However, it can bioaccumulate in the food chain, potentially resulting in selenium poisoning at various trophic levels. The solubility and toxicity of selenium is partially dependent on its chemical form. The mineral chemical forms are essentially insoluble, but the oxidized selenite, selenate, and selenomethionine forms are significantly more soluble and subject to bioaccumulation in the environment.

The interburden and overburden within the Meade Peak Member of the Phosphoria Formation contains shales that regionally have elevated selenium concentrations when compared to the mean selenium concentration in rocks throughout the western United States.

The selenium contained within the overburden removed from the phosphate mine open pits can be subject to oxidation and biological processes that may increase its mobility in the environment. Selenium from this overburden rock can be mobilized from the mine site in dissolved compounds and sediment transported in runoff. Dissolved compounds can be transported in recharge to the groundwater.

In 1997, selenium poisoning was diagnosed in some horses that had been grazing in a pasture downstream of old phosphate overburden dumps within the Maybe Creek area, northwest of Soda Springs. Investigations indicated that surface water leaving the subject mine sites was anomalously high in selenium that originated from mine overburden. In response to this finding, five Idaho phosphate-mining companies, the land management and environmental regulatory agencies, and other organizations joined together to form the *Selenium Working Group*. The group initiated technical studies to better understand the occurrence of selenium within the phosphate mining region in southeast Idaho - in rocks, soils, streams, stream sediments, groundwater, vegetation, and animals and includes the Simplot Smoky Canyon site.

A number of reports have been issued by the Selenium Working Group that describe the methods and findings of the studies to date and recommend management practices for control of selenium from the phosphate mining industry. Some of these management practices have been validated through experience and monitoring as Best Management Practices (BMPs). Others have yet to be validated through monitoring. Simplot has retained the services of the University of Idaho to conduct site-specific selenium studies and recommend potential mitigation measures at the Smoky Canyon site.

The unofficially titled Middle Waste Shale member of the Phosphoria Formation has been demonstrated throughout southeast Idaho to contain selenium at anomalously high concentrations. As a result of monitoring required in the 1983 Record of Decision, selenium has been found in concentrations over background values measured for southeast Idaho in the drainage below Pole Canyon, Sage Creek, Hoopes Springs, and several surface water seeps and springs directly associated with the Smoky Canyon Mine.

In summary, the mining activities described in the Smoky Canyon Proposed Action must incorporate mitigation measures to reduce the potential for selenium impacts to the environment.

Final Supplemental EIS

Smoky Canyon Mine
Chapter 2- Description of the Proposed Action and Alternatives

Chapter 2
Description Of The Proposed Action And Alternatives

2.0 Introduction

This chapter describes Simplot's existing operations at the Smoky Canyon Mine, Simplot's Proposed Action, and the Alternatives to the Proposed Action. The proposed mining operations would consist of two open pits - Panels B and C, topsoil stockpiles, mine equipment parking areas, access and haul roads, a power line relocation, an external overburden disposal area, and runoff/sediment control facilities. Mining would include management practices for control of releases of sediment and dissolved contaminants.

Alternatives considered in the SEIS are based on issues identified by the BLM and the USFS, and comments received during the public scoping process. Alternatives developed for consideration in this SEIS are intended to reduce potential impacts associated with the Proposed Action. Discussions of the following topics are presented in this chapter:

- Simplot's existing mining operations;
- Proposed Action description for Panels B and C;
- Alternatives to the Proposed Action including the No Action Alternative;
- Best Management Practices that are already incorporated in the Proposed Action;
- Summary and Comparison of Alternatives; and
- Alternatives Considered but Eliminated from Detailed Analysis.

2.1 Existing Operations

2.1.1 Location

The Smoky Canyon Mine is located in Caribou County, Idaho approximately ten air miles west of Afton, Wyoming on the east slope of the Webster Range between Smoky Canyon to the north and South Fork Sage Creek to the south. Access to the mine is gained by traveling west from Afton approximately three miles, then north about four miles toward Auburn to the intersection with the Stump-Tygee Road, then approximately eight miles west and southwest to Smoky Canyon.

The Webster Range and Sage Valley to the east are part of the eastern Idaho/western Wyoming overthrust belt of the middle Rocky Mountains Physiographic Province. This province is characterized by northwest trending ridges and valleys. Elevations in the project area range from about 6,600 feet above mean sea level (AMSL) at the mouth of Smoky Canyon to about 8,300 feet AMSL along the ridge of unnamed peaks immediately west of the mine.

The mine office, mill, and maintenance shops are located in Section 25, T. 8 S., R. 45 E. Panels A, D, and E are located north to south along the Boulder Creek Anticline ridge line stretching from Section 30, T. 8 S., R. 46 E. at Smoky Canyon southward 4.5 miles to Section 18, T. 9 S., R.46 E. at South Fork Sage Creek. The north to south trending mining operations are separated into mining panels by the locally east to west trending canyons containing Pole Canyon Creek, Sage Creek, and South Fork Sage Creek.

The tailings ponds are located about 3.2 air miles northeast of the mill site in the Tygee Creek drainage. The mill is connected to the tailings ponds with a pipeline down Smoky Canyon.

2.1.2 Land Ownership

The mining and milling operations are contained within 2,600 acres of federal phosphate mineral leases administered by the Pocatello Field Office of the BLM. The mining operations are located on Federal Phosphate Leases No. I-012890, I-026843, I-027801, I-27512, and I-30369. The federal land surface is administered by the Caribou-Targhee National Forest, Soda Springs Ranger District. The tailings ponds are located on 1680 acres of private land owned by Simplot. Simplot has acquired about 880 acres of additional federal leases contiguous with the current ones and extending south to Deer Creek. **Figure 2.1-1** shows land ownership and the location of current mining facilities. **Table 2.1-1** summarizes surface and mineral ownership.

Table 2.1-1 Land and Mineral Ownership

Lease Number	Surface Ownership	Mineral Ownership
I-012890	U.S. Forest Service	Federal
I-015259	Private	Federal
I-026843	U.S. Forest Service	Federal
I-027801	U.S. Forest Service	Federal
I-30369	U.S. Forest Service	Federal
I-27512	U.S. Forest Service	Federal

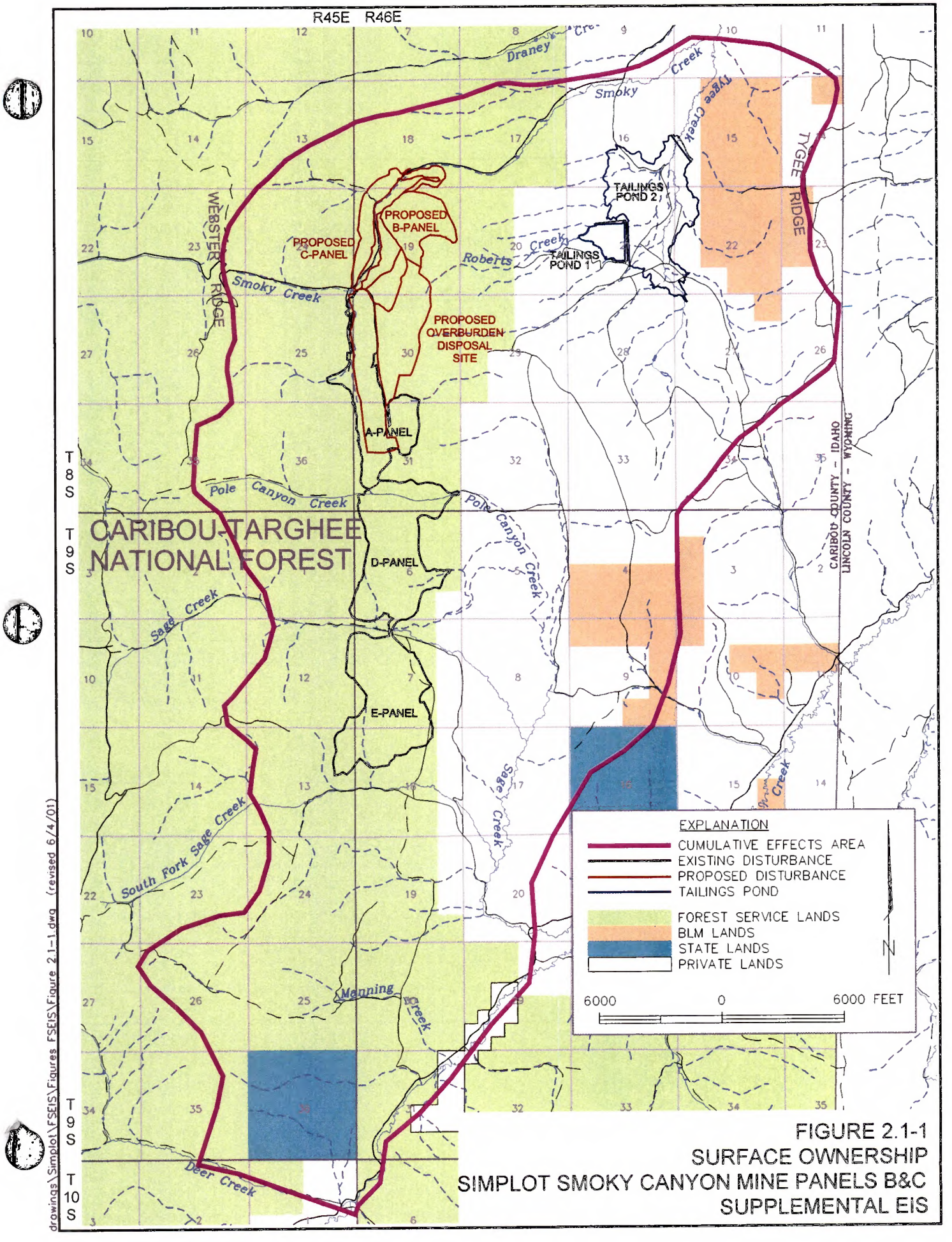

FIGURE 2.1-1
SURFACE OWNERSHIP
SIMPLOT SMOKY CANYON MINE PANELS B&C
SUPPLEMENTAL EIS

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2.1.3 Facilities Description

Existing facilities at Smoky Canyon Mine include an access road, office/shop complex, mill, ore stockpile, open pits, backfilled pits, external overburden disposal sites, tailings ponds, power line, tailings pipeline, concentrate slurry pipeline, and ancillary facilities such as runoff control systems, field storage yards, and "Hot Start" (mine equipment fueling, fuel storage, and parking) areas **(Figure 2.1-2)**. The office/shop complex consists of a combination shop and office building. This building houses the office, warehouse, and repair shop facilities. Employee parking, site security office, truck wash bay, mill, and emergency generators are also located at the office/shop complex. Detailed descriptions of the major facilities are as follows:

Security Trailer: Security provides around the clock (24 hours per day/7 day a week) coverage of the mine facility. Along with security personnel, this facility houses employee lockers.

Office/Warehouse: This facility houses the offices of office personnel including mine management, and warehouse/purchasing personnel. The offices are located upstairs above the shop/warehouse.

Maintenance Shop/Mill: The maintenance shop houses the mechanics and welders that work on company mobile equipment. The mill area is housed in the same building where raw phosphate ore is fed from the outside via front-end loaders. The ore is milled into a fine powder/slurry (with water) through crushing and grinding operations. The phosphate-containing minerals are beneficiated (separated) from the rest of the rock and then are pumped to the Don Plant in Pocatello for further processing.

Wash-bay: This area is used for steam washing of company mobile equipment. An oil-water separator system for used-oil recovery is connected to the wash bay.

Fuel/Used Oil Containment Area: South of the wash bay building and east of the mill (in the yard), are above-ground storage tanks for anti-freeze, diesel fuel (low-sulfur), gasoline (lead-free), and used anti-freeze. These are located in containment berm areas lined either with concrete (used oil and antifreeze), or polyethylene liners (diesel fuel and gasoline).

Tailings Thickener: Once the ore is beneficiated, the non-ore rock materials are passed on to a thickener, located 1/4 mile north of the mill, and sent in a pipeline to the tailings ponds.

Production and Culinary Wells: The production well provides fresh water for the mill operations. The culinary well provides potable water for mine personnel and is recognized by the state as a public drinking water source. These wells are located approximately 3/4 mile north of the shop, near Smoky Creek.

Hot Starts: The "Hot Starts" is the name given to the staging area for the mobile equipment used in the mining operations. Service islands for maintenance and fueling of a number of vehicles simultaneously, lubing services and fuel/lube oil tanks (all protected in a containment area lined with a polyethylene liner) are located here. The Hot Starts are located near the actual mining area for convenience and accessibility. The Hot Starts area is relocated, as needed, to adjust to the mine area location.

Tailings Ponds No. 1 and No. 2: Located approximately 3.2 air miles northeast of the mill area, this area consists of two tailings ponds with associated delivery lines and pump houses.

Bone Yard: This is a temporary storage area for large recyclable scrap iron. Some material located here can be reused in the mining operation.

Ammonium Nitrate/Fuel Oil (ANFO) Storage: This is a staging area for blasting materials (kept separate from magazines for safety reasons). Ammonium nitrate and emulsion are kept in separate, above ground storage tanks in this area.

2.1.4 Mining Operations

Current operations at Simplot's Smoky Canyon Mine include drilling, blasting, loading, and hauling of ore and overburden from Panel E using a shovel and truck fleet. Mining proceeds sequentially by opening individual mining pits along the trend (strike length) of the Phosphoria Formation outcrop. Mining in Panel E is ongoing and is expected to continue until the fall of 2003 when mining would commence in Panels B and C.

The sequential mining of pits along the strike length of the deposit facilitates backfilling open pits with overburden from subsequent pits. When overburden is removed from the ground it is fractured into particles which occupy approximately 30 percent more volume than before the rock was mined. This volume expansion is called "swell" and is the reason why all the overburden cannot be returned to the open pit from which it came. Some overburden must be placed in external overburden disposal sites outside of the open pits.

Under the initial approved Mine Plan, mining production commenced at Panel A in 1984 and was completed in 1995. Overburden from Panel A was disposed of in an external overburden disposal site called the A1 Ridge Top Dump. This is located on the top of the ridge line east of the southern portion of Panel A. In 1985 placement of overburden in the Pole Canyon Overburden Disposal Site was authorized. Most of the overburden in the Pole Canyon Overburden Disposal Site was from Panels A-1 and A-2. Most of the south portion of Panel A pit was backfilled with overburden from Panels A-3 and A-4. The southern portion of Panel A has been reclaimed while the north portion is still open. This area is scheduled to be backfilled and reclaimed with overburden from Panels B and C.

In 1992 the decision was made and approved to not mine Panels B and C next in series as originally planned but to mine Panel D instead, followed by Panel E and then Panels B and C. The reasoning for this decision was that the geologic information available at that time indicated lesser economic potential for Panels B and C compared to Panels D and E, making the reserves in Panels D and E more cost effective to recover with greater resource utilization. Additional geologic information obtained since then on Panels B and C has better defined the ore reserves and mining conditions, allowing extraction of these resources to proceed at this time. Panel D mining production began in 1993 and was completed in 1998. The overburden from Panel D-1 was placed in an external overburden disposal site east of the D-1 pit. Most of the overburden from the D-2 pit was placed into the mined-out portions of the D-1 pit and on the footwall slopes above the active mining areas of the D-2 pit. Some of the overburden from the D-2 pit was placed in the Pole Canyon Overburden Disposal Site, while a small portion was placed in the southern portion of Panel A. Overburden from the D-3 pit was placed in the mined out portions of the D-2 pit and on the footwall slope above the active mine areas of the D-3 pit.

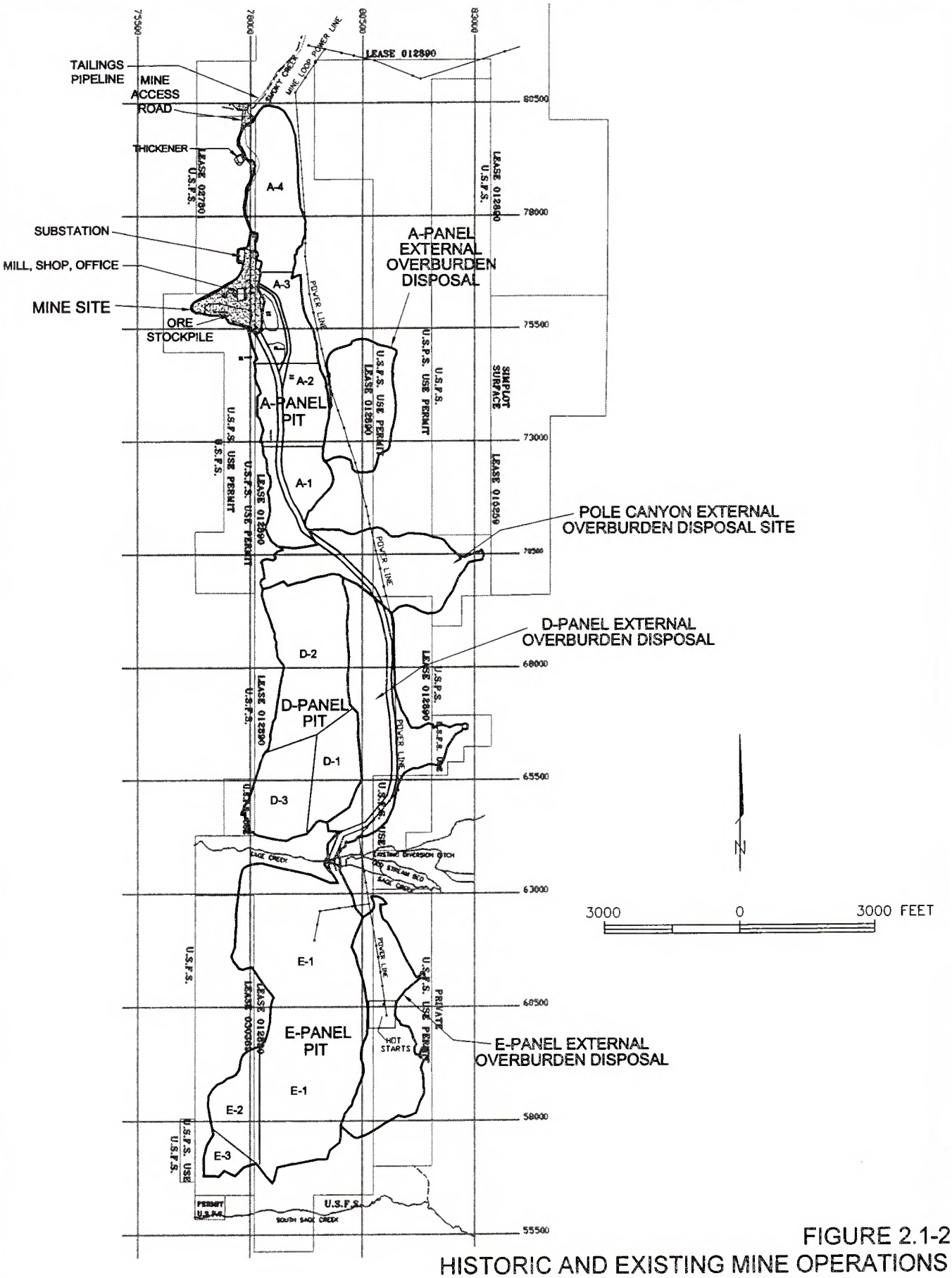

FIGURE 2.1-2
HISTORIC AND EXISTING MINE OPERATIONS
SIMPLOT SMOKY CANYON MINE PANELS B&C
SUPPLEMENTAL EIS

drawings\Simplot\FSEIS\Figures FSEIS\Figure 2.1-2.dwg (Revised 3/5/01)

Mining began in Panel E in 1998 and is ongoing. The southern portion of Panel D has been backfilled with overburden from the E-1 pit. Some overburden from the E-1 pit was placed in the Panel E External Overburden Disposal Site located directly east of Panel E. As mining proceeded south, the overburden from the southern portion was placed in the northern portion of Panel E, backfilling that pit. The overburden from the E-3 pit will be used to backfill the southern portion of the E-1 pit. Overburden from the E-2 pit will be used to backfill the E-3 pit. In areas where topsoil was utilized, establishment of herbaceous cover on previously reclaimed lands has been generally rapid, resulting in satisfactory erosion control. Tree plantings have shown good survival in some areas and poor survival on others. South-facing slopes, in particular, have had poor survival of planted trees; if Simplot plants more trees, they would be concentrated in areas where success is more likely. If Simplot is permitted to plant trees on mine reclamation areas, it would be done in consultation with Caribou National Forest personnel trained in silviculture and reforestation to provide species suitable for the site. Tree planting on engineered covers needs to be evaluated to determine if it could compromise the structural integrity of designed covers and if tree roots would penetrate the covers providing a pathway for selenium to impact other reclamation vegetation.

In the summer of 2000, the total disturbed area of the existing operations at the Smoky Canyon Mine was 1,345 acres of which 496 acres have been reclaimed.

The mine is operated 24-hours per day throughout the year with crews working overlapping shifts. Hard overburden is drilled with 2 blast hole drills. The blast holes are loaded with a mixture of ammonium nitrate and fuel oil (ANFO). The loaded blast holes are then typically detonated once every two to three days . Softer overburden is ripped with dozers. The mine owns a total of seven tracked dozers and two wheel dozers. Three 12- to 22-cubic-yard diesel-powered hydraulic shovels and one 25 cubic yard electric shovel are used to load ore and overburden into off-road type haul trucks.

Ore and overburden are loaded into (15) 150-ton rear dump haul trucks. Depending on the concentration of phosphate mineral in the rock, the trucks deliver the material to the mill ore stockpile, external overburden disposal areas, or previously mined pits as backfill. Up to three 6,000- to 13,000-gallon water trucks are used to water haul roads, ancillary roads and the pit floor to control dust. Roads are also maintained with three motor graders. Other equipment used in the operation include pickup trucks, vans, service trucks, maintenance trucks, explosives trucks and other miscellaneous support equipment.

The typical current mining operation in any mining panel complies with the following general sequence:

- A detailed mining and reclamation plan for the next phase of mining is prepared and sent to the BLM and USFS for their review. The mining plan is reviewed by BLM mining engineers to ensure that the mineral resource is being properly developed. The environmental impacts of the plans are reviewed by BLM and USFS resource specialists who determine what mitigation is necessary. Appropriate stipulations are decided upon by the agencies and a Mine and Reclamation Plan approval is issued to Simplot authorizing the mining operations in compliance with conditions in the Record of Decision.

- The USFS determines the fair value of the timber on the area to be disturbed in the mine plan and issues a timber sale to Simplot who then pays the USFS the timber sale price. Simplot contracts with another firm for the removal of the timber.

- Surface runoff management ditches, culverts, settling ponds, and sediment traps are constructed following approved BMPs and information contained in the Smoky Canyon SWPPP. The SWPPP was developed in accordance with EPA NPDES rules and other regulatory input.

- Access and haul roads are built.

- Simplot equipment clears the remaining vegetation from the disturbance area on an as-needed basis. After the vegetation is removed, available topsoil is stripped and stockpiled in designated locations. Long-term topsoil piles are graded and reseeded to reduce loss of the soil resource by erosion.

- Upper chert overburden is removed down to the first ore beds and is hauled away. Overburden is used to backfill existing open pits. Chert overburden is also used for road construction and other civil engineering projects at the mine. Some overburden is disposed of in external overburden disposal sites. The chert does not contain elevated concentrations of selenium and is currently used to cap or cover any seleniferous overburden that has been placed in pit backfills or external overburden disposal sites. This was not fully implemented in pre-2000 mining operations but has since been adopted as a management practice for seleniferous overburden. This is possible at Smoky Canyon Mine because the chert is low in selenium, which is not universally the case at phosphate mines in southeast Idaho.

- Ore from the upper ore zone is removed and hauled to the mill ore stockpile.

- The middle waste shale is removed and hauled to previous open pits for use as backfill or is placed in external overburden disposal sites. Because the middle waste shale is known to contain the highest concentrations of selenium, it is placed deeper in these disposal sites and is covered with non-seleniferous chert overburden to isolate it from the surface environment. This was not fully implemented in mining operations prior to 2000 but has since been adopted as a management practice for seleniferous overburden.

- The lower ore zone is removed and hauled to the mill ore stockpile.

- The open pit is then available for backfilling from subsequent mining operations in a future pit. When the backfill reaches the final grade, reclamation of that area is commenced.

Each mine panel is divided into a number of separate open pits. The above described physical mining sequence is repeated in each of the separate pit areas within the Panel. All the pits within each panel are designed at the same time and reviewed by the agencies.

The hard rock overburden above the Phosphoria phosphate ore zones and the low grade middle waste shale between the ore zones often requires blasting in order to facilitate their separation. The blasting procedures are dictated by the Federal Metal and Nonmetallic Mine Safety and Health Standards (30 CFR 56/57/58).

The blasting materials used are controlled by the Federal Explosives Law, Regulation of Explosives (Public Law 91-452) through the Bureau of Alcohol, Tobacco, and Firearms Department of the Treasury. The Smoky Canyon Mine is required by law to apply for and periodically renew a permit for the use of high explosives and a license for the manufacture of blasting agents.

Only qualified trained personnel have access to or can handle blasting materials as prescribed by federal rules. Smoky Canyon Mine uses non-electric blasting. A pattern of drill holes is laid out and drilled to the appropriate depth with the appropriate diameter in order to maximize the fragmentation of the rock. A detonating cap is attached to a booster of high explosives and lowered down the blast hole with a delay cord. Predetermined volumes of ANFO and emulsion are mixed in the proper proportions as they are augered into the blast hole. A calculated volume of stemming (loose rock) is placed into the blast hole over the ANFO mixture to contain and redirect the energy of the blast. The delay cords are tied together on the surface with detonating cords.

Personnel are moved at least a quarter of a mile away from the blast site after the blaster informs the hill coordinator that a blast pattern is ready to be shot. After the area surrounding the blast site has been cleared, a five-minute warning siren is sounded after which the blaster and his helper initiate the blast. After the shot, the blaster and his helper check the blast site for misfires and live explosives. If none are found, the all clear message is conveyed to the hill coordinator so the operators can continue their work. All explosive materials are accounted for each day. None are lost; all are used or placed back in secured inventory.

2.1.5 Water Management

Simplot has developed a site-wide Storm Water Pollution Prevention Plan (SWPPP) for surface water resources at the Smoky Canyon Mine in compliance with the General Stormwater Permit issued by the U.S. EPA (Simplot, 2000). The primary purpose of the SWPPP is to prevent any discharges to surface waters associated with the mine disturbance. The SWPPP provides for control of run-off from mine facilities (removal of sediment prior to dispersed discharge to vegetated areas) and designation of water diversions necessary to accommodate mine facilities. The SWPPP is updated as new disturbance areas are added to the mine operations.

The existing SWPPP is designed to be implemented in phases over the life of the Smoky Canyon Mine. Depending on the location of mining activity, the SWPPP describes water diversions (ditches) of ephemeral channels and tributaries to the nearest perennial or intermittent creek. In addition to ephemeral stream diversions, Simplot has constructed stream crossings for the major east-flowing creeks that cross the mine footprint. These are built with corrugated metal culverts placed in the stream channels at the base of road fills. Simplot has installed fish ladders in the Sage Creek culvert to allow for upstream fish migration.

The mine pits and external overburden disposal sites have been designed to avoid any direct disturbance of the existing main east-flowing intermittent or perennial stream channels (Sage and South Sage Creeks). This is done by establishing a prescribed buffer zone on either side of these stream channels with no disturbance allowed within this buffer zone.

Storm water catch basins are located throughout the mining area to collect, settle, infiltrate, and evaporate run-off water from land disturbed by the mining operation. These ponds are designed to contain runoff from the contributing watershed area that would be produced in a 100-year, 24-hour storm event (3.0 inches of precipitation) plus 2.5 inches of snow melt runoff (Appendix D, USFS, 1981). The ponds have engineered outlets to protect the impounding dikes from erosion by discharges.

Outlets from ditches and culverts are protected from erosion with rock rip rap, as are some of the steeper ditches. Simplot also uses revegetation and other land reclamation techniques to reduce erosion from disturbed areas. Once mine pits are backfilled, Simplot replaces topsoil and seeds the reclaimed surface.

Haul roads and access roads at the Smoky Canyon Mine site are designed and constructed to provide proper surface drainage. Use of culverts, roadside sediment traps, and berms allows Simplot to control erosion from roadways and subsequent sedimentation. Snow removal from roadways involves placement of snow where eventual melting will not cause erosion or increase sediment delivery to potential receiving waters.

2.1.6 Mill and Tailings Operations

Ore is fed from the mill stockpile into a hopper. The hopper feeds a trommel washing system where water is added and the ore is screened, crushed and then mixed with water and ground to a fine consistency in grinding mills. The ground ore slurry is then beneficiated to separate the material with the highest phosphate content (ore concentrate) from the low-grade material (tailings).

The ore concentrate slurry (a 60:40 ore to water ratio) is introduced into a buried eight inch pipeline. A 1,000 horse power pump at Smoky Canyon pumps the concentrate slurry 27 miles to Conda, Idaho, crossing the Webster Range and Dry Ridge. At Conda, two 1,200 horse power booster pumps provide additional power to push the slurry another 60 miles, crossing Inman Pass and ending up at the Simplot Don Plant fertilizer manufacturing facility near Pocatello. The slurry is then processed into various grades of both liquid and dry fertilizer. The Simplot ore-slurry pipeline safely transports over 1.5 million tons of phosphate concentrate over the mountainous terrain annually.

The tailings slurry leaving the mill passes through a tailings thickener. The underflow solids from this thickener discharge into the existing tailings line at a maximum rate of 550 gallons per minute (gpm) and 50 percent solids. The overflow water from the thickener is pumped directly back to the mill for reuse in the milling operation. Tailings slurry is discharged to the tailings ponds (No. 1 and No. 2), located about 3.2 air miles northeast of the mill, in a controlled manner with a system of pipes and valves. As the slurry flows from the discharge points out into the tailings impoundments, the tailings solids settle out and sink to the bottom of the ponds. The clarified water is collected on top of the solids behind two earth fill tailings dams. Water is reclaimed from the ponds with pumps, then transported back to the mill through a reclaim water pipeline. By design, there is no discharge of tailings solids or water from the tailings ponds. Approximately 1,000 gpm of reclaimed water is recycled to the mill. Additional water is added to the tailings ponds, as needed from the production well and from Roberts Creek, in order to maintain the water level in the ponds at the proper operating levels. Depending on production requirements, the Smoky Canyon Mill produces approximately 500,000 tons of tailings solids per year.

The tailings ponds were built to be no-discharge facilities under a permit issued by the U.S. Army Corps of Engineers (USCOE). They are located on private land owned by Simplot in a topographically low area along Tygee Creek. Geotechnical investigations of both tailings pond sites prior to their construction indicated that the entire area of both impoundments is underlain by low-permeability clayey soils that provide control of seepage from the impoundments. The two tailings dams were also constructed from these low permeability soils, designed to prevent seepage of tailings water through them. Piezometers in the tailings dams are monitored to ensure that any seepage is detected and controlled before any surface discharge past the dam could occur. Roberts and Tygee Creeks were diverted around the

tailings ponds in open channels designed to safely pass the design storm runoff required by the Idaho Department of Water Resources.

The tailings ponds are existing facilities on private land that are currently fully permitted by the State of Idaho and the USCOE. The environmental impacts of the tailings ponds were analyzed in the 1981 DEIS and the 1982 FEIS for the Smoky Canyon Mine. The USCOE prepared another environmental assessment to analyze the environmental impacts of full development of the tailings facility in the early 1990's and the environmental impacts identified at that time were mitigated. The current capacity of the tailings ponds is sufficient to contain all the tailings that would be produced by the Proposed Action and Alternatives and no additional permits, approvals, or construction is necessary at this time. For these reasons, the tailings facility was not included within the Proposed Action or Alternatives and the environmental impacts for the tailings ponds are evaluated as part of the Cumulative Effects analysis in this SEIS.

2.1.7 Existing Environmental Monitoring Program

Simplot monitors water levels within the two tailings dam structures (Dam No. 1 and Dam No. 2) with piezometers. Tailings Dam No. 1 has nine (9) piezometers (three in the north line, three in the middle line, and three in the south line). Tailings Dam No. 2 has six (6) piezometers (three in the north line and three in the south line).

Under the SWPPP, regular inspections (monthly, quarterly, and annually) of the storm water control systems are conducted. Samples taken during storm events are collected for laboratory analysis of total suspended solids. Simplot also follows state drinking water requirements for the sampling of coliform bacteria in its culinary water supply and complies with all other drinking water parameters.

TRC Mariah Associates Inc. (TRC Mariah) of Laramie, Wyoming conducts water quality monitoring for the mine facility. They collect surface water samples at twelve (12) stream locations (six streams -each at an upper and lower reach), as well as the Tailings Dam No. 2 toe drain. Water samples are submitted to ACZ Laboratories in Steamboat Springs, Colorado. Samples are analyzed for a variety of metals, as well as wet chemistry parameters. TRC Mariah also collects benthic samples (macro-invertebrates) to better understand the water quality. Data are provided annually to the BLM, USFS and Idaho Department of Environmental Quality (IDEQ).

Under the mine Spill Prevention, Control and Countermeasure (SPCC) Plan, Simplot inspects petroleum storage facilities for leaks and spills, then follows the procedures in the plan to respond to any such incidents.

2.1.8 Reclamation

Reclamation of disturbed areas is an ongoing process, concurrent with mining. After backfilling is completed in a mine panel, the area is rough graded and drainage configurations are established. Topsoil is directly hauled from soil salvaging operations or from nearby stockpiles and spread over the graded surface. The seedbed is prepared by fine grading followed by placement of fertilizer and seed.

Permanent revegetation is implemented when mine activities in an area are completed or where future stabilization of temporary use areas (e.g., road cuts and fills) is necessary. In addition to erosion

protection, reclamation is intended to meet the final land use goals of grazing and wildlife habitat. At closure, ancillary mine facilities, as well as roads deemed no longer necessary for maintenance access or monitoring, will be removed. Offices, buildings, shops, mill facilities and utilities will be removed. The entire remaining disturbed area will be revegetated with the seed mix in **Table 2.1-2.** Simplot has also been testing reforestation potential for reclamation of forested areas by planting tree seedlings. The decision to attempt to establish forests on reclaimed lands will be made in concert with future studies related to selenium uptake in tree species. Reclamation plans will be coordinated with USFS professionals such as botanists, silviculturalists, hydrologists, soils scientists, and foresters.

Table 2.1-2 Smoky Canyon Mine Seed Mix

Species	Native?	Rate* (lbs/acre)
Intermediate Wheat Grass	No	15.7
Smooth Brome Grass	No	15.8
Timothy	No	5.3
Sheep Fescue	Yes	5.3
Orchard Grass	No	5.2
Total		47.3

* Rate is in pounds of pure live seed per acre.

The tailings ponds have been designed to remain upon abandonment and closure after the tailings storage volume is filled. At that time, the reclaimed water pumping facilities would be removed. The present closure plan, filed with the Idaho Department of Water Resources, indicates that an overflow spillway would be excavated into one abutment of both tailings dams. These spillways would be designed to pass the peak flow from a 100-year, 24-hour storm event. The peak flow was calculated from the 8.7-square mile watershed directly upgradient of the tailings dams. The design capacity of the spillways assumes that both dams would be full of water to the flowline elevation of their spillways and the Roberts Creek/Tygee Creek diversion channel would not be functioning (Golder, 1992). The spillway for Tailings Dam No. 1 would discharge to the No. 2 tailings impoundment. The spillway for Tailings Dam No. 2 would be connected to the Tygee Creek diversion channel downstream of the dam. The spillways would be designed to be open channels with bottom widths over 30-feet wide, 3h:1v side slopes and 5-foot depths. During the 100-year, 24-hour storm less than two feet of flow depth would occur, leaving at least three feet of additional channel depth for safety.

The existing Roberts Creek/Tygee Creek diversion channel was designed to safely carry runoff from a 100-year, 24-hour storm event. It is proposed to be left in place after reclamation of the tailings facility to handle normal runoff flows from the watershed above the tailings facility. During final reclamation activities, the diversion channel would be fitted with a number of overflow spillways at its north side. These overflow spillways would be located and designed to safely pass this peak flow if the diversion channel were to become blocked. This storm flow would be directed into the tailings ponds where water would be directed to the above-mentioned spillways.

The tailings impoundments would be allowed time to dry out to the maximum extent feasible. A permanent pond is expected to form in the areas against the upstream faces of the tailings dams where the tailings are deepest and tailings consolidation will be the greatest. The grades of the final tailings

solids surface will depend on the total tailings deposited in the impoundments, the pattern of deposition, and the amount of water stored in the impoundments. Where the final tailings solids surface is not submerged by the final pond, its surface would be covered with a layer of topsoil from existing stockpiles. The finished surface would be revegetated by broadcasting seed. The seed chosen for reclamation would be selected in concert with the regulatory agencies to provide perennial cover and to reduce biological uptake of selenium and other contaminants from the tailings.

Reclamation Bonding

Total existing reclamation bonding by Simplot is $2,406,498. Based upon the anticipated land disturbance, bond calculations are made yearly at the BLM's Pocatello Field Office. Simplot has posted bonds with both State and Federal agencies to ensure compliance with reclamation requirements. Simplot's Federal phosphate operations in the state of Idaho are covered under a statewide bond of $1,281,088. Simplot must provide reclamation to BLM's satisfaction. As reclaimed areas are accepted by the BLM, a lower bond amount may be requested. In addition, the J.R. Simplot Company has a $1,125,410 bond with the State of Idaho Department of Lands, and Department of Water Resources. Simplot's bonds have been calculated using an $1800.00 /acre of disturbance formula based on bonding amounts established by the Idaho Land Board and assessed by Idaho Department of Lands for mine land disturbances. While not policy, this calculation process was adopted by the Federal management agencies. Bonds are adjusted as needed when mine disturbance areas increase.

2.1.9 Hazardous Materials

The Simplot Smoky Canyon operations comply with both state and federal hazardous materials regulations. The term "hazardous materials" is defined in 49 CFR 172.101 (U.S. Department of Transportation (DOT) regulations governing transportation of hazardous materials). Federal environmental statutes defining reportable quantities are the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) as amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986. The principal hazardous materials that are transported, stored, or used at the Smoky Canyon Mine are summarized in **Table 2.1-3.**

The primary route for transporting hazardous materials to the mine is via U.S. Interstate Highway 15 and U.S. Highway 30 to Soda Springs. From Soda Springs, principal hauling routes are U.S. Highway 30 to U.S. Highway 89 to Afton, Wyoming. An alternate route is from Interstate Highway 80 at Evanston or Little America, Wyoming to Highway 30 to Border and then Highway 89 to Afton. Another alternate route is Interstate 15 to Idaho Falls and then Highway 26 to Alpine and then south on Highway 89 to Afton. From Afton, access to the site is via the Afton to Auburn road to the Stump-Tygee Road to the Smoky Canyon Road. U.S. DOT-regulated transporters are used for shipping regulated hazardous materials. Hazardous materials are stored at designated locations onsite in tanks or DOT-approved containers. Spill containment structures are provided as appropriate for all liquid hazardous materials.

2.1.10 Petroleum Management

Simplot has implemented a SPCC Plan (Simplot, 2000) for managing above-ground petroleum product tanks and vessels and potential spills, in accordance with the Clean Water Act (40 CFR Part 112). The plan describes types of containment structures at the facility to prevent petroleum products from reaching surface water and groundwater receptors, and the procedures to be followed in the event of a spill or release. The plan is amended when there is a change in facility design, construction, operation, or

maintenance that materially affects the potential for a release of oil or other petroleum products into the environment.

All liquid petroleum products and antifreeze are stored in above-ground containers as described in **Table 2.1-3.** The bulk storage area is bermed and lined to contain spills. The SPCC Plan states that all above-ground tanks, pumps, and pipelines will be visually inspected for leaks. Inspections are conducted and logged on a routine basis by mine personnel. The SPCC Plan also requires that Simplot's operating and maintenance personnel be trained in the proper use and maintenance of all equipment containing petroleum products. The training is necessary to educate employees as to environmental consequences, thus minimizing the chance of a spill due to operator error. All bermed containment areas are of sufficient capacity to hold the entire contents of the largest tank within and allow sufficient freeboard for precipitation. The shop building provides containment for all tanks located in that structure.

Table 2.1-3 Hazardous Materials Management, Simplot Smoky Canyon Project

Substance	Area Used/ Stored	Annual Rate of Use (gallons)	On-Site Storage Capacity	Storage Method	Shipment Quantities (gallons)	Waste Manage-ment
Diesel (Hi & Lo Sulfur)	Yard Stockpile Hot Start	3,000,000	(1) 10,300 gallon tank (1) 7,400 gallon tank (1) 50,000 gallon tank (1) 11,700 gallon tank	Above-ground bulk tanks	10,000	Not Applicable
Gasoline	Yard	48,000	(1) 10,000 gallon tank	Above-ground bulk tank	10,000	Not Applicable
10W Oil 15-40W Oil HD 30W 50W Oil 5W-39 Oil Used Oil 80W-90 Oil 10W Oil 15W-40 Oil ATF 50W TD4 40W Oil 40W TD4 40W Oil 30W Oil 10W Oil 15W-40 Oil Used Oil	Shop Yard Hot Start	100,000	(1) 4,000 gallon tank (1) 2,000 gallon tank (1) 2,000 gallon tank (1) 2,000 gallon tank (1) 300 gallon tank (1) 10,000 gallon tank (1) 500 gallon tank (1) 7,800 gallon tank (1) 7,800 gallon tank (1) 500 gallon tank (1) 2,300 gallon tank (1) 2,100 gallon tank (1) 3,000 gallon tank (1) 500 gallon tank (1) 500 gallon tank (1) 500 gallon tank (1) 500 gallon tank (1) 8,500 gallon tank	Above-ground bulk tanks	2,000	Recycled
Antifreeze Used Coolant Antifreeze	Yard Hot Start		(2) 500 gallon tanks (1) 5,000 gallon tank (1) 300 gallon tank	Above-ground bulk tanks	2,000	Recycled

2.1.11 Hazardous Waste

Hazardous waste is regulated under the Federal Resource Conservation and Recovery Act (RCRA) and the RCRA regulations (40 CFR Part 260 et. seq.). Generators of hazardous waste must follow strict rules regarding the generation, storage, handling, and disposal of their wastes. The Simplot Smoky Canyon Mine is considered a *Conditionally Exempt Small Quantity Generator* because it generates less than 100 kilograms of hazardous waste per month. These wastes are generated and temporarily stored at the mill and mine maintenance shops. The only specific hazardous waste generated at the facility is paint-related waste including waste paint and thinner (Waste Code D001). The off-site disposal facility for this waste is a permitted hazardous waste incinerator.

The mine complies with applicable state and federal hazardous waste regulations. All hazardous wastes are accumulated and shipped in proper containers that are normally closed except when wastes are added or removed. These containers are properly labeled and marked according to the hazardous waste and U.S. DOT hazardous materials transportation regulations. Employees at the mine are trained to properly handle and dispose of hazardous wastes in accordance with mine procedures.

The overburden and tailings produced from the mine operations are exempted from regulation as hazardous waste under state and federal regulations.

2.1.12 Safety

The Simplot Smoky Canyon Mine is subject to the Federal Mine Safety and Health Act of 1977 (MSHA), which sets mandatory safety and health standards for surface metal and nonmetal mines, including open-pit operations. The purpose of these standards is the protection of life, promotion of health and safety, and prevention of accidents. Regulations promulgated under MSHA are codified under 30 CFR.

Simplot maintains site-specific safety procedures and policies. These include procedures for operating equipment, requirements for wearing personal protective equipment, lockout-tagout procedures, fire suppression, housekeeping, proper use and storage of explosives, first aid, hazardous materials handling, and other operation or production related health and safety scenarios.

Shipping and receiving personnel, and the facility health and safety coordinator receive applicable training in handling and care of hazardous materials in accordance with the DOT regulations (40 CFR 172.704). Simplot personnel also receive hazard communication and recognition training in accordance with the MSHA regulations.

2.2 Proposed Action

Background

The Proposed Action is to mine phosphate ore reserves in Panels B and C, and to use existing facilities to process and transport the ore. In general terms, this Proposed Action was part of the Proposed Action of the 1982 EIS. As a condition to the approval (January 7, 1983) of the Smoky Canyon Project, Surface Mine and Reclamation Plan, and supplements thereto, the J. R. Simplot Company agreed to submit the following:

- Descriptions of all developments that involve lands within leaseholds I-012890 and I-026843, and plans for each mine panel, overburden disposal area and any structures - buildings and other improvements. Also, plot plans showing the location of other improvements or facilities constructed off the lease that are incident to the project are required.

- Detailed geologic information from exploration, geologic interpretation, trench and drill logs and assays, any other geophysical or geological reports, and records or histories for these federal leases. Geologic cross sections of all mine panels at intervals of 500 feet or less. Such cross sections must be developed from physical exploration (trenching and/or drilling data) located within the required cross section intervals.

A mine plan for Panels B and C was submitted to the BLM and USFS on June 30, 1999 (**Appendix 2A**). During the initial review of this mine plan, the BLM determined that an SEIS would be required for review of the environmental impacts of the proposed mining operations. During the public scoping of the 1999 mine plan for the SEIS, a number of environmental and regulatory concerns were identified including:

- The proposed external overburden disposal site would cross off-lease USFS land. National Forest Service regulation prohibits the issuance of new Special Use Permits for the permanent disposal of solid waste, hazardous substances, or radioactive materials on USFS administered land.

- There was agency concern over the potential impact to Smoky Creek from the lengthy culvert installation required to protect the channel from the Panel B haul road fill.

- The proposed external overburden disposal site would have required a modification to the 1983 approved Surface Mine and Reclamation Plan, and required extensive additional impact analysis for the new disturbance area.

- There was agency concern over the potential infiltration of snow melt into the north-facing aspect of the proposed overburden disposal site, which made up about 50 percent of the external overburden disposal facility.

All of the above issues would have required extensive analysis. Therefore, Simplot re-evaluated its plans for development of Panels B and C to eliminate these major issues. In March 2000, Simplot decided to modify the mine plans for the external overburden disposal to comply with the mine plan as approved in 1982. This plan required the external overburden from Panels B and C to be placed in an overburden disposal facility located on the ridge top between the existing Panel A1 overburden disposal site and Panel B.

In response to the impacts identified in the Draft SEIS and agency and public comments on that document, Simplot further modified its mining and reclamation plans to address concerns over the extent of the estimated groundwater impacts. These modifications are described in more detail later in this chapter and have been applied to the Proposed Action and Alternatives A and B.

The proposed mining operations would consist of two open pits - Panels B and C, topsoil stockpiles, mine equipment parking areas, access and haul roads, a power line extension, an external overburden disposal area, and runoff/sediment control facilities. Operations would include management practices for the control of releases of sediment and dissolved contaminants.

2.2.1 Disturbance

Under the Proposed Action, approximately 93.77 million tons (MMT) of ore and overburden would be removed during 4.6 years of active mine life. The disturbed area of the two open pits would be 274 acres. Most of the overburden from the pits would be used to backfill them and the remaining open pit in the north half of Panel A. The backfilling of the south portion of the Panel A pit would also be completed. Approximately 20.82 million cubic yards of excess overburden that would not be used for pit backfill would be placed in an external overburden disposal site. The overburden disposal site would be located between the existing A1 overburden disposal site and Panel B. The additional disturbance caused by the new external overburden disposal area would be approximately 244 acres. Road and water management facilities would disturb 100 acres. The total new site disturbance would be 618 acres. A summary of newly disturbed acres related to the revised plan for Panels B and C is shown in **Table 2.2-1.**

Table 2.2-1 Summary of New Disturbed Acres - Proposed Action

Pits	External Overburden Disposal Area	Roads	Water Management Activities	Total
274	244	85	15	618

Note: 217 acres of existing mine disturbance area in Panel A would also be utilized.

Topsoil Stockpiles

Topsoil removed during preparation for extraction of overburden would be stored temporarily within total permitted disturbance areas.

2.2.2 Panels

The configuration of the Panel B pits would have the foot wall contact at the top of the hill on the south margin of the Panel B pits and the downhill (north) edge of the pit area would roughly parallel Smoky Creek and be located about 400 to 500 feet away from the creek, leaving a vegetated buffer between the pit operations and Smoky Creek (**see Figure 2.2-1**). The highwall in the north and northeast portion of the reconfigured pit would be approximately 3,700-feet long and would have a maximum height of about 270 feet. The bottom of the deepest portion of the Panel B pit in the Proposed Action (elevation 7,130 feet - AMSL) would be located approximately 230 feet above the elevation of Smoky Creek at its closest approach to this point in the pit. A cross section of the Panel B and C pits is shown in **Figure 2.2-2**. The location of this section is shown on **Figure 2.2-4.**

The Panel B haul road fill would encroach on about 200 feet of the Smoky Creek channel. This 200 feet of creek channel would be protected by a rock gabion retaining wall which would support the road fill out of the channel in this reach. A typical cross section of a haul road is shown in **Figure 2.2-3.**

Panel C would parallel Smoky Creek for a length of about 6,000 feet and would be divided into two pits, as shown in **Figure 2.2-1.** The edge of the Panel C disturbance would have a minimum buffer width of at least 50 feet from Smoky Creek and this buffer would be as wide as 500 feet from the creek. The pit bottom, or footwall, would be inclined downslope toward the west and northwest, away from the creek, to the highwalls along the west and north margins of the panel as shown in **Figure 2.2-2**. The final highwall of Panel C would be approximately 7,000 feet long and up to 340 feet high. The bottom elevation

of the deepest portion of the south Panel C Pit would be approximately 7,100 feet and located over 600 feet away from the creek. The north Panel C pit bottom elevation would be approximately 6,860 feet and this point would be located over 500 feet away from Smoky Creek.

The remaining open pit in the northern portion of Panel A would be backfilled and all the remaining exposed foot wall in the southern portion of Panel A would also be backfilled to a maximum slope of 3h:1v. This would result in the entire Panel A pit being reclaimed.

The open pits in Panels B and C would be backfilled with overburden as part of the mining operation. This backfill would eventually produce a topographic condition similar to natural conditions by backfilling the open pit footwalls to approximate 3h:1v slopes or less, and covering highwalls as shown in **Figure 2.2-2**. The reclaimed configuration is shown in **Figure 2.2-4**.

All of the footwall of Panel B would be covered with overburden configured to approximate the original slope that would also cover part of the highwall. Panel B would have a highwall remaining after reclamation that would be approximately 2,800 feet long at its base and have a maximum height of about 250 feet. The remaining highwall would be located in the northeast edge of the pit and would face toward the southwest. The highwall would not be visible from the Smoky Canyon road.

All of the Panel C footwall would be covered with overburden, which would also cover most of the highwalls. The Panel C highwalls remaining after reclamation would be approximately 3,100 feet long and have a maximum height of about 50 to 150 feet. The original topography in the north Panel C pit would be approximately restored. The south Panel C pit backfill would slope similarly to the natural topography but would have a flatter slope.

2.2.3 Overburden Handling

Most of the overburden (69 percent) would be used to backfill the open pits in Panels A, B and C. The remaining overburden (31 percent) would be placed in an external overburden disposal site located on the ridge top immediately south of Panel B (**Figure 2.2-4**).

The ridge top external overburden disposal site would be located completely within existing leased or permitted land and would occupy the northern portion of the preferred external overburden disposal site of the 1982 Record of Decision. It has purposely been configured to reduce incursion into the ephemeral drainages on the east side of the ridge.

The other areas of the Proposed Action incorporate south and west aspects that are favorable for increased evapotranspiration of precipitation. All of the Panel A backfill would be west facing, as would all of the area of the Panel B haul road to the A Pit, mill, and about one-third of the Panel B pit backfill. Approximately half of the Panel C backfill would have a south aspect (**Figure 2.2-4**).

Selective handling of mine overburden would be practiced during the proposed operations. Waste overburden shales known to contain elevated concentrations of selenium (seleniferous) would be handled separately from other overburden. Low selenium content (non-seleniferous) chert and limestone overburden (hereafter referred to as "chert") would also be handled separately. This chert overburden would be spread over the seleniferous overburden shales at a thickness of approximately

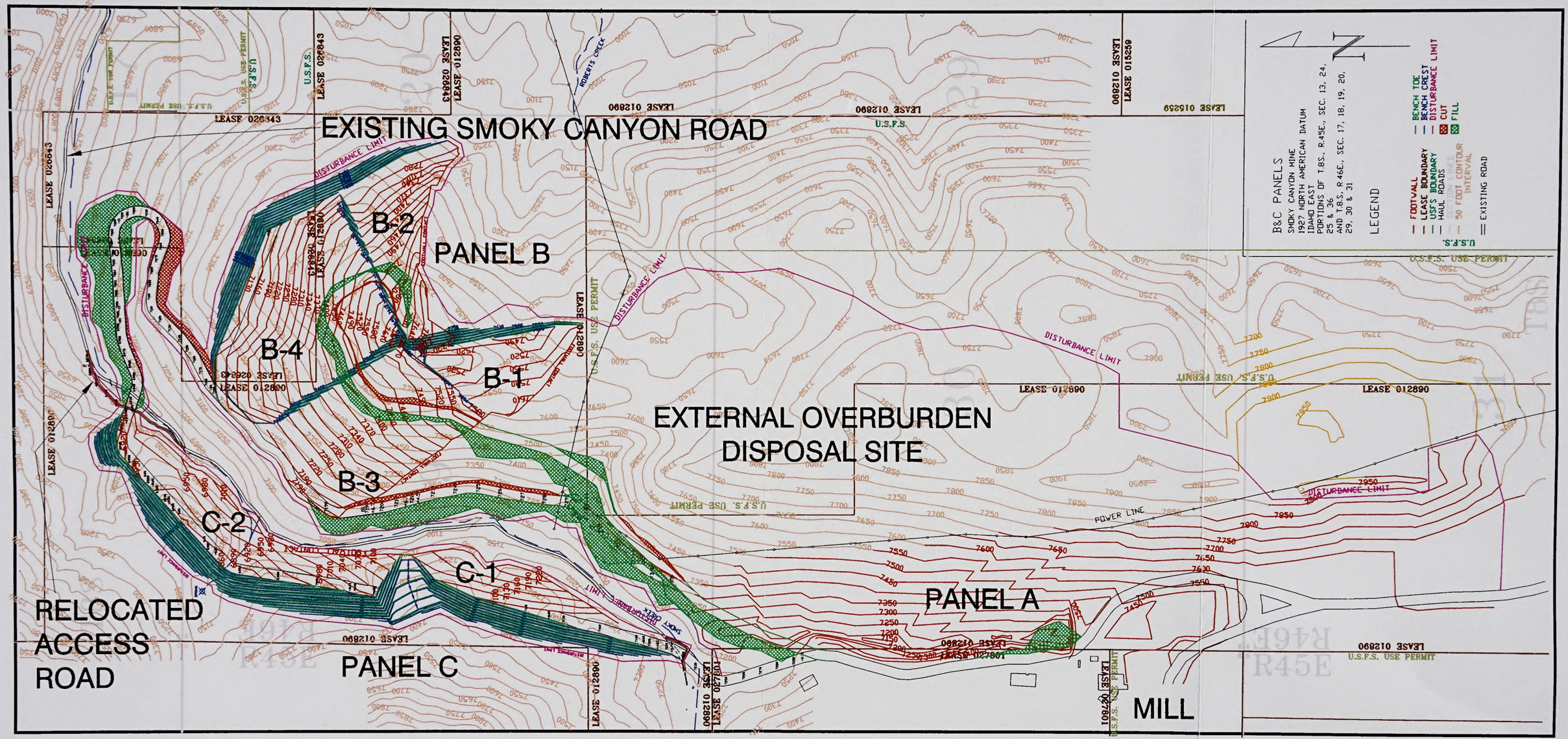

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FIGURE 2.2-1
PROPOSED ACTION MINE PLAN
SIMPLOT SMOKY CANYON MINE PANELS B&C
SUPPLEMENTAL EIS

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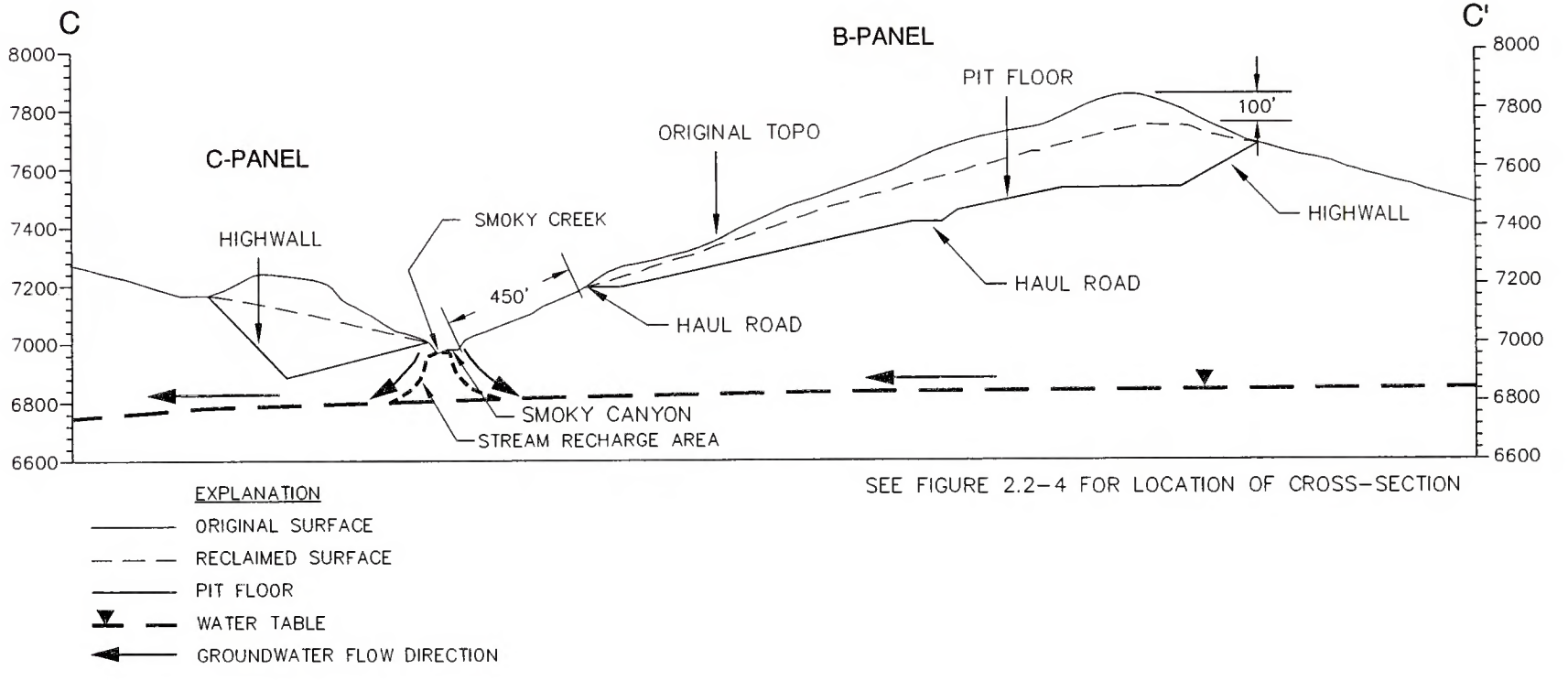

FIGURE 2.2-2
CROSS SECTION THROUGH PROPOSED ACTION MINE PITS
SIMPLOT SMOKY CANYON MINE PANELS B&C
SUPPLEMENTAL EIS

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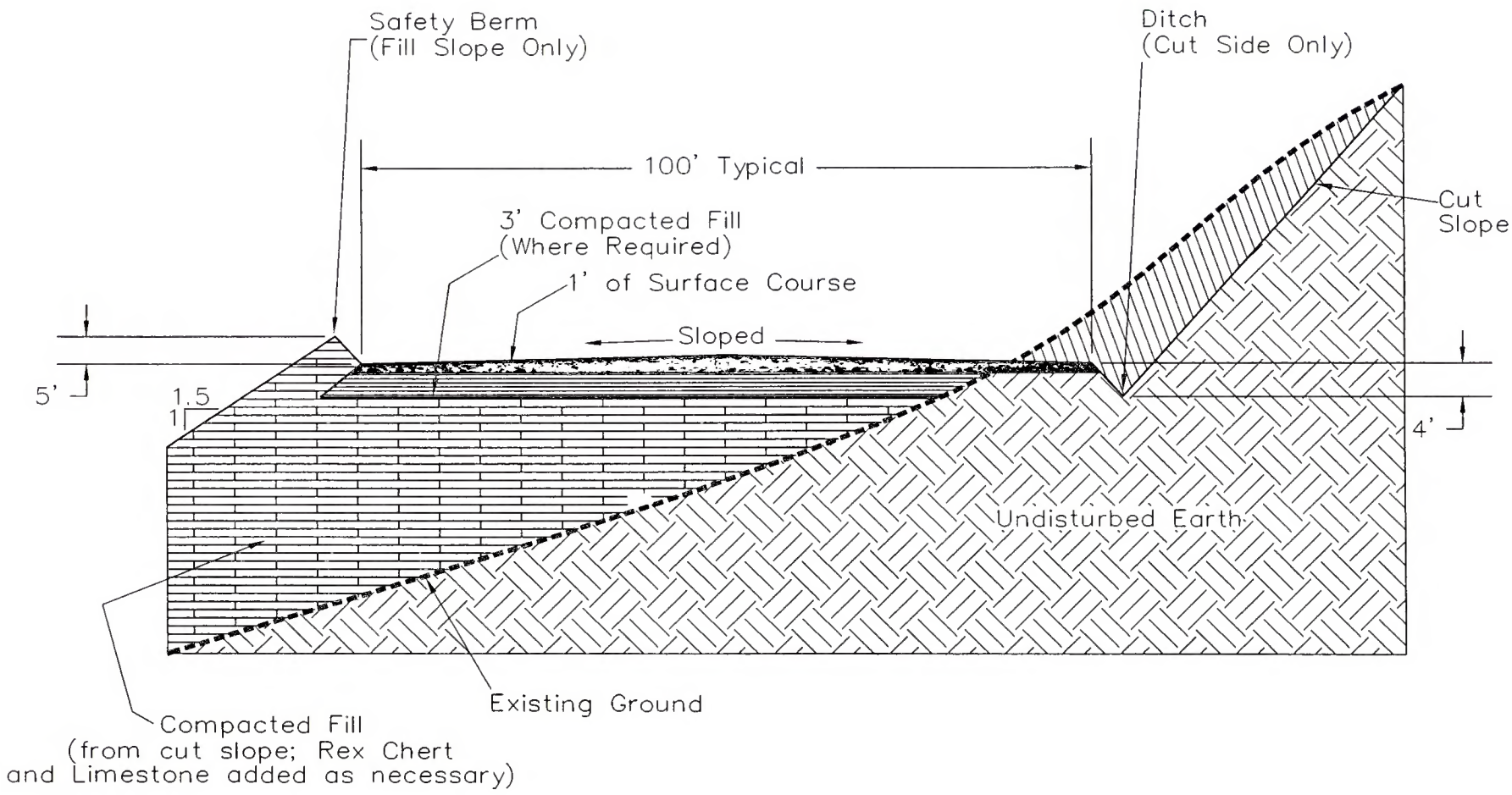

FIGURE 2.2-3
TYPICAL HAUL ROAD CROSS SECTION
SIMPLOT SMOKY CANYON MINE PANELS B&C
SUPPLEMENTAL EIS

Reference: Modified from FMC Dry Valley Mine EIS

B&C PANELS
SMOKY CANYON MINE
1927 NORTH AMERICAN DATUM
IDAHO EAST
PORTIONS OF T.9S., R.45E., SEC. 13, 24, 25 & 36
AND T.8S., R.46E., SEC. 17, 18, 19, 20, 29, 30 & 31

LEGEND

- HIGHWALL
- LEASE BOUNDARY
- U.S.F.S. BOUNDARY
- HAUL ROADS
- SETTLEMENT BASINS
- RECLAMATION
- 50 FOOT CONTOUR INTERVAL

EXPLANATION

RUNOFF RECHARGE AREA

1000 0 1000 FEET

FIGURE 2.2-4
PROPOSED ACTION POST RECLAMATION PLAN
SIMPLOT SMOKY CANYON MINE PANELS B&C
SUPPLEMENTAL EIS

drawings\SIMPLOT\FSEIS\Figures DFSEIS\Figure 2.2-4.dwg (revised 1/15/02)

eight feet at the external overburden disposal facility and the pit backfill areas. This thickness of chert cover is intended to prevent the underlying seleniferous overburden shales from erosion and prevent root penetration. One to three feet of topsoil would be spread over most of the chert cover to complete the cap. A typical cross section of this overburden disposal facility design is shown in **Figure 2.2-5.**

To complete the capping of the B-4 pit backfill, the chert would need to be temporarily stacked 50 feet thick on the A pit and the B-1, B-2 and B-3 pit backfills. It would then be rehandled and placed over the B-4 backfill when that is completed. This would require the rehandling of approximately 4 percent of the total overburden volume.

The chert cap is designed to cover all areas of seleniferous overburden and isolate it from the surface environment, but the soil and chert cap would be permeable to infiltration of meteoric water from rain and snowmelt. This infiltrating water would percolate vertically through the cap and into the underlying material. Where seleniferous overburden underlies the cap, the percolating water would contact the seleniferous overburden prior to eventually percolating out the base of the overburden. This water can potentially dissolve selenium from the seleniferous overburden and carry this contaminant deeper into the permeable bedrock or laterally to the margin of the overburden fill. Where the cap overlies native ground at the margins of the regraded overburden slopes, infiltrated water would not contact seleniferous overburden and so would not become contaminated. The amount of water that would drain off the topsoiled surface of the regraded overburden slopes has been calculated to be roughly three times greater than the amount that would percolate downward. This is because the native soils which would be salvaged for topsoiling the final cap surface have moderate to high runoff potential and moderate to slow permeability (**Table 3.4-5**). This fact, and the regraded configuration of the overburden slopes with the chert cap, provides a useful built-in mitigation measure for the seleniferous infiltration that would occur through the seleniferous portion of the overburden.

Runoff from the top of the cap would be expected to be non-seleniferous because it would not contact the seleniferous shale under the cap. This clean runoff would flow across the cap and be collected at the margins of the overburden fills. At these margins, the overburden overlies native ground, so the collected runoff would be allowed to percolate into the permeable bedrock. There, it would recharge the local groundwater aquifer with large amounts of fresh water. Roughly three times as much clean runoff water would recharge in these areas as would percolate through the seleniferous overburden so the potential groundwater impacts from the seleniferous overburden seepage would be reduced by the combined effects of raising local water tables under the runoff recharge areas and by mixing the seepage through the seleniferous overburden with three times as much clean water. Both water streams, seepage through seleniferous overburden and seepage through the runoff recharge areas, originate as rain and snow falling on the surface of the overburden. Thus they are both mining-related waters that will be co-managed at the overburden fills before they percolate into the subsurface. As shown in **Figure 2.2-6**, these overburden margin runoff recharge areas would be approximately 100 to 150 feet wide. All low permeability topsoil, subsoil or other material would be removed from the foundation of the overburden fills in these recharge areas. This would result in an excavation about 2 to 3 feet deep and a low permeability soil berm about 3 to 5 feet high at the outer margin of the recharge areas. This entire area would be filled with porous, non-seleniferous chert during construction of the overburden fills. When the final regrading and topsoiling is done on the overburden slopes, topsoil would not be applied over the runoff recharge areas which would be left with a rough surface having maximum infiltration capacity. The boundary between the topsoiled slope and the lower non-topsoiled recharge area would be irregular like a natural talus area at the base of a natural mountain slope.

Runoff recharge areas would be located at the lower slope margins of the ridgetop external overburden disposal site as shown in **Figure 2.2-4**. A runoff recharge area would also be constructed at the lower margin of the Panel B-4 slope against the pit highwall. They would not be located over the lower margins of the Panel B-3 pit backfill or the C Panel backfill because of the large amounts of fresh water that already naturally recharge the underlying Wells Formation aquifer under Smoky Creek in this area (**Figure 2.2-2**).

The overburden margin runoff recharge areas have been conservatively designed to infiltrate all the runoff water intercepted by them. The annual water recharge rate required to infiltrate all the captured runoff in these areas is approximately 6.3 feet per year. Estimates of the observed infiltration rate for ponded water in the bottom of the A Panel pit vary from about 26 to 54 feet per year. The estimated infiltration rate under Smoky Creek is approximately 38 feet in about 4 months. Peak runoff flows during spring snowmelt would be accommodated by temporary storage of water in the porosity of the chert (30 percent) in the 5-foot deep storage zone at the base of the recharge areas. The chert thickness and porosity in the runoff recharge areas would also accommodate any sediment eroded from the soil slope above the recharge areas.

A runoff recharge area has also been designed for the north A Panel backfill to introduce the runoff from the future capped slope over the reclaimed A Panel (**Figure 2.2-4**). In this case, a trapezoidal section drainage channel would be built across the base of this slope to direct runoff from the A Panel area toward Smoky Creek. Where this channel is routed over the A Panel pit it would be built over a 3500 foot long chert recharge backfill area which would extend over the entire bottom width of the channel (**Figure 2.2-7**). This chert backfill area would be approximately 200 feet wide where it contacts the permeable Wells Formation in the bottom of the A Panel pit. All low permeability shale would be removed from the Wells Formation in this area so water percolating down in the chert backfill can readily recharge the Wells Formation and eventually enter the aquifer under the pit. The required annual recharge rate for the runoff water that would be captured by this chert backfill is approximately 14 feet per year which is significantly less than the 26 to 54 feet per year infiltration rate observed for the A Panel pit. A similar recharge area backfill is not possible in the southern portion of the Panel A because that pit has already been backfilled.

To reduce the potential for external overburden seeps developing along the margin of the external overburden disposal site the following design and management practices would be followed:

- All topsoil material would be removed from the entire footprint of the external overburden disposal site. This soil would be salvaged and utilized in reclamation of the disturbed areas. Topsoil at the site has significant silt and clay content which would produce a low permeability zone and the base of the overburden fill if left in place. Removing all low permeability topsoil would enhance the potential that seepage from the entire overburden fill would percolate downward at the base of the fill instead of migrating laterally.

- Seleniferous overburden would not be placed within the external overburden fill any closer than 200 feet from the final (regraded and reclaimed) outer toe of the external overburden disposal site (**Figure 2.2-6**). This setback would reduce the potential that seleniferous seepage from the interior of the overburden fill can migrate laterally to the external toe of the fill because all the low permeability topsoil would have been stripped from this setback zone.

- Under the location of the outer margin of the seleniferous overburden within the external overburden fill, all low permeability subsoil would be removed to expose permeable foundation material in a strip at least 30 feet wide (**Figure 2.2-6**). This infiltration strip would collect and infiltrate lateral seepage from the seleniferous overburden before it escaped the interior of the overburden fill.

- An earth berm would be constructed between the infiltration trench and the runoff recharge area (**Figure 2.2-6**). This berm would be at least 5 feet high and 5 feet wide at this height. It would be constructed of subsoil from the overburden disposal site or other low permeability material which would be placed and compacted with a dozer. It would interrupt any high permeability zone produced at the base of the first lift of the overburden fill caused by natural sorting of the overburden particles when dumped off the face of the overburden lift. This would help ensure that any seleniferous seepage from the interior of the overburden fill should be contained within the interior of the fill.

- The 100 to 150-foot wide runoff recharge area itself would be an outer zone of defense reducing the potential for seleniferous seepage from exiting the toe of the external overburden fill. Any such lateral seepage that would unexpectedly get past the infiltration strip and berm described above would be collected in the runoff recharge area and directed into the subsurface. Fresh surface water also collected in the runoff recharge area would reduce the solute concentrations of any lateral seepage collected in the runoff recharge area.

- Runoff from the entire periphery of the external overburden disposal site would be directed to settling ponds which will serve as backup collection and infiltration sites for any unexpected overburden seeps that might develop at the margins of the overburden disposal site.

The overburden design and management measures described above would provide multiple layers of protection to reduce the potential for development of seleniferous seeps at the outer margin of the external overburden disposal facility.

2.2.4 Related Actions

There would be two haul road crossings over Smoky Creek. One new crossing would be along the haul road between the Panel B and C pits, and would be located on the north end of the proposed mining activity (**Figure 2.2-1**). This would involve installation of a new, approximately 300-feet-long, corrugated metal culvert in Smoky Creek, with a 45-foot-high fill placed over it. The access road would be relocated on an alignment sloping up the north side of the canyon on either side of the haul road fill to meet the haul road grade for a road crossing. A new 100-foot long culvert would be installed in Smoky Creek for the temporary access road alignment south of the new haul road crossing. Approximately 1,300 feet of temporary access road would be constructed. Traffic on the Smoky Canyon Road would be directed onto this temporary access road during the proposed operations.

During reclamation of Panels B and C, the haul road fill and temporary access road would be removed and their disturbed areas on the canyon slopes revegetated. The culverts placed in Smoky Creek during construction of the haul road and the temporary access road would also be removed and the creek channel reclaimed. The 1,300 feet of Smoky Canyon access road that was abandoned during B and C Panel operations would be restored to its former condition and put back into use.

Where the temporary access road crosses the haul road, this road intersection would be controlled with an automatic signal, crossing gate or manned guard station to protect drivers on the Smoky Canyon access road from potential accidents with the mine haul traffic on the haul road.

The existing road crossing and culvert in Smoky Creek near the south end of the proposed Panel C would be widened about 100 feet to accommodate a new C-Panel haul road. A crossing guard station similar to the northern access/haul road crossing would also be located at this road intersection.

All the new culverts installed in Smoky Creek would be a minimum of 30 inches in diameter, and designed to safely pass the peak flow from the 100-year, 24-hour storm. The road fills over these culverts would be constructed of chert to prevent leaching of minerals into Smoky Creek.

The existing power line would be re-located within existing disturbed areas to avoid the proposed mining areas.

All facilities associated with the project would be designed and constructed to accommodate seismic activity in accordance with the potential seismic risks.

2.2.5 Reclamation

The reclamation would occur concurrently with mining as described above. The overburden handling from the mining of the Panels B and C may be sequenced as follows:

a. Backfill A-pit from north to south,
b. Create the ridge top overburden disposal facility from north to south,
c. Backfill Pit B-1,
d. Backfill Pit B-2,
e. Backfill Pit C,
f. Backfill Pit B-3,
g. Backfill Pit B-4.

Reclamation activities would closely follow completion of the fills described above, in the following sequence:

a. Shaping and contouring overburden,
b. Placement of the chert cap material,
c. Spreading topsoil over the chert surface,
d. Seedbed preparation, seeding, and fertilizing.

Reclamation would be conducted concurrently with the mining and may follow this schedule:

Year	Reclamation Activity
1-4	Reclaim A-Pit from south to north
1-4	Reclaim ridge top overburden disposal site south to north
2-3	Reclaim Pits B-1 and C-1
3-4	Reclaim Pits B-2 and C-2
4-5	Reclaim Pits B-3 and B-4

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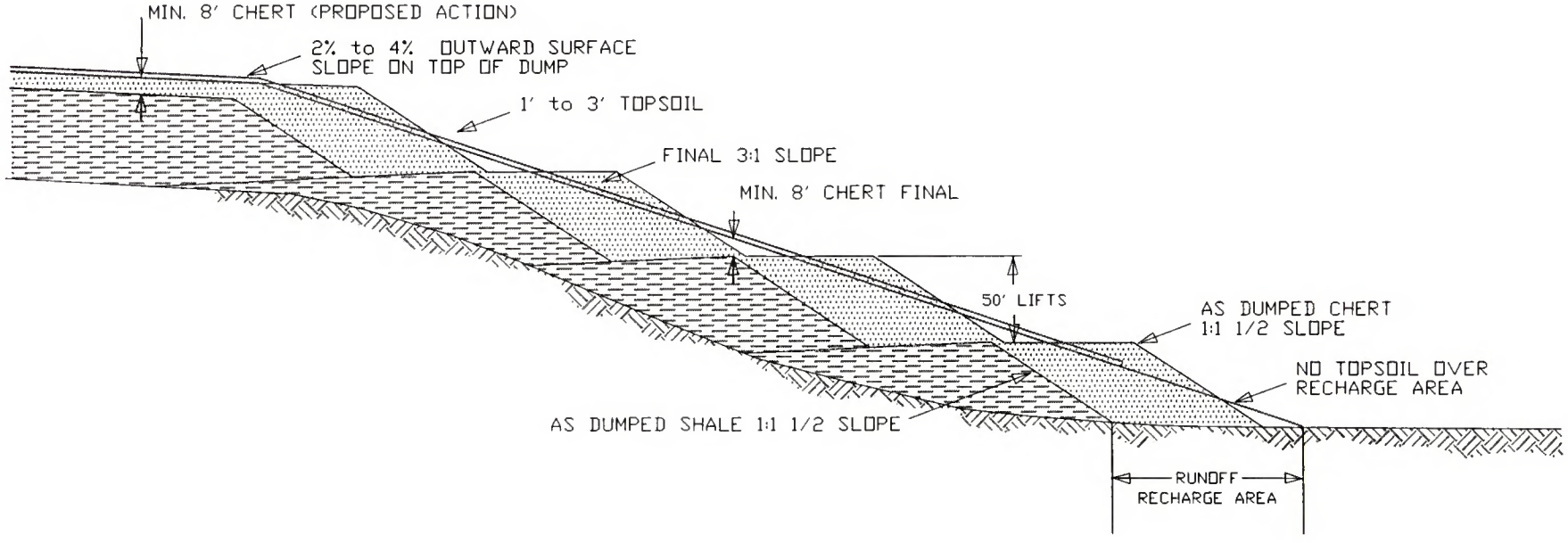


FIGURE 2.2-5
TYPICAL OVERBURDEN DISPOSAL SITE CROSS SECTION
SIMPLOT SMOKY CANYON MINE PANELS B&C
SUPPLEMENTAL EIS

SIMPLOT\FSEIS\Figures DFSESI\Figure 2.2-6.dwg (revised 3/1/02)

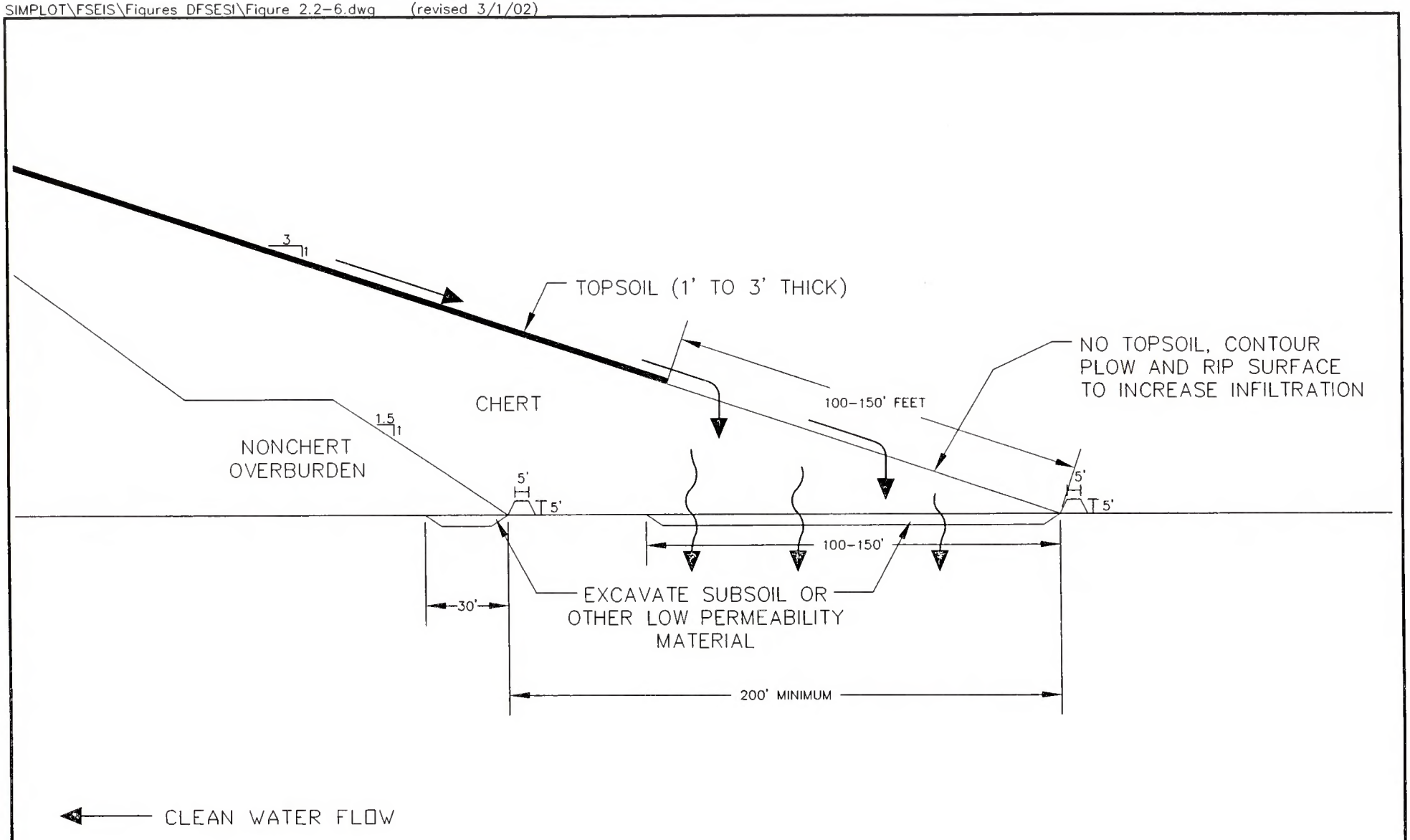
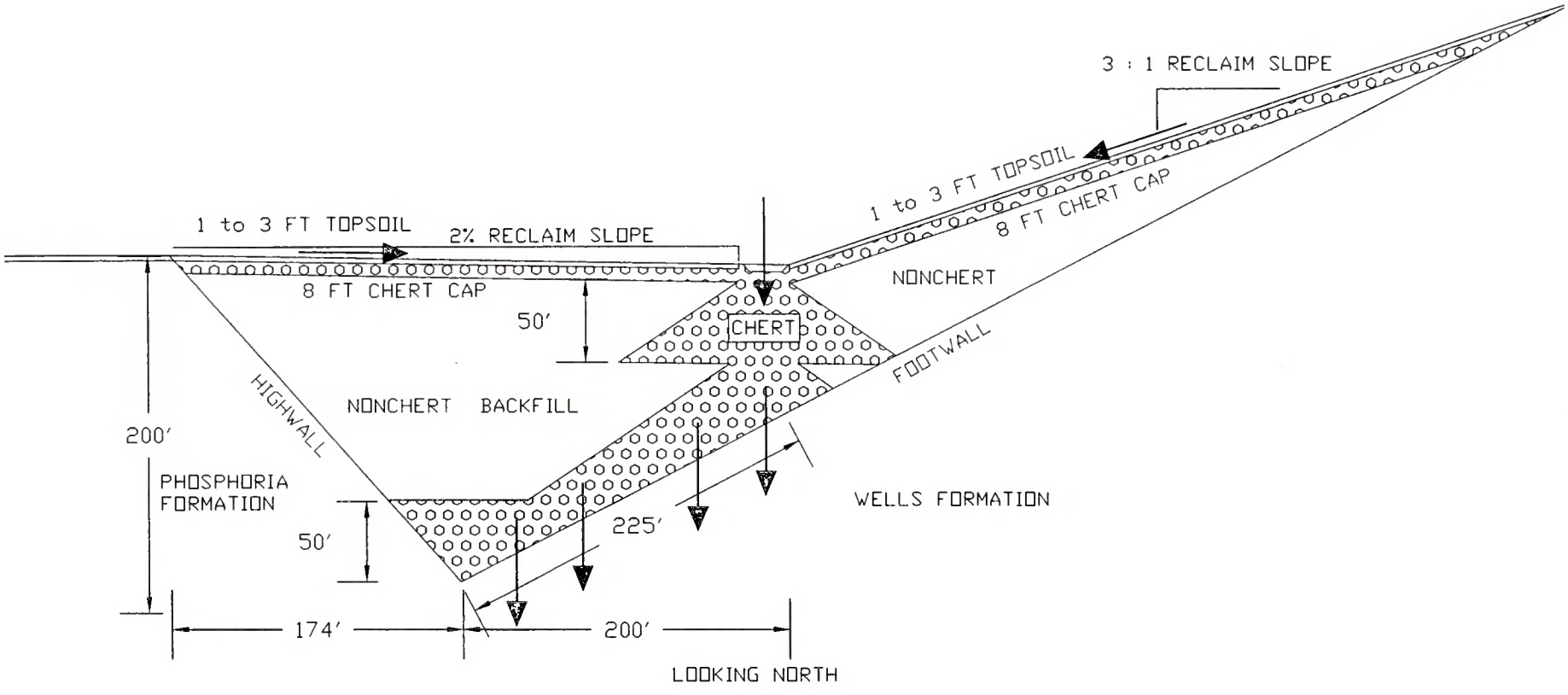


FIGURE 2.2-6
EXTERNAL OVERBURDEN FILL MARGIN RECHARGE AREA DESIGN
SIMPLOT SMOKY CANYON MINE PANELS B&C
SUPPLEMENTAL EIS

drawings\SIMPLOT\Figures FSEIS\Figure 2.2-7.dwg (revised 3/1/02)



SCALE: 1" = 100'

CLEAN WATER FLOW

FIGURE 2.2-7
A-PANEL RECHARGE AREA DESIGN
SIMPLOT SMOKY CANYON MINE PANELS B&C
SUPPLEMENTAL EIS

At the end of their useful lives, all of the haul roads built for Panels B and C would be removed and the disturbed areas restored to approximate original contour. The new haul road (northern) crossing would be removed along with the culvert and the stream channel would be restored. This restoration would be conducted during the summer/fall low flow when this section of channel is typically dry. The road fill would be removed down to the culvert. The culvert would then be removed, along with any bedding soil down to the original channel surface. The channel would be restored to approximate original contour and seeded appropriately. The excess culvert no longer required for the southern haul road crossing would also be removed and the stream channel restored. The fill for the Panel B haul road that encroached on Smoky Creek would be removed as well as the gabion retaining walls and the stream channel would be restored in these areas. The disturbed areas would be reseeded with grass. Reclamation would be in accordance with the recommendations of USFS professionals such as botanists, silviculturalists, hydrologists, soils scientists, and foresters as well as in accordance with any COE and/or IDWR Permits.

For each alternative, a reclamation plan has been developed to reshape the final surface to blend with the surrounding natural topography. Slopes would not exceed 3:1. The remaining highwalls would range in length from 2,800 feet in Panel B to 3,100 feet in Panel C. The residual highwalls would vary in height from 50 to 250 feet, and would consist of a benched slope of approximately 45 degrees.

2.3 Alternatives to the Proposed Action

This section describes alternatives to the Proposed Action, including the No Action Alternative, Alternatives Considered but Eliminated from Detailed Analysis, and the Agency Preferred Alternative. Alternatives selected by the BLM and USFS are based on the potential impacts associated with the Proposed Action and issues, including those identified by the public during the scoping process. The agencies are also required to analyze environmental consequences that would result if the Proposed Action was not implemented. The agencies can select components of more than one alternative in developing the Agency Preferred Alternative. Combinations of alternatives and mitigation measures can also be used by the agencies to reduce or eliminate potential impacts associated with the project.

The substantive issues identified during the public scoping process, combined with reviews and evaluations made by BLM and USFS form the basis for development of alternatives considered in the SEIS. These substantive issues are:

- Site-specific reclamation plans should be developed to incorporate management practices to mitigate environmental impacts from the proposed mining operations, particularly issues related to selenium in overburden.

- External disposal of seleniferous overburden should be minimized; instead, this type of material should be used for pit backfill to the maximum extent reasonably possible.

- Physical impacts to surface streams and associated riparian values should be reduced or eliminated.

- Impacts to water resources (groundwater and surface water) from the proposed mining, including changes in water quality and quantity, should be evaluated and alternatives that would reduce or eliminate these potential impacts developed. Specific focus for changes in water quality relates to selenium mobilization from mining overburden.

- Potential impacts to wildlife, fish, aquatic resources, threatened and endangered species, sensitive species, and cultural resources as a result of the proposed mining operations should be evaluated and alternatives should be developed that would eliminate or reduce these potential impacts.

- Specific focus should be directed to selenium uptake from soil, overburden and surface water and the potential resulting bioaccumulation and biomagnification of selenium and trace metals in plants and the food chain.

- Cumulative effects that could result from the combined impacts of past, present, and reasonably foreseeable activities within the area of the existing and proposed mining activities should be evaluated.

Formulation of alternatives for consideration in the Draft SEIS was a multi-step process that used the issues identified during scoping, the purpose and need for the project, and post-closure land use goals as guidance.

The agencies evaluated the issues and determined which of the issues or comments would guide development of alternatives. The numerous scoping issues and comments were combined into key issue statements and indicators in the SEIS Preparation Plan (JBR, 2000) which were analyzed during the SEIS process and were tracked through this document.

Operational impacts and post-closure land use objectives were the primary issues that guided selection of alternatives. The relationship of these issues and potential mobilization of selenium, uptake of selenium, and biomagnification/bioaccumulation of selenium provided the basis for developing alternatives that would address mechanisms for controlling, limiting, or eliminating selenium movement in the environment.

2.3.1 Alternative A - Handling of Wasterock to Eliminate External Disposal of Seleniferous Waste

This alternative would incorporate all the components of the Proposed Action but would require Simplot to selectively handle and replace all seleniferous overburden shale as backfill in the mine pits of Panels A, B, and C. This responds to the scoping issues requesting evaluation of an alternative that eliminates the disposal of elevated concentrations of selenium in overburden disposal facilities outside of the open pits. Other overburden, such as chert and limestone that do not contain elevated concentrations of selenium would be placed in the ridge top external overburden disposal site that is included within the Proposed Action.

The disturbance footprint of the pits and overburden disposal areas would be the same in this alternative as in the Proposed Action. However, completion of the capping for the pit backfills with chert overburden would require rehandling overburden from the external overburden disposal area back to Panel B. This would amount to approximately 16 percent of the total overburden volume moved. This would add about 50 feet to the Panel B backfill thickness and reduce the length of remaining highwall in this panel from 2,800 feet in the Proposed Action to 2,100 feet. It would reduce the height of this highwall from 250 feet in the Proposed Action to 200 feet. This final rehandling of overburden would extend the completion date of the reclamation activities by approximately ten months.

The configuration of the Panel C backfill would be the same as under the Proposed Action.

The reclamation configuration of the disturbed area would be essentially the same as the Proposed Action **(Figure 2.3-1)**.

Selective handling of mine overburden would also incorporate capping the seleniferous pit backfill material. Chert overburden would be spread over seleniferous overburden to an approximate thickness of 8 feet in the seleniferous overburden disposal areas. This thickness of chert cover is intended to protect the underlying seleniferous shale from erosion and root penetration. One to three feet of topsoil would be spread over the chert rock cover. A chert rock cover would not be required over the external overburden disposal site because it would not contain seleniferous overburden.

2.3.2 Alternative B - No External Wasterock Disposal

This alternative would incorporate all the components of the Proposed Action but would require Simplot to replace all chert, limestone, shale and mudstone overburden as backfill in the mine pits of Panels A, B, and C. This alternative was suggested in several of the comments received during public scoping of the SEIS. The main issue addressed by this alternative is minimization of potential mobilization of contaminants from the overburden to the environment by replacing all overburden back into the open pits. To make this alternative possible, Simplot would have to temporarily store overburden within the same 244 acre area as the external overburden disposal site in the Proposed Action or Alternative A and then relocate all of it back into Panel B when mining in that panel is completed.

This alternative would eliminate the need to develop any new, permanent external overburden disposal area; however, approximately 244 acres of the temporary overburden storage area would still be disturbed during mining and need to be reclaimed. Thus, the disturbance area for this alternative would be the same as for the Proposed Action or Alternative A.

The requirement for rehandling the overburden from the temporary external overburden storage area, and some additional chert at the end of mining, would require the rehandling of approximately 36 percent of the total overburden volume. This would extend the time period for final reclamation of Panel B by approximately 21 months.

The backfilling of Panel C would essentially be the same as for the Proposed Action and Alternative A. The full backfilling of Panel B would completely eliminate the highwall in this panel compared to the 250-foot high and 2,800-foot long highwall that would remain in the Proposed Action **(Figure 2.3-2)**.

Selective handling of mine overburden would be practiced during the mine backfill operations. Chert overburden would be spread over the combined overburden in a thickness of approximately eight feet. This thickness of chert cover is intended to protect the underlying overburden from erosion and root penetration. One to three feet of topsoil would be spread over the chert cover.

2.3.3 No Action Alternative

Under the No Action Alternative, Simplot's proposed detailed mining and reclamation/mitigation plans for the development of mine Panels B and C would be delayed. Simplot would not be able to proceed with mining of the ore in these panels until such time as a mining and reclamation plan is found to be acceptable by the BLM and USFS.

A No Action Alternative was evaluated in the 1981/1982 EIS for the Smoky Canyon Mine that would have resulted in not developing the phosphate resources at Smoky Canyon. This alternative was rejected in favor of an agency preferred alternative that would result in the development of mine panels A through E, incorporating suitable mitigative measures and monitoring practices.

2.4 Features Common to the Proposed Action and Alternatives

2.4.1 Common Features

The following features are common to the Proposed Action, and Alternatives A and B. Some of these features are not applicable to the No Action Alternative.

- Mining of Panels B and C ore bodies with the same methods as currently used;
- Operation of the mill, concentrate slurry pipeline, and tailings ponds in approximately the same manner as currently practiced;
- Continued operation of the administrative, maintenance and support facilities;
- Two new stream crossings of Smoky Creek and lengthening an existing crossing;
- Projected continued employment of approximately 190 persons;
- Utilization of groundwater and surface water at approximately the current rate;
- Consumption of electricity, petroleum, reagents, and supplies at approximately the current rate;
- All surface disturbances would be reclaimed in accordance with federal, state and local regulations;
- Topsoil would be salvaged, in compliance with agency topsoil salvage guidelines, from areas proposed for disturbance. This topsoil would be stockpiled for future use or direct hauled to regraded areas and spread in preparation for concurrent surface reclamation of those areas;
- Overburden would be used to backfill mined-out open pits or placed in external overburden disposal facilities, regraded to slopes of 3h:1v, capped as required (seleniferous overburden only) with 8 feet of chert rock and reclaimed with 1 to 3 feet of topsoil and vegetation;

B&C PANELS
SMOKY CANYON MINE
1927 NORTH AMERICAN DATUM
IDAHO EAST
PORTIONS OF T.8S., R.45E., SEC. 13, 24, 25 & 36
AND T.8S, R.46E., SEC. 17, 18, 19, 20, 29, 30 & 31

LEGEND

- HIGHWALL
- LEASE BOUNDARY
- USFS BOUNDARY
- HAUL ROADS
- SETTLEMENT BASINS
- SECTION LINES
- RECLAMATION
- 50 FOOT CONTOUR INTERVAL

N

LEASE 026843
LEASE 012890
LEASE 015259
LEASE 027801
U.S.F.S.
U.S.F.S. USE PERMIT
ROBERTS CREEK
SMOKY CREEK
MAIN CLOSE PUMPER LINE
POWER LINE
2% SLOPE FOR ENTIRE RIDGETOP

EXPLANATION

RUNOFF RECHARGE AREA

1000 0 1000 FEET

FIGURE 2.3-1
ALTERNATIVE A RECLAMATION PLAN
SIMPLOT SMOKY CANYON MINE PANELS B&C
SUPPLEMENTAL EIS

drawings\SIMPLOT\FSEIS\Figures FSEIS\Figure 2.3-1.dwg (revised 1/15/02)

B&C PANELS
SMOKY CANYON MINE
1927 NORTH AMERICAN DATUM
IDAHO EAST
PORTIONS OF T.8S., R.45E., SEC. 13, 24, 25 & 36
AND T.8S., R.46E., SEC. 17, 18, 19, 20, 29, 30 & 31

LEGEND

- HIGHWALL
- LEASE BOUNDARY
- USFS BOUNDARY
- HAUL ROADS
- SETTLEMENT BASINS
- RECLAMATION
- 50 FOOT CONTOUR INTERVAL

EXPLANATION

RUNOFF RECHARGE AREA

1000 0 1000 FEET

FIGURE 2.3-2
ALTERNATIVE B RECLAMATION PLAN
SIMPLOT SMOKY CANYON MINE PANELS B&C
SUPPLEMENTAL EIS

drawings\SIMPLOT\FSEIS\Figures FSEIS\Figure 2.3-2.dwg (revised 1/21/02)

- Overburden disposal facilities would be designed at approximately 3h:1v overall slope to facilitate final regrading to that approximate slope;

- Run-off control ditches, catch basins, and sediment traps would be constructed as necessary to minimize transport of eroded material away from disturbed areas (**Figure 2.4-1**);

- Areas of disturbance would be kept to the minimum necessary for safe and efficient operations;

- Haul roads would be constructed with stable cuts, fills, ditches, and culverts. Haul roads would be surfaced with non-seleniferous, durable materials and crowned to shed water. Run-off from roads would be collected and channeled to retention ponds in stable ditches (**Figure 2.4-2**);

- Designed surface water management would follow applicable BMPs to protect water quality (**Appendix 2B**). These would include: run-on and runoff control, sediment collection, soil stabilization, seeding and revegetation, overburden disposal site construction to minimize mobilization of selenium, and range management;

- All seleniferous overburden shale would be covered with eight feet of chert overburden prior to final reclamation. This is intended to separate the roots of the vegetation from the underlying seleniferous shale and protect the shale (overburden) from erosion;

- Vegetated buffer zones at least 50 feet wide would be maintained between the Panel B and C pits and Smoky Creek; and

- Runoff recharge areas would be used to mitigate potential groundwater impacts.

2.4.2 Overburden Cap

Selenium and other potential contaminants contained in the seleniferous shale overburden can be mobilized to the environment through a number of pathways including: erosion and transportation as sediment in air or water, dissolution and washing away in surface runoff, dissolution and infiltration in percolating water, vegetative uptake by plant roots, and ingestion of plants subject to selenium bioaccumulation by wildlife and livestock.

Past practices in design of the overburden disposal facilities at the Smoky Canyon mine and other mines typically consisted of handling overburden material as a mixture as it came from the mine pit, sometimes purposely handling it so as to cover the entire surface of the overburden disposal facility with a layer of shale which would presumably weather into a topsoil substitute growth medium. These practices placed shales, now known to have high selenium concentrations, on the surface of waste piles. The selenium was available for mobilization to the environment in one or more of the release pathways listed above.

Mitigation for the mobilization of selenium, from plant uptake and to facilitate rapid drainage of the soils, is the placement of chert as a cover. Chert of sufficient depth and coarse texture would deter deep root penetration and provide rapid drainage there by preventing or significantly reducing bio-accumulation in reclamation vegetation.

The proposed cap would control erosion by covering all seleniferous overburden with 8 feet of hard chert material resistant to weathering and erosion and 1 to 3 feet of topsoil over the chert. All areas of the chert cover would also be revegetated to further protect the reclaimed surface from erosion and provide evapotranspiration. Simplot would monitor the reclaimed areas after revegetation is complete to identify erosion potential or problems. Identified problems will be addressed.

Separation of vegetation roots from the seleniferous overburden shale would be accomplished by the chert and topsoil cap. Rooting depths for the vegetation mix proposed for reclamation are typically up to 4 feet which is less than the 9 to 11 foot thick chert and topsoil cap.

Infiltration of precipitation and snow melt into the seleniferous overburden shales would be reduced by a number of features including: 1) producing a final grade on reclaimed surfaces to shed runoff instead of letting it pond and infiltrate; 2) establishing a perennial vegetation cover which would remove some infiltration by evapo-transpiration; and 3) providing adequate thickness of topsoil and chert to retain annual infiltration in the chert cap, making it available for evapo-transpiration.

2.4.3 Best Management Practices

Simplot would incorporate appropriate management practices into the operations. A thorough explanation of these management practices is contained in **Appendix 2B**. The following summarizes the BMPs for erosion and sediment control that would be utilized:

Run-on Collection/Run-off Control: As necessary, drainage and diversion channels would be constructed to collect run-on water around disturbance areas and collect run-off from disturbed area to route it to settling ponds and other sediment control features.

Soil Salvage: Suitable topsoil resources and growth medium would be salvaged from proposed disturbed areas for use in reclamation. A minimum of 1 foot and up to 3 feet of topsoil would be placed over all regraded areas.

Sediment Control: Run-off from disturbed areas would be directed to sediment ponds or silt traps to contain sediment in the run-off water. Sediment ponds would be designed for the runoff from the 100-year, 24-hour storm event in the control area, plus a snow melt event.

Soil Stabilization: Erosion of soil from reclaimed areas would be controlled with engineering design and revegetation techniques.

Seeding and Revegetation: Seeding of the approved reclamation seed mix would proceed no later than the first fall after a regraded area is covered with topsoil.

Concurrent Reclamation: Reclamation of disturbed areas that are no longer required for active mining operations would be conducted concurrent with other mining operations.

Range Management: Livestock grazing in reclaimed areas would be controlled until the areas have become stabilized and are deemed ready for grazing by the USFS.

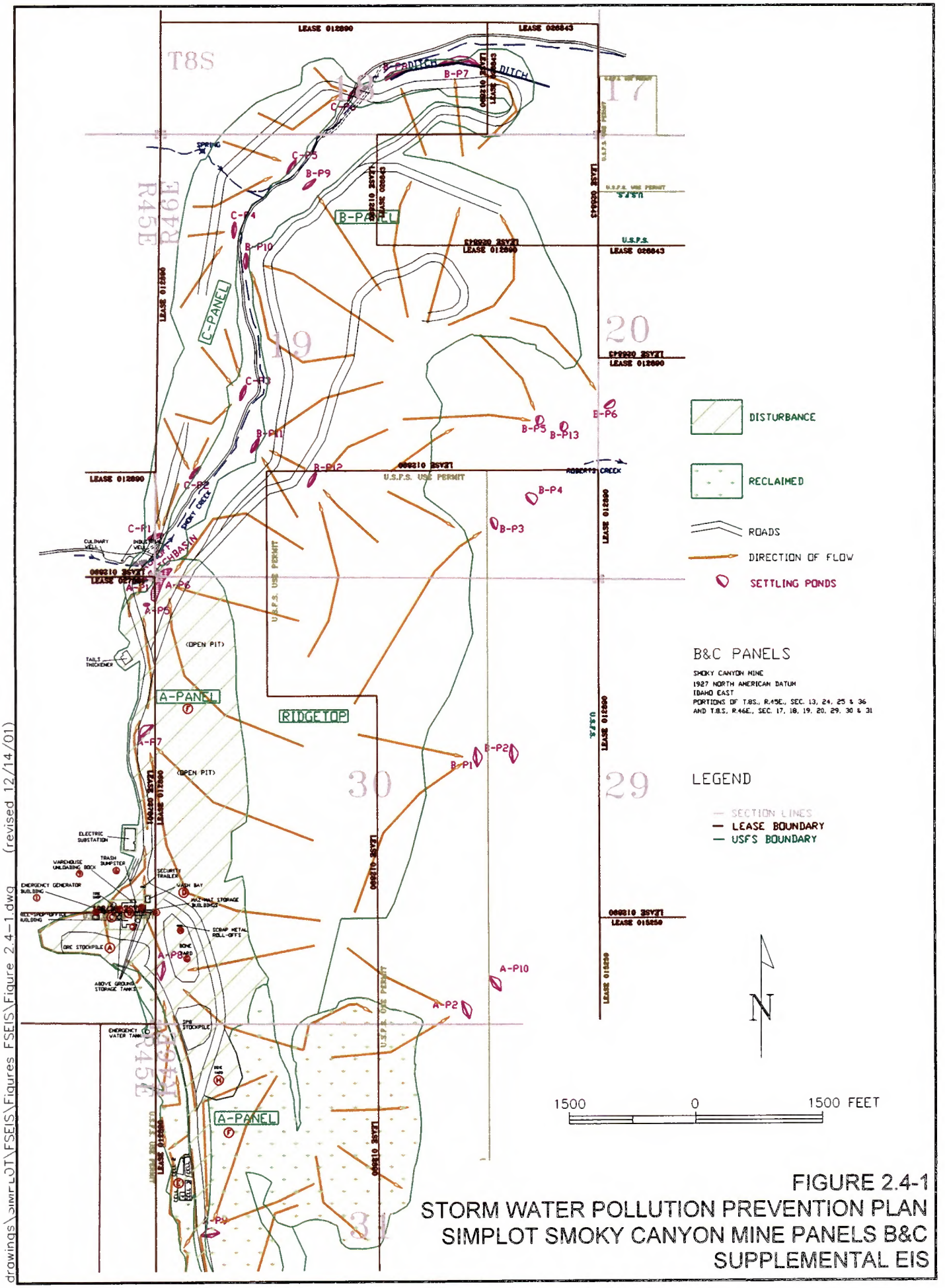


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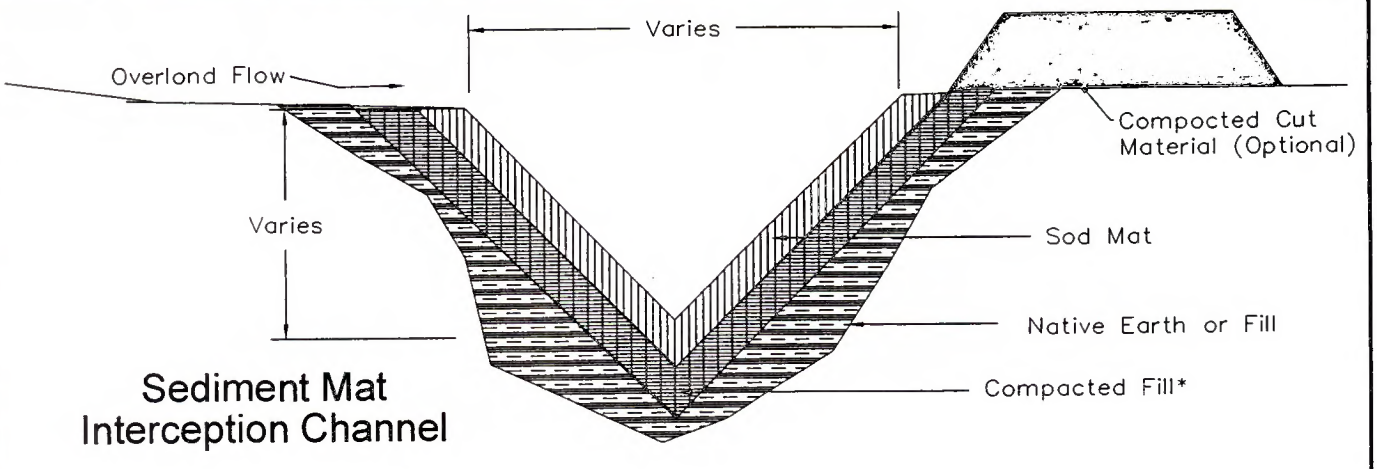
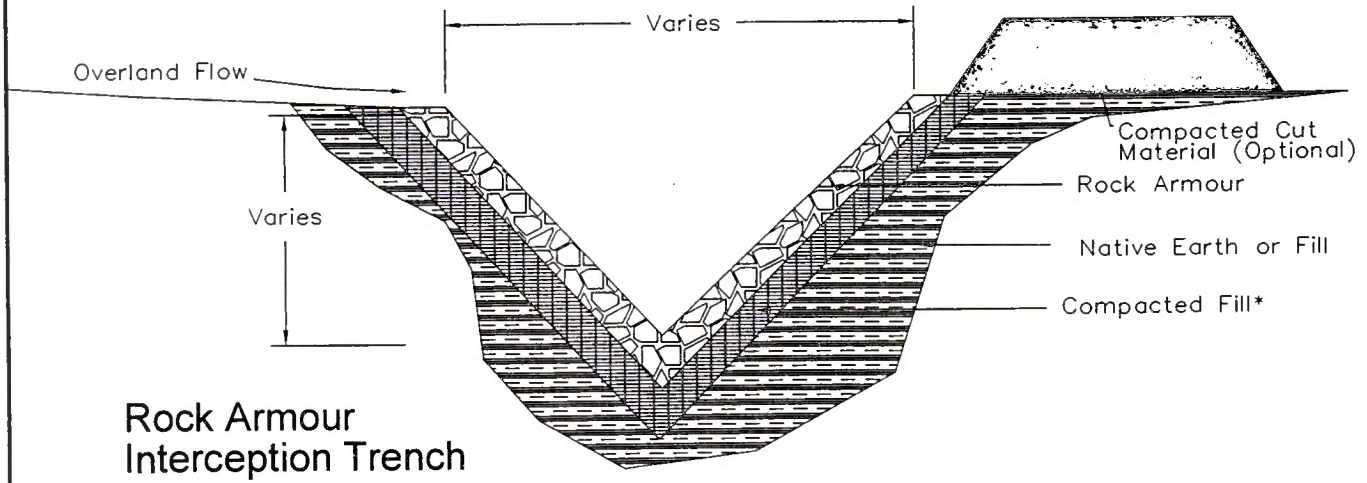
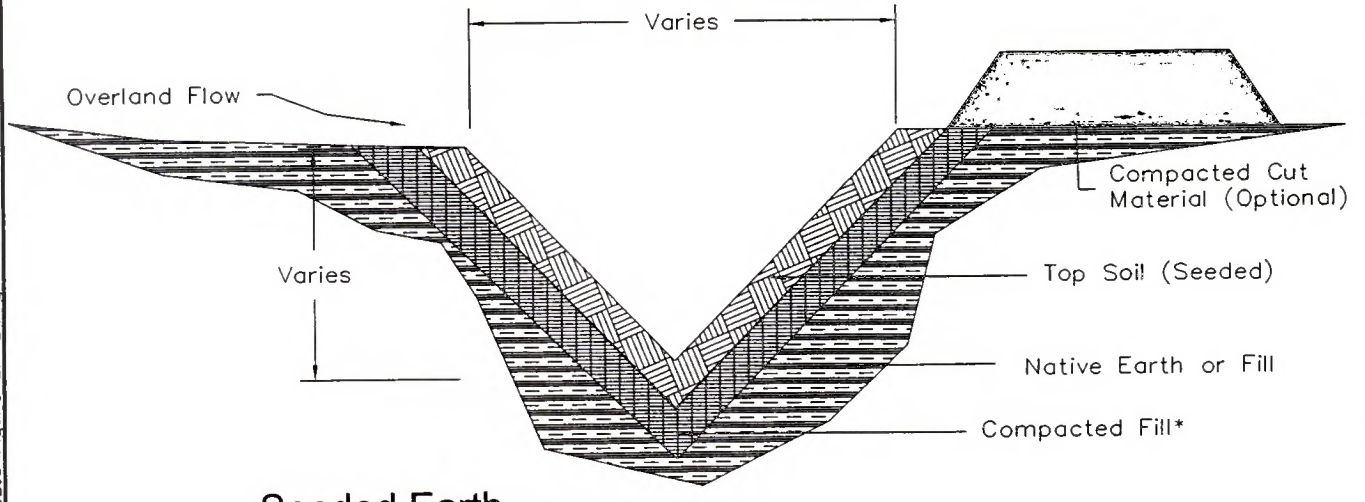
FIGURE 2.4-1
STORM WATER POLLUTION PREVENTION PLAN
SIMPLOT SMOKY CANYON MINE PANELS B&C
SUPPLEMENTAL EIS



Sediment Mat
Interception Channel



Rock Armour
Interception Trench



Seeded Earth
Interception Channel

*Compacted fill to be used where ditch is routed over external overburden fill

FIGURE 2.4-2
DIVERSION DITCH CROSS SECTION
SIMPLOT SMOKY CANYON MINE PANELS B&C
SUPPLEMENTAL EIS

drawings\SIMPLOT\FSEIS\Figures FSEIS\Figure 2.4-2.dwg (revised 6/4/01

Riprap, Gabions and Culverts: Erosion of channels and fills would be controlled by use of vegetation, chert, or limestone riprap or gabions filled with chert or limestone. Culverts would be properly sized and installed for road crossings of waterways.

The following management practices for dissolved selenium control would be utilized in construction of overburden disposal areas to reduce formation of soluble selenium compounds and their removal from the overburden through leaching by precipitation:

Snow Removal: Snow removal would be practiced to prevent the soil contained in the removed snow from being released outside of the run-off control area and to reduce man-made entrainment of snow in overburden fills to the extent practicable.

Construction of Fills for Roads and Facilities: Fills for road and parking area surfaces would be constructed of chert and would be designed with slopes and temporary vegetation, as applicable, to stabilize slopes and reduce generation of sediment in run-off from these areas.

Pit Backfills and Reclamation: Exposed pit bottoms would be covered with overburden fills to restore approximate natural contours, capped with chert as required to cover seleniferous overburden, topsoiled and revegetated.

Characterization and Selective Handling of Overburden: Overburden would be characterized to determine selenium containing (seleniferous) lithologic units that can generate problematic leachate or promote bioaccumulation. Overburden from these lithologic units would be selectively handled to reduce its exposure to surface environments.

Avoiding Drainages: Perennial and significant intermittent drainages would be avoided in location of overburden disposal areas to the extent possible.

Run-on Control: Overburden run-on from higher slopes would be controlled with collection and diversion ditches as necessary. Run-on to Panel C will be collected in a stable channel around the active mine area. The locations of the proposed B-Panel backfill and the external overburden disposal site on the ridgetop will eliminate any run-on to these areas.

Design of Drainage Channels on Overburden: Drainage channels that are routed over overburden would be designed to reduce infiltration of channel flow into underlying seleniferous overburden.

Design of Sediment Controls: Run-off and sediment control facilities would be located off overburden fills to the extent feasible to reduce infiltration of collected water into seleniferous overburden.

Grading Overburden: Overburden final slopes would be graded to promote runoff and avoid ponding to reduce infiltration from precipitation and snow melt.

Overburden Aspect: South and west facing aspects would be incorporated into final overburden fill slopes as possible to enhance evapotranspiration and reduce infiltration.

Haul Road Runoff Control: Runoff from haul road drainage ditches onto external overburden fills would be avoided.

Snow Removal: Manmade deposits of snow would be controlled and placed in areas to reduce infiltration or mixing of snow or snow melt into/with overburden to the extent practicable.

Cap: Seleniferous overburden fills would be capped with chert and topsoil to reduce exposure of the overburden to vegetation roots, protect them from erosion and to promote evapotranspiration from the cap.

Reduce Surface Area: Surface area of seleniferous overburden fills would be reduced to the extent practicable to limit the amount of water infiltration and potential release.

Avoid Groundwater Discharges: Covering natural seeps and springs with overburden would be avoided to eliminate introduction of water into the overburden from these sources.

Reclamation and Revegetation: Topsoil and vegetation would be re-established on overburden disposal areas to enhance evapotranspiration of precipitation.

Material Consolidation: Seleniferous overburden would be consolidated through use of 50-foot benches in external overburden fills to reduce the porosity of the overburden. Thinner benches would be used as needed for site-specific locations where additional reductions in porosity of the overburden is needed.

Basal Layer Control: The bottom layer of overburden fills would be constructed to reduce the potential for formation of permeable basal layers that could contribute to oxidation of the overburden and formation of overburden seeps.

Reduction of Mining Oxidation: Seleniferous overburden would be mined and disposed of in a timely manner to reduce exposure of this material to surface weathering and oxidation, the process that liberates soluble selenium compounds.

Modification or Elimination of Low Permeability Foundation Material: Low permeability layers of soil or shale in foundations of overburden disposal area slopes would be modified or removed to avoid the perching of water leading to the formation of overburden seeps.

Use Runoff Recharge Areas: Clean surface runoff from certain areas of the reclaimed overburden fills would be directed to permeable chert fills overlying permeable bedrock so the aquifer under these areas can be recharged by the clean water. This would reduce the concentrations of selenium in seepage from nearby overburden fills in the aquifer.

2.5 Environmental Monitoring

Monitoring of environmental mitigation systems, as required by existing permits, would be continued under the proposed operations. This monitoring may change over time as these permit requirements change, but currently includes the following:

- Monthly visual inspections of the mine site storm water BMP structures are performed as weather permits. These include assessments of the integrity of the storm water diversions, conveyance systems, sediment control and collection systems, vegetation, slopes, material handling and storage

areas, catch basins, and check dams. Following these inspections, any necessary maintenance or repair actions are reported to the mine management and filed in the SWPPP records.

- As required by existing permits, during a 0.1-inch or larger storm event, visual inspection is made at least once per quarter during daylight hours of storm water discharge from each outfall (discharge point). Samples are collected from the initial discharge at each outfall and analyzed for total suspended solids (TSS).

- Annual comprehensive site evaluations of the storm water control systems would be conducted in early summer to determine if any revisions are necessary to these systems and to the SWPPP.

- TRC Mariah Associates Inc. of Laramie, Wyoming conducts water quality monitoring for the mine facility. They collect surface water samples on twelve (12) stream locations (six streams at an upper and lower reach), as well as the Tailings Dam No. 2 toe drain. Water samples are submitted to ACZ Laboratories in Steamboat Springs, Colorado. Samples are analyzed for a variety of metals, as well as wet chemistry parameters. Mariah also collects benthic samples containing macro-invertebrates that help to further understand the water quality.

2.6 Summary Comparison of Alternatives

A summary of the key issues related to the Proposed Action and Alternatives for each environmental resource is shown in **Table 2.6-1**. A summary comparison of the Alternatives is included in **Table 2.6-2**. Detailed descriptions of impacts for specific resources are included in Chapter 4.

Table 2.6-1 Effects Summary

Resource	Proposed Action	Alternative A No External Disposal of Seleniferous Overburden	Alternative B No External Disposal of any Overburden	No Action Alternative
Geology, Minerals and Topography	Modification of 618 acres of natural terrain, and 217 acres of existing mine disturbance.	Modification of 618 acres of natural terrain, and 217 acres of existing mine disturbance.	Modification of 618 acres of natural terrain, and 217 acres of existing mine disturbance.	No terrain modified until a mine plan is approved.
	Removal of 93.77 MMT of ore and overburden.	Removal of 93.77 MMT of ore and overburden.	Removal of 93.77 MMT of ore and overburden.	No ore removal until a mine plan is approved.
	Potential area of seleniferous overburden is 722 acres	Potential area of seleniferous overburden is 480 acres	Potential area of seleniferous overburden is 486 acres	No new seleniferous overburden until a mine plan is approved.
	External disposal of both seleniferous and non-seleniferous overburden.	No external disposal of seleniferous overburden.	No external disposal of any overburden.	No overburden disposal until a mine plan is approved.
	9-11 foot thick cap on all areas of seleniferous overburden disposal.	9-11 foot thick cap on all areas of seleniferous overburden disposal.	9-11 foot thick cap on all areas of seleniferous overburden disposal.	No overburden disposal until a mine plan is approved.
	13 acres of highwalls left after reclamation in Panels B and C pits.	11 acres of B and C highwalls left after reclamation.	5 acres of Panel C highwalls left after reclamation.	No highwalls created until a mine plan is approved.
Air Resources & Noise	Shift air quality impacts from mining about 4 miles north.	Shift air quality impacts from mining about 4 miles north.	Shift air quality impacts from mining about 4 miles north.	Air impacts remain at existing mine area until a mine plan is approved.
	Mining and hauling fugitive dust releases would be close to public access.	Mining and hauling fugitive dust releases would be close to public access.	Mining and hauling fugitive dust releases would be close to public access.	Dust impacts would remain in existing mine area until a mine plan is approved.
	Fugitive dust (486 TPY) from handling overburden including double handling of 4% of overburden.	16% of the total overburden would be handled twice producing 1,242 TPY of fugitive dust.	36% of the total overburden would be handled twice producing 1,548 TPY of fugitive dust.	No fugitive dust would be produced from Panels B and C until a mine plan is approved
	Noise impacts would shift north 4 miles closer to public access road.	Noise impacts would shift north 4 miles closer to public access road.	Noise impacts would shift north 4 miles closer to public access road.	Existing noise impacts would continue until a mine plan is approved.

Table 2.6-1 Continued

Resource	Proposed Action	Alternative A No External Disposal of Seleniferous Overburden	Alternative B No External Disposal of any Overburden	No Action Alternative
Water Resources	New road construction in Smoky Canyon would cause a temporary increased sediment load in ephemeral sections of Smoky Creek.	New road construction in Smoky Canyon would cause a temporary increased sediment load in ephemeral sections of Smoky Creek.	New road construction in Smoky Canyon would cause a temporary increased sediment load in ephemeral sections of Smoky Creek.	Impact to Smoky Creek would remain at current levels.
	Rehandling 4% of overburden would expose it to more weathering and erosion.	Rehandling 16% of overburden would expose it to more weathering and erosion.	Rehandling 36% of overburden would expose it to more weathering and erosion.	No overburden would be produced in Panels B and C until a mine plan is approved.
	9-11 foot thick cap on all seleniferous overburden will reduce migration of contaminants to surface and ground water resources.	9-11 foot thick cap on all seleniferous overburden will reduce migration of contaminants to surface and ground water resources.	9-11 foot thick cap on all seleniferous overburden will reduce migration of contaminants to surface and ground water resources.	No cap would be necessary as no overburden would be produced from Panels B and C until a mine plan is approved.
	Ephemeral flow in Smoky Creek would temporarily decrease 14% and Roberts Creek 10% due to interception of runoff from mine areas.	Ephemeral flow in Smoky Creek would temporarily decrease 14% and Roberts Creek 10% due to interception of runoff from mine areas.	Ephemeral flow in Smoky Creek would temporarily decrease 14% and Roberts Creek 10% due to interception of runoff from mine areas.	Ephemeral flow in Smoky Creek and Roberts Creek would not be impacted by additional sediment controls until a mine plan is approved.
	Ephemeral flow would be permanently decreased by 8% in Smoky Creek and 11% in Roberts Creek from the runoff recharge areas.	Ephemeral flow would be permanently decreased by 8% in Smoky Creek and 11% in Roberts Creek from the runoff recharge areas.	Ephemeral flow would be permanently decreased by 8% in Smoky Creek and 0% in Roberts Creek from the runoff recharge areas.	Ephemeral flow in Smoky Creek and Roberts Creek would not be impacted until a mine plan is approved.
	Disposal of seleniferous overburden will increase potential leaching exposure from infiltration at external overburden site and both pit backfills.	No exposure of seleniferous overburden external to open pit areas.	No exposure of seleniferous overburden external to open pit areas.	No overburden produced therefore no leaching due to mining Panels B and C would occur until a mine plan is approved.
	A total aquifer area of about 550 acres is estimated to have groundwater selenium concentrations greater than the MCL. Of this, 100 acres outside the mine area is estimated to have groundwater selenium concentrations greater than the MCL.	A total aquifer area of about 322 acres is estimated to have groundwater selenium concentrations greater than the MCL. Of this, 100 acres outside the mine area is estimated to have groundwater selenium concentrations greater than the MCL.	A total aquifer area of about 322 acres is estimated to have groundwater selenium concentrations greater than the MCL. Of this, 100 acres outside the mine area is estimated to have groundwater selenium concentrations greater than the MCL.	No new groundwater impact would occur due to mining Panels B and C until a mine plan is approved. Existing impacts would continue. No additional groundwater impact would occur due to mining Panels B and C until a mine plan is approved.

Table 2.6-1 Continued

Resource	Proposed Action	Alternative A No External Disposal of Seleniferous Overburden	Alternative B No External Disposal of any Overburden	No Action Alternative
Soil and Watershed	Loss of soil productivity during salvage and replacement of 2 MMCY of suitable and marginally suitable topsoil.	Loss of soil productivity during salvage and replacement of 2 MMCY of suitable and marginally suitable topsoil.	Loss of soil productivity during salvage and replacement of 2 MMCY of suitable and marginally suitable topsoil.	No soil impacts from Panels B and C until a mine plan is approved.
	Approximately 618 acres of soil would be disturbed. Soil erosion within disturbed area possible but contained within disturbance.	Approximately 618 acres of soil would be disturbed. Soil erosion within disturbed area possible but contained within disturbance.	Approximately 618 acres of soil would be disturbed. Soil erosion within disturbed area possible but contained within disturbance.	No soil impacts from Panels B and C until a mine plan is approved.
	Total reclaimed area of 822 acres, 13 acres of highwall unreclaimed and exposed.	Total reclaimed area of 824 acres, 11 acres of highwall unreclaimed and exposed.	Total reclaimed area of 830 acres, 5 acres of highwall unreclaimed and exposed.	No highwalls from Panels B and C until a mine plan is approved.
	9-11 foot thick cap of nonseleniferous topsoils and chert would prevent plant uptake of selenium and trace metals from overburden shale.	9-11 foot thick cap of nonseleniferous topsoils and chert would prevent plant uptake of selenium and trace metals from overburden shale.	9-11 foot thick cap of nonseleniferous topsoils and chert would prevent plant uptake of selenium and trace metals from overburden shale.	No overburden would be produced from Panels B and C until a mine plan is approved
Vegetation	Vegetation communities would be altered on 618 acres of new disturbance.	Vegetation communities would be altered on 618 acres of new disturbance.	Vegetation communities would be altered on 618 acres of new disturbance.	No vegetation impacts from Panels B and C would occur until a mine plan is approved.
	Revegetation would temporarily replace forests and shrub communities with grass and forb communities except for 13 acres of highwall that would be unreclaimed.	Revegetation would temporarily replace forests and shrub communities with grass and forb communities except for 11 acres of highwall that would be unreclaimed.	Revegetation would temporarily replace forests and shrub communities with grass and forb communities except for 5 acres of highwall that would be unreclaimed.	No highwalls or removal of vegetation from Panels B and C would occur until a mine plan is approved .
	9-11 foot thick cap would prevent plant uptake of selenium and trace metals from overburden shale.	9-11 foot thick cap would prevent plant uptake of selenium and trace metals from overburden shale.	9-11foot thick cap would prevent plant uptake of selenium and trace metals from overburden shale.	No vegetation impacts from mining Panels B and C would occur until a mine plan is approved.

Table 2.6-1 Continued

Resource	Proposed Action	Alternative A No External Disposal of Seleniferous Overburden	Alternative B No External Disposal of any Overburden	No Action Alternative
Grazing Management	Forage for grazing would be initially removed from 618 acres.	Forage for grazing would be initially removed from 618 acres.	Forage for grazing would be initially removed from 618 acres.	No impacts to forage due to mining Panels B and C would occur until mine plan is approved.
	Forage for grazing would be permanently removed from 13 acres of unreclaimed highwalls.	Forage for grazing would be permanently removed from 11 acres of unreclaimed highwalls.	Forage for grazing would be permanently removed from 5 acres of unreclaimed highwalls.	No highwalls from mining Panels B and C would occur until mine plan is approved.
	Cap design over overburden would make selenium and trace metals unavailable for plant uptake thereby reducing potential for ingestion by livestock.	Cap design over overburden would make selenium and trace metals unavailable for plant uptake thereby reducing potential for ingestion by livestock.	Cap design over overburden would make selenium and trace metals unavailable for plant uptake thereby reducing potential for ingestion by livestock.	No overburden would be produced from Panels B and C until mine plan is approved
	Sheep Spring trough relocated.	Sheep Spring trough relocated.	Sheep Spring trough relocated.	No relocation of trough required.
	Potential for noxious weed invasion on 822 reclaimed acres.	Potential for noxious weed invasion on 824 reclaimed acres.	Potential for noxious weed invasion on 830 reclaimed acres.	No mine disturbance would occur until mine plan is approved .
Wetlands	Smoky Creek would be crossed with three new road fills/culverts.	Smoky Creek would be crossed with three new road fills/culverts.	Smoky Creek would be crossed with three new road fills/culverts.	No new road fills or culverts would be installed in Smoky Creek until mine plan is approved.
	Ephemeral flows in Smoky Creek would temporarily decrease due to interception of runoff from mine areas.	Ephemeral flows in Smoky Creek would temporarily decrease due to interception of runoff from mine areas.	Ephemeral flows in Smoky Creek would temporarily decrease due to interception of runoff from mine areas.	No interception of ephemeral flows to Smoky Creek would occur from Panels B and C until mine plan is approved.
	Ephemeral flow in Smoky Creek would be permanently decreased by 8% from the runoff recharge areas.	Ephemeral flow in Smoky Creek would be permanently decreased by 8% from the runoff recharge areas.	Ephemeral flow in Smoky Creek would be permanently decreased by 8% from the runoff recharge areas.	There would be no changes in Smoky Creek flow until a mine plan is approved.
	0.3 acres of wetland would be excavated in C Panel and filled in Smoky Creek at road crossings.	0.3 acres of wetland would be excavated in C Panel and filled in Smoky Creek at road crossings.	0.3 acres of wetland would be excavated in C Panel and filled in Smoky Creek at road crossings.	No wetlands would be impacted in Smoky Canyon until mine plan is approved.

Table 2.6-1 Continued

Resource	Proposed Action	Alternative A No External Disposal of Seleniferous Overburden	Alternative B No External Disposal of any Overburden	No Action Alternative
Wildlife Resources, Fisheries and Aquatics	Direct loss of habitat, mostly forest habitat, on 618 acres, displacing wildlife from direct impact areas. Ephemeral flow in Smoky Creek would temporarily decrease due to interception of runoff from mine areas. Ephemeral flow in Smoky Creek would be permanently decreased by 8% from the runoff recharge areas. Continued exposure to elevated levels of selenium and trace metals in tailings water until 2007 or until the tailings ponds are closed. Temporary exposure of wildlife to elevated selenium levels in water and sediments of mine areas until 2007 or until reclamation is completed. Reclamation would replace natural plant communities with grass/forb communities on 605 acres of new disturbance, 13 acres of unreclaimed highwall could provide habitat for some species. Cap design would prevent selenium and trace metals uptake by plants thereby reducing potential for ingestion by wildlife.	Direct loss of habitat, mostly forest habitat, on 618 acres, displacing wildlife from direct impact areas. Ephemeral flow in Smoky Creek would temporarily decrease due to interception of runoff from mine areas. Ephemeral flow in Smoky Creek would be permanently decreased by 8% from the runoff recharge areas. Continued exposure to elevated levels of selenium and trace metals in tailings water until 2007 or until the tailings ponds are closed. Temporary exposure of wildlife to elevated selenium levels in water and sediments of mine areas until 2008 or until the tailings ponds are closed. Reclamation would replace natural plant communities with grass/forb communities on 607 acres of new disturbance, 11 acres of unreclaimed highwall could provide habitat for some species. Cap design would prevent selenium and trace metals uptake by plants thereby reducing potential for ingestion by wildlife.	Direct loss of habitat, mostly forest habitat, on 618 acres, displacing wildlife from direct impact areas. Ephemeral flow in Smoky Creek would temporarily decrease due to interception of runoff from mine areas. Ephemeral flow in Smoky Creek would be permanently decreased by 8% from the runoff recharge areas. Continued exposure to elevated levels of selenium and trace metals in tailings water until 2007 or until the tailings ponds are closed. Temporary exposure of wildlife to elevated selenium levels in water and sediments of mine areas until 2009 or until the tailings ponds are closed. Reclamation would replace natural plant communities with grass/forb communities on 613 acres of new disturbance, 5 acres of unreclaimed highwall could provide habitat for some species. Cap design would prevent selenium and trace metals uptake by plants thereby reducing potential for ingestion by wildlife.	No habitat loss or displacement of wildlife would occur in Panels B and C until mine plan is approved. Flow in Smoky Creek would not be affected by mining of Panels B & C until mine plan is approved. There would be no changes in Smoky Creek flow until a mine plan is approved. Continued exposure to elevated levels of selenium and trace metals in tailings water until 2003 or until the tailings ponds are closed. No exposure of wildlife to elevated selenium levels in Panels B & C until mine plan is approved . No disturbance of natural plant communities in Panels B & until mine plan is approved . No overburden would be produced from Panels B C until mine plan is approved.

Table 2.6-1 Continued

Resource	Proposed Action	Alternative A No External Disposal of Seleniferous Overburden	Alternative B No External Disposal of any Overburden	No Action Alternative
Threatened, Endangered and Sensitive Species	Elevated concentrations of selenium and trace metals in tailings water may impact TES species until 2007 or until tailings operations are closed. Boreal and flammulated owls, sensitive species, impacted by clearing of 532 acres of conifers.	Elevated concentrations of selenium and trace metals in tailings water may impact TES species until 2007 or until tailings operations are closed. Boreal and flammulated owls, sensitive species, impacted by clearing of 532 acres of conifers.	Elevated concentrations of selenium and trace metals in tailings water may impact TES species until 2007 or until tailings operations are closed. Boreal and flammulated owls, sensitive species, impacted by clearing of 532 acres of conifers.	Elevated concentrations of selenium and trace metals in tailings water may impact TES species until the tailings ponds are closed. No clearing of conifer habitat until a mine plan is approved
Transportation Recreation and Wilderness	Impacts of traffic volume to and from the mine on existing transportation facilities would be unchanged from current conditions until 2007. Two controlled road crossings would be built on Smoky Canyon road to protect public from mine haulage traffic. Minor delays would be experienced. Hunting access to the areas of Panel B and C would be temporarily stopped until 2007. No direct impacts to wilderness areas predicted. No impacts to wild and scenic rivers predicted	Impacts of traffic volume to and from the mine on existing transportation facilities would be unchanged from current conditions until 2008. Two controlled road crossings would be built on Smoky Canyon road to protect public from mine haulage traffic. Minor delays would be experienced. Hunting access to the areas of Panel B and C would be temporarily stopped until 2008. No direct impacts to wilderness areas predicted. No impacts to wild and scenic rivers predicted	Impacts of traffic volume to and from the mine on existing transportation facilities would be unchanged from current conditions until 2009. Two controlled road crossings would be built on Smoky Canyon road to protect public from mine haulage traffic. Minor delays would be experienced. Hunting access to the areas of Panel B and C would be temporarily stopped until 2009. No direct impacts to wilderness areas predicted. No impacts to wild and scenic rivers predicted	Impacts of traffic volume to and from the mine on existing transportation facilities would be unchanged from current conditions until existing mining is completed and then may be reduced until a mine plan is approved. New road crossings would not be required in Smoky Canyon until a mine plan is approved. No reason to restrict hunting access to Panels B & C until a mine plan is approved. No direct impacts to wilderness areas predicted. No impacts to wild and scenic rivers predicted
Cultural Resources	No direct impacts to any NRHP eligible sites.	No direct impacts to any NRHP eligible sites.	No direct impacts to any NRHP eligible sites.	No cultural resources would be disturbed by mining in Panels B and C.

Table 2.6-1 Continued

Resource	Proposed Action	Alternative A No External Disposal of Seleniferous Overburden	Alternative B No External Disposal of any Overburden	No Action Alternative
Social and Economic Resources	Annual beneficial impact to socioeconomic resources would be same as current conditions until approximately 2007 when mining and reclamation is completed. Costs associated with reclamation ($4,799,000) due to proposed mining including a 4% double handling of overburden	Annual beneficial impact to socioeconomic resources would be same as current conditions until 2008. This extension of mine life may be offset by revising the mine plan to reduce stripping ratios which could reduce phosphate resource recovery. Costs related to double handling 16% of the overburden ($6,052,000) would be added to the proposed action. These costs may be offset by revising the mine plan to reduce stripping ratios which would reduce mine cost and result in less ore being developed.	Annual beneficial impact to socioeconomic resources would be same as current conditions until 2009. This extension of mine life may be offset by revising the mine plan to reduce stripping ratios which could reduce phosphate resource recovery. Costs related to double handling 36% of the overburden ($17,900,000) would be added to the proposed action. These costs may be offset by revising the mine plan to reduce stripping ratios which would reduce mine cost and result in less ore being developed.	Annual beneficial impact to socio-economic resources would be same as current conditions until 2003 when further mining may be delayed until detailed mining plans for Panels B and C are approved. This could result in layoffs of approximately 180 employees and loss of approximately $4.7 million in payroll. Not applicable.
Hazardous Materials	Annual use and handling of hazardous materials would be the same as current conditions until 2007.	Annual use and handling of hazardous materials would be the same as current conditions until 2008.	Annual use and handling of hazardous materials would be the same as current conditions until 2009.	Annual use and handling of hazardous materials would be the same as current conditions until a mine plan is approved.
Visual Resources	Open pit mining in Panels B and C would be visible to public using Smoky Canyon Road until 2007. Backfilling of Panel A would reduce the existing visual impacts of this pit. The VQO of Partial Retention would not be met.	Open pit mining in Panels B and C would be visible to public using Smoky Canyon Road until 2008. Backfilling of Panel A would reduce the existing visual impacts of this pit. The VQO of Partial Retention would not be met.	Open pit mining in Panels B and C would be visible to public using Smoky Canyon Road until 2009. Backfilling of Panel A would reduce the existing visual impacts of this pit. The VQO of Partial Retention would not be met.	No mining of Panels B and C would occur until a mine plan is approved. Panel A visual impacts would remain the as they presently exist until a mine plan is approved. The VQO of Partial Retention would be met in Panels B & C.

Table 2.6-1 Continued

Resource	Proposed Action	Alternative A No External Disposal of Seleniferous Overburden	Alternative B No External Disposal of any Overburden	No Action Alternative
Environmental Justice	Issues associated with environmental justice would not be affected by the Proposed Action	Issues associated with environmental justice would not be affected by the Proposed Action	Issues associated with environmental justice would not be affected by the Proposed Action	Issues associated with environmental justice would not be affected by delay in mining Panels B and C.

Table 2.6-2 Comparison of Alternatives

Resource	Comparison of Effects
Geology, Minerals and Topography	Area of permanent highwall disturbance would be 13 acres for the Proposed Action, 11 acres for Alternative A and 5 acres for Alternative B. Total area of disturbance would be the same for the Proposed Action and Alternatives A and B. Utilization of ore resource could be less than the Proposed Action for Alternative A and more so for Alternative B. Potential area of seleniferous overburden disposal, and potential area where leaching of this overburden could occur, would be 722 acres in the Proposed Action, 480 acres for Alternative A, and 486 acres for Alternative B. Actual area for the Proposed Action may be smaller if more seleniferous overburden can be used in backfill. The total volume of seleniferous overburden handled, and made subject to potential leaching, would the same for the Proposed Action and Alternatives A and B.
Air Resources and Noise	TSP (dust) emissions would be 486 TPY for the Proposed Action, 1,242 TPY for Alternative A and 1,548 TPY for Alternative B. Local mining noise effects (north end of property) would be extended for one year longer than the Proposed Action with Alternative A and two years longer with Alternative B.

Table 2.6-2 Continued.

Resource	Comparison of Effects
Water Resources	Permanent ephemeral flow reduction in Smoky Creek (about 8%) would be the same for the Proposed Action and Alternatives A and B. Permanent ephemeral flow reduction in Roberts Creek would be about 11% for the Proposed Action and Alternative A, and 0% in Alternative B. Rehandling of seleniferous overburden would increase its potential short-term exposure to weathering and erosion compared to overburden that is not rehandled. Overburden rehandling would be 4% for the Proposed Action, 16% for Alternative A, and 36% for Alternative B. Short-term and long-term potential for sediment and selenium mobilization to surface streams would be the same for the Proposed Action and Alternatives A and B. Long-term exposure of seleniferous overburden to erosion and runoff would the same for the Proposed Action and Alternatives A and B. Area of selenium concentrations in groundwater greater than the MCL would be approximately 550 acres for the Proposed Action and 322 acres for Alternatives A and B. Panel A (100 acres) is the same for the Proposed Action and Alternatives A and B. Groundwater quality impacts (100 acres) outside of the mine area would be the same for the Proposed Action and Alternatives A and B. Drinking water quality in the Culinary Well would comply with MCLs for the Proposed Action and Alternatives A and B. Selenium concentrations in Lower Smoky Spring would be less than cold water aquatic life criteria for the Proposed Action and Alternatives A and B.

Table 2.6-2 Continued.

Resource	Comparison of Effects
Soil and Watershed	Completion of topsoiling of disturbed area would be delayed for 10 months longer than the Proposed Action for Alternative A and 21 months longer for Alternative B. Topsoil area would be permanently reduced by 13 acres for the Proposed Action, 11 acres for Alternative A and 5 acres for Alternative B. Total area of disturbance would be the same for the Proposed Action and Alternatives A and B.
Vegetation	Revegetation of disturbed area would be delayed for 10 months longer than the Proposed Action for Alternative A and 21 months longer for Alternative B. Vegetation area would be permanently reduced by 13 acres for the Proposed Action, 11 acres for Alternative A and 5 acres for Alternative B. Total area of disturbance would be the same for the Proposed Action and Alternatives A and B. Total cap thickness to prevent vegetation uptake of COPCs would be 9-11 feet for the Proposed Action, Alternative A, and Alternative B. Vegetation uptake is expected to be adequately controlled for the Proposed Action and Alternatives A and B.
Grazing Management	Potential area for grazing would be permanently reduced by 13 acres for the Proposed Action, 11 acres for Alternative A and 5 acres for Alternative B. Total area of disturbance would be the same for the Proposed Action and Alternatives A and B. Grazing access to reclaimed areas would be temporarily denied for 10 months longer than the Proposed Action for Alternative A and 21 months longer for Alternative B.
Wetlands	There are no differences between the Proposed Action and Alternatives A and B.

Table 2.6-2 Continued.

Resource	Comparison of Effects
Wildlife Resources, Fisheries and Aquatics	Terrestrial habitat would be permanently changed from forest to exposed highwalls on 13 acres for the Proposed Action, 11 acres for Alternative A and 5 acres for Alternative B. Total area of disturbance would be the same for the Proposed Action and Alternatives A and B.
	Habitat restoration would be delayed for ten months longer than the Proposed Action for Alternative A and 21 months longer for Alternative B.
Threatened, Endangered and Sensitive Species	There are no differences between the Proposed Action and Alternatives A and B.
Transportation, Recreation and Wilderness	There are no differences between the Proposed Action and Alternatives A and B for transportation or wilderness effects. Hunting and recreational access to reclaimed areas would be temporarily denied for 10 months longer than the Proposed Action for Alternative A and 21 months longer for Alternative B.
Cultural Resources	There are no differences between the Proposed Action and Alternatives A and B.
Social and Economic Resources	Beneficial impacts from mining and reclamation operations would be extended for 10 months longer than the Proposed Action for Alternative A and 21 months longer for Alternative B. Reclamation costs would be $4,799,000 for the Proposed Action. These costs would be increased by $6,052,000 for Alternative A and $17,900,000 for Alternative B. Increased costs for reclamation may be offset by reducing stripping ratios, thus reducing ore recovery. Ore recovery may be less for Alternative A compared to the Proposed Action and even less for Alternative B.
Hazardous Materials	There are no differences between the Proposed Action and Alternatives A and B.
Visual Resources	Mining activities would be visible 10 months longer than the Proposed Action for Alternative A and 21 months longer for Alternative B.
Environmental Justice	There are no differences between the Proposed Action and Alternatives A and B.

2.7 Alternatives Considered but Eliminated from Detailed Analysis

This describes alternatives to the Proposed Action that were not reviewed in detail in this SEIS because they were not considered to be technically feasible, economically reasonable, would not meet the Purpose and Need, or would not have an environmental advantage over the other alternatives that were reviewed in detail. These alternatives include the following:

2.7.1 Underground Mining

Use of underground mining methods offers the potential benefit of eliminating the development of open pits and the associated overburden disposal issues. Underground mining of phosphate ore has not been practiced in southeast Idaho or northeast Utah since 1976. There are no underground phosphate mines currently operating in the United States. The economics of modern open pit mining practices, by using more efficient mining methods and equipment, allows for increased economical extraction of the phosphate resource compared to underground methods. Underground mining of Panels B and C would result in lower utilization of the public phosphate resource, which does not comply with the Purpose and Need. Underground mining methods typically do not entirely eliminate the need for external overburden disposal facilities and some overburden would likely be disposed of on the surface even with underground methods, although the amount of this material would be much less than using open pit mining methods.

Underground mining is not without its own set of potential impacts that are not shared with open pit methods and include:

- Increased safety hazards to mine workers;
- Increased mine worker population;
- Replacing surface miners with underground miners;
- Increased electrical power needs for mine ventilation and other equipment;
- Increased mining costs per ton of ore extracted;
- Potential long-term subsidence (caving) of ground over the mined out areas;
- Interception of groundwater in underground openings; and
- Long-term public safety hazard from unauthorized entrance into mine openings.

2.7.2 No Pit Backfill

Not placing any of the overburden produced from the proposed Panels B and C mining operations in these open pits and in Panel A would not be in compliance with the existing mine plan approvals and the 1982 Record of Decision. Mining costs would increase without concurrent backfilling of adjacent open pit areas with overburden. If overburden had to be hauled to another disposal site, costs would be driven up, both from long hauls and costs to landfill rock with high selenium content.

Not practicing any pit backfill would increase the amount of overburden disposed of in external disposal sites, which is contrary to the scoping comments. Environmental impacts would increase due to additional disturbance to the larger overburden disposal sites.

2.7.3 No Tailings Disposal Onsite

Currently, a percentage of the ore processed at the Smoky Canyon Mill is disposed of as tailings in the local tailings ponds. If 100 percent of the ore was pumped to the Don Plant it would eliminate the need for additional tailings disposal at the Smoky Canyon mine site which would have the following benefits:

- No additional tailings water would be disposed of in the tailings ponds which would reduce the duration of exposure of wildlife to tailings and the amount of tailings water ultimately available for seepage from the tailings ponds.
- The height and surface area of the tailings solids in the tailings ponds would not be increased.
- The tailings ponds could be closed and reclaimed sooner.

Potential impacts associated with pumping all the ore to the Don Plant for processing would include:

- More groundwater would be consumed at the mine site through increased slurry water requirements for the slurry line to transport the additional ore tonnage.
- Slurry line energy usage and operation cost would increase due to increased slurry tonnage. The tailings line requires no pumping due to a 100 percent downhill route from the mill to the mine tailings ponds.
- The Don Plant would need to be modified to process a lower grade feedstock which would require investment in additional equipment as well as increase unit costs.
- More waste would be disposed of in the Don Plant waste disposal pond potentially shortening its life and thus requiring an unplanned expansion of this facility to hold the increased processing waste volume.

Continued operation of at least Tailings Pond No. 1 would be required for mill water storage for the mill operations even if 100 percent of the ore was piped to the Don Plant.

The significantly increased costs to the mine, slurry line, and Don Plant operations would reduce this alternative's compliance with the Purpose and Need.

2.7.4 Purchasing Ore Elsewhere

If mining at the Smoky Canyon Mine did not continue, the operation of the Don Plant would be terminated unless suitable ore concentrates were obtained and shipped to the plant. Simplot currently does not have any phosphate reserves other than those at Smoky Canyon that are ready to mine and fill the needs of the Don Plant within the next year or two. Alternatives sources of feedstock for the plant could not be readily purchased on the open market because:

- The Don Plant is designed to receive beneficiated ore concentrates and not raw ore. This limits the potential suppliers to only those able to provide beneficiated ore concentrates or they would need to construct a new mill and tailings pond.

- The processing systems at the Don Plant are specifically designed to process only ore from the Smoky Canyon area. Other sources of ore in southeast Idaho would likely not be compatible with the Don Plant process. So, the process may have to be modified.

- The few other phosphate mines in southeast Idaho are vertically integrated operations with their own milling and processing facilities that currently require all the ore produced by these mines. Alternative ore supplies for the Don Plant would require opening additional mining operations to those already in production or currently planned and permitted.

2.7.5 Overburden Area Infiltration Barrier

A detailed evaluation of infiltration barriers was prepared in response to agency and public comments on the DSEIS for the Smoky Canyon Mine Panels B and C (**Appendix 2C**). The intent of this evaluation was to determine the potential feasibility of using infiltration barriers on the overburden disposal fills proposed for the B and C Panel operations to reduce groundwater contamination from seepage of meteoric water through those fills.

A number of design criteria and objectives were proposed in the report with the two main ones being that the infiltration barrier must be resistant to expected differential settlement in the overburden fills and must reduce the seepage rate through the overburden by at least 55 percent. The 55 percent reduction was calculated with groundwater impact modeling and was determined to be the minimum reduction necessary to eliminate concentrations greater than the Idaho Ground Water Quality Standards [IDAPA 58.01.11.200] for selenium and manganese outside of the mine disturbance boundary. A seepage reduction of approximately 80 percent would be required to completely eliminate any COPC concentrations greater than the ground water quality standards anywhere under the proposed mine disturbance.

Two earth infiltration barrier designs were reviewed including barriers built of crushed mine overburden shale from the B and C Panels or clayey earth borrowed from the Salt Lake Formation located east of the mine operations. Both of these materials have average permeabilities that are too high to meet the design objectives and would require addition of more clay (bentonite) to produce a uniformly low permeability. This requirement for amending the materials with bentonite eliminates the potential for using run-of-mine shale for construction purposes because it contains too high a percentage of large and hard particles to be uniformly mixed with the bentonite. Only crushed overburden shale could be successfully blended with the bentonite to produce the uniform mixture required. Mixing bentonite with either earth material would be very difficult on the proposed 3h:1v slopes of the overburden fills. It is also questionable if the earth infiltration barriers would be completely successful in withstanding the differential settlements expected to occur in the overburden fills, although the bentonite amendment would help in this regard.

Three man-made, sheet-type infiltration barriers were evaluated including High-Density Polyethylene (HDPE), polyvinyl chloride (PVC), and geosynthetic clay liner (GCL). All of these liner types can withstand significant elongation from differential settlement without increases in permeability so they are superior in this regard to the earth infiltration barriers. All of these flexible barriers would require careful installation on uniform, smooth subgrades of crushed shale (100 percent minus 3/4 inch) to provide the required support and all of them require a cover layer of crushed chert (100 percent minus 3/4 inch) to protect them from being torn or punctured by the overlying run-of-mine chert in the overburden cap.

These crushed overburden layers would each be about 12 inches thick and would add considerable cost to the installed cost of the liner materials themselves.

A spray-on, asphalt-based soil sealant was reviewed. It has potential problems withstanding differential settlement and would be inferior in this regard to the sheet-type flexible infiltration barriers discussed above. For these reasons, it is not considered a feasible design.

A spray-on asphalt elastomeric membrane was also reviewed and was found to be resistant to differential settlement. It would have the same need for a smooth-rolled, crushed shale subgrade and a crushed chert cushion layer as the sheet-type barriers. It would be very difficult to uniformly apply this material to the proposed 3h:1v slopes of the overburden fills but it could be applied to the 2 percent slopes.

Soil-cement and asphalt paving infiltration barriers were evaluated. The soil cement mixture would have the same limitations as the bentonite amended option reviewed above and would not be able to be accomplished with run-of-mine overburden. This would require crushing shale or chert to make a uniformly fine material that could be mixed with the cement. This would also be the case for making the asphalt paving on site; it would require a source of crushed rock aggregate. Both of these alternatives have the negative characteristics of being very difficult to apply to 3h:1v slopes and not being able to withstand the differential settlement in the overburden fills. They are therefore not considered feasible designs.

Water that is collected on top of an infiltration barrier would need to be disposed of in an environmentally acceptable manner. Estimates of the water quality draining from the top of infiltration barriers made of non-seleniferous materials and seleniferous shales were made in the report. It appears that this water should comply with applicable surface water quality standards and primary ground water standards if non-seleniferous materials were used in the construction of the infiltration barrier. If overburden shales were used for construction of the barrier, it is estimated that the concentration of selenium and some other parameters could be greater than applicable surface water and potentially ground water quality standards for selenium. This water would need treatment for selenium before being discharged to the surface environment. Treatment of this water could add considerable cost to the overall project. However, at the Smoky Canyon Mine, a feasible low-cost method for disposal of this water would be to recharge it to the Wells Formation in constructed recharge areas at the margins of the overburden fills. For this reason, water treatment costs were not added to the feasibility analysis.

A number of configurations for infiltration barriers were evaluated including construction on two types of 3h:1v slopes and on the outer edges of the tops of each lift. Although all the infiltration barrier designs reviewed have been constructed on 3h:1v slopes, there would be difficulties involved in building any of the infiltration barriers on the 3h:1v slopes and the final result would have questionable slope stability. The preferred approach to building the infiltration barriers would be to build them on the outer edges of each overburden lift (Crest Lined Slope configuration). This would allow unhindered construction techniques for all the infiltration barriers evaluated and would significantly reduce the slope stability concerns. It also had the lowest construction costs compared to the other slope configurations, in part because the crushed shale subgrade could be thinned from 12 inches to 6 inches.

The ranking of the per acre costs of the different infiltration barriers, for the Alternatives A & B, Crest Lined Slope configuration were:

Infiltration Barrier	Cost/Acre
Salt Lake Formation w/ 5% bentonite	$67,276
Crushed Overburden Shale w/ 5% bentonite	$53,982
Geosynthetic Clay Liner	$53,632
PVC membrane	$48,373
Spray-on Asphalt Membrane 6	$46,047
HDPE membrane	$45,452

Adding an infiltration barrier to the Proposed Action would produce total overburden environmental mitigation costs (overburden rehandling, infiltration barrier, and reclamation) in a range of $37.8MM to $43.8MM for that alternative, $32.9MM to $37.9MM for Alternative A, and $44.7 to $49.7MM for Alternative B. Using site-specific information on costs for the Smoky Canyon Mine operations, the BLM has determined that adding an infiltration barrier to the B and C Panel operations would likely make those operations economically unviable. This additional mitigation may not be reasonable because of less costly designs proposed by Simplot that would reduce the potential for overburden seeps and groundwater quality impacts (see Section 2.2.3 and Appendix 2C).

It must be emphasized that the infiltration barrier feasibility analyses conducted for the Smoky Canyon Mine are only generally applicable to other mining locations and do not replace the need for site-specific feasibility analyses for use of infiltration barriers at other locations. This must include the problem of disposing of the water that would be collected on the top of the infiltration barriers.

2.8 Historic Mining Environmental Impact Investigation Report

Simplot has prepared a Historic Mining Environmental Impact Investigation (HMEII) Report to describe existing selenium impacts in the Smoky Canyon mine area. Federal agencies and the Idaho Department of Environmental Quality (IDEQ) developed a Memorandum of Understanding (MOU) to address selenium issues related to phosphate mining in southeast Idaho. From that agreement, the USFS was designated the lead agency in the development and implementation of an enforceable, site-specific Administrative Order on Consent (AOC) to conduct a National Contingency Plan compliant "Site Investigation" and subsequent "Engineering Evaluation/Cost Analysis" for the mobilization of hazardous substances from the Smoky Canyon Mine. Several Federal agencies and the Idaho Department of Environmental Quality may serve in a support role at this site. Simplot will alone sign this agreement at this site as no other companies have a role there. Simplot in signing the site-specific AOC for the Smoky Canyon mine agrees to initially pay the costs of the Site Investigation and Engineering Evaluation/Cost Analysis, but may not provide costs recovery for the Forest Service or other Federal agencies. EPA will serve in an advisory role, but site specific activities will be conducted using authorities granted to the USFS to administer CERCLA.

In a related action, phosphate mining member companies of the Idaho Mining Association, entered into an area-wide AOC, in July 2001, with IDEQ, Forest Service, Bureau of Land Management, Bureau of Indian Affairs, Environmental Protection Agency, Fish and Wildlife Service, and the Shoshone-Bannock Tribes to further investigate the mobilization of hazardous substances throughout the phosphate mining area of southeast Idaho and to develop Risk Assessments for Human and Ecologic Health. Additional

efforts may be made to develop and validate management practices that have generic applicability. IDEQ will also collect sufficient data at specific sites to complete assessments of the Total Maximum Daily Load characterization for metals on streams documented to have releases of hazardous substances under the IDEQ's Clean Water Act authorities. Simplot and other mining companies each provide a share of the costs for IDEQ and several, but not all, Federal agencies and the tribes.

Preparation of this SEIS has not involved a detailed review of existing impacts from selenium and other potential contaminants resulting from current mining and milling operations at the Smoky Canyon Mine. This is because the regulatory approach for addressing these impacts will be designed, in concert, with the enforceable site-specific Administrative Order on Consent (AOC) described in the HMEII Report. Federal and State agencies will address those impacts from past and present mining at the Smoky Canyon Mine within the site investigations, engineering evaluations and other requirements of the site-specific AOC. The regulatory approach is that of a typical CERCLA non-time critical removal action that will be developed in an AOC and work plan negotiated between Simplot, USFS, and IDEQ (for the tailings impoundments). This process is described in the HMEII Report which is a public information document that is a non-enforceable show of Simplot's commitment to the area-wide and site-specific AOC process. As described in the HMEII Report, the USFS will work with Simplot to develop suitable remediation alternatives based on data currently available and yet to be collected. All available data collected at the site will be provided in support of the Engineering Evaluation/ Cost Analysis to be developed by Simplot for the USFS.

This SEIS focuses on analyses of potential impacts from future mining development of Panels B and C, using the current understanding of existing mining impacts at Smoky Canyon and other phosphate mining operations in southeast Idaho. Management practices and other mitigation measures, proposed in this document, are intended to ensure compliance with Clean Water Act and other established regulatory requirements so that no unnecessary or undue degradation of public lands will result from the project.

2.9 Monitoring, Mitigation and Agency Preferred Alternative

2.9.1 Required Monitoring and Mitigation

The agencies have determined that certain monitoring and mitigation programs are necessary, additional to those already proposed by Simplot, in response to potential environmental impacts identified in the SEIS. These monitoring and mitigation programs are described in the Smoky Canyon Mine Environmental Monitoring Plan in Appendix 2E. These monitoring and mitigation programs would apply to all alternatives (except the No Action Alternative).

Paleontological Resources

Notification and Avoidance Simplot would notify the USFS and BLM of the discovery of any vertebrate fossils that are exposed during mining. These fossils would be avoided to the extent possible until the USFS or BLM conduct field surveys as needed to determine the significance of these fossils (USFS, 2001, p.3:11). At the discretion of the USFS or BLM, these fossils will be avoided for a length of time that is reasonable to allow agency personnel to conduct the field surveys.

Water Resources

Overburden Chemistry Monitoring Simplot would periodically sample and analyze chert overburden to confirm it is low in leachable selenium according to a plan approved by the agencies.

Selective Placement of Overburden Seleniferous overburden that is mined as part of the B and C Panels operations would be disposed of west of the Boulder Creek Anticline axis with the intent of reducing eastward migration of groundwater contamination from the overburden disposal operations.

Additional Surface Water Monitoring Additional surface water monitoring sites would be added to the current biannual water monitoring program and conducted by an outside consultant to obtain additional information on surface water quality conditions in the area of the Smoky Canyon Mine (Appendix 2E). Results of monitoring the water in Tailings Pond No.2 and water discharging from the Toe Drain for the IDEQ would be forwarded to the BLM and USFS.

Gain/Loss Survey in Lower Smoky Creek A gain/loss survey would be conducted of Lower Smoky Creek from Lower Smoky Spring in Section 17 to monitoring site SW-2 in order to determine if other groundwater discharges occur along this reach.

New Monitoring Well The potential connection between the Wells Formation aquifer and Lower Smoky Spring and Creek would be determined by installation of a piezometer well in the southwest quarter of Section 17, T8S, R46E between Panel B and Lower Smoky Spring to a depth at least 200 feet deeper than the elevation of Lower Smoky Spring. Specialists from either the USFS, BLM, or IDEQ would be present during drilling to ensure the target aquifers are sampled and verify proper piezometer installation.

Groundwater Monitoring The following existing wells would be added to the semi-annual water quality monitoring program to measure water levels and analyze water quality: Lower Smoky monitoring well, Culinary Well, and GW-12 (Figure 3.3-6). The water level in GW-9 would be monitored quarterly during the mining of C-Panel to provide data verifying that those pits will not intercept the Wells Formation water table. The water level in the Industrial Well would be monitored quarterly when the well is not being pumped.

Overburden Seep Inspections Regular inspections would be conducted along the outer toes and slopes of all overburden fills to look for indications of seeps or springs discharging from the overburden.

Hoopes Spring Investigation A study would be conducted to determine the occurrence of the increased selenium concentrations in Hoopes Spring. Once completed, the influence of mining activities on groundwater at the Smoky Canyon Mine may be better understood. This study would be done along with the CERCLA investigations discussed in the HMEII Report.

BMP Effectiveness Monitoring Regular observations as to the effectiveness of the management practices employed as part of the proposed operations would be incorporated into the mine's regular monitoring practices.

Implement Work Under Site-Specific AOC At the order of the USFS and other CERCLA oversight agencies, compliance with the site-specific AOC would commence in a timely manner. Additional future

studies and their design would include input from the applicable Federal, State and local agencies and the general public.

Infiltration Testing Simplot would conduct infiltration testing within the footprint of the seleniferous overburden disposal sites prior to placing overburden. This testing would be conducted according to a plan that will be reviewed and approved by the agencies before implementation and is intended to demonstrate that the vertical percolation rate in the runoff recharge area, infiltration strip, and seleniferous interior of the overburden fill is sufficient to prevent development of seleniferous external overburden seeps.

Records of Construction Recordkeeping and use of a third party quality control inspector satisfactory to the agencies would be employed by Simplot to ensure that the external overburden disposal facility is built as proposed.

Soils

Mixing Soils To increase the production potential of soils, slash and surface vegetation would be incorporated into the growth medium during soil recovery. This would increase the organic matter content of the material and its production potential. Fine grained soils would be mixed with coarser-grained soils to enhance soil properties and thereby increase the production potential of the growth medium.

Monitoring Selenium in Soils and Vegetation Selective handling of waste by the placement of approximately eight feet of chert overburden and a one to three-foot layer of growth medium over the seleniferous waste overburden is a measure that is intended to prohibit selenium accumulation in vegetation (no root uptake). The sampling and analysis of selenium and trace element concentrations in soil and vegetation would comply with the requirements in the Environmental Monitoring Plan (**Appendix 2E**). The results would be analyzed to determine the effectiveness of the overburden cap and to identify plants that may be potential selenium accumulator species.

Vegetation

Increase Emphasis on Native Species Non-native species would be used only when reclamation goals cannot be attained otherwise, or when only temporary cover is needed for lands that will be disturbed again.

Increase Diversity of Species Increase the number of forbs and shrubs in the revegetation plan. Forbs and shrubs are an important part of the post-disturbance ecosystem, providing food and cover that is not available in a grassland. Although forbs and shrubs may eventually become established in reclaimed areas through natural processes, it could take an excessively long time for this to happen. It should be noted that this recommendation is intended only for areas where a thick chert cap will be used, as in the Proposed Action and Alternatives, and not for existing disturbances. This is because recent studies at the Smoky Canyon Mine have shown that forbs can accumulate relatively high levels of total selenium when they are rooted in seleniferous growth medium. Plants known to establish quickly and not persist will be used to initially stabilize soils and reduce erosion.

Create Site-Specific Revegetation Plans Conifer establishment has been fairly successful on east-, north-, and west-facing slopes but poor on south-facing slopes. The probability of successfully revegetating dry south- and southwest-facing slopes should be increased by seeding with species found on these sites prior to disturbance. South-facing slopes are typically vegetated with mountain big sagebrush (*Artemisia tridentata vaseyana*), mountain snowberry (*Symphoricarpos oreophilus*), antelope bitterbrush (*Purshia tridentata*), arrowleaf balsamroot (*Balsamorhiza sagittatata*), bluebunch wheatgrass (*Pseudoroegneria spicata*) and western needlegrass (*Stipa occidentalis*) (Maxim, 2000d). Establishing a similar sagebrush community on south-facing slopes is likely to be more successful than establishing conifers.

Aspen is a component of the native plant communities and readily colonizes arid, sunny sites not readily colonized by conifers. Aspen, once established, can spread throughout a reclaimed area by root sprouting. Aspen is commonly found in forest openings and on south and west aspects in sagebrush stands. Aspen could be mixed in with any conifer plantings and in drier areas where sagebrush would be seeded. This would be done only after further consideration of potential selenium bioaccumulation in species used for reclamation.

Reclamation designs will take into consideration aspects of site conditions. While ecologic diversity may be desirable, scientific evidence may indicate the need for different reclamation tactics.

Increase Tree Planting Density Simplot has experimented with tree planting at the mine reclaimed areas, in addition to its currently approved reclamation seed mix. Tree planting could be incorporated into the revegetation plans for new disturbed areas. However, reforestation plans would be made in concert with future studies related to selenium uptake in tree species. Typical recommended tree planting densities are 430 to 700 per acre for lodgepole pine and 300 to 1,200 per acre for Douglas-fir trees. All reforestation plans would be reviewed by USFS silviculturists for adequacy.

Use Locally-Derived Seedling and Planting Stock Seedlings and plantings will have the best chance of survival if they are derived from local plants growing at approximately the same elevation as the areas to be restored. If feasible, harvesting seeds from areas that would be disturbed should be practiced to ensure an optimal match between seedlings and site conditions - increasing the likelihood of success. This approach would also preserve the genetic diversity of local vegetation. If the use of locally-derived seed and planting stock is not feasible for economic or other reasons, an attempt would be made to make the best match between available stock and local site conditions.

Document Revegetation Work It is important that records be kept of items such as seed or tree source, seeding methods, tree planting methods, species used, substrate, date of seeding or planting, etc. The boundaries of seeding or planting areas would be mapped in enough detail so they can be easily located again in the future. Accurate record keeping is necessary in order to determine if revegetation methods have been successful and cost effective, or if changes should be made.

Noxious Weed Control Simplot must continue their program of monitoring and controlling noxious weed infestations. Only certified weed-free seed, mulch, straw bales, etc. should be used. Simplot will develop a plan for annual noxious weed treatment.

Grazing Control The reclaimed areas would be protected from grazing with cooperation between the grazing permittees and the USFS, and/or fencing to preserve revegetation until it is established. Simplot must immediately notify the USFS when livestock are found grazing on mine facilities.

Fisheries

Diversity and Contaminant Monitoring Simplot would monitor contaminant levels and diversity in fish populations in Smoky Creek downstream of the B and C Panel area according to a plan approved by the agencies.

Wetlands

Monitoring Mitigation Targets As a part of any wetland mitigation project, the USCOE requires monitoring to demonstrate that created (mitigation) wetlands have been successfully constructed. Specific success criteria (such as percent cover and species composition) are stipulated in the mitigation plan.

Threatened, Endangered, and Sensitive Species

Monitoring Tailings Pond Utilization by Listed/Sensitive Species The Proposed Action has limited potential to impact listed or sensitive species. Should listed/sensitive species (bald eagles, whooping cranes or trumpeter swans) begin to forage on the Smoky Canyon Mine's tailings ponds, these species could accumulate harmful levels of selenium or other trace elements. The use of the tailings pond by these species would be studied according to plans reviewed by the USFWS.

Grazing Management

Sheep Spring One stock watering trough on the Pole Canyon allotment would be impacted by development of the Panel C. Mitigation would be provided by relocating the trough during mining operations and piping water from the spring to the trough. This trough may need to be permanently relocated if sheep can no longer graze on reclaimed mine areas.

Recreation and Wilderness

Public Information To enhance public understanding of the access limitations in Smoky Canyon during the mining of Panels B and C, Simplot would construct a sign at the top and bottom of Smoky Canyon along the Smoky Canyon access road, informing the public of recent changes in public access to National Forest System lands due to the development of the Panels B and C.

Transportation

Public Information The local public is used to unrestricted travel through Smoky Canyon. To protect public safety and explain the new controls on public access across the two new haul road crossings in Smoky Canyon, Simplot would erect signs at both new crossings explaining the reasons for the crossings and procedures the public should follow at the crossings.

Cultural

Class III Inventory of External Overburden Site Although the proposed overburden disposal site has been previously inventoried for cultural resources and no sites were encountered, the inventory was conducted almost twenty years ago. A small portion of the east edge of the proposed overburden area was inventoried again in 1991 during a timber sale with negative results. The current survey (Gray, 2000) covered only a small portion of this area on the northern edge. Therefore, the proposed overburden area may need a current Class III inventory before disturbance. This would be discussed with the State Historic Preservation Officer and USFS.

Monitoring and Mitigation of Sites The known prehistoric sites near mining activities would continue to be avoided by current mining activities and would be monitored on occasion for possible impacts. Three potentially eligible sites are located within the Cumulative Effects Area. If future actions are proposed for these areas, these sites need to be mitigated for the actions to proceed. Mitigation measures would likely include test excavation to evaluate the site's eligibility status and to gather information to protect the archaeological record. Further, the possible historic features noted on General Land Office (GLO) maps within the Cumulative Effects Area would need to be visited in the field in order to determine whether they still exist on the ground. These features may then need to be recorded and evaluated.

2.9.2 Agency Preferred Alternative

The agencies have determined that the Proposed Action is the Preferred Alternative.

The agencies believe that the overburden design and management elements currently proposed by Simplot for the Proposed Action would reasonably reduce the potential for formation of seleniferous overburden seeps from the external overburden disposal site. This would be accomplished by application of management practices for control of soluble selenium compounds that are included as part of the Proposed Action to reduce the potential for seleniferous overburden seeps appearing at the external toes of the external overburden disposal site and the pit backfills (see Section 2.2.3). These practices would include the following which are illustrated on **Figure 2.2-6**:

- All low permeability topsoil material would be removed from the entire footprint of the external overburden disposal site.

- Seleniferous overburden would be placed within the core of the external overburden fill no closer than 200 feet from the final toe of the fill.

- All low permeability subsoil would be removed to expose permeable foundation materials in a strip at least 30 feet wide under the outer margin of the seleniferous overburden within the fill. This infiltration strip would collect and infiltrate any lateral seepage at the outer margin of seleniferous overburden.

- An earth berm would be constructed between the infiltration strip and the runoff recharge area. It would interrupt any high permeability zone produced at the base of the first lift of the overburden and help retain lateral seepage within the overburden fill.

- The 100 to 150-foot wide runoff recharge area itself would be a redundant outer collection zone within the overburden fill further reducing the potential for seleniferous seepage from exiting the toe of the external overburden fill.

- Finally, runoff from the entire periphery of the external overburden disposal site would be directed to settling ponds which would serve as backup collection and infiltration sites for any unexpected overburden seeps that might develop at the margins of the overburden disposal site.

The agencies think the above design elements and management practices would provide multiple layers of protection to reduce the potential for development of seleniferous seeps along the margin of the external overburden fill. In addition to the above, the following mitigation measures would also be employed:

- Simplot would conduct infiltration testing within the footprint of the overburden disposal site prior to placing overburden. This testing would be conducted according to a plan that will be reviewed and approved by the agencies before implementation and is intended to demonstrate that the vertical percolation rate in the runoff recharge area, infiltration strip, and seleniferous interior of the overburden fill is sufficient to prevent development of seleniferous external overburden seeps.

- Recordkeeping and use of a third party quality control inspector satisfactory to the agencies would be employed by Simplot to ensure that the external overburden disposal facility is built as proposed.

The agencies are confident that the above described measures would reasonably prevent the occurrence of seleniferous overburden seeps at the proposed external overburden disposal site. Empirical support for this position is that the existing A Panel external overburden site was constructed in 1984 immediately south of the proposed external overburden disposal site on essentially the same topographic, hydrologic, and geologic conditions as the proposed external overburden disposal site and a monitoring well installed to the base of this fill in 2000 did not detect any saturated zone at the base of the fill. The existing A Panel external overburden disposal site has been operated at the site since 1984 with apparent success in limiting surface environmental impacts to area of the fill itself. This is the case despite the fact that none of the low permeability topsoil was removed from the footprint of this overburden fill when it was constructed and none of the special treatments described above to be utilized for the B and C Panel external overburden disposal site were employed.

Regarding the potential for development of seleniferous overburden seeps, the external overburden disposal site in the current Proposed Action is functionally equivalent to Alternatives A or B.

Final Supplemental EIS

Smoky Canyon Mine
Chapter 3 - Affected Environment

Chapter 3
Affected Environment

Introduction

The Smoky Canyon Mine is located approximately 26 miles east of Soda Springs, Idaho, the county seat of Caribou County, and approximately 10 miles west of Afton, Wyoming, which is the population center for the Star Valley area of western Wyoming. The elevation within the project area ranges from approximately 6,600 feet AMSL at Sage Valley on the southern boundary to approximately 8,700 feet AMSL on the northern boundary near Pole and Smoky Canyons.

3.1 Geology, Minerals, and Topography

3.1.1 Regional Geologic Setting

During the Permian Period, the Phosphoria Formation was deposited in a deep basin, at depths of up to a few hundred meters, over a large area of eastern Idaho, northern Utah, western Wyoming, and southwestern Montana (Piper, 1999). The Phosphoria Formation forms the western phosphate field and comprises one of the world's largest known reserves of phosphate.

The area is within the middle Rocky Mountain and Basin and Range physiographic provinces and is in the central part of the Over Thrust Belt, a major orogenic zone extending through the North American continent in a general north-south trend. Thrust faults developed parallel to typical anticlinal/synclinal folding, resulting in crustal deformation in a west to east direction forming northwest trending ranges and valleys. Block faulting began as part of the Basin and Range Province about 17 million years ago and continues to affect the region today (BLM and USFS, 2000). **Figure 3.1-1** shows the general geology of the project area and **Figure 3.1-2** is a typical east-west cross section (IBMG and BLM, 1984).

3.1.2 Stratigraphy

Marine sedimentary rocks outcrop in the region, dating from the Paleozoic Era to Middle Mesozoic. Overlying these sediments are younger sedimentary rocks, generally siltstones and sandstones, of the Middle Mesozoic to Cenozoic Age which were deposited primarily in lacustrine and fluvial environments. On top of this series of formations exists sediments of Tertiary Age. Unconsolidated Quaternary Age alluvial deposits overlie these older strata. **Figure 3.1-3** illustrates the general stratigraphic section of the region (USFS, 1982; Connor, 1980; IBMG and BLM, 1984).

The ages of rocks within the project area range from Mississippian to recent. The Pennsylvanian-age Wells Formation is the oldest formation encountered on-site during exploration drilling. Locally, the Grandeur Member of the Permian-age Park City Formation overlies the Pennsylvanian Wells Formation and is sometimes mapped with it because of the similarity in lithology (USFS, 1981; Simplot, 2000).

The Permian-age Phosphoria Formation conformably overlies the Park City and Wells Formations. The Phosphoria Formation is from 250 to 450 feet in thickness and consists of several members. The phosphate bearing ore beds targeted for mining at the Smoky Canyon Mine are contained in the Meade Peak Member of the Phosphoria Formation. The Meade Peak Member consists of about 170 feet of thin-bedded, dark brown, carbonaceous, phosphatic mudstones and phosphorites.

The Meade Peak Member is overlain by the Rex Chert Member. The Rex Chert Member consists of about 150 feet of massive grey and black chert and cherty limestone. The Rex Chert is overlain by the Cherty Shale Member. The Cherty Shale Member consists of about 100 feet of black, thin-bedded cherty shale. **Figure 3.1-4** shows a Smoky Canyon cross section of the Phosphoria Formation, including the ore bearing Meade Peak Member. The Meade Peak Member can be divided from top to bottom into the Hanging Wall Mudstone, the Hanging Wall Phosphatic Shale, the Hanging Wall Ore Zone, the Middle Shale Wastes or Low Grades, the Footwall Ore Zone and the Footwall Mudstone.

At the Smoky Canyon Mine, the overlying formations have been primarily eroded away, and the Phosphoria Formation is either exposed at ground surface, or is unconformably covered by varying thicknesses of unconsolidated Quaternary-age alluvium and/or colluvium.

3.1.3 Structural Setting

Two major thrust plates, the Absaroka and Meade plates, are recognized in the region. Six major imbricate thrust faults associated with these plates, occurring during the Laramide Orogeny in early Tertiary to Cretaceous times, have been identified to the east of the Smoky Canyon Mine (**Figure 3.1-1**). The Boulder Creek Anticline and the Webster Syncline are major north-south trending folds existing across the project area and were probably formed contemporaneously with thrusting (Connor, 1980).

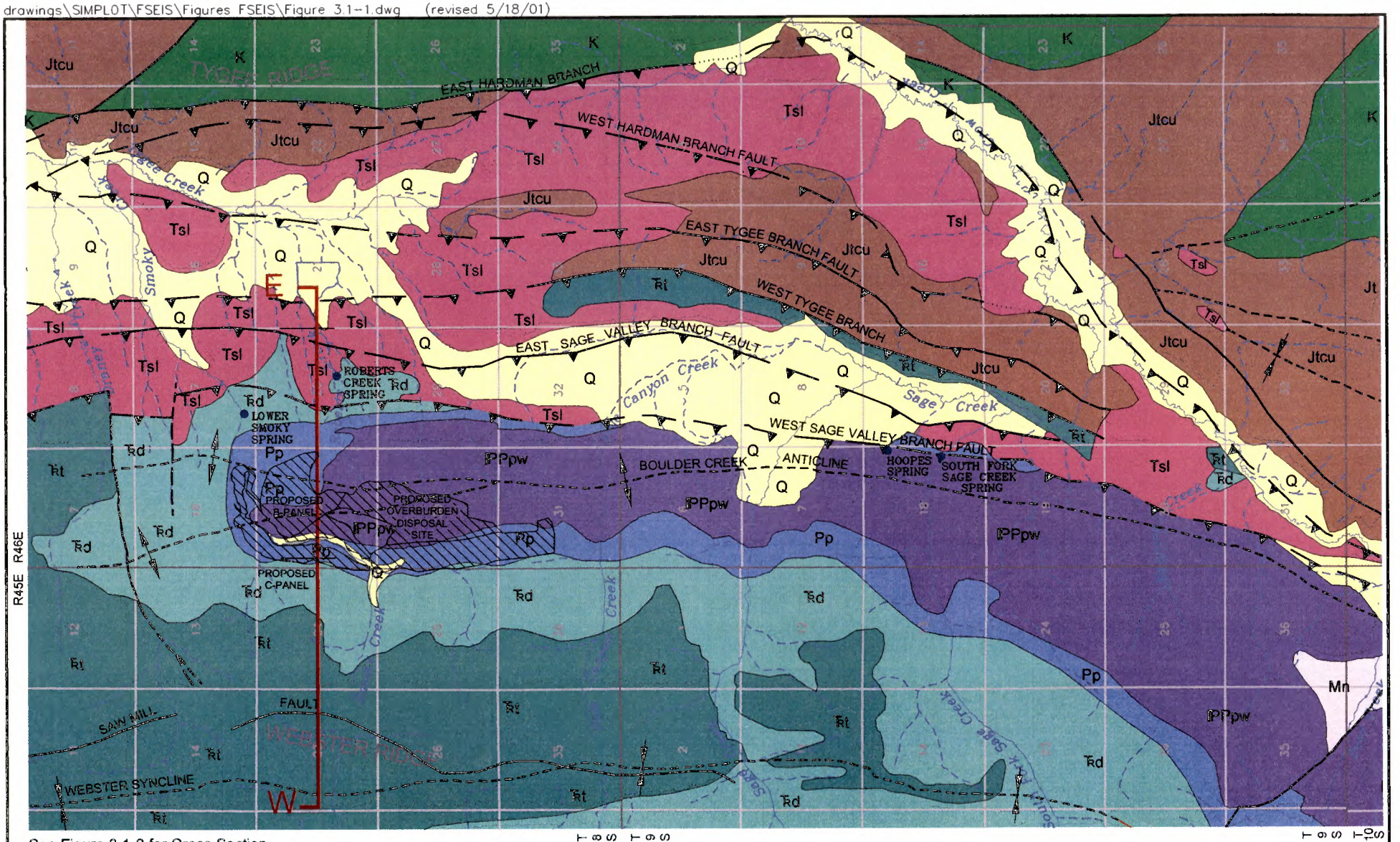
Several minor east-west trending tear faults and normal faults, which probably occurred during Cenezoic-age Basin and Range faulting, offset the thrust faults, fold axes, and individual rock units. The east-west trending Draney Creek normal fault passes just north of the Boulder Creek Anticline nose. A north-south normal fault, the Sawmill Fault, parallels the Webster Syncline in the valley to the west.

The Smoky Canyon ore deposit is located mainly on the west limb of the Boulder Creek Anticline. The Phosphoria Formation dips from 5 to 35 degrees (Derkey et al., 1984a). On the east side of the Boulder Creek Anticline, the Phosphoria Formation is steeply eastward dipping (greater than 75 degrees) to overturned (Derkey et al., 1984b). On the northern end of the Boulder Creek Anticline, the Phosphoria Formation dips north from 9 to 30 degrees, reflecting the northward plunge of the anticline (Derkey et al., 1984a).

3.1.4 Seismicity and Geotechnical Stability

The Smoky Canyon project area lies within a Zone III seismic region (UBC, 1991) extending from northern Arizona through the Wasatch Front in Utah to the Yellowstone and Hebgen Lake regions in Wyoming and Montana **(Figure 3.1-5)**. About 20 earthquakes capable of damaging structures (greater than 5.0 on the Richter Scale) have occurred within this seismic region from 1880 through 1994 (USGS, BLM, and USFS, 1975; UISS, 2000). The near-future earthquake activity would probably be similar to that observed during the past 100 years (BLM and USFS, 2000).

drawings\SIMPLOT\FSEIS\Figures FSEIS\Figure 3.1-1.dwg (revised 5/18/01)



See Figure 3.1-2 for Cross Section

Q	QUATERNARY (ALLUVIUM, COLLUVIUM)	Rt	TRIASSIC (THAYNES, ANKAREH)
Tsl	TERTIARY (SALT LAKE FORMATION)	Rd	TRIASSIC (DINWOODY)
K	CRETACEOUS (GANNETT GROUP)	Pp	PERMIAN (PHOSPHORIA FORMATION)
Jtcu	JURASSIC (TWIN CREEK LIMESTONE)	PPpwu	PENNSYLVANIAN/PERMIAN (WELLS FORMATION)
		Mn	MISSISSIPPIAN

CONTACT
FAULT, DASHED WHERE INFERRED
ANTICLINE
SYNCLINE

6000 0 6000 FEET

FIGURE 3.1-1
GENERAL GEOLOGIC MAP
SIMPLOT SMOKY CANYON MINE PANELS B&C SUPPLEMENTAL EIS

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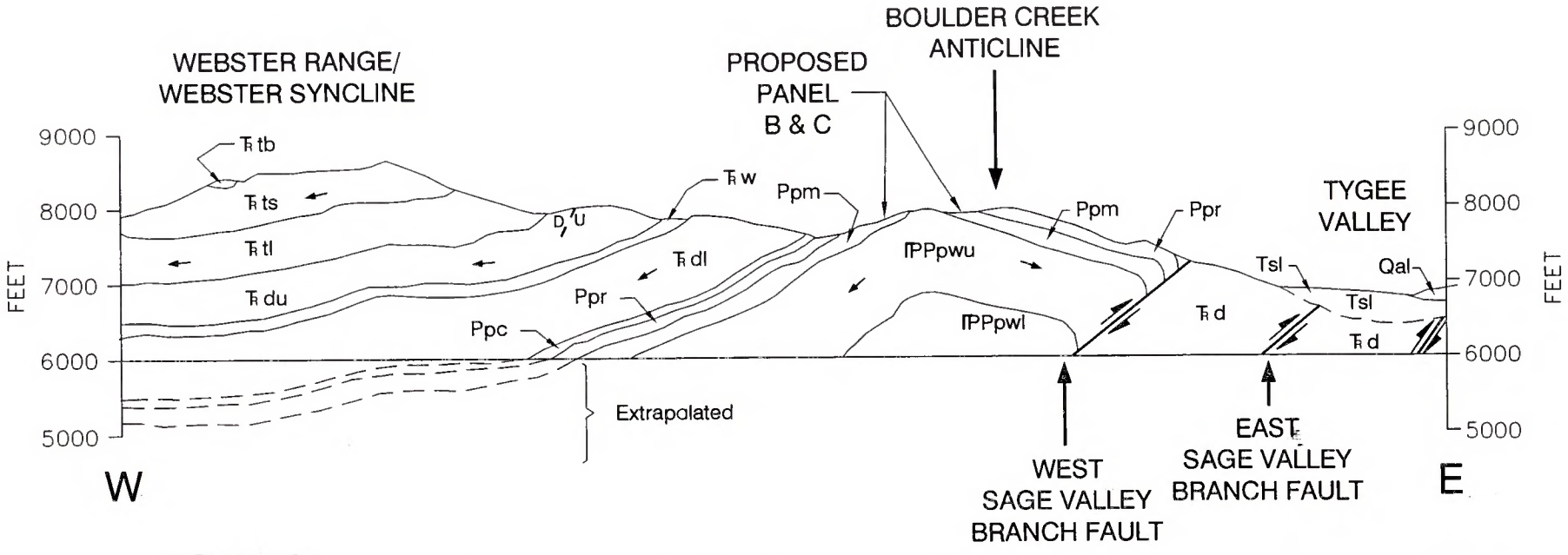


EXPLANATION

Trtn	Thoynes Nodular Siltstone	Ppc	Cherty Shale Member
Trtb	Thaynes Black Shale	Ppr	Rex Chert Member
Trts	Thaynes Platy Siltstone	Ppm	Phosphatic Shale Member
Trtl	Thaynes Black Siltstone	IPPpwu	Upper Wells Formation (Includes Grandeur Member)
Trdu	Upper Dinwoody Formation	IPPpwl	Lower Wells Formation
Trw	Woodside Formation	Tsl	Salt Lake Formation
Trdl	Lower Dinwoody Formation		

Thrust Faults

Groundwater Flow

Ref: Revised from Smokey Canyon Draft EIS, 1981

FIGURE 3.1-2
TYPICAL EAST-WEST GEOLOGIC CROSS SECTION
SIMPLOT SMOKY CANYON MINE PANELS B&C
SUPPLEMENTAL EIS

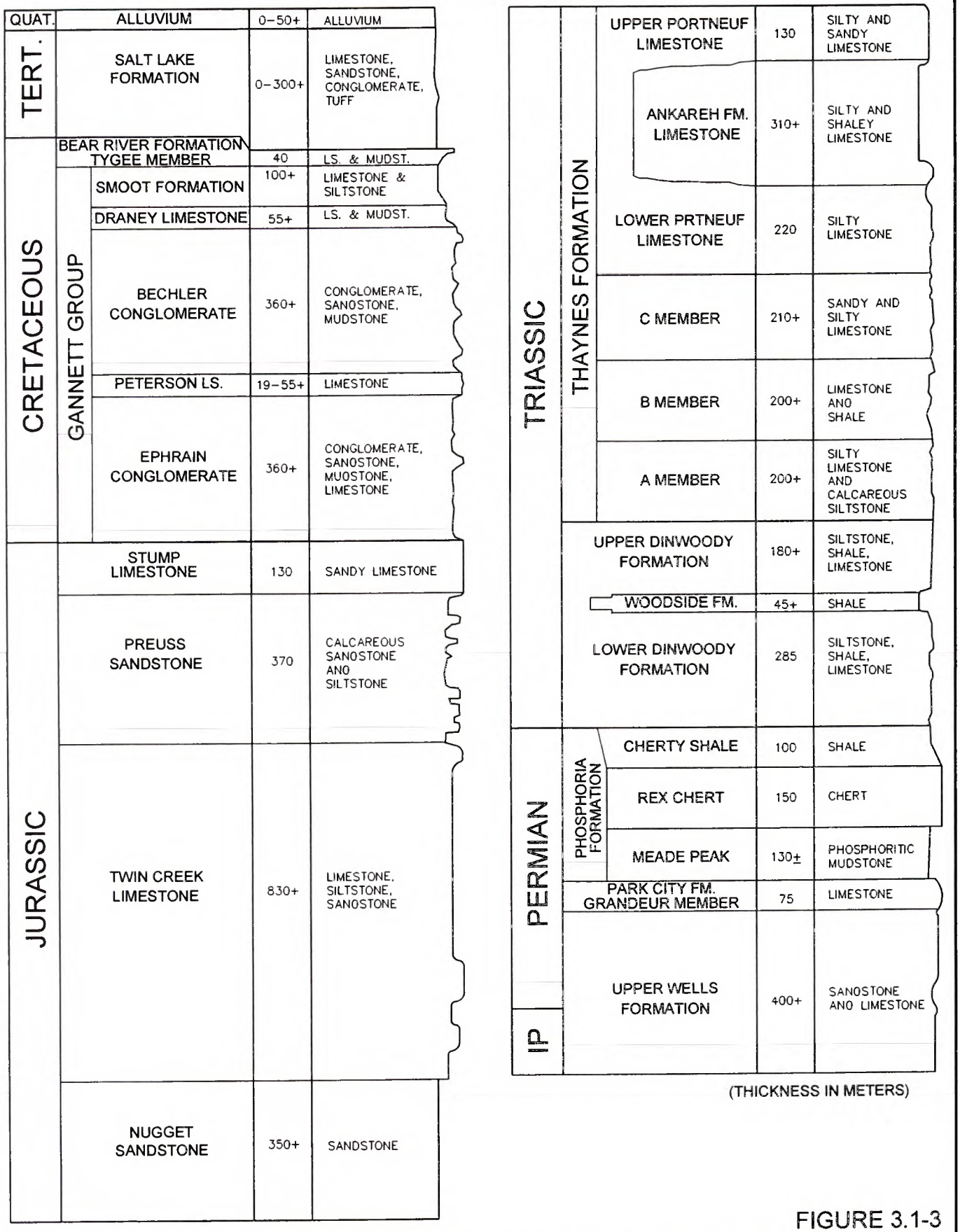
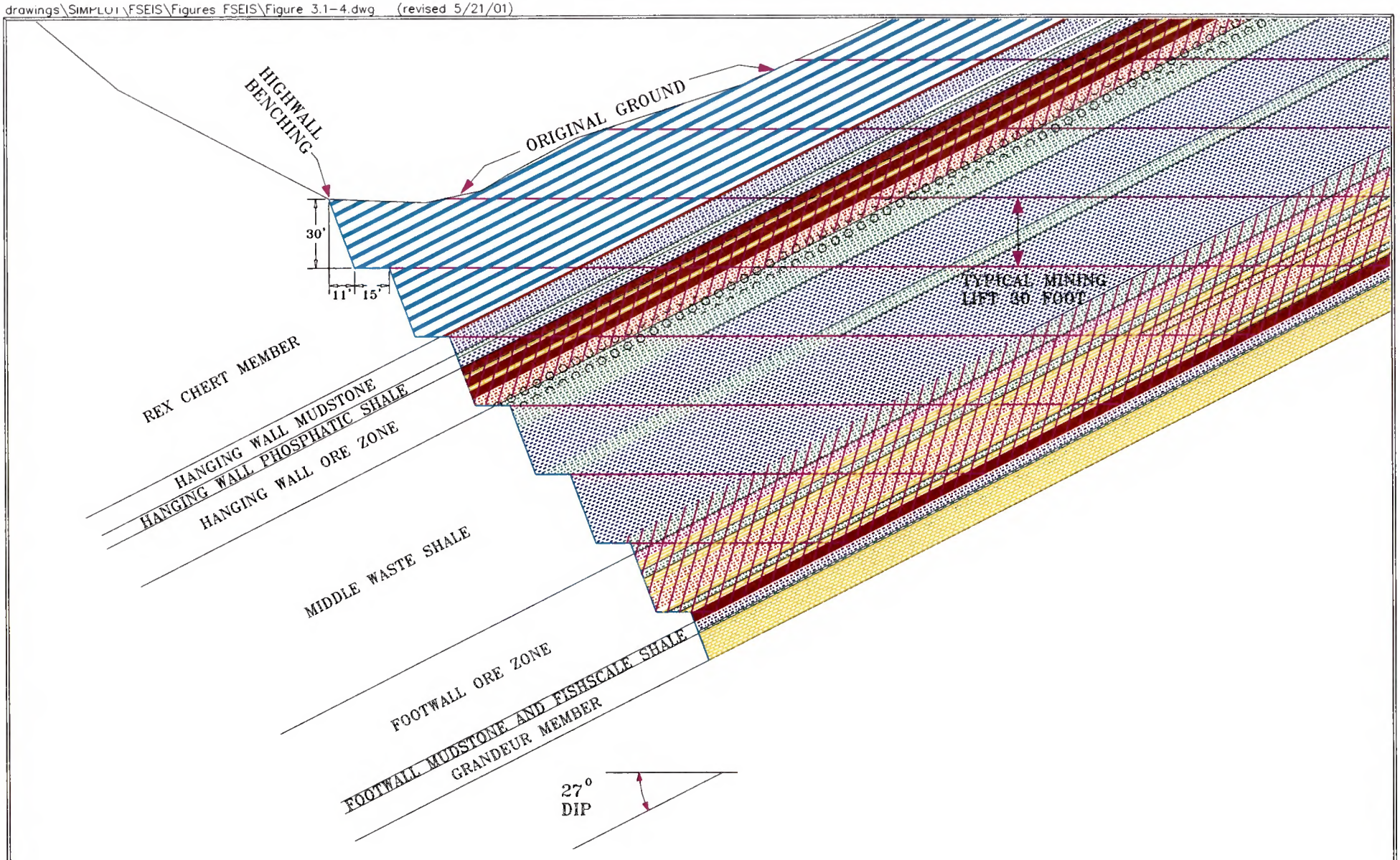


FIGURE 3.1-3

GENERALIZED STRATIGRAPHIC COLUMN FOR SOUTHEASTERN IDAHO
SIMPLOT SMOKY CANYON MINE PANELS B&C
SUPPLEMENTAL EIS

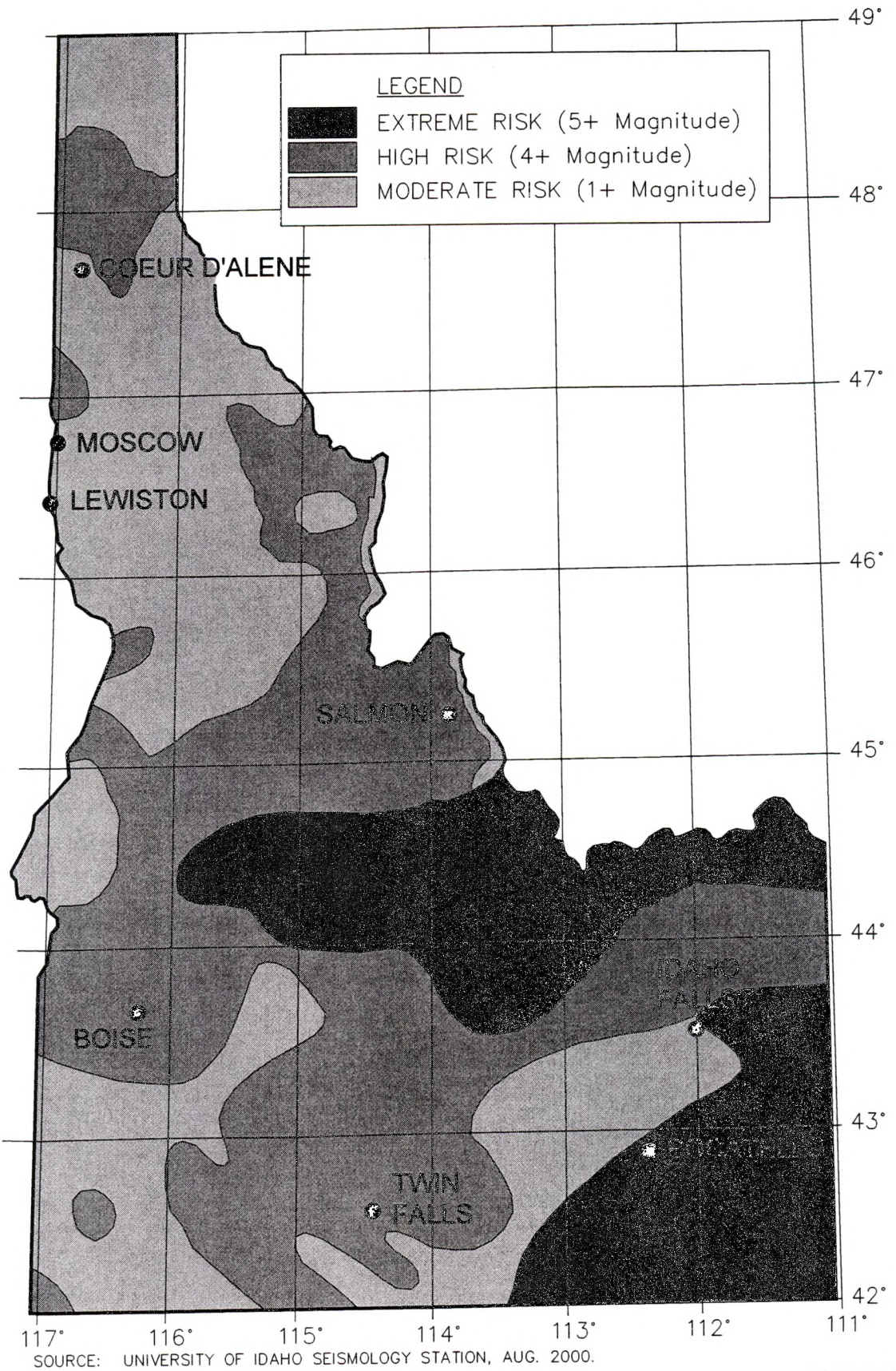
drawings\SIMPLOT\FSEIS\Figures FSEIS\Figure 3.1-3.dwg (revised 3/16/01)

drawings\SIMPLOT\FSEIS\Figures FSEIS\Figure 3.1-4.dwg (revised 5/21/01)



ADAPTED FROM J.R. SIMPLOT, SMOKY CANYON MINE, TYPICAL-CROSS SECTION, (LOOKING NORTH)

FIGURE 3.1-4
TYPICAL CROSS-SECTION PHOSPHORIA FM.
SIMPLOT SMOKY CANYON MINE PANELS B&C
SUPPLEMENTAL EIS



SOURCE: UNIVERSITY OF IDAHO SEISMOLOGY STATION, AUG. 2000.

FIGURE 3.1-5

STATE OF IDAHO EARTHQUAKE RISK MAP PER UNIFORM BUILDING CODE
SIMPLOT SMOKY CANYON MINE PANELS B&C
SUPPLEMENTAL EIS

drawings\SIMPLOT\FSEIS\Figures FSEIS\Figure 3.1-5.dwg (revised2/27/01)

Although several earthquakes have occurred in recent years, there is no reported evidence they have caused surface features such as scarps, displacement of streams, or creation of sagponds (USFS, 1981; Mariah Associates, 1990).

Figure 3.1-6 shows locations of earthquake epicenters in southeast Idaho, northeast Utah, and southwest Wyoming. The closest earthquake recorded between 1880 and 1994 occurred approximately three miles north of the Smoky Canyon Mine near Draney Peak and had a Richter Scale magnitude of 5.9 (Schuster and Murphy, 1996; BLM and USFS, 2000). Other significant earthquakes in the vicinity of the project area include one that occurred in 1930 near Grover, Wyoming about 12 miles to the southeast of Smoky Canyon, and two along the Utah/Idaho border in 1914 and 1963. These three earthquakes were assigned intensities (Modified Mercali Scale) of 6, 7, and 7, respectively. The most recent earthquake in the area occurred April 21, 2001 centered about 27 miles northwest of Afton, Idaho. The preliminary magnitude of this earthquake was 5.3.

Eastern Idaho has experienced structural damaging effects from the following earthquakes in the last 30 years (Moore, 1990; BLM and USFS, 2000):

		Earthquake Richter Magnitude
Hebgen Lake, Montana	1959	7.1
Pocatello Valley, Idaho	1975	6.1
Borah Peak, Idaho	1983	8.1
Draney Peak, Idaho	1994	5.9

Factors related to geotechnical stability of highwalls and overburden disposal site slopes have been identified through past operations at the Smoky Canyon Mine. Factors related to stability of highwalls include the type and strength of rock, degree of rock alteration, steepness of the final highwall slope, presence of any groundwater, spacing and orientation of fractures and faults, and blasting practices. Stronger rock which is less fractured and altered will produce more stable highwalls than weaker or more altered or fractured rock. Groundwater discharges from a highwall can also destabilize it. In general, highwalls at Smoky Canyon have proven to be stable over the duration of the mining operations.

Factors related to stability of overburden fill slopes include the topography of the surface underlying the overburden pile, stress such as shock loading or overloading, slope heights, reduction of material strength by introduction of water, and the scheduling of reclamation contouring. Flat areas or topographic rises, whether natural or man-made, provide a more stable base for overburden fills and backfills. Shock loading occurs when loaded trucks roll to the crest or edge of the overburden pile or backfill. Overloading occurs when too much material is placed on a given area of the overburden pile or backfill. This potential for overloading increases as fill heights increase. Introduction of water, snow, mud or ice weakens the overburden material strength, increasing the potential for instability. Slopes left at angle of repose for long periods are more likely to experience instability than those that are regraded shortly after construction. Instability of overburden fill slopes at Smoky Canyon has been related to high fill heights and excess water content due to excess incorporation of snow or snow melt into the material. Mine practices have been modified based on experience to preclude future slope failures.

3.1.5 Overburden Characterization

Since stratigraphy and structure are consistent within the Boulder Creek anticline, rock types to be mined in Panels B and C are the same as those which have been mined historically in other panels of the Smoky Canyon Mine.

Potential for Acid Rock Drainage (ARD)

ARD is produced when sulfide minerals contained in rock chemically react with oxygen and water to produce sulfuric acid and other reaction products. This acidic condition can lead to the dissolution of metals which are only soluble in water at low pHs. Other minerals in rock (primarily carbonates) can neutralize acid and cause the precipitation or co-precipitation of dissolved constituents. The potential for generation of ARD is a function of the amount of sulfide minerals present in mine waste and the amount of available minerals to neutralize any generated acid (Lapakko, 1993). The potential for ARD generation can be minimized by implementation of operational practices to minimize availability of oxygen and water that can contribute to sulfide oxidation (Chermak and Runnells, 1997). To assess the potential for acid rock generation, the amount of oxidizable sulfide minerals, or Acid Generation Potential (AGP), and the amount of neutralizing materials, or Acid Neutralizing Potential (ANP), in the material being assessed are typically measured. A ratio of these measurements (ANP:AGP) determined by the acid base accounting (ABA) test indicates the potential for acid to be generated. Although any material with an ANP:AGP ratio above 1.0 could be considered non-acid generating, the BLM ARD risk threshold is based on an ANP:AGP ratio of 3:1 (BLM and USFS, 2000).

The overburden to be mined under the Proposed Action and Alternatives, and the rock material in the existing mine facilities (overburden, backfill, tailings, soil and sediment), were characterized to determine their potential to generate acid (Maxim, 2000b). Representative samples of cuttings from 40 rotary drill holes completed in 2000 and previous years by Simplot were collected to test ANP:AGP of the major stratigraphic overburden units to be mined. The formations that were characterized include the Rex Chert, Hanging Wall Mudstone, Middle Waste Shale, and Footwall Mudstone. ABA analyses were conducted on 102 formation-specific overburden samples obtained from the rotary drill hole cuttings.

Existing overburden was characterized by collecting grab samples of overburden material from the external overburden disposal facility at Panel E, the internal overburden fill in Panel D, and the northern margin of backfill in Panel A. In addition, a low grade ore stockpile and tailings from the tailings impoundment were also sampled.

Average measured ANP:AGP ratios in the existing overburden facilities were 8.8 for Panel A backfill, 18.8 for Panel D internal overburden fill, and 35.5 for Panel E external overburden disposal facility. These results corroborate limited field observations and indicate sufficient neutralization capacity so that the mine overburden would not generate ARD.

University of Idaho researchers studied mineralogy and water quality at the Pole Canyon overburden disposal facility (Bond, 2000). Water samples were analyzed from Pole Canyon Creek upstream and downstream of the French drain that carries the creek through the base of the overburden fill. Increases in downstream sulfate, TDS, alkalinity, and hardness compared to their upstream concentrations and a 9 percent downstream decrease in pH (to 7.34) were interpreted as evidence of sulfide oxidation within the overburden. There apparently is sufficient neutralizing capacity in this overburden facility to avoid acid drainage conditions.

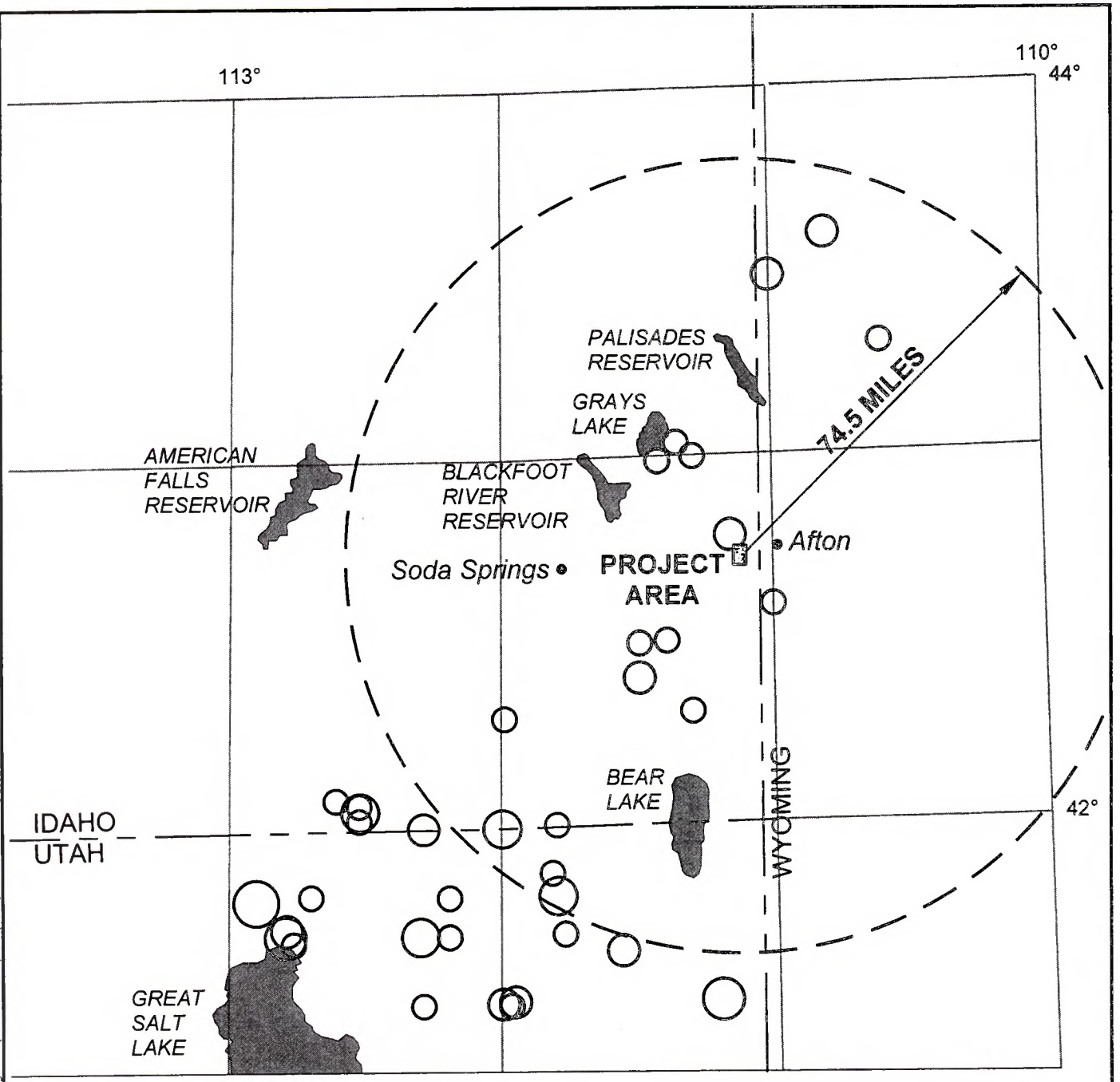


FIGURE 3.1-6
EPICENTER MAP OF SE IDAHO EARTHQUAKES, INTENSITY ≥5
SIMPLOT SMOKY CANYON MINE PANELS B&C
SUPPLEMENTAL EIS

drawings\SIMPLOT\FSEIS\Figures FSEIS\Figure 3.1-6.dwg (revised 2/27/01)

Trace Metals and Sources

Selenium and many other metals and metalloids occur in the Phosphoria Formation in high concentrations relative to average crustal abundances (USFS et al., 1976, Desborough et al., 1999, Herring et al., 1999a, Munkers et al., 2000).

Assay Data on Selenium

Herring and others (2000b) sampled measured sections in the Phosphoria Formation at the Smoky Canyon Mine and assayed these samples for various metals and selenium. They showed selenium occurs in the Mead Peak Phosphatic Shale Member of the Phosphoria Formation primarily in the Hanging Wall Mudstone, Middle Waste Shale and Footwall Mudstone beds where selenium concentrations ranged from 6 to 708 mg/kg. The selenium concentration in the Rex Chert member was 1 mg/kg. The USGS noted that selenium concentrations varied greatly between samples. This variability is due to greatly variable degrees of alteration and weathering based on depth below the ground surface, and structural features such as fractures and faults.

Munkers (2000) discussed drill core assays of the Phosphoria Formation obtained from the Smoky Canyon Mine. These data showed that the largest concentrations of selenium occurred in the Middle Waste Shale. Most of these concentrations were below 150 mg/kg but three zones in this unit had concentrations as high as 250 to 300 mg/kg.

Selenium in the Phosphoria Formation occurs in several forms. The USGS has identified selenium associated with organic matter (kerogen) in carbon-rich rocks and also with the mineral pyrite (Desborough et al., 1999). Munkers et al. (2000) noted that most of the selenium in the Smoky Canyon Mine rocks occurs as selenide (Se^{-2}) in ionic substitution for sulfur in pyrite; however, native selenium (Se^{0}) has also been identified (Munkers et al., 2000). These forms of selenium are insoluble; however, upon exposure to surface conditions and weathering, selenide and elemental selenium can be oxidized to more soluble forms. In the overburden in the vicinity of Pole Creek south of the proposed project area, Möller (1997) found that approximately two percent of the selenium in samples analyzed from the overburden disposal facility occurred as the more soluble form, selenite (Se^{+4}), although its chemical or mineralogical occurrence was not described. The most soluble forms of selenium, selenate (Se^{+6}) and certain organo-selenium compounds, are not found in the undisturbed overburden material.

Cadmium commonly occurs in ionic substitution for zinc in the sulfide mineral sphalerite (ZnS). Desborough (1977) found cadmium to occur in sphalerite in the Meade Peak Member in Coal Canyon, Wyoming. Munkers et al. (2000) reported that sphalerite is common in siltstones in overburden samples from the Meade Peak Member collected at the Smoky Canyon mine. Accordingly, and by extension, it is probable that cadmium occurs in sphalerite in the Middle Waste Shale; however, concentration in organic compounds is also probable.

The mineralogical occurrence of other metals in the Middle Waste Shale has not been well documented; however, Desborough (1977) studied metal occurrences in vanadium-rich zones in the Meade Peak Member in eastern Idaho and western Wyoming. He determined that trace elements and metals occurred in sulfide minerals (zinc in sphalerite), oxides (molybdenum, titanium and vanadium), silicates (chromium), and organic compounds (chromium, silver, vanadium), as well as an indeterminate occurrence for nickel. Lead, arsenic, and other metals and metalloids were not studied. A similar diversity of mineralogical and organic-compound occurrences can be assumed, although it has not been documented, for the occurrence of metals in the Middle Waste Shale at Smoky Canyon. The absence

of low pH conditions in the overburden, and waters that pass through it, substantially inhibits the leaching and mobilization of most metals and metalloids, other than selenium.

Geochemical Conceptual Model

Selenium and trace metals occur naturally in minerals contained within rocks that are mined at phosphate mines in southeast Idaho. Leaching and mobilization of these metals can lead to elevated concentrations in ground and surface water. Subsequent vegetative uptake can affect biological receptors. Since the discovery of local selenium environmental impacts in 1996, the southeastern Idaho phosphate industry has been cooperating with state and federal regulatory and land management agencies to identify causal factors for the selenium impacts and develop appropriate mitigative measures.

Based on the current understanding of the sources, release mechanisms, and transport pathways for selenium in the phosphate production region of southeastern Idaho, there are several factors that affect the amount of leaching and mobilization of selenium and trace metals. These factors are described briefly below, as are potential control methods. A conceptual model of selenium and trace metal leaching and transport is presented to assist in prediction of contamination and in evaluation of control methods.

Elevated concentrations in mined overburden, most notably the Middle Waste shales, have been identified as sources of selenium. Direct and indirect impacts to vegetation, surface and groundwater, and terrestrial and aquatic wildlife could potentially occur in areas directly influenced by active phosphate mines in southeastern Idaho (Montgomery Watson, 2000b). Exposure of the overburden to the atmosphere after it is mined begins the process of oxidation of the insoluble forms of selenium that are most common in the overburden, selenide (Se^{-2}) and selenium (Se^{0}). Selenium is most soluble in high-pH aqueous environments (Desborough et al., 1999, Munkers, 2000).

In alkaline environments like those found in overburden stockpiles in southeastern Idaho, selenide is oxidized to selenite. Selenide also oxidizes readily to elemental selenium; however, elemental selenium is resistant to oxidation. Since much of the selenium in undisturbed Phosphoria Formation overburden may occur as selenide in pyrite (Desborough, 1977, Desborough et al. 1999, Munkers, et al, 2000), it is probable that oxidation directly from selenide to selenite through bacteria-induced biochemical reactions without creation of elemental selenium is the most common selenium oxidation reaction in disturbed overburden. The growth rate of aerobic bacteria in the oxidizing surface environment would be increased as the result of the electron transfer and free energy that would be generated by this direct oxidation reaction. In turn the aerobic bacteria would thrive on the energy created by the reaction and enable the continued process of relatively rapid oxidation of selenide to selenite.

Oxidation from selenite (Se^{+4}) to selenate (Se^{+6}) also would begin simultaneously with oxidation of selenide. Selenite compounds are highly toxic once in solution; however, their solubility is hindered by the tendency of selenite to form "...relatively stable complexes and compounds with iron and aluminum sesquioxides..." and the relatively lower solubility of selenite salts compared to equivalent selenate salts. Selenate is the most geochemically mobile inorganic form of selenium and the one most easily accumulated by and toxic to plants and animals (Herring et al., 1999a).

Although organo-selenium compounds, most commonly the amino acid selenomethionine, are highly toxic and can be common in the environment, they have not been identified in unweathered rocks in the Meade Peak Member. These compounds are created by organic reactions in plant tissue and become present in soil and water as the result of decay of vegetation containing the compounds.

Selenium as selenate or organo-selenium compounds are highly mobile in surface water and groundwater and can be concentrated in soils derived from seleniferous bedrock or disturbed seleniferous overburden.

A previous study by Möller (1997) included analyses on soil (overburden) samples from the Pole Canyon overburden disposal site at the Smoky Canyon Mine and on waters that have contacted these overburden materials. These analyses indicated that total selenium concentration in overburden does not provide a good indicator for the selenium leaching potential (Möller, 1997). To effectively assess the potential mobilization of selenium and metals, it appears that representative samples must be subjected to leachability tests in addition to measurements of the total concentration of the constituents of interest.

USGS passive leaching experiments with samples of Phosphoria Formation overburden obtained from locations throughout southeast Idaho showed that selenium concentrations in the leachate were higher for unoxidized rock than for oxidized rock (Desborough et al, 1999). The concentration of selenium in the leachate correlated strongly with the concentration of selenium in the rock. Other USGS studies in the region have shown that highly oxidized and weathered Phosphoria Formation shales have lower selenium concentrations than less weathered shales (Herring et al., 2000a)

Oxidation of overburden begins when it is drilled and blasted. Additional exposure to oxygen occurs during and following placement in overburden disposal facilities. Overburden fills are porous and contain rock which can be exposed to both atmospheric oxygen and/or oxygenated groundwater which, in the alkaline environment that exists in these stockpiles, results in oxidation of seleniferous pyrite or of native selenium. Data as to the kinetics of the natural leaching of oxidized Phosphoria Formation shales is limited, but USGS studies of elemental concentrations in the Fishscale Shale exposed in an open pit footwall of the Smoky Canyon Mine showed concentrations half or less compared to the same element concentrations in fresher samples of the same unit (Herring et al., 2000b) This would suggest that leaching of exposed rock can occur within a matter of a few years.

Control methods focus on minimizing exposure of selenium and metals to air and water through selective handling and placement of seleniferous overburden. This approach involves numerous phases from mining to reclamation. Selenium control management practices applicable to the Smoky Canyon Mine were discussed in Chapter 2 and are more thoroughly described in **Appendix 2B**. These methods incorporate several of the draft BMP's developed by the Idaho Mining Association (IMA) Selenium Subcommittee (Montgomery Watson, 2000a).

A conceptual model for selenium and trace metal leaching and mobilization is summarized below. This model is illustrated in **Figure 3.1-7**.

Oxidation of selenium-bearing minerals is initiated when rock with high selenium concentration is exposed to weathering conditions as a result of mining activities. Oxidation of the immobile reduced selenium forms in the overburden minerals results in creation of selenite and selenate compounds in water which are leached by either direct contact with surface water runoff or by infiltrating meteoric water. These forms of selenium become dissolved in water as inorganic or organic complexes. Surface water flow from mining areas is collected in sediment/runoff collection ponds where mineral particles with selenium content are collected and water either infiltrates or evaporates. Sediment ponds are typically designed to contain runoff for a short period. During situations where runoff occurs over an extended period, ponds must decant their excess minus their sediment load. Contact of overburden with surface run-on from uphill watersheds can be reduced through use of upgradient diversion ditches. Infiltrating meteoric

water in overburden can become enriched in selenium or metals and be taken up by vegetation or it can become seepage below vegetation roots and eventually enter the foundation materials under the overburden fills. Contact of seleniferous overburden with surface runoff and/or vegetation roots can be controlled by covering (capping) the seleniferous overburden with relatively clean chert or other cover and topsoil. When the thickness of this cap is sufficient to separate most vegetation roots from the seleniferous overburden, uptake of selenium and metals in vegetation is minimized. Seepage in overburden may eventually enter the groundwater table after percolating through the unsaturated zone above the water table. Geochemical reactions are likely to occur throughout the pathway of this seepage through the overburden and the foundation materials either accentuating or attenuating the concentrations of selenium and metal compounds in the seepage. Contaminants added to groundwater may flow along with the groundwater potentially discharging at streams, seeps and springs from where selenium can be made available to biological receptors in the aquatic habitat or terrestrial species ingesting the water or aquatic biota. Any of these steps can be controlled using effective management practices. These control measures include construction of caps over seleniferous overburden to reduce exposure to the surface environment, use of clean topsoil for reclamation revegetation, diversion of upgradient run-on, collection of runoff, and design of overburden piles to reduce porosity and permeability. The Contaminant Leaching and Mobilization Conceptual Model, **Figure 3.1-7**, shows some of these control measures (light blue).

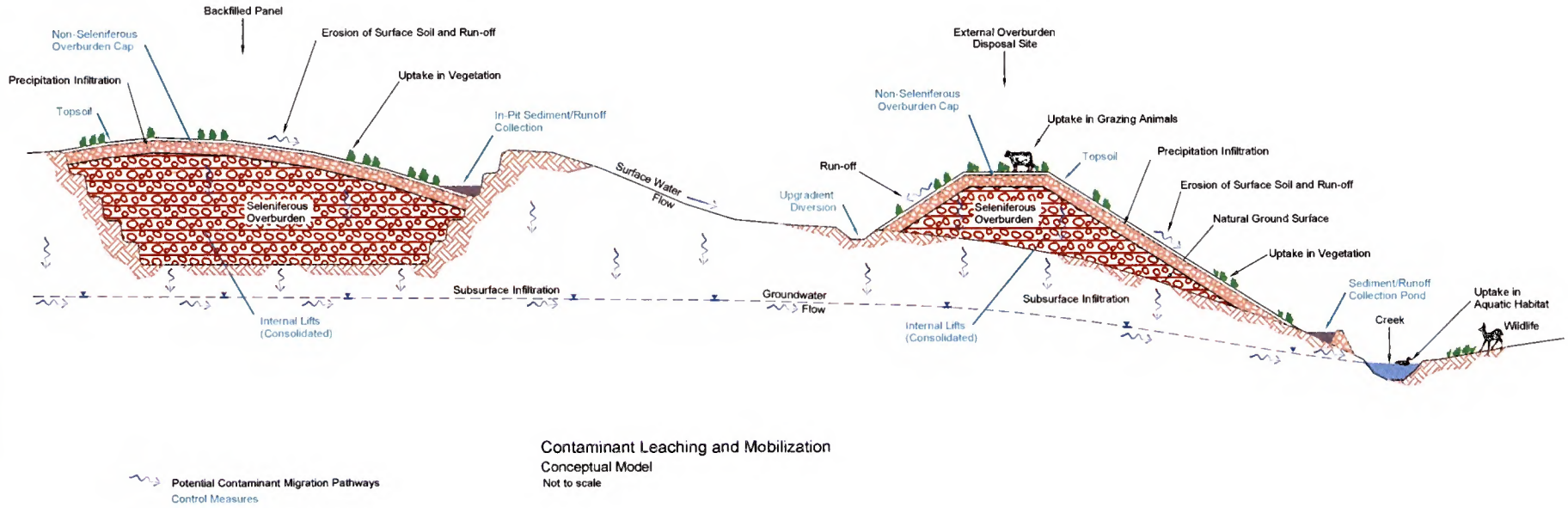
SPLP Leaching Test Data

Samples of overburden from existing Smoky Canyon overburden disposal facilities and backfills and future overburden material were collected as previously described, and analyzed to assess which metals and metalloids would be expected to be leachable from overburden. Ten samples were collected from each of three existing overburden disposal facilities, Panel A backfill, Panel D internal overburden backfill, and Panel E external overburden disposal facility. A total of 102 samples from drill holes in proposed Panels B and C were collected from archived rotary drill cuttings. These samples represent the five recognized stratigraphic units within the Phosphoria Formation that comprise overburden to be mined under the Proposed Action and Alternatives. Five low-grade ore stockpile samples and one tailings sample from the tailings pond were also tested for leachable metals and metalloids.

Leachable elements were determined for each of these samples using Environmental Protection Agency (EPA) Method 1312, the Synthetic Precipitation Leaching Procedure (SPLP). The SPLP test uses a dilute inorganic acid solution with a volume 20 times that of the sample to be leached. The sample and solution are rolled for 18 hours, the leachate is filtered, and the resultant solution is analyzed for the selected analytical parameters.

Average concentrations of the various parameters in leachates were derived from samples of the Middle Waste Shale, Rex Chert, Footwall Mudstone, Hanging Wall Mudstone, and Hanging Wall Phosphatic Shale. The average concentrations of cadmium, zinc and selenium in leachate derived by SPLP testing for each of these units, plus alluvium, as well as their weighted average concentration in the entire mass of overburden based on the anticipated proportion of each overburden type, are shown in **Table 3.1-1**. The SPLP leachate does not provide a direct measurement of predicted water quality that could result from exposure of overburden to the environment. However, the leachate does allow comparison of relative amounts of constituent leaching from various lithologic units.

drowings\SIMPLOT\FSEIS\Figures FSEIS\Figure 3.1-7.dwg



Contaminant Leaching and Mobilization
Conceptual Model
Not to scale

Modified from: Montgomery Watson, 2000. Draft BMP Guidance Manual for Active and Future Mines, April 2000.

FIGURE 3.1-7
CONTAMINANT LEACHING & MOBILIZATION CONCEPTUAL MODEL
SIMPLOT SMOKY CANYON MINE PANELS B&C
SUPPLEMENTAL EIS

As shown in **Table 3.1-1**, the Hanging Wall Phosphatic Shale and the Middle Waste Shale yielded the highest concentrations of selenium and zinc in leachate. The cadmium concentration of the Footwall Mudstone was between that of the Middle Waste Shale and the Hanging Wall Phosphatic Shale. These data indicate that selective handling and management of these units is warranted.

The Rex Chert had the lowest concentrations of selenium, cadmium and zinc of all the lithologies tested. The lack of clay minerals, insolubility of the silicate mineral making up the chert, and apparent lack of mineralization all indicate that the chert is expected to be inert with regard to being a potential source of soluble metals and selenium. Selenium assay information for the chert also shows it to have very low selenium concentrations compared to the shales (Munkers, 2000). The "chert" at Smoky Canyon does not include the cherty shale between it and the underlying shales. This cherty shale can have elevated selenium content.

Table 3.1-1 Average Concentration of Leachable Selenium, Cadmium and Zinc in Overburden Stratigraphic Units and Weighted Average Concentrations for All Units

Overburden Unit	Number of Samples	Average Concentration in SPLP Leachate (mg/l)		
		Selenium	Cadmium	Zinc
Rex Chert	20	0.001	0.0001	0.1
Hanging Wall Mudstone	20	0.004	0.0012	0.15
Hanging Wall Phosphatic Shale	22	0.019	0.004	0.25
Middle Waste Shale	19	0.041	0.002	0.3
Footwall Mudstone	21	0.003	0.0037	0.17
Alluvium	26	0.0025	0.0012	0.19
Weighted Average	102	0.0152	0.0014	0.187

Cadmium and zinc were found to occur in elevated concentrations in the SPLP extracts of all five low-grade ore stockpile samples and in the single tailings sample. Since the pH of both surface and ground water in the Smoky Canyon Mine area is alkaline, mobility of cadmium and zinc is anticipated to be low, despite the high concentrations in SPLP extracts.

Although selenium and metal concentrations were determined to be generally higher for the Middle Waste Shale and the Hanging Wall Phosphatic Shale, there may be significant variability in constituent concentrations within these units. Herring et al. (2000b) found that a weathered section of the Meade Peak Member had lower concentrations of selenium, nickel, vanadium and zinc than an unweathered section, while chromium and copper were more enriched in the weathered section. In addition, variability in selenium concentrations has been noted for stratigraphic intervals in the Phosphoria Formation, with significant differences in selenium concentration between adjacent strata (Herring et al., 1999a; Desborough et al., 1999; Herring et al., 2000b). Thus, there may be zones in the Middle Waste Shale or other units of the Meade Peak Member, that have higher or lower concentrations of metals or metalloids than the average values determined by Maxim (2000b).

3.1.6 Mineral Resources

Simplot began construction operations at Smoky Canyon Mine in 1982. Current mining operations are conducted in Panel E, located immediately south of Panel D and Panel A which are mined out. Plans are to begin mining Panels B and C upon completion of this SEIS. Smoky Canyon Mine produced 2.3 MMT of phosphate ore in 1998, making it the largest phosphate mine in Idaho (USGS, 1998). Over 50 million tons of phosphate ore reserves were projected to exist at the Smoky Canyon site before mining began (USFS, 1981).

Phosphate ore resources occur primarily as sedimentary marine phosphorites. In the Phosphoria Formation of southeastern Idaho, these deposits are confined to well-defined and specific stratigraphic horizons. The Western Phosphate Field, primarily in southeast Idaho contains large phosphate reserves within the Caribou-Targhee National Forest.

Phosphate Leasing Program and Description of Existing Rights

Phosphate ore mining rights are granted under a leasing program, in accordance with the Mineral Leasing Act of 1920 (as amended) and applicable regulations. Mineral leases are administered by the BLM. These leases, purchased by mining companies, convey the right to mine and develop phosphate resources within the lease.

Panel B and C ore reserves occur in leases (I-012890 and I-026843), for which Simplot is the lessee, and Simplot therefore has purchased rights to mine and develop the phosphate reserves within these leases from the federal government, in concurrence with applicable conditions set by the BLM, USFS, and other federal and state agencies and laws.

The existing mining and milling operations were authorized by a Record of Decision that was issued in 1982 upon completion of the Final Smoky Canyon Phosphate Mine EIS. The conditional permits granted by the BLM and USFS at the beginning of the Smoky Canyon mining operations required that subsequent site-specific mine plans for the individual mine phases be submitted to the agencies for their review and that appropriate mitigation measures be developed using further environmental analysis. NEPA also requires supplemental analysis of environmental conditions if potentially significant issues are identified subsequent to approvals.

Mineral Economics

Costs associated with mining include removal of overburden as well as mining and processing costs of the ore. Because deeper ores require excavation of a larger pit, the ratio of overburden to ore, or strip ratio, increases with pit depth. As ore depths increase, economic return decreases, and at a certain depth, mining of the phosphate ore becomes uneconomic. The depth at which ore recovery becomes uneconomic is also affected by ore grade, weathering, and other factors including operational efficiency specific to the operation.

Economics are also affected by supply and demand, foreign producers, and by proximity of deposits to processing facilities. Most phosphate ore, including that produced at Smoky Canyon, is used in the production of fertilizer. In general, the need for increased food production world-wide assures that demand of phosphate rock, as a component of fertilizer, will increase over the long-term. The United States is currently the largest producer and consumer of phosphate rock and is the largest producer and exporter of fertilizer (USGS, 2000). United States phosphate production in 1999 was approximately 41.5 MMT, with about 85 percent of this production coming from North Carolina and Florida, and the balance

from the Western Phosphate Fields, primarily Idaho mines. The phosphate rock reserve base in the United States is estimated at 4.2 billion tons, while the reserve base in the rest of the world is estimated at approximately 31.8 billion tons (USGS, 2000). Significant reserves are known to occur in Morocco and South Africa.

Proximity to existing mining and processing facilities affects mine economics due to capital expenditures and uncertainty of reserves. A large capital expense is necessary to build and staff mining and processing facilities, so the use of existing facilities allows new deposits to be more economically mined.

The Proposed Action would use the existing facilities at the Smoky Canyon Mine to mine the phosphate ore in Panels B and C, concentrate the ore, and pipe the concentrate slurry out from the mine. Facilities include a mill, shop, and pipeline for product transportation. The mill and shop facilities are located adjacent to Panel A, approximately 3/4 mile south of proposed Panels B and C. Fertilizer would be produced from the concentrate at the existing Simplot plant in Pocatello, Idaho.

3.1.7 Topographic Resources

The Smoky Canyon Mine existing panels and proposed B and C Panels are located on the eastern flank of the Webster Range, which is the dominant topographic feature in the project area. The Webster Range is a north-south trending range that covers the western half of the project area as shown on **Figure 1.0-2**.

The Boulder Creek Anticline is located on the east flank of the Webster Range. The surface topography of the Boulder Creek anticline mimics the orientation of its sedimentary units, forming a gentle ridge parallel to the Webster Range. The west side of this Boulder Creek Anticline ridge is a small swale in the overall east-facing slope of the Webster Range. Along this swale, part of the Permian Phosphoria has been eroded. The Smoky Canyon Mine existing and proposed panels follow this exposure of the Phosphoria for approximately five and one-half miles.

Numerous east-trending drainages flow down the east side of the Webster Range and feed Tygee, Sage and Crow creeks. The more prominent of these drainages are Smoky Creek and Roberts Creek which feed Tygee Creek; Pole Creek, Sage Creek and South Fork Sage Creek which are tributary to Sage Creek; and Manning Creek and Deer Creek, which are tributary to Crow Creek. Sage Creek itself flows into Crow Creek near the southeast boundary of the Cumulative Effects Area. The drainage relationships described herein are based on topography; during the dry summer and fall months, some of the drainages on the east side of the Webster Range flow short distances only, before becoming dry.

The highest point in the project area is an unnamed peak in the Webster Range near the northeast boundary of the project area, which is 8,724 feet in elevation. Draney Peak, approximately one and one-half miles north of this unnamed peak, is 9,131 feet in elevation, and forms a prominent point on the Webster Range ridge line. In the southern portion of the project area, the east facing slopes of the Webster Range are notably steep, in some locations rising as much as 500 feet in a distance of one quarter mile. All of the east-flowing drainages cutting across the Webster Range form steep-sided canyons, but in the proposed action area, the drainages are more steeply incised.

Smoky Creek is the northernmost of the drainages in the Cumulative Effects Area that flow east across the flanks of the Webster Range. It originates at the northwestern edge of the project area on the

Webster Range ridgeline at an elevation of approximately 7,800 feet and flows for approximately six miles before joining north-flowing Tygee Creek in the extreme northeast portion of the project area at an elevation of approximately 6,350 feet. Although the other drainages flow essentially eastward across the east flank of the Webster Range, Smoky Creek bends sharply to the north and flows north for approximately one mile before turning back to the east. Proposed Panels B and C are located immediately east and west, respectively, of this north-flowing section of Smoky Creek.

3.1.8 Paleontological Resources

Sedimentary rocks of southeastern Idaho have paleontological resources consisting of vertebrate, invertebrate, and paleobotanical fossils including fish and shark remains. Fossils found in the Smoky Canyon Mine area are not unique to the project area or southeastern Idaho. They are found throughout the region wherever similar formations exist (Robinson and de Henaut, 2000).

The Paleozoic and Triassic-age bedrock units are generally fossiliferous. Fossils in the Wells Formation were described by G.H. Girty (Mansfield, 1927) as predominantly consisting of bryozoa and brachiopods with wide distribution (BLM and USFS, 2000).

The Meade Peak Member of the Phosphoria Formation contains abundant pelecypods, gastropods, and brachiopods, as well as ammonites, nautiloids, crinoids, bryozoa, and sponge spicules. The base of the Meade Peak Member contains a thin marker bed identified as the fishscale bed, which reportedly contains some fossil fish and shark fragments (BLM and USFS, 1992). Heliocoprion fossils are found in the basal Fishscale bed, and other units in the Meade Peak Member. The Rex Chert Member of the Phosphoria Formation contains brachiopods, crinoid fragments, and sponge spicules (Mansfield, 1927; BLM and USFS, 2000).

Unconsolidated valley fill sediments in southeastern Idaho have yielded Ice Age and older mammals including mammoths, mastodons, horses, bison, camels, ground sloths, carnivores, rodents, and other animals. These are from lake, stream, and/or windblown deposits and consist of clay, silt, ash, sand, and gravel (BLM and USFS, 2000).

3.2 Air Resources and Noise

The study area for air resources and noise, relative to the Smoky Canyon Mine project, consists of the immediate project area and the surrounding airshed out to a radius of 100 kilometers (60 miles). To properly assess the air quality resources for this area, a description of the meteorology, climate, surrounding air quality, and source classification is required. The description of these elements including data from the National Weather Service, is provided in the Dry Valley Draft EIS (BLM, 1999). A summary is provided below.

3.2.1 Climate and Meteorology

In general, the region is typically that of the cool Rocky Mountain area climate. The climate is influenced by major topographic features like the Cascade Mountains to the west and the Rocky Mountains to the east. Nearby mountain ranges trend primarily north to south and have an impact on local winds, as well

as temperature and precipitation patterns in the immediate area. Annual precipitation in the vicinity of the Smoky Canyon Mine is 30-35 inches.

The valleys in the immediate project area have elevations that range from approximately 4,500 feet AMSL to 6,600 feet AMSL. These valleys have a middle-latitude steppe climate. The summers tend to be warm to hot and are typically dry. Winters are typically cold.

The average daily temperature ranges from 70 degrees Fahrenheit (°F) in July to 23°F in January at Pocatello and from 60°F in July to 20°F in January at Conda. Afton is cooler in the summer and winter months, with a high monthly average daily temperature of 58°F in July and a low monthly average temperature of 14°F in January.

3.2.2 Air Resources

The air quality in the vicinity of the Smoky Canyon Mine is excellent because of the site's remote location, and relatively limited human activity in the area. The State of Idaho has adopted EPA's National Ambient Air Quality Standards (NAAQS) for criteria pollutants. The criteria pollutants are ozone, carbon monoxide (CO), nitrogen oxides (NO_x), sulfur dioxide (SO_2), particulate matter with aerodynamic diameter less than or equal to 10 microns (PM_{10}), and lead (Pb). The NAAQS are shown in **Table 3.2-1**.

Table 3.2-1 State of Idaho and National Ambient Air Quality Standards

Pollutant	Averaging Time	Concentration
Ozone	1 hour	235 µg/m^3 (0.12 ppm)
	8 hours	157 µg/m^3 (0.08 ppm)
Carbon Monoxide (CO)	1 hour	40,000 µg/m^3 (35 ppm)
	8 hours	10,000 µg/m^3 (9.0 ppm)
Nitrogen Oxides (NO_x)	Annual Arithmetic Mean	100 µg/m^3 (0.05 ppm)
Sulfur Dioxide (SO_2)	3 hours	1,300 µg/m^3 (0.5 ppm)
	24 hours	365 µg/m^3 (0.14 ppm)
	Annual Arithmetic Mean	80 µg/m^3 (0.03 ppm)
Particulate Matter as PM_{10} (Aerodynamic diameter ≤ 10 microns)	24 hours	150 µg/m^3
	Annual Arithmetic Mean	50 µg/m^3
Particulate Matter as $PM_{2.5}$ (Aerodynamic diameter ≤ 2.5 microns)	24 hours	65 µg/m^3
	Annual Arithmetic Mean	15 µg/m^3
Lead (Pb)	Quarterly Arithmetic Mean	1.5 µg/m^3

Note: µg/m^3 = micrograms per cubic meter; ppm = parts per million
Source: Code of Federal Regulations, 40 CFR Part 50, National Primary and Secondary Air Quality Standards

Ambient air quality standards for NO_x, SO_2, and PM_{10} must not be exceeded at any time during the year in areas with general public access. Short-term standards for CO, NO_x, and SO_2 can be exceeded only once annually. Compliance with the 24-hour PM_{10} and $PM_{2.5}$ standards is based on the 98th percentile of 24-hour concentrations averaged over three years.

Air quality in the Smoky Canyon Mine project area is designated as in attainment with all NAAQS and Idaho Ambient Air Quality Standards. No violations of the national or state air quality standards have been documented in the region.

Air Quality Monitoring Data

The IDEQ has conducted ambient air sampling and data collection in the region. The majority of the sampling and data collection sites within the airshed are located to the north and west of the Smoky Canyon Mine site. These sites typically monitor background levels for criteria pollutants.

Six years (1990 through 1995) of PM_{10} ambient air quality data have been collected at the Soda Springs monitoring location. The annual average ambient concentration of PM_{10}throughout this period has been approximately one-half of the NAAQS requirement. In 1993, one 24-hour average PM_{10} concentration exceeded the NAAQS in the Pocatello-Chubbuck monitoring area. However, in each of the other years within the monitoring period, maximum 24-hour PM_{10} concentrations were measured to be approximately one-half of the NAAQS level.

Air Quality Source Classification

The area surrounding the Smoky Canyon Mine project is designated as Class II, as defined in the Federal Prevention of Significant Deterioration (PSD) program. Moderate growth and/or degradation of air quality is allowed to occur within certain prescribed limits above baseline levels within a Class II designated area. Industrial sources desiring to locate or expand within the Class II area must demonstrate that the increased emissions will not cause significant degradation of air quality in all classified areas.

Within areas determined to be Class I PSD areas, the level of deterioration allowed and, therefore, the standards prescribed, are much more stringent. Class I areas typically include wilderness areas and National Parks. Within 125 miles of the Smoky Canyon Mine project, the Federal Mandatory Class I areas include Yellowstone National Park, Grand Teton National Park, the Bridger Wilderness Area in Wyoming, and Craters of the Moon National Monument in Idaho. A general distance guideline in evaluating Class I area impacts is 60 miles. **Table 3.2-2** below presents the distances and directions to the nearest Class I areas. These Class I areas receive visibility protection under the Federal PSD Program and the included PSD permitting process.

Table 3.2-2 Federal Mandatory Class I Airsheds Nearest the Smoky Canyon Mine Project

Area	Direction From Project	Distance from Project (Miles)
Grand Teton National Park	Northeast	75
Bridger Wilderness Area	East	75
Yellowstone National Park	North	100
Craters of the Moon National Monument	Northwest	120

Existing Sources

Within the immediate vicinity of the Smoky Canyon Mine there are more than a dozen active and inactive mine sites. Mining operations emit primarily fugitive particulate matter emissions from such operations as ore mining, truck hauling, and ore crushing. Heavy equipment internal combustion engines used in the mining process (hauling, electrical generation, etc.) generate primarily gaseous (NO_x, SO_2, CO, and VOC) emissions and small quantities of fine particulate matter.

Table 3.2-3 identifies those industrial air emission sources within Caribou, Bear Lake, and Sublette counties that have air quality permits issued by the states of Idaho or Wyoming. Under these permits, the facilities are allowed to emit PM_{10}, as well as products of combustion (NO_x, SO_2, CO, and VOC) from engines, kilns, and other processes. According to the Wyoming Department of Environmental Quality office in Cheyenne, there are four permitted sources of air emissions within 100 kilometers of the Smoky Canyon Mine. The nearest Wyoming facilities are located outside La Barge, Wyoming, which is approximately 62 miles to the southeast. Unpermitted sources of fugitive dust and smoke in the immediate area include farming and agricultural activities, field burning, non-operational mine sites, and dust from vehicular travel on unpaved roadways.

Table 3.2-3 Permitted Industrial Emission Sources - Southeast Idaho and Southwest Wyoming

Source	County, State
NW Pipeline Compressor Station, Peagram	Bear Lake, ID
NW Pipeline compressor Station, Soda Springs	Bear Lake, ID
Professional Manufacturing, Inc.	Bear Lake, ID
Montpelier School District	Bear Lake, ID
Cargoll, Inc.	Bear Lake, ID
Smoky Canyon Mine	Caribou, ID
Chemstar Lime Quarry	Caribou, ID
Kerr McGee Vanadium Chemicals	Caribou, ID
P4 Production L.L.C. (Monsanto)	Caribou, ID
Agrium Phosphate Fertilizer	Caribou, ID
Soda Springs Phosphate Fertilizer	Caribou, ID
Eurogreen Resources	Caribou, ID
FMC Dry Valley Mine	Caribou, ID
Monsanto Company - ENOCH Valley Mine	Caribou, ID
Conda Partnership Mt. - Fuel Phosphate Mine	Caribou, ID
Rhone-Poulenc Basic Chemicals Company	Caribou, ID
Alexander Company	Caribou, ID
Williams Field Services - Saddle Ridge	Sublette, WY
Williams Field Services - Big Piney	Sublette, WY
Exxon - Labarge Dehydration Facility	Sublette, WY
Ammoco Pipeline - Labarge Station	Sublette, WY
City Transfer S Storage	Caribou, ID
Smith Paving S Construction	Caribou, ID
Johnson Ready Mix	Caribou, ID
Brancroft Grain	Caribou, ID

Source: IDEQ, June 2000, and WDEQ, 2000

3.2.3 Noise

Most noise generated in the project area is related to the operation of equipment, blasting, warning sirens, haul trucks, and support vehicle traffic. Noise receptors at the mine site are predominantly mine employees or contracted workers. Mine employees, workers, and visitors are required to wear hearing protection in specified areas. Specific areas requiring noise protection under MSHA are areas where noise levels exceed 85 dBA. Travelers on the truck routes in the area experience mine noise relative to their location. The closest residents to the Proposed Action live in Tygee Valley about four miles away.

The unit of sound level measurement is decibel (dB), expressed as dBA (decibel-A weighted). The A-weighted decibel measure is used to evaluate ambient noise levels and common noise sources. Environmental noise is best studied by A-weighted sound level. Sound measurements in dBA give greater emphasis to sound at the mid- and high- frequency levels, which are more discernible to humans. The decibel is a logarithmic measurement, thus, the value increases one fold for every increase in 10 dBA.

Generally, noise levels will be around 35 dBA in rural areas away from communities and roads. Within a rural community, the noise level ranges from 45 dBA to 52 dBA. According to the Noise Effects Handbook (Office of Noise Abatement and Control, 1981), the day-night sound level of residential areas should not exceed 55 dBA to protect against activity interference and annoyance. **Table 3.2-4** presents typical sound levels and relevant standards in dBA associated with noise sources.

Table 3.2-4 Sound Levels Associated with Ordinary Noise Sources

Noise Source	Noise Level	Subjective Description
Commercial Jet Take-Off	120 dBA	deafening
Road Construction Jackhammer	100 dBA	deafening
Busy Urban Street	90 dBA	very loud
Standard For Hearing Protection 8-Hour Exposure PEL (MSHA) Action Level	90 dBA 85 dBA	very loud loud - to very loud
Limits at 50 ft for Construction Equipment used on Government Contracts (US GSA)	80-75	loud
Freeway Traffic at 50 feet	70 dBA	loud
Noise Mitigation Level for Residential Areas (FHA)	67 dBA	loud
Normal Conversation at 6 feet	60 dBA	moderate
Noise Mitigation Level for Serene Lands (FHA)	57 dBA	moderate
Typical Office (interior)	50 dBA	moderate
Typical Residential (interior)	30 dBA	faint

3.3 Water Resources

The Cumulative Effects Area comprises about 50 square miles. In its northern portion, it extends from the Webster Range on the west to the Tygee Ridge about 5 miles to the east. The central and southern portions of the study area extend from the Webster Range on the west about 2 to 4 miles east to the

divide between Sage Valley and Crow Creek. The Sage Creek watershed is separated from the Tygee Creek watershed by an unnamed ridge on the north end of Sage Valley.

There are several streams which originate on the eastern slope of the Webster Range, pass through the Boulder Creek Anticline, and drain into the Sage Valley to the southeast or off site to the east. They are important because of their relationship to groundwater recharge and discharge in and near the existing and proposed mining areas. Smoky Creek is of high importance to the project since it passes between proposed Panels B and C, as shown in **Figure 3.3-1**. The stream flows northeast joining with Tygee Creek approximately two miles downstream from the mouth of Smoky Canyon. Roberts Creek, located in the northern portion of the study area, originates from a spring east of the proposed Panels B and C and drains into Tygee Creek. Water in Tygee Creek joins Stump Creek and eventually enters the Salt River Valley about 10 miles away. The other streams crossing the anticline to the south of Smoky Canyon are: Pole Canyon Creek, Sage Creek, South Fork Sage Creek, Manning Creek and Deer Creek. Pole, Sage, and South Fork Sage creeks all flow to Sage Valley. Sage Creek flows south to Crow Creek. Manning and Deer creeks flow directly into Crow Creek. Crow Creek flows to the northeast into the Salt River Valley.

Within the project area and surrounding region, surface water and groundwater are notably interrelated: springs and/or diffuse, influent groundwater provide flow to support perennial and intermittent streams; in turn, those streams also provide recharge to aquifers in other formations as they lose flow downstream. Precipitation, which averages 30-35 inches annually, provides stream flow and recharges the groundwater system. A significant portion of the precipitation occurs as winter snowfall, to depths in excess of 100 inches (Simplot Agribusiness, 2000).

The existing Smoky Canyon Mine and the proposed future developments are located within tributary watersheds to the Salt River drainage system. The Salt River flows northward through western Wyoming, and ultimately joins the Snake River; the Snake River is part of the Columbia River system. The general direction of most groundwater flow in the Smoky Canyon area is northward and westward, and is controlled by bedrock strata (Ralston, 1979).

This section is organized such that surface water resources are described first; descriptions of groundwater resources and seeps/springs follow in separate sections. Their inter-relationship is reflected in frequent referrals between sections.

3.3.1 Surface Water Resources

Simplot's existing mining operations have primarily occurred within small drainages that drain the east slopes of the north/south trending Webster Range (**Figure 3.3-1**). The northernmost part of the operations is within the Tygee Creek basin and several of its small tributaries. The southern part of the operations is within Sage Creek basin. The Proposed Action would occur entirely within Tygee Creek basin; consequently, the discussions in this section focus on the sub-drainages of Tygee Creek basin that could be affected by the Proposed Action, and upon the Stump Creek/Salt River systems into which Tygee Creek flows. The Cumulative Effects Analysis includes descriptions and discussions of the Sage Creek basin, where existing mining has occurred, and where future mining expansions, which are not a part of the Proposed Action, would take place.

Snow melt, rainfall, springs, and diffuse groundwater discharge all contribute to stream flow in the project area and its surroundings. In general, most runoff is attributed to snow melt, and due to the overall high infiltration rate, surface runoff from rainfall is typically low (USGS, 1977).

None of the streams within the project area or the Cumulative Effects Area have been designated by the State of Idaho as Outstanding Resource Waters or as Special Resource Waters (Idaho Administrative Code IDAPA 58.01.02). Neither are any of the streams in the project area or Cumulative Effects Area designated under the Wild and Scenic Rivers System, or listed in the Nationwide Rivers Inventory as potentially possessing "outstandingly remarkable values" that may make them eligible for designation in the system (National Park Service, 2000). Further, the USFS has determined that none of the streams in the area are eligible for inclusion in the Wild and Scenic Rivers System (USFS, 1998). Downstream from the project area, the Hells Canyon area of the Snake River has been designated as a Wild and Scenic River, and portions of the Upper Salt River in Wyoming were listed in the Nationwide Rivers Inventory in 1993 (National Park Service, 2000). Within the Caribou-Targhee National Forest, two areas were determined eligible for further study: a reach of the St. Charles River and a wetland site known as Elk Valley Marsh (USFS, 1998).

Salt River

As the Salt River flows through Star Valley, Wyoming, east of the project area, it collects flow from Crow Creek and Stump Creek, both of which collect flow from all of the smaller drainages related to Simplot's operations. A United States Geological Survey (USGS) stream gaging station (#13027500) has been recording flow data on lower Salt River since 1954 (USGS, 2000a). The peak flow during that measurement period was 5,090 cubic feet per second (cfs), recorded in early June, 1986. Typically, snow melt runoff influences flows at the gage site between early April and late July; flows the remainder of the year are relatively uniform, averaging between 500 and 600 cfs (Miller and Mason, 2000).

Stump Creek

Stump Creek flows into the Salt River in lower Star Valley, about 20 miles upstream from the Salt River gaging station. The majority of Stump Creek's approximately 100-square-mile watershed is located in Idaho, draining slopes of the Webster and Caribou ranges. Extensive flow data for Stump Creek are lacking; a four-year period of record in the late 1940s showed annual peaks ranging from about 350 cfs to about 500 cfs (USGS, 2000), and an average annual flow during those years of about 56 cfs (USFS, 1981).

Tygee Creek

With a drainage area of about 37 square miles, Tygee Creek is one of the main tributaries of Stump Creek, joining it near the Idaho/Wyoming border. Tygee Creek flows northward, capturing flow from the east slopes of the Webster Range and the west slopes of Tygee Ridge. Roberts Creek, Smoky Creek, Draney Creek, Salt Lick, and Webster Canyon Creek are the named tributaries to Tygee Creek (**Figure 3.3-1**).

Coincident with Simplot's mining activities and pre-mine permitting, periodic stream flow measurements have been obtained at various locations in Tygee Creek since 1979. Most of these measurements have been obtained for Simplot by TRC Mariah Associates, Inc. as part of their ongoing aquatic studies. Flow measurements have typically been obtained twice yearly at Tygee Creek stations both upstream and downstream of Simplot's tailings pond (see **Figure 3.3-2**). **Table 3.3-1** below summarizes these flow data. Higher reported flows in the spring than in the fall season reflect the regional seasonal hydrologic

characteristics noted above: snow melt runoff produces the highest flows, and are quite variable, while the fall season flows reflect base flow conditions that vary over a much smaller range.

Table 3.3-1 Historic Stream Flow Measurement Summary - Tygee Creek

Location	Site Identification	Period of Record	Spring Season Range (cfs)	Fall Season Range (cfs)
Upper Tygee Creek	TRC-UT1 or TRC-UT2	1979-1999	0.66-7.40	0.34-1.60
East Tygee Creek	TRC-ET	1989-1999	0.74-2.70	0-0.9
Lowest Tygee Creek	TRC-LT3	1986-1999	<1.0-17.0	0.23-3.10

Reference: (TRC Mariah Associates, Inc., 2000b).

Stream flow measurements recently obtained by Maxim (2000e) at these same Tygee Creek sites were generally lower than had been reported during spring season measurements for the past 20 years (**Table 3.3-2**). Tygee Creek and its tributaries including Smoky Creek and Roberts Creek supply only a small portion of Stump Creek flows.

Table 3.3-2 Stream Flow Measurements during 2000 in the Tygee Creek Basin

Site Location	Site Identif-ication	Stream Flow Measurement (cfs)			
		March, 2000	June, 2000	Sept., 2000	Dec., 2000
Upper Tygee Creek	SW-6	0.34	0.39	0.18	0.18
East Tygee Creek	SW-7	0.03	0.42	0.02	0.002
Lower Tygee Creek	SW-5	0.37	0.63	0.41	0.17
Upper Smoky Creek	SW-1	0.01	0.47	0.21	0.01
Lower Smoky Creek	SW-2	0.58	1.17	0.42	0.54
Lower Smoky Creek #2	SW-3	Not Measured	0.58	Not Measured	1.31
Tygee Creek below Smoky	SW-18	1.20	no data	0.48	1.31
Upper Roberts Creek	SW-4	Not Measured	0.42	0.71	0.16

Reference: (Maxim Technologies, Inc., 2000e).

Smoky Creek and Roberts Creek are the two tributary watersheds to Tygee Creek in which previous mining activities by Simplot have occurred, and in which the Proposed Action would occur.

Roberts Creek

Roberts Creek lies upstream (west) of the tailings disposal facilities, and it's lower reaches were the site of the first phase of the tailings ponds (Tailings Dam No. 1) construction. Some of the water from the creek headwaters was originally rerouted around the pond in 1984, and the remainder was allowed to flow into the tailings pond (Mariah, 1990). Currently, all flow in Roberts Creek is generally routed around the pond via the Tygee Creek diversion. Occasionally, Simplot diverts some of this water into Tailings

Pond No.1, however the amounts or frequency of water diversion are not known. No mining pits or overburden disposal have been constructed to date in the Roberts Creek drainage.

Smoky Creek

The Smoky Creek watershed represents the northernmost drainage wherein Simplot's activities have occurred. The basin drains an area of about 6.6 square miles (**Figure 3.3-1**). Currently, a USFS road (used also for a mine access road) follows along the north/northwest bank of Smoky Creek, and crosses it once near the northern proposed haul road crossing, and once near where it enters Simplot's existing mine area. The mine's tailing and power lines also follow along, and cross, the creek. Smoky Creek has been realigned, channelized, and bermed throughout much of its length (Maxim, 2000c).

Flow in Smoky Creek, as with other streams draining the east side of the Webster Range, varies spatially along its alignment. Groundwater discharged from distinct springs, or from diffuse sources, can contribute to stream flow. Conversely, in-channel surface flow can be lost to the substrate, but continue to flow down-canyon in a subsurface manner, either dispersing to recharge a groundwater system, or reappearing as surface flow at some point downstream. As a result, flows in a down-canyon direction increase or decrease. Such gain/loss characteristics have been described for portions of Smoky Creek and other streams in the general area (Ralston, 1979).

The stream flow in Smoky Creek is perennial from about 0.3 miles upstream of the upper access road crossing to about 1,000 feet downstream of this road crossing. In this reach, the stream flows across the Lower Dinwoody and Phosphoria Formations. Downstream of this point, the stream flows over an outcrop of the Wells Formation where it loses flow (Ralston, 1979). Thus, from about 1,000 feet below the upper road crossing, Smoky Creek loses flow through percolation downward into the Wells Formation and then the Rex Chert and Lower Dinwoody Formation with the stream eventually drying up before reaching the mouth of Smoky Canyon during typical years from summer until the following spring snowmelt. The proposed Panels B and C would be located adjacent to the reach where Smoky Creek is losing flow through percolation.

The lack of a shallow groundwater connection between the proposed Panels B and C and Smoky Creek is indicated by data from two monitoring wells, GW-5 between the C Panel and the creek and GW-6 between the B Panel and the creek (**Figure 3.3-3**). Both of these monitoring wells are completed below the elevation of the creek, down hill from the well collars, and the wells were dry in 1999 and 2000.

A spring discharging into the Smoky Creek channel in the southwest corner of Section 17 (Lower Smoky Spring) supports perennial flow in lower Smoky Creek. During summer and fall, Smoky Creek is dry in the lower reaches of the canyon until Lower Smoky Spring is reached at the mouth of the canyon. From this point downstream, Smoky Creek is perennial.

A number of years of flow data have been obtained on Smoky Creek (TRC Mariah, 1999). An upstream monitoring site (TRC-USm) is located near the southeast corner of Section 24, where flow is perennial. A downstream site (TRC-LSm) is located about one mile downstream of Lower Smoky Spring; it has also documented perennial flow conditions.

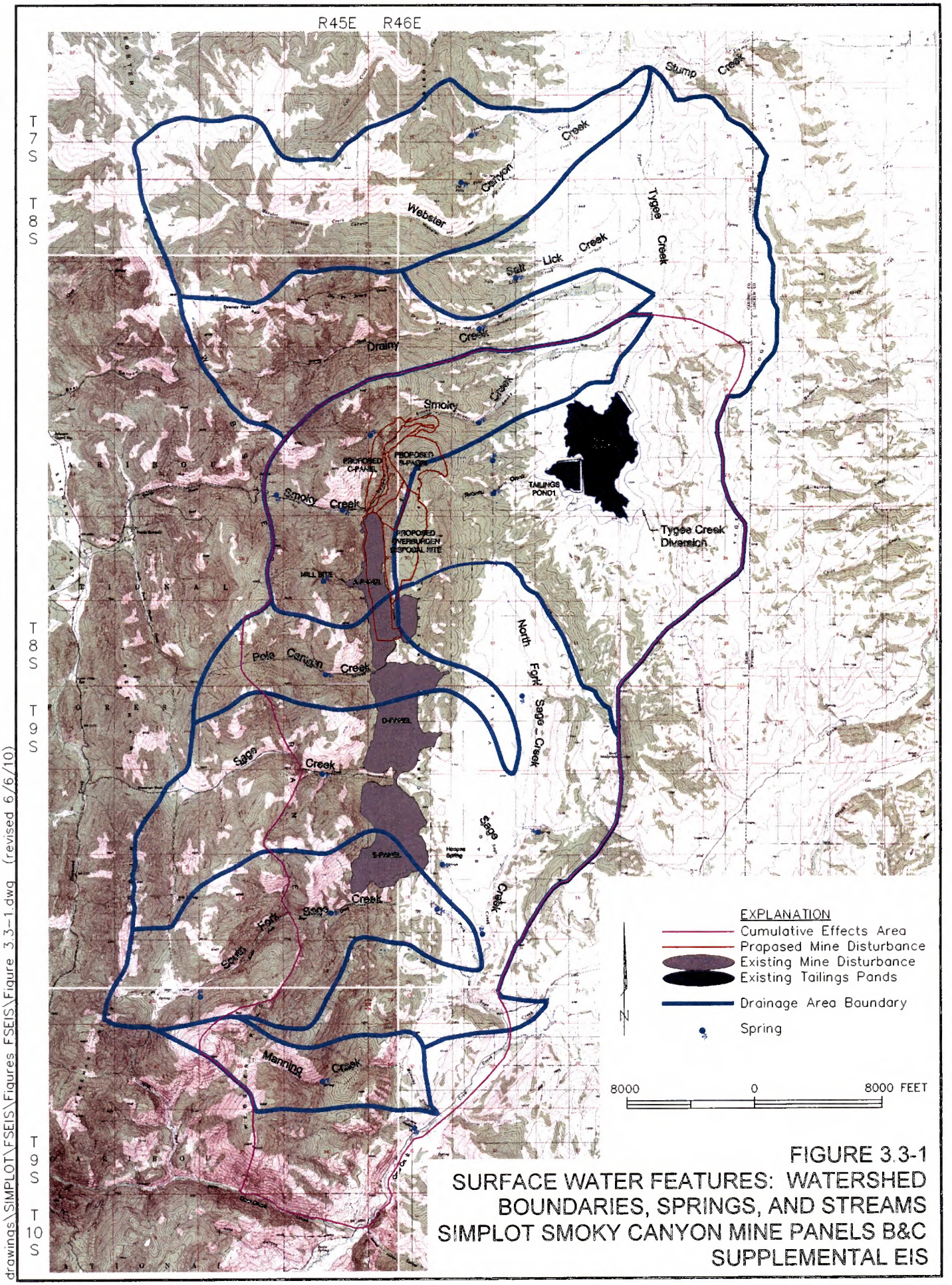


FIGURE 3.3-1
SURFACE WATER FEATURES: WATERSHED BOUNDARIES, SPRINGS, AND STREAMS
SIMPLOT SMOKY CANYON MINE PANELS B&C
SUPPLEMENTAL EIS

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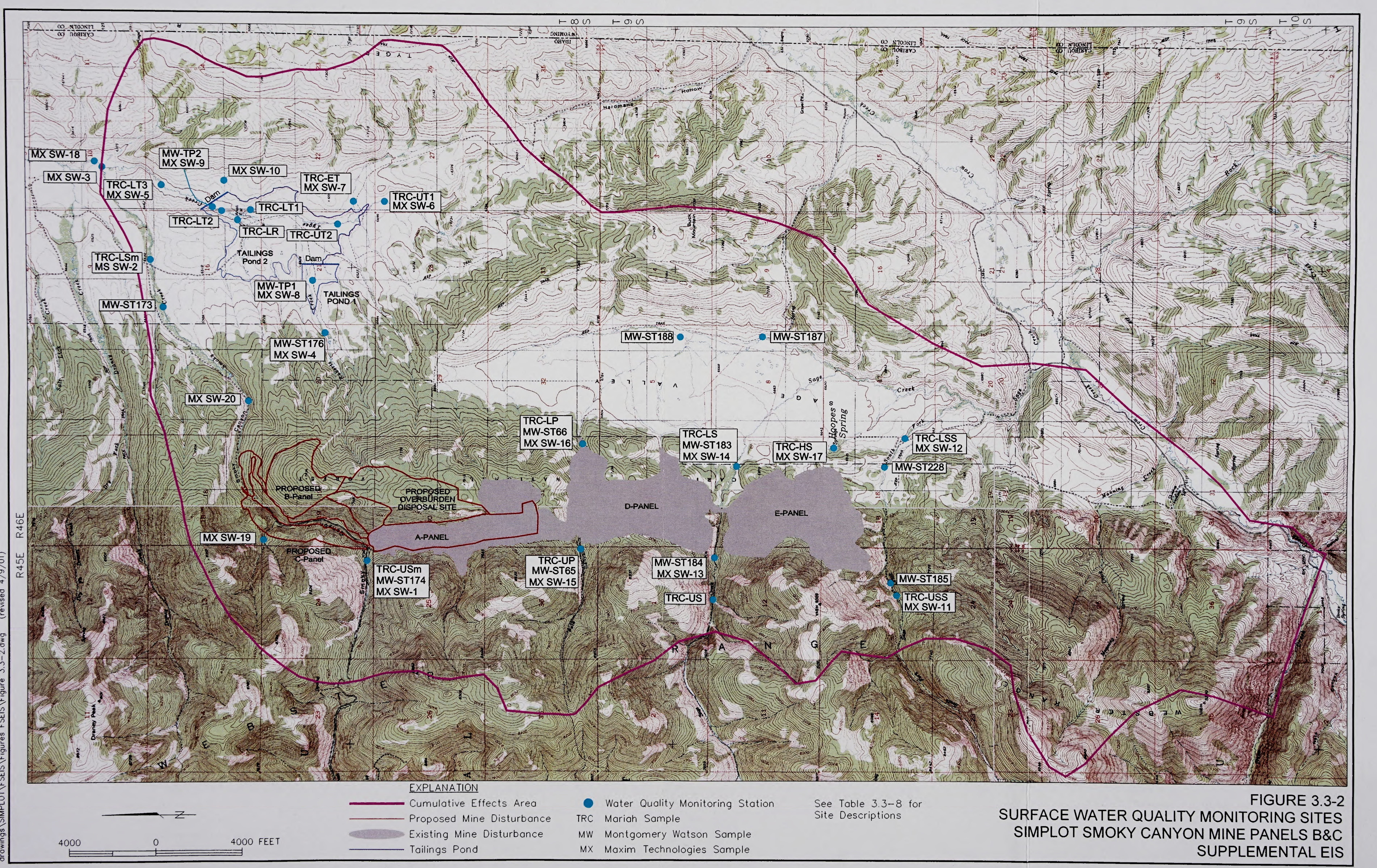


FIGURE 3.3-2
SURFACE WATER QUALITY MONITORING SITES
SIMPLOT SMOKY CANYON MINE PANELS B&C
SUPPLEMENTAL EIS

Table 3.3-3 provides the past five years of flow records at these two sites (TRC Mariah, 1996, 1997, 1998, 1999, 2000b); data obtained prior to that time show similar trends. As the table indicates, flow occurred at both of these sites during all of the measurement periods (typically May or June through November). There were no reports where a non-flowing, dry streambed was noted at either of these two sites. The table also indicates that, for the majority of the time, flow is significantly higher at the downstream site.

Table 3.3-3 Stream Flow Measurement Data (cfs) - Smoky Creek

Year	Month	Upper Smoky Creek at Map Location TRC-USm	Lower Smoky Creek at Map Location TRC-LSm
1999	May	0.8	0.5
	June	0.7	1.0
	July	0.4	0.8
	August	0.2	0.4
	September	0.2	0.4
	October	0.1	0.3
	November	0.1	0.3
1998	June	2.0	2.7
	July	0.8	2.7
	August	0.3	1.9
	September	0.2	1.6
	October	0.2	1.1
	November	0.1	0.9
1997	May	6.7	12.7
	June	1.8	4.1
	July	0.4	2.7
	August	0.2	1.4
	September	0.1	1.0
	October	0.1	1.2
1996	Spring	7.6	12.9
	Fall	1.2	2.1
1995	May	0.4	1.1
	June	2.3	1.9
	July	0.6	1.7
	August	0.1	1.2
	September	0.1	1.1
	October	0.1	0.9

Reference: TRC Mariah, 2000a

Flood flow peaks were derived for two locations on Smoky Creek as part of the original site development planning described in the 1981 DEIS (USFS, 1981). These estimates are shown in **Table 3.3-4.**

Table 3.3-4 Flood Flow Estimates - Smoky Canyon

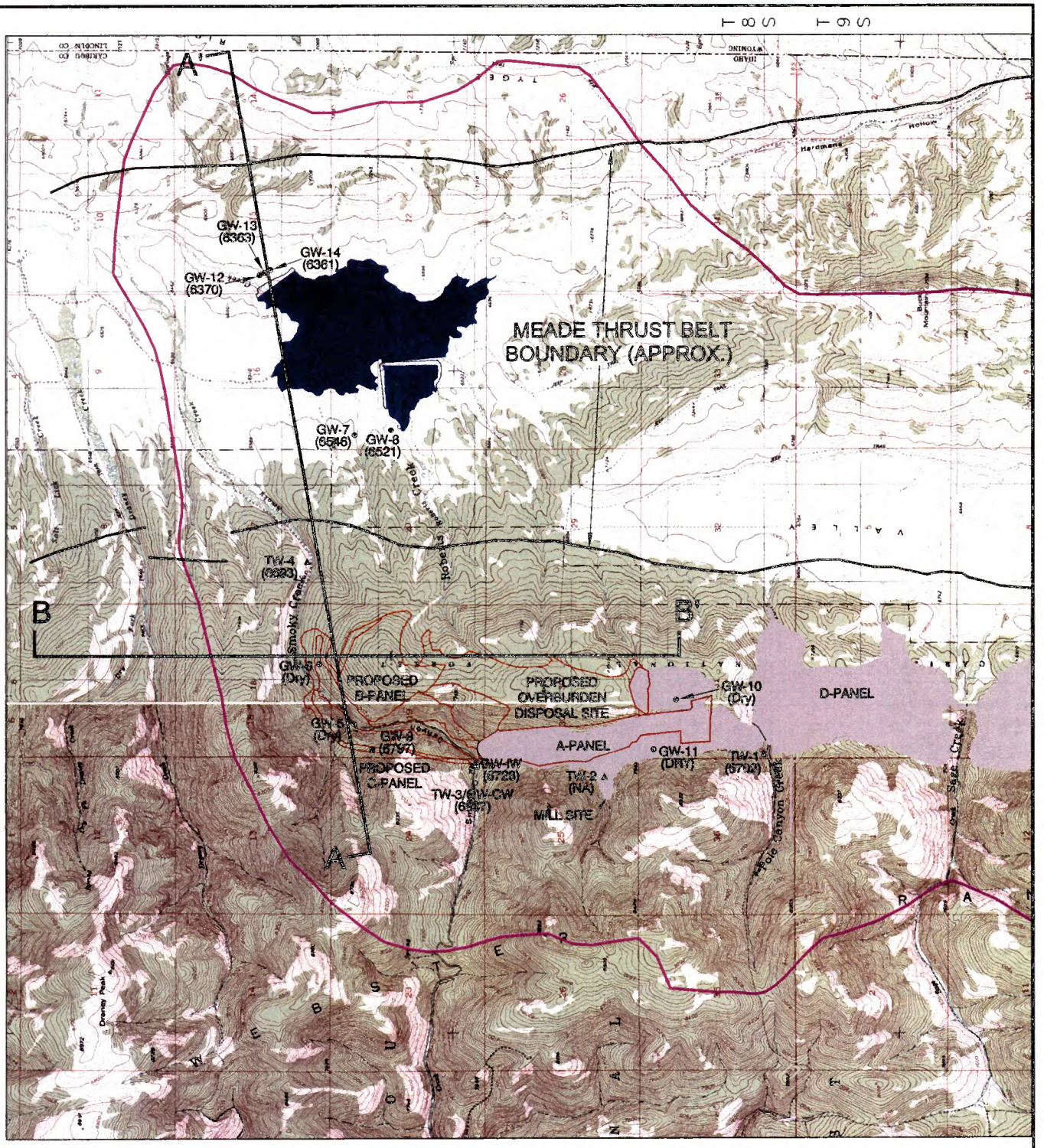
Location	Contributing Drainage Area (mi^2)	10-Year Flood Peak (cfs)	50-Year Flood Peak (cfs)	100-Year Flood Peak (cfs)
Upper Smoky Creek	1.2	35	50	57
Lower Smoky Creek	6.2	145	210	240

Reference: USFS, 1981

Channel Characteristics in Smoky Creek

TRC Mariah (2000b) describes the Upper Smoky site as being confined within the canyon, occurring within forested and riparian vegetation communities, and possessing cobble and earthen banks. They report the base flow channel as having an average width and depth of 3.0 feet and 0.2 feet, respectively. In contrast, the Lower Smoky site is located within shrub/grass communities and its banks are comprised of fine-grained sediments; this site is noted as being impacted by livestock trampling. The base flow channel is reported as having an average width of 6.2 feet and an average depth of 0.6 feet.

TRC Mariah (2000b) has been rating the streambed embeddedness at the two sites on an annual basis since 1990. The rating system describes the amount of gravel and larger particles that have their surfaces covered by fine sediment. By its nature, use of the measure of embeddedness indicates that the original stream bed substrate is comprised of a matrix of coarse grained particles (gravel and larger); embeddedness ratings cannot be done on beds that are comprised predominately of fines. Values can range from 1 to 5. Implied in a lower embeddedness value is the assumption that fine sediments have been eroded from up-channel or in the watershed, and deposited over the surface of "cleaner" substrate that is more suitable for aquatic habitat. A value of 5 would indicate particles that have not been covered over by fines and are therefore of potentially greater habitat value. **Table 3.3-5** provides embeddedness data from ratings done biannually from 1990 through 1999.



EXPLANATION

- Cumulotive Effects Areo
- Proposed Mine Disturbonce
- Existing Mine Disturbonce
- Existing Toilings Ponds
- Geologic Cross-Section
- • Groundwoter Monitor Wells
- ▲ Test Wells (Abondoned)
- ▨ Process Woter Well
- ○ Culinory Woter Well
- (6937) Groundwoter Elevotion (ft) Sept. 2000

See Figures 3.3-4 and 3.3-5 for Cross Sections

N

5000 0 5000 FEET

FIGURE 3.3-3
GROUNDWATER CONDITIONS MAP
SIMPLOT SMOKY CANYON MINE PANELS B&C
SUPPLEMENTAL EIS

drawings\SIMPLOT\FSEIS\Figures FSEIS\Figure 3.3-3.dwg (revised 6/6/01)

Table 3.3-5 Streambed Embeddedness Data - Smoky Creek

Year	Season	Upper Smoky Creek at Map Location TRC-USm	Lower Smoky Creek at Map Location TRC-LSm
1999	Spring	2	4
	Fall	2	1
1998	Spring	3	Water too turbid to observe
	Fall	4	1
1997	Spring	Water too turbid to observe	Water too turbid to observe
	Fall	Water too turbid to observe	2
1996	Spring	3	2
	Fall	1	2
1995	Spring	2 - 3	2
	Fall	2	2
1994	Spring	2	2
	Fall	2	2
1993	Spring	Water too turbid to observe	Water too turbid to observe
	Fall	1 - 2	1
1992	Spring	1	1
	Fall	1	1
1991	Spring	1	1
	Fall	1	1
1990	Spring	1	1
	Fall	1	1

Maxim (2000e) collected stream bed samples in Smoky Creek and other area streams as part of their September 2000 sampling program. Data from the Smoky Creek sites are given in **Table 3.3-6**; three subsamples were taken at each site to account for variability of depositional environments. These subsamples were analyzed individually rather than composited into one sample. The average of the three subsamples taken from each location is also shown in the table. As seen, the data show the variability of particle size distributions at the two locations, and do not indicate a marked difference between the up- and downstream locations.

Within the reach of Smoky Creek that traverses the project area, Maxim (2000e) reported stringer wetlands found in association with the stream alluvium; these were of limited lateral extent due in part to adjacent steep canyon walls.

Table 3.3-6 Streambed Substrate Particle Size Data by Maxim - Smoky Creek

Data Source	Location	Sub-sample ID	Particle Distribution			
			Percent Fines	Percent Sand	Percent Gravel	Percent Cobbles
Maxim	Upper Smoky Creek at Map Location SW-1	A	11.0	30.0	54.0	5.0
		B	20.0	38.0	42.0	0.0
		C	4.3	25.7	63.0	7.0
		Avg.	11.8	31.2	53.0	4.0
Maxim	Lower Smoky Creek at Map Location SW-2	A	7.6	38.4	54.0	0.0
		B	7.6	46.4	46.0	0.0
		C	6.8	63.2*	30.0	0.0
		Avg.	7.3	49.3	43.3	0.0

*An incorrect value was reported in Maxim's Table 8; correct value obtained from their Appendix E.
Fines=minus 200 mesh, Sand=minus 4 mesh, gravel=minus 3 inch, cobbles=plus 3 inch

Runoff

Runoff from disturbed areas of the mine is diverted into pits or into constructed settlement basins with dams less than 10 feet high (Simplot Agribusiness, 2000). Such structural storm water controls are managed according to the Storm Water Pollution Prevention Plan (SWPPP) required under the Environmental Protection Agency's (EPA) *Multi-Sector General Permit* for storm water discharges. Settlement basins constructed under the SWPPP are designed to contain the runoff from a 100-year, 24-hour rainfall that occurs on snow pack; they range in size from 1 acre-foot to about 30 acre-feet (Simplot Agribusiness, 2000).

These basins hold water from their contributing watershed areas on site, reducing total storm runoff and possibly peak flow in events up to their design capacity in the streams that would normally receive runoff from those areas. Similarly, open pits also hold runoff/snowmelt waters that would enter downstream channels under undisturbed conditions. For Smoky Creek, according to the SWPPP (Simplot Agribusiness, 2000), settlement basins A-P1 and A-5, located at the north end of the A Pit, capture runoff from a 6.5-acre area; the northern part of the pit, within the Smoky Canyon watershed, impounds runoff from about a 150-acre area. Combining these areas represents about 20 percent of the total area that naturally contributed flow to Smoky Creek near the upstream project boundary and represents about 4 percent of the total at the lower Smoky Creek site. Given a total watershed area of 6.6 square miles, there is currently about a 3.5 percent reduction in contributing area.

3.3.2 Surface Water Quality

Quality of surface waters in Idaho is protected by the implementation of the Idaho State Water Quality Standards at IDAPA 58.01.02. At that location in the Idaho Administrative Code, the Department of Water Quality classifies streams according to their designated beneficial uses, and applies numeric criteria based upon those uses. For undesignated surface waters (including Tygee Creek, Crow Creek within Idaho, Sage Creek, and Stump Creek within Idaho), cold water aquatic life and contact recreation

beneficial uses are presumed by default according to the Idaho Code, and the relevant criteria for those uses are applied to such waters by the Idaho Department of Environmental Quality. These criteria would be applicable to the streams within the project area and the Cumulative Effects Area, but would not be applicable to the mine facilities such as sediment ponds, tailings ponds, and pit impoundments.

Further downstream, water that originates within the project area eventually flows into the Salt River, which in Wyoming, is considered a Class 2 water. Class 2 waters are, according to *Quality Standards for Wyoming Surface Waters*, "Those surface waters, other than those classified as Class 1, which are determined to: (i) Be presently supporting game fish; or (ii) Have the hydrologic and natural water quality potential to support game fish; or (iii) Include nursery areas or food sources for game fish." The Wyoming reach of the Salt River, as a Class 2 water, has therefore been designated as a cold water game fishery, and water quality criteria are set similar to those in Idaho. For example, the applicable aquatic life chronic value for selenium is 5 micrograms per liter.

From 1979 to the present, Simplot and/or its consultants have been monitoring water quality at sites upstream and downstream of mining activity at the Smoky Canyon Mine (TRC Mariah, 1988, 1993-2000a). Within the project area, these data records include monthly or bi-annual sampling results for Smoky Creek and Tygee Creek. Summaries of those data can be found in TRC Mariah (2000a), and are provided in **Table 3.3-7** below. More limited data from samples taken in Roberts Creek and the mine facilities are available from those sources, as well.

Table 3.3-7 Historic Water Quality Data - Range of Values From 1979 - 1999 (mg/l)

Parameter mg/l unless noted	Upper Smoky Creek (TRC-USm)	Lower Smoky Creek (TRC-LSm)	Upper Tygee Creek (TRC-UT1)	Lowest Tygee Creek (TRC-LT3)	Aquatic Life Criterion
Oxygen, D	7.2 - 12.0	6.0 - 14.4	4.2 - 14.4	5.4 - 16.2	>6.0
Temp., °C	2.0 -11.0	0.0 - 12.0	1.0 - 21.0	2 - 18	22/19
Aluminum, T	ND - 52.6	ND - 5.65	ND - 3.37	ND - 1.01	NS
Arsenic, T	ND - 0.012	ND - 0.003	ND - 0.002	ND - 0.002	0.190
Barium, T	ND - 0.384	ND - 0.200	ND - 0.33	0.090 - 0.171	NS
Boron, D	ND - 0.364	ND - 0.257	ND - 0.322	ND - 0.04	NS
Cadmium, T	ND - 0.020	ND - 0.01	ND - 0.01	ND - 0.003	0.0017*
Calcium, D	37 - 86	39 - 71	42 - 92	38 - 162	NS
Chromium, T	ND - 0.1	ND - 0.01	ND - 0.01	ND - 0.06	0.314*
Copper, T	ND - 0.06	ND - 0.03	ND - 0.069	ND - 0.04	0.021*
Iron, T	ND - 68.3	0.12 - 5.86	0.01 - 2.84	0.05 - 0.89	NS
Lead, T	ND - 0.1	ND - 0.10	ND - 0.04	ND - 0.001	0.005*
Magnesium, D	ND - 18.0	14 - 20	11 - 22	15 - 69	NS
Manganese, T	ND - 5.31	0.050 - 0.540	ND - 0.20	0.020 - 0.220	NS
Mercury, T	ND - 0.0004	ND - 0.002	ND - 0.0004	ND	0.000012

Table 3.3-7, continued.

Parameter mg/l unless noted	Upper Smoky Creek (TRC-USm)	Lower Smoky Creek (TRC-LSm)	Upper Tygee Creek (TRC-UT1)	Lowest Tygee Creek (TRC-LT3)	Aquatic Life Criterion
Nickel, T	ND - 0.07	ND - 0.01	ND - 0.04	ND - 0.03	0.283*
Potassium, D	ND - 1.8	ND - 1.1	ND - 2.6	ND - 2	NS
Selenium, T	ND - 0.003	ND - 0.001	ND - 0.005	ND - 0.004	0.005
Silver, T	ND	ND - 0.01	ND - 0.01	ND	0.0034*
Sodium, D	2 - 7	2 - 9	8 - 26	10 - 1,895**	NS
Vanadium, T	ND - 0.092	ND - 0.01	ND - 0.01	ND - 0.01	NS
Zinc, T	ND - 0.32	ND - 0.35	ND - 0.19	ND - 0.09	0.188*
Bicarbonate $CaCO_3$	170 - 349	180 - 221	179 - 248	163- 302	NS
Carbonate $CaCO_3$	0 - 22	ND - 16	0 - 24	0 - 24	NS
Alkalinity $CaCO_3$	170 - 220	186 - 233	196 - 239	163 - 310	NS
Chloride	ND - 8.6	ND - 14	1.5 - 32	6 - 1,270	NS
Conductivity, mhos/cm	218 - 406	231 - 451	283 - 550	402 - 27,900**	NS
Fluoride	ND - 0.5	ND - 0.4	0.1 - 0.31	0.1 - 0.5	NS
Hardness $CaCO_3$	185 - 224	208 - 246	190 - 234	195 - 508	NS
Nitrate as N, D	ND - 0.73	ND - 1.40	ND - 1.27	ND - 0.16	NS
Nitrate/Nitrite N, D	ND - 0.4	ND - 1.40	ND - 0.19	ND - 0.16	NS
Nitrite as N, D	ND - 0.04	ND - 0.01	ND - 0.02	ND - 0.01	NS
Nitrogen Ammonia	ND - 0.49	ND - 1.12	ND - 0.82	ND - 0.09	NS
pH (std. units)	7.7 - 8.6	7.8 - 8.6	7.8 - 8.7	8.0 -8.7	6.5 - 9.5
Phosphorus ortho D	ND - 0.243	ND - 0.220	ND - 0.22	ND - 0.043	NS
Phosphorus, T	ND - 2.86	ND - 2.3	0.06 - 3.60	0.007 - 0.24	NS
Dissolved solids	190 - 346	220 - 448	204 - 294	220 - 17,760**	NS
Suspended Solids	ND - 1120	ND - 240	ND - 134	ND - 28	NS
Sulfate	ND - 39	ND - 33	ND - 42	ND - 290**	NS
Turbidity, NTU	0.0 - 1,060	0.3 - 133	1.4 - 72	1.2 - 18	50

D = Dissolved , T = Total, ND = Non-detectable, value below method detection limit. NS = No regulatory standard has been set.
*Values calculated for a hardness of 200 mg/l.
** High values occurred before 1992 when Tailings Pond No.2 was built and Roberts and Tygee Creeks were diverted around natural salt accumulations which resulted in lower concentrations of these parameters.
Detection limits have decreased since 1979.

Examination of the ranges of data in **Table 3.3-7** shows that the major ions are generally within the same range for the Upper and Lower Smoky Creek sites, and indicates that the waters are of the same water type. Dissolved constituents seem to be generally greater overall at the downstream site, but the difference is not of statistical or environmental significance. The nitrogen component of nutrients is similarly of slightly greater concentration at the downstream site, but the phosphorus component is slightly lower downstream. In regard to the minor elements, selenium and metals, the upstream, background site generally has higher concentrations than the lower site, presumably because this stream traverses bedrock and derived alluvium that acts as a source of these metals. The above data do not indicate that the current mining activities have negatively affected water quality in Smoky Creek.

Tygee Creek above and below the tailings ponds shows differences in certain of the water quality parameters, most notably in the major ions and total levels of dissolved constituents. The downstream site data (TRC-LT3) show a much narrower range of values and indicate generally better water quality, except for dissolved sodium chloride and sulfate which were naturally elevated at this site prior to construction of the Tailings Dam No.2. Metals and nutrients concentrations at the downstream site are generally within the range reported for the upstream site.

In the past, Lower Roberts Creek, and Tygee Creek near its confluence with Roberts Creek, accumulated sodium, chloride and sulfate as they flowed through natural alkaline soil flats and saline spring discharge (Mariah, 1990, Ralston, 1987). These stream reaches therefore had higher conductivity and dissolved solids downstream of the alkaline flats than upstream of the flats. This area was covered by a clay cap prior to inundation by Tailings Pond No. 2 in 1991, and Tygee and Roberts Creeks were rerouted, avoiding the tailings pond and the former alkaline flats. An examination of water quality at the Lowest Tygee Creek site shown on **Figure 3.3-2** as TRC-LT3, located downstream of the alkali flat area, indicates that total dissolved solids (TDS) ranged from 470 to 17,660 mg/l between 1986 and 1991. From 1992 through 1999, TDS at that site ranged from 220 to 556 mg/l. The diversion of Tygee and Roberts Creek around the tailings ponds has resulted in improved water quality, with regard to dissolved salt, in lower Tygee Creek than was natural for this area.

In a baseline water quality report prepared by Maxim Technologies, Inc. (2000e), the current water quality of the three streams in the project area (Tygee Creek, Smoky Creek, and Roberts Creek) was described based upon sampling events at six sites during 2000. Sites are listed in **Table 3.3-8**. In addition, they analyzed samples from both Tailings Pond No.1 and No. 2, and from the toe drain below Tailings Pond No. 2. Data for the Maxim sample events are included in **Appendix 3A**.

Table 3.3-8 Surface Water Sampling Locations, Project Area, Year 2000 by Maxim

Maxim Station Number	Station Name	Previous Station Number
SC-SW-1	Upper Smoky Creek	TRC-USm; MW-ST174
SC-SW-2	Lower Smoky Creek	TRC-LSm
SC-SW-3	Lower Smoky Creek #2	None
SC-SW-4	Upper Roberts Creek	MW-ST176
SC-SW-5	Lowest Tygee Creek	TRC-LT3
SC-SW-6	Upper Tygee Creek	TRC-UT1

Table 3.3-8 Continued

Maxim Station Number	Station Name	Previous Station Number
SC-SW-7	East Tygee Creek	TRC-ET
SC-SW-8	Tailings Pond No. 1	TP1
SC-SW-9	Tailings Pond No. 2	TP2
SC-SW-10	Toe Drain	None
SC-SW-18	Tygee below Smoky	None
SC-SW-19	Sheep Spring	None
SC-SW-20	Lower Smoky Spring	None

From: (Maxim Technologies, Inc., 2000e).

Based on their data, summarized in **Table 3.3-9**, Maxim (2000e) described surface waters in the project area and vicinity as generally of a calcium-bicarbonate type, of moderate hardness or very hard, slightly alkaline pH, and with low nutrient levels. Data from the project area sites met aquatic water quality criteria. Water quality complied with Cold Water Aquatic Life Criteria for the three project area streams (Smoky Creek, Roberts Creek, Tygee Creek) below the mining activity.

Table 3.3-9 June 2000, Water Quality, Maxim Baseline Study, Selected Sites and Parameters

Parameter mg/l, unless noted	SC-SW-2 Lower Smoky Creek	SC-SW-4 Roberts Creek	SC-SW-5 Lowest Tygee Creek	SC-SW-9 Tailings Pond 2	Aquatic Life Criterion
Cadmium, T	0.0002	0.0001	0.0002	0.0033	0.0017*
Calcium	64	84	57	73	NS
Selenium, T	0.001	0.001	0.001	0.041	0.005
Sodium	6	38	16	21	NS
Zinc, T	0.02	0.02	0.02	<0.02	0.188*
Bicarbonate	251	225	211	159	NS
Chloride	7	64	19	32	NS
Hardness	233	317	184	232	NS
Nitrate, as N	0.05	0.05	0.05	<0.05	NS
pH (std. units)	8.6	8.4	8.2	8.7	6.5- 9.5
Phosphorus, T	0.15	0.05	0.06	0.28	NS
TDS	247	415	250	374	NS
TSS	16	9	21	9	NS
Sulfate	17	85	17	93	NS

T = Total * Value calculated for a hardness of 200 mg/l. NS = No regulatory standard has been set.
From: (Maxim Technologies, Inc., 2000e).

Selenium levels in surface water have been set forth in the scoping for this project as an issue of concern. The selenium issue, common to all of the phosphate mines in the region, including Smoky Canyon, has only recently (1996) been recognized as a local problem and begun to be studied. It is currently under study by several entities, including the Idaho Mining Association Selenium Subcommittee (IMA). The IMA is conducting ongoing studies of several media, including surface water, to determine the presence of six target elements (selenium, cadmium, manganese, nickel, vanadium, and zinc). The study area covers the Southeast Idaho Phosphate Resource Area; it includes a total of 57 stream monitoring sites, of which 3 are within this report's project area, and 9 are within the overall Cumulative Effects Area. Several mine water sites have also been sampled. Formed in 1997, the IMA released three data reports, one providing 1997 study results (Montgomery Watson, 1997), one providing 1998 study results (Montgomery Watson, 1999b), and one providing draft 1999 study results (Montgomery Watson, 2000b).

Within the project area, three stream sites were monitored in the 1998 IMA study (Montgomery Watson, 1999b) (see sites identified with the MW prefix on **Figure 3.3-2**). None of the data from these three sites (two on Smoky Creek and one on Roberts Creek) showed elevated levels of selenium or of the other elements of concern (Montgomery Watson, 1999b).

Mine water that is not discharged to streams was also sampled during the first two Montgomery Watson studies. In 1997 (Montgomery Watson, 1997), Tailings Pond No. 1 was sampled; in 1998 (Montgomery Watson, 1999b), both tailings ponds and the A-pit Pond were sampled. The A-pit Pond is surface runoff collected in the bottom of the A-pit. Montgomery Watson did not sample any site in or near the Smoky Canyon Mine area in 1999 (Montgomery Watson, 2000b). The 1997 and 1998 mine water sampling results showed elevated levels of selenium and cadmium as shown in **Table 3.3-10**.

Table 3.3-10 Project Area Elevated Elements, by Montgomery Watson (1997, 1999, 2000)

Location	Parameter	Sample Date	Reported Concentration (mg/l)	Aquatic Life Criterion * (mg/l) For Reference Only
Tailings Pond No. 1	Selenium	Fall 1997	0.010	0.005
Tailings Pond No. 1	Selenium	May 1998	0.018	0.005
Tailings Pond No. 1	Selenium	September 1998	0.017	0.005
Tailings Pond No. 2	Selenium	May 1998	0.029	0.005
Tailings Pond No. 2	Selenium	September 1998	0.030	0.005
Tailings Pond No. 2	Cadmium	September 1998	0.0083	0.0017
A-Pit Pond	Selenium	May 1998	0.064	0.005
A-Pit Pond	Selenium	September 1998	0.097	0.005
Pole Canyon	Selenium	Fall 1997	0.583	0.005

*The criterion column is provided for reference only. Regulatory criteria have not yet been determined to be applicable for these mine waters.

Selenium in stream sediments within the project area can be addressed in two ways, based upon the available data. First, water samples which have been analyzed for both total and dissolved selenium

concentrations provide a measure of how much selenium is being conveyed in both of those two forms. Second, the amount of selenium contained within stream bed substrate can also be reviewed. Selenium in substrate would represent more of a cumulative indication of selenium in the stream system over time, and would include selenium from sediments that may have been transported as either suspended load or bedload. Sediment-associated selenium is an important pathway for transfer of the element to higher trophic levels and a large part of the selenium inventory in an ecosystem can be in sediments (Luoma and Presser, 2000). Selenium occurs in sediments within phytoplankton, bacteria, detritus and inorganic particles. Sedimentary selenium can occur through biological uptake of the contaminant from the dissolved state and incorporation in cell tissue. Selenium can also accumulate in sediments through biogeochemical reduction, adsorption and coprecipitation. The possible particulate selenium species can include organic selenides (Se^{-2}), elemental selenium (Se^{0}), selenite (Se^{+4}) and selenate (Se^{+6}) (Luoma and Presser, 2000).

Maxim (2000e) reported selenium concentrations in both total and dissolved forms for their surface water samples. For the 38 samples taken, all of them reported the same value for total selenium concentration as for dissolved selenium concentration; 21 of these were greater than the detection limit, and values reached as high as 0.5 mg/l. Further, total suspended solids for those same samples ranged from <1 mg/l to 159 mg/l. The implication of these data is that selenium load in the project area streams was primarily being conveyed in the dissolved form. This is consistent with previous regional studies (Montgomery Watson, 1997 and 1999a). Maxim (2000e) also reported selenium values for 5 streambed substrate sediment samples from Tygee and Smoky creeks; none of the 5 samples had detectable selenium values.

In summary, existing data do not show that the current stream environments of Roberts Creek, Smoky Creek, or Tygee Creek include elevated selenium or other contaminants of concern. However, the data show that the current mine water environments, consisting of the tailings ponds and the A-pit pond do have elevated levels, most notably and consistently in regard to selenium. Water discharging from the Pole Canyon overburden disposal fill, in the Cumulative Effects Area, was also elevated in selenium. Since 1998, there is also water quality data from Hoopes Spring (TRC-H5) that selenium concentrations are increasing in this water.

None of the streams within the project area are on the current (1998) State of Idaho 303(d) list of impaired waters, nor are they on the list of streams whose quality has been determined to be threatened (State of Idaho DEQ, 1999). Both Tygee Creek and Stump Creek were surveyed by the Division of Environmental Quality in the mid 1990's and were found to be of sufficient quality to support their beneficial uses.

3.3.3 Surface Water Uses

Water usage within the state of Idaho is managed through the adjudication of water rights, and the adjudication process is managed by the Idaho Department of Water Resources. Their staff provided water rights information from their computer database for this report. Within the project area, the water rights information obtained from them did not indicate any surface water rights for Smoky Creek, Tygee Creek, or Roberts Creek other than those reported in the 1981 DEIS (USFS, 1981). As that document reported, there are surface water rights for the use of Smoky Canyon Creek water for irrigation and stock watering purposes; points of diversion for those rights are located in lower Smoky Creek 2.5 to 3 miles downstream of the proposed B and C pit locations. The Idaho Department of Water Resources had no

records of existing rights to water in Roberts Creek, or in Tygee Creek down to its confluence with Smoky Creek.

USFS records indicate they have surface water rights for stockwater use for Sage Creek (T9S, R45E Section 15 to T9S, R46E Section 7), Pole Canyon Creek (T8S, R45E Section 35 to T8S, R46E Section 31), Smoky Creek (T8S, R45E Section 23 to T8S, R46E Section 17), Draney Creek (T8S, R45E Section 14 to T8S, R46E Section 8), and Salt Lick Creek (T8S, R46E Section 8). The USFS also has water right filings for springs and developments in T8S, R45E Section 25, T8S, R45E Section 23, T8S, R46E Section 19, T8S, R45E Section 12, T9S, R45E Section 24 and T9S, R46E Section 18.

Simplot uses surface water from Roberts Creek to provide makeup water to their tailings pond. Simplot also uses groundwater from vicinity wells; those uses are described in the Groundwater Section.

The Division of Water Resources also considers rights to springs as surface water rights. Two springs filed upon by the USFS for stock watering are located within the project area. One of those (in T8S, R45E Section 25) was reported in the 1981 DEIS (USFS, 1981) and is still current in the state database. The other, known as Sheep Spring, was not listed in the 1981 DEIS, in spite of an 1870 priority date. Sheep Spring is located in T8S, R46E in the northwest corner of Section 19 above Smoky Creek.

3.3.4 Groundwater Resources

Groundwater flow characteristics within the project area have been defined using information from exploration drilling, process water well investigations, monitoring wells, and applicable published reports from various agencies, academia, mining, and private investigations. Boring logs from monitoring and process well installations provided information on the alluvial and bedrock groundwater conditions, plus aquifer flow parameters where testing was done.

Well Installations

There have been 15 groundwater wells drilled within the project area since 1980, as shown on **Figure 3.3-3.** The completion data for these wells is shown in **Table 3.3-11**. Wells TW-1 through TW-4 were drilled in 1981 as test holes for potable/process water investigations, some to depths over 1,000 feet (Ralston, 1981).

Wells GW-5 and GW-6 were drilled in 1999 as monitoring wells in Smoky Canyon near the location for the proposed Panels B and C. GW-5 was a shallow well completed in alluvium and GW-6 was a deeper well completed in Rex Chert. Both wells were dry during 2000.

Wells GW-7 and GW-8 were installed in 1999 west of the tailings ponds and completed in the Tertiary Salt Lake Formation. Both wells contained water during 2000.

Three monitoring wells, GW-9, GW-10, and GW-11 were installed during the summer of 2000. GW-9, located near the proposed Panel C, encountered water at a depth of 492 feet, about 65 feet below the projected pit depth. GW-10, located on the A-1 overburden disposal site south of proposed Panel B and GW-11, located in the pit backfill area of Panel A, were both dry during 2000. Groundwater level measurements and water quality analysis resulting from sampling events of 2000 are included in **Appendix 3A**.

Three other nested monitoring wells (GW-12, GW-13, GW-14) were all installed at the same site immediately below Tailings Dam No. 2 during July/August of 2000. GW-12 is a shallow monitoring well developed in alluvium. GW-13 is developed in a permeable, water yielding zone in the approximate middle of the Salt Lake Formation. GW-14 is developed in the basal water yielding zone of the Salt Lake Formation near the contact with the underlying Jurassic rocks. These wells were monitored in the third quarter of 2000.

Well GW-CW (same as TW-3) is the culinary water supply well for the mine which was drilled to a depth of 1,000 feet in the Wells Formation. Another deep water supply well (GW-IW) was also installed in upper Smoky Canyon at this same location to a depth of 1,320 feet in the Wells Formation and supplies industrial water for the mill.

In addition to the water supply and monitoring wells discussed above, numerous shallow geotechnical borings were installed in 1983 and 1988 in the vicinity of the existing tailings ponds (Forsgren-Perkins, 1983, 1988). These were tested to determine permeability and geotechnical characteristics of the foundation materials for the tailings dams and impoundment areas. These encountered Salt Lake Formation and/or alluvial/colluvial materials.

Finally, numerous mineral exploration drill holes have been installed throughout the Smoky Canyon mine area. Geological logs of these holes help to define the thicknesses and structures of the beds within, above and below the Phosphoria Formation. Hydrogeological testing was not conducted in these holes but drill logs verify that the beds above, within, and immediately below the Phosphoria Formation do not contain aquifers in the mine area (J. Louis, personal communication, 2000).

General Geology

Geology in the mine area has been studied by Mansfield (1927) and Conner (1980), who mapped the Sage Valley Quadrangle (**Figure 3.1-1**). The project area is located on the eastern edge of the Meade Thrust Allochthon, a massive plate of sedimentary rock that has been moved eastward on the underlying Meade Thrust fault zone. The Smoky Canyon Mine is located on the west limb of the Boulder Creek Anticline. Beds in the mine area dip to the west at angles of approximately 20 - 30 degrees. Immediately west of the mine area is the Webster Syncline which is exposed in the Webster Range (**Figure 3.1-2**). To the east of the mine area are six major sub-parallel thrust faults of the Meade Thrust Zone, including from west to east: West Sage Valley Branch, East Sage Valley Branch, West Tygee Branch, East Tygee Branch, West Hardman Branch, and East Hardman Branch.

The eroded folds west of the thrust faults expose the following formations: Pennsylvanian/Permian Wells, Permian Phosphoria, Triassic Dinwoody, and Triassic Thaynes. Within the thrust zone are wedges of the same formations as well as the Jurassic Nugget Sandstone Formation. All of these units have been thrust eastward over Jurassic Twin Creeks Limestone and Nugget Sandstone (**Figure 3.3-4**). The folded rocks are also regionally tilted to the north as indicated by the northward plunge on the Boulder Creek Anticline axis (**Figure 3.3-5**).

The flat-lying Tertiary Salt Lake Formation, a fresh-water lacustrine sedimentary formation, was deposited over much of the area after the folding and faulting occurred and an angular unconformity is present between this unit and the older underlying rocks. Quaternary alluvium and colluvium exist throughout the area.

Table 3.3-11 Well Completion and Elevation Data Smoky Canyon Mine

Well I.D.	Location	Geologic Unit	Total Depth (feet)	Year	Screen Depth (feet)	WLDepth (feet)	Collar Elev. (feet)	WL Elev. (feet)
TW - 1	Pole Canyon	Wells Fm.	900	1981	430 - 900	526	7,462	6,936
TW - 2	Mill Site	Wells Fm.	845	1981	Caved - well not completed			
TW - 3	South Edge Panel C-Upper Smoky Creek Jct. (Same well as GW-CW)	Wells Fm.	1,000	1981	330 - 940	297	7,234	6,937
TW - 4	Lower Smoky Creek	Alluvium/ Bedrock	130	1981	22 - 130	25	6,718	6,693
GW - 5	Between Panels B & C - Smoky Creek	Alluvium	34	1999	15-30	DRY	7,040	(7006)
GW - 6	NE Panel B - Lower Smoky Creek	Rex Chert	169	1999	99 - 169	DRY	7,004	(6835)
GW - 7	West of Tailings Ponds	Salt Lake Fm.	90	1999	50 - 90	15	6,561	6,546
GW - 8	West of Tailings Ponds	Salt Lake Fm.	43	1999	30 - 43	37	6,558	6,521
GW - 9	Middle Panel C - Smoky Creek	Wells Fm.	519	2000	NA	492	7,289	6,797
GW -10	Panel A External Overburden Site	Backfill	154	2000	NA	DRY	7,940	(7,786)
GW - 11	South Panel A Pit Backfill	Backfill	134	2000	NA	DRY	7,610	(7,476)
GW - 12*	North Tailings Dam # 2 - Tygee Creek	Alluvium	35	2000	12 - 22	12	6,382	6,370
GW - 13*	North Tailings Dam # 2 - Tygee Creek	Salt Lake Fm.	278	2000	110 - 130	21	6,384	6,363
GW - 14*	North Tailings Dam # 2 - Tygee Creek	Salt Lake Fm.	335	2000	280 - 300	28	6,389	6,361
GW - CW	South Edge Panel C - Upper Smoky Creek Jct. (Same well as TW-3)	Wells Fm.	1000	1981	330-940	297**	7,234	6,937
GW - IW	South Edge Panel C-Upper Smoky Ck	Wells Fm	1320	1983	650 - 980	475**	7,203	6,728

Notes:
1. TW = Test Well for process water investigation (Ralston, 1979-83)
2. GW = Monitoring Well (Installed by JRS and JBR*, 2000)
3. CW = Culinary Well (SWL from Ralston, 1981)**
4. IW = Industrial Well (SWL from Ralston, 1983)**
5. TW-3 and GW-CW are the same well (culinary).

NA = Information not available.
DRY = Well condition during sampling (September 27, 2000)
(ELEV) = Elevation at bottom of DRY well.

Hydro-stratigraphy

The general hydro-stratigraphy of the southeastern Idaho phosphate area has been described by a number of authors. The University of Idaho (1977) described the hydrogeology of the Diamond Creek Valley immediately west of the Webster Range as well as Dry Valley further west. The Wells, Dinwoody, and Thaynes Formations were described as being aquifers and the intervening Meade Peak Member of the Phosphoria Formation as being an aquitard. The Thaynes and Dinwoody Formations were indicated as significant local aquifers that are recharged in the high elevations and discharge down dip at springs where drainages cut across bedding. The Wells Formation was described as responsible for inter-basin groundwater flow along bedding in the major folds where the recharge area of the Wells Formation is higher in elevation than the discharge area.

The Phosphoria Formation ranges from 250 to 450 feet thick and consists of three members from base to top including the: Meade Peak phosphatic shale and mudstone, Rex Chert, and Cherty Shale. The Meade Peak Member is approximately 170 feet thick, and consists of interbedded carbonaceous phosphorite, mudstone and argillite. At the Smoky Canyon Mine, the Meade Peak Member contains four phosphate ore beds at its bottom and three at its top with a middle shale zone in between. Based on observations and testing in the general phosphate production region of southeast Idaho, the Meade Peak Member of the Phosphoria is thought to serve as an aquitard to groundwater in the underlying Wells Formation (Mayo et al., 1985).

The Idaho Water Resources Research Institute (1980) studied the general hydrogeology of the area between the Aspen Range to the Smoky Canyon area. They summarized hydraulic conductivity data for the Meade Peak Member of the Phosphoria Formation from multiple test locations in the area and concluded that it was an aquitard that "virtually prevented" groundwater flow between the overlying Dinwoody and Thaynes formation aquifers and the underlying Wells Formation aquifer. They also characterized the upper aquifers as being "intermediate flow systems" dominating local conditions while the Wells Formation was postulated to be a regional flow system.

The 1981 Smoky Canyon Draft EIS (USFS, 1981) indicated that the general trend of groundwater movement in the mine operations area was to the north. That document also indicated that the Thaynes, Dinwoody, Woodside, Rex Chert Member of the Phosphoria, and the Wells formations had high hydraulic conductivities. Studies described in the DEIS showed the regional pattern of stream loss in the Wells Formation was also present in the Smoky Canyon Mine area and that a number of springs located along the thrust faults east of the Boulder Creek Anticline were most likely attributed to discharge of water from the Wells Formation.

Dr. Dale Ralston conducted a number of site-specific hydrogeology studies in the Smoky Canyon mine area (1979, 1980, 1981, 1983, 1987). He concluded that there are two major zones of groundwater flow in the Smoky Canyon area, the Triassic beds above the Phosphoria shale and the Wells Formation below it. He described the same pattern of stream gains and losses in the Triassic beds and Wells Formation respectively that has been noted throughout the southeast Idaho area. Gaining perennial flows were noted for the upper reaches of Smoky, Pole, Sage, and South Fork Sage creeks where they flowed over the Triassic beds. Flows were noted to be stable where these streams flow across the Phosphoria shale and then decrease dramatically where they flow over the Wells Formation.

Ralston conducted a groundwater exploration program for Simplot at the mine site between 1980 and 1983 to determine the location and best design of water supply wells for the Smoky Canyon mine. He

found that quantities of groundwater sufficient for water supply wells in the mine area can only be obtained from the Wells Formation. The Wells Formation has two members, a lower interbedded limestone and sandy limestone, and an upper calcareous quartz sandstone with subordinate limestone and chert. Four test wells (TW 1 to 4) installed in the mine area in 1981 indicated that the groundwater in the Wells Formation at the Smoky Canyon mill site was unconfined and had a transmissivity of approximately 3,600 gallons/day/ft (Ralston, 1981). A 1,320-foot deep water well (GW-IW) was later installed in upper Smoky Canyon and data obtained from it indicated that the static water level was about 475 feet deep (elevation 6,728 feet) (Ralston, 1983).

The experience of drilling the deep test and production wells indicated to Ralston that the Wells Formation aquifer was layered with a number of "semi-separated" aquifer systems characterized by high- and low-hydraulic conductivity beds. The depth to water also increased with increasing well depth indicating downward gradients in the Wells Formation to the depths explored. He concluded that there was no direct hydraulic connection between the springs located to the east along the trace of the West Sage Valley Branch Fault and the Wells Formation aquifer at the Industrial Well location.

Drilling in the vicinity of the proposed C Panel (GW-9) indicated that the elevation of the static water level in that location is at least lower than a depth of 492 feet (elevation 6,797 feet) at this location. This shows that the water table in the Wells Formation at the C-Panel pit is more than 63 feet below the maximum depth of the proposed Panel C pit (elevation 6,860 feet). The water table would be over 330 feet below the bottom elevation of the proposed Panel B pit (elevation 7,130 feet) which is located up dip from the Panel C pit. Monitoring well GW-6, located down dip of the proposed Panel B and drilled to a depth of 169 feet (elevation 6,835 feet), has been a dry well since it was installed in 1998 in the Rex Chert. Well GW-5 was installed to a depth of 34 feet (elevation 7,006 feet) in alluvium/colluvium north of the Smoky Canyon Road and between Smoky Creek and the proposed Panel C. It has been dry during 2000 indicating the lack of a shallow water table in the alluvium in Smoky Canyon at this location.

Two monitoring wells were installed west of Tailings Pond No. 2 (GW-7 and GW-8) in 1999. These penetrated 90 and 43 feet respectively of Salt Lake Formation. The depth of the water table in these wells was 12 feet in GW-7 and 33 feet in GW-8. These water elevations (6,546 and 6,521 feet, respectively), are above the elevation of the tailings in Tailings Pond No. 2 indicating that these represent upgradient groundwater relative to the tailings.

The new monitoring wells GW-10, located on the A-Panel pit backfill and drilled to a depth of 154 feet (elevation 7,786 feet) and GW-11 located in the A-Panel external overburden disposal area to a depth of 134 feet (elevation 7,476 feet) were both dry during 2000. These were installed to determine if there were perched saturation zones at the bases of these overburden fills on top of the Wells Formation.

Drilling done for Tailings Dams No. 1 and No. 2 have demonstrated that the Tertiary Salt Lake Formation is present under all areas of the tailings and is overlain with alluvial and colluvial deposits ranging up to about 30 feet thick (Forsgren-Perkins, 1983, 1988). The Salt Lake Formation in this location was described as consisting of reddish clay, clayey silts, and silty sands and gravels. Groundwater was intercepted in all these borings.

Forsgren-Perkins (1988) conducted detailed piezometric testing in the vicinity of the former saline springs at the site of the Tailings Pond No. 2 and found that shallow groundwater discharging from colluvium or

alluvium in the spring area was generally moving to the east in the surficial materials under the influence of gravity.

Three monitoring wells installed below Tailings Dam No. 2 in 2000 encountered approximately 25 feet of alluvial material underlain by more than 340 feet of Salt Lake Formation. The Salt Lake Formation was found to consist of relatively impermeable clay and silty sediments. A 20-foot thick silty gravel zone was found in the Salt Lake Formation at an approximate depth of 140 feet. A permeable sandy gravel zone over 30 feet thick was found in the formation at a depth of about 300 feet. Monitoring wells were completed with screens in each of these potential groundwater flow zones. Monitoring well GW-12 was installed to a depth of 35 feet in alluvial material overlying the Salt Lake Formation. Well GW-13 was installed to a depth of 278 feet to monitor the upper permeable zone in the Salt Lake Formation and well GW-14 was installed to a depth of 335 feet to monitor the lower permeable zone in the Salt Lake Formation. Static water level depths in these three holes were 11.9 (elevation 6,370 feet), 21.11 (elevation 6,363 feet) and 27.74 (elevation 6,361 feet), respectively, as measured in September 2000.

Hydraulic Characteristics

In his site-specific studies of the Smoky Canyon hydrogeology, Ralston (1979) characterized the Meade Peak Member of the Phosphoria Formation as an aquitard and summarized field pump or slug tests completed in the Meade Peak Member of the Phosphoria Formation at other locations in southeast Idaho. These tests indicated that the hydraulic conductivity of this unit ranged from less than 1 ft/day to about 4 ft/day.

The Rex Chert Member of the Phosphoria Formation has been characterized at Smoky Canyon and elsewhere in southeast Idaho as a potential aquifer of moderate hydraulic conductivity (Ralston, 1979). The hydraulic conductivity of the Rex Chert and the overlying Cherty Shale are shown to range from 2 to 75 ft/day depending on fracturing. Ralston indicated that groundwater can flow between these members and the overlying Dinwoody Formation.

Pump testing of GW-CW at the Smoky Canyon site showed the Wells Formation to have a transmissivity of 3,600 gal/day/ft and a storage coefficient of 0.1 to 0.2 (Ralston, 1981). The testing indicated that the upper sandstone facies of the Wells Formation is expected to have superior transmissivity compared to the lower limestone facies. Ralston estimated that the potentiometric surface in the Wells Formation at the Smoky Canyon Mine site was about 6,720 feet. He suggested that the gradient from this point east was about 10 feet per mile (Ralston, 1980).

Numerous in-situ permeability tests in borings up to about 80 feet deep located throughout the tailings ponds area indicated that the Salt Lake Formation has a uniformly low permeability ranging from practically impermeable (no water take during the test) to approximately 1 ft/yr in the clay beds and up to about 40 ft/yr in the coarser beds (Forsgren-Perkins, 1983, 1988). Some borings intercepted a few zones of anomalous permeabilities in the Salt Lake Formation with permeabilities of up to 600 ft/yr. The alluvial and colluvial sediments above the Salt Lake Formation have reported in-situ permeabilities ranging from about 200 to about 2,000 ft/yr.

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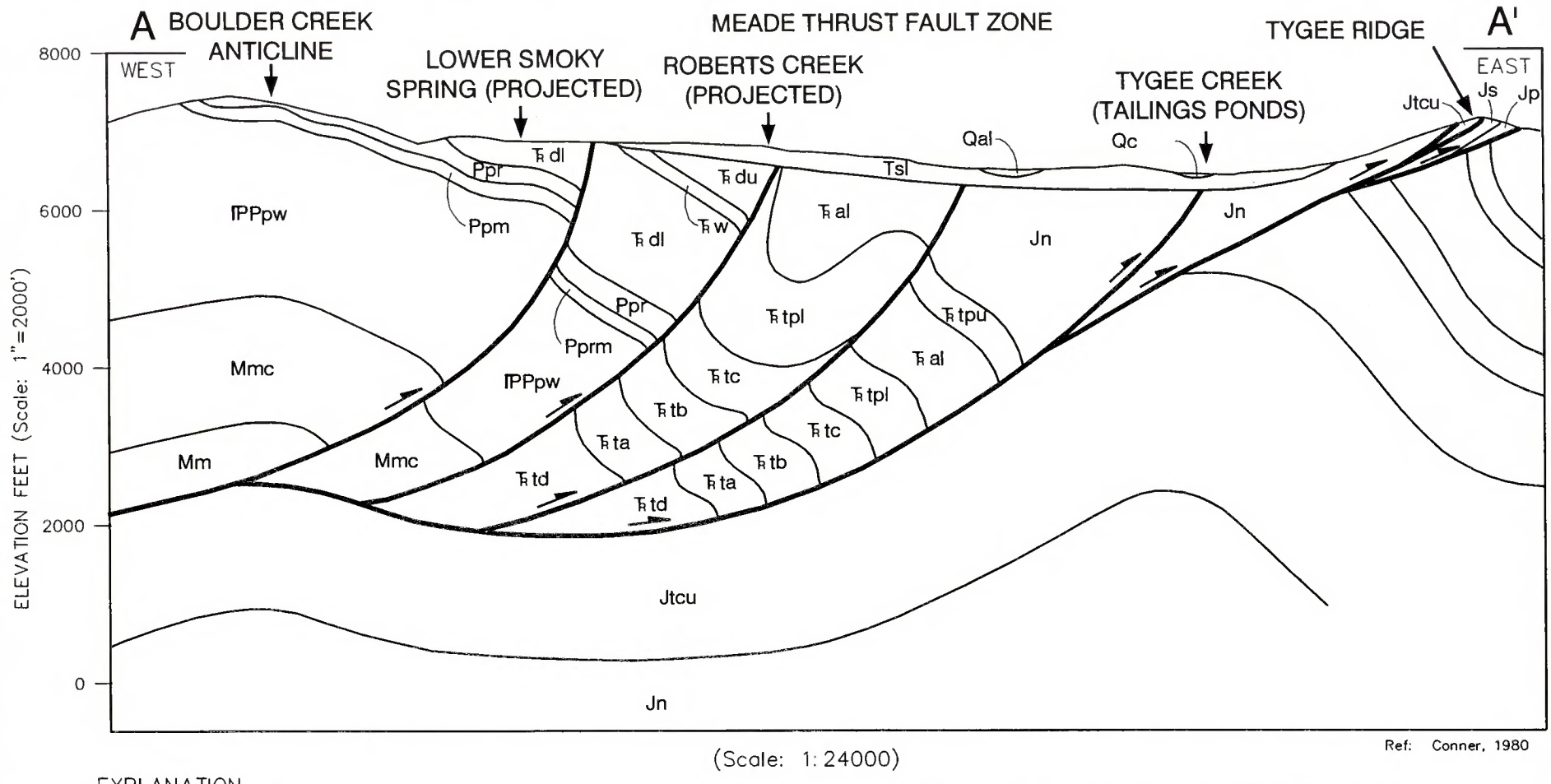

(Scale: 1: 24000)

Ref: Conner, 1980

EXPLANATION

Qal	Alluvium	Ŧtpl	Lower Portneuf Limestone	Ppr	Rex Chert Member
Qc	Colluvium	Ŧtc	Thaynes C Member	Ppm	Meade Peak Phosphatic Shale Member
Tsl	Salt Lake Formation	Ŧtb	Thaynes B Member	fPPpw	Wells Formation (Undivided)
Js	Stump Siltstone	Ŧta	Thaynes A Member	Mmc	Monroe Canyon Limestone
Jp	Preuss Sandstone	Ŧtd	Dinwoody Formation (undivided)	Mm	Madison Limestone
Jtcu	Twin Creeks Limestone	Ŧdu	Upper Dinwoody Formation		Faults
Jn	Nugget Sandstone	Ŧw	Woodside Formation		
Ŧtpu	Portneuf Limestone	Ŧdl	Lower Dinwoody Formation		
Ŧal	Ankareh Formation				

See Figure 3.3-3 for Location of Cross Section A--A'.

FIGURE 3.3-4
HYDROGEOLOGIC CROSS SECTION A-A'
SIMPLOT SMOKY CANYON MINE PANELS B&C
SUPPLEMENTAL EIS

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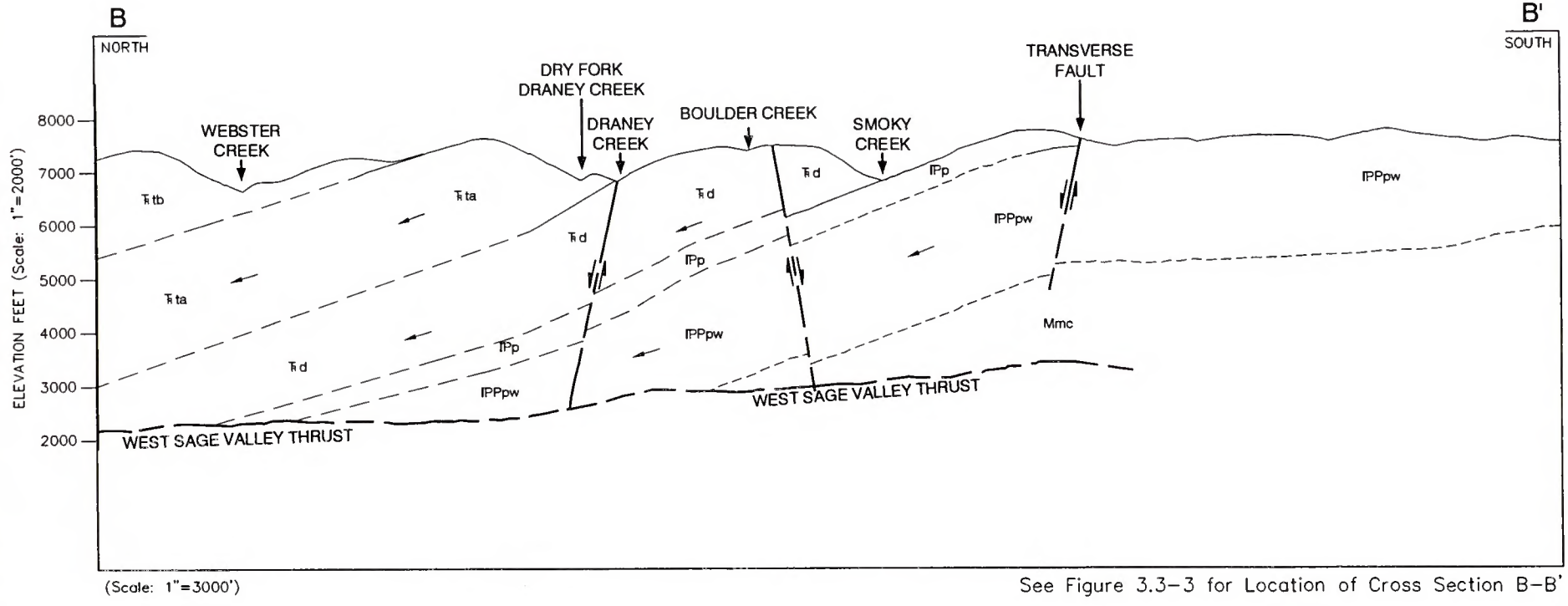


(Scale: 1"=3000')

See Figure 3.3-3 for Location of Cross Section B-B'

EXPLANATION

Ttb	Thoynes Block Shole
Tta	Thoynes Block Siltstone
Td	Dinwoody Formotion
IPp	Phosphorio Formotion (Undivided)
IPPpw	Wells Formotion (Undivided)
Mmc	Monroe Conyon Limestone

Foult showing relotive movement
Observed Conditions
Inferred Conditions
Direction of Ground Woter Flow

Reference: Conner, 1980
Rolston, 1987
USGS Stewort Quodrongle, 1949
University of Idoho-Bureou of Mines, published 1984

FIGURE 3.3-5
HYDROGEOLOGIC CROSS SECTION B-B'
SIMPLOT SMOKY CANYON MINE PANELS B&C
SUPPLEMENTAL EIS

The primary hydraulic conductivity of the bedrock aquifers can also be affected by faulting and fracturing. Faults can be zones of high hydraulic conductivity where the rock is strongly fractured along the plane of the fault, or the fault zone can have relatively low permeability where the rock is ground to a fine texture, is altered to clay, or is cemented. Ralston (1979) reviewed the possibility of east-west fault zones through the Boulder Creek Anticline providing zones of preferential groundwater flow and concluded that there is no evidence for this. Mayo et al. (1985) indicated that the thrust faults east of and below the Boulder Creek Anticline were barriers to groundwater flow transverse to the plane of the faults, while also providing potential flow pathways parallel to the faults in the shatter or damage zone of the faults.

Groundwater Flow and Recharge Conditions

The Webster Range highland is located within the Webster Syncline and contains high-permeability Thaynes, Dinwoody, and Woodside Formations in the higher elevations. In other areas, Ralston and others (1977) estimated that the recharge rate of these formations is dependent on locally intense fracturing where snow accumulation occurs. These conditions were thought to result in net recharge rates of 2 to 4 inches in Little Long Valley. This is at a lower elevation than the Webster Range and recharge rates are expected to be higher in the Webster Range where precipitation amounts are greater. These are recharge areas for what Ralston (1977) called the upper flow system that is contained on top of the Phosphoria Formation. Groundwater moves along bedding and fractures within these upper flow system rocks, flowing down dip in the more permeable beds to locations were the beds outcrop in canyons and/or where geologic structure provides secondary permeability.

In the area of the Proposed Action and Alternatives, groundwater in the Triassic units on the west side of the Boulder Creek Anticline flows westward and northward along the dip and plunge of the west limb of the anticline. This westward flowing groundwater moves under the Webster Range to eventually discharge in the Diamond Creek drainage area (Ralston et al., 1977 and Ralston 1979). Likewise, groundwater in the Triassic units along the east limb of the Boulder Creek Anticline can move eastward and northward to eventually discharge in springs such as are located north of Smoky Canyon at the Falls area north of Webster Canyon and Spring Creek.

Local recharge to the Wells Formation occurs along the outcrop pattern of the Wells Formation along the Boulder Creek Anticline east and south of the Smoky Canyon Mine. Stream flow in all the drainages on the east side of the Webster Range is noticeably decreased over the outcrop of the Wells Formation where the streams lose water into the underlying permeable limestone (Ralston, 1979). Groundwater movement into or out of the Wells Formation through the Phosphoria Formation is negligible because the Meade Peak Member of the Phosphoria is considered to be an aquitard throughout the region. Groundwater flow in the Wells Formation is controlled by stratigraphy, structure and by elevation head differences between the Wells Formation in the Boulder Creek Anticline and the Snowdrift Anticline area along Freeman Ridge about two miles to the west of Webster Ridge.

Once in the Wells Formation, aquifer flow is primarily controlled by bedding planes, fractures, faults and the hydraulic gradient. In his review of data obtained in test drilling conducted at four well sites in the Smoky Canyon area, Ralston concluded that the upper sandstone facies of the Wells Formation consisted of a number of high permeability beds that were semi-separated by low permeability beds (Ralston, 1981). He said that one cannot directly compare static water levels in these wells with springs in the area because the water levels in the wells are composites of a number of semi-separated aquifer systems.

The eastern edge of the Wells Formation in the Smoky Canyon mine area terminates against the trace of the West Sage Valley Branch Fault (**Figures 3.1-1 and 3.1-2**). The east limb of the Boulder Creek Anticline terminates against this high angle reverse fault where vertical to overturned bedding exists apparently as the result of drag folding. Phosphoria Formation typically outcrops along the east limb of the anticline extending from Smoky Canyon south.

Ralston concluded that the flow from Hoopes Spring and springs in lower South Fork Sage Creek occurred from the Wells Formation along the West Sage Valley Branch fault where the trace of the fault and adjacent Wells Formation outcrop is at an elevation below the water table in the Wells Formation, estimated at approximately 6,700 feet (Ralston, 1979). He also postulated that a spring in the SW¼, SW¼ Section 17, T8S, R46E (now called Lower Smoky Spring) could also be due to the same hydrogeologic controls. However, later geologic mapping work done by Conner (1980) showed that Lower Smoky Spring is not located in outcrop of the Wells Formation but is located within outcrop of the Lower Dinwoody Formation, approximately 1,000 - 1,300 feet west of the surface trace of the West Sage Valley Branch Fault (**Figures 3.1-1 and 3.3-4**). Thus Lower Smoky Spring appears to be stratigraphically separated from the Wells Formation by part of the Lower Dinwoody Formation and the entire thickness of the Phosphoria Formation, so its hydrogeology is different from Hoopes Spring and the springs in lower South Fork Sage Creek.

The large spring north of Webster Canyon, known as the Falls, discharges from the trace of the West Sage Valley Branch Fault and provides the water source for the Auburn Fish Hatchery. This spring is within an extensive outcrop area of the Thaynes Formation which would place it more than 4,000 feet up-section from the top of the Wells Formation. The hydrograph of the spring tracks the local precipitation closely indicating that the spring is recharged locally from annual infiltration. Ralston also concluded in his studies of the area that the Falls spring was hydraulically separate from the springs on the west side of Sage Valley (Ralston, 1979).

Mayo and others (1985) have described the regional hydrogeology of the Meade Thrust Allocthon throughout southeastern Idaho. They determined that groundwater contained in the Dinwoody and Thaynes Formations strata above the Phosphoria Formation did not circulate through that aquitard to strata below the Phosphoria. Groundwater below the Phosphoria Formation aquitard in the Wells Formation did not circulate to rocks above the aquitard and also did not pass through the Meade Thrust Fault zone to the Salt Lake Formation and other rocks on the east side of the fault. In the Smoky Canyon area, this means that groundwater in the Wells Formation is thought to be isolated from strata above the Phosphoria Formation and also from rocks on the east side of the West Sage Valley Branch Fault.

Unconsolidated Quaternary colluvium and alluvium occur along the bottoms of Lower Smoky Creek and other creeks flowing east from the Webster Range. Alluvial deposits, consisting of well- to poorly-sorted gravel, sand, silt and clay, are very narrow and thin in the bottoms of these creeks where they flow through their respective canyons and become thicker at the mouths of the canyons (Connor, 1980). Permeability of the alluvium is likely high to moderate, depending on the amount of clay in the sediments. Groundwater flow in alluvial and colluvial deposits on the east side of the Boulder Anticline is thought to be toward the downhill direction which is generally toward the east (Ralston, 1987).

3.3.5 Groundwater Quality

Groundwater quality monitoring has not been routinely conducted at the Smoky Canyon Mine. Monitoring of wells GW-7, 8, 12, 13, 14, CW, and IW began in the first quarter of 2000 and has continued through third quarter 2000. The GW-CW well was also sampled by Montgomery Watson in 1998 for the regional selenium studies. Wells GW-12, 13, and 14 were installed during the second quarter of 2000 and the first sample from them was obtained in the third quarter of 2000. These data are shown in **Table 3.3-12**.

Bedrock groundwater quality in the project area is generally classified as a calcium-bicarbonate type (except for GW-13 and -14). Analytical results indicate a TDS of approximately 250 mg/l, a pH near 7.6, and a nitrate level near 0.35 mg/l (**Table 3.3-12**). A majority of the trace metals were not detected in any of the groundwater samples taken during sampling efforts in 2000 (**Table 3.3-12**). Those metals and metalloids with concentrations below detection levels were: aluminum, antimony, barium, beryllium, chromium, copper, iron, manganese, lead, mercury, nickel, silver, and thallium. Arsenic, antimony, barium, copper, iron, manganese, and zinc were detected in GW-13 and barium, boron, copper, lead, manganese and zinc were detected in GW-14. Cadmium concentrations ranged from below detection to 0.0014 mg/l (MCL=0.005 mg/l). Well GW-CW had detectable amounts of arsenic, cadmium, selenium, vanadium, and zinc, all below the applicable MCLs.

Groundwater quality samples collected from the GW-CW Well by Simplot in 1984, '87, '89, and '94 show that selenium concentrations were at or below detectable concentrations indicating this was the natural selenium background concentration. Background concentrations continued in the well until between 1994 and 1996 when selenium concentrations in the well increased to 0.017 mg/l and have been above background since then.

Solute Chemistry

Review of the major groundwater quality parameters supports the concept that there is physical separation between the aquifers in the Dinwoody Formation, Wells Formation, and Salt Lake Formation.

Stiff diagrams (Stiff, 1951) graphically portray the major cation-anion makeup of waters in horizontal axes for sodium+potassium chloride, calcium bicarbonate+carbonate and, magnesium sulfate. Visual inspection of these diagrams for different monitoring locations allows a convenient comparison of major water chemistries. For example, the up- and down-gradient stream samples for South Fork Sage Creek and Sage Creek, SC-SW-11/SC-SW-12 and SC-SW-13/SC-SW-14 respectively show essentially the same Stiff diagrams up- and down-gradient indicating no major changes to the water chemistry between these sampling locations. The source of the perennial flows in the up-gradient monitoring locations of Pole Canyon, Sage, and South Fork Sage creeks is groundwater discharging at springs from the Dinwoody Formation and all of these waters are chemically similar (**Figure 3.3-6**).

Comparison of the Stiff diagrams for springs and streams in Smoky Canyon, beginning with SW-1 at the upper end of the canyon and proceeding down through SW-19, SW-20, and SW-2 all show the same general chemistry. The springs providing the water for sites SW-1, SW-19, and SW-2A are all located within Dinwoody Formation outcrops and the water chemistry appears to be representative of groundwater from the Dinwoody Formation aquifer.

This is not the case for the Pole Canyon Creek down-gradient sample, SW-16, which shows a magnesium sulfate axis that is approximately 3.3 times larger than the up-gradient sample, SW-15. This

is apparently the result of contact of the surface water in Pole Canyon Creek with the overburden in the Pole Canyon overburden disposal site.

The Stiff diagram for the GW-CW water is approximately the same as Hoopes Spring water (SC-SW-17). The water quality of these samples is considered to be representative of current water quality characteristics in the Wells Formation aquifer including any current effects of mining.

The water chemistry of the springs at the Star Valley Trout Ranch to the north of Smoky Canyon is different from the Wells Formation discharged from Hoopes Spring (SW-17) or the Dinwoody Formation groundwater (SW-1, -13, -11, or -15), indicating they are supplied by different aquifers in the Thaynes Formation from which they discharge (see **Figure 3.3-6**).

Monitoring wells GW-5, -6, -10 and -11 were dry during 2000; groundwater quality samples were not obtained from these locations.

GW-7, and GW-8 monitor shallow groundwater conditions (15-37 feet deep) in the upper portion of the Salt Lake Formation upgradient (west) from the tailings ponds. The water in these wells is a calcium bicarbonate+carbonate type with lower magnesium sulfate and higher sodium+potassium chloride concentrations than either the Dinwoody or Wells Formations waters (**Figure 3.3-6**).

The groundwater in GW-14 is significantly different than anywhere else in the study area. The water is a brine consisting of sodium+potassium chloride type water that is very low in calcium carbonate and magnesium sulfate. This water type is clearly different than the other natural groundwater in the Salt Lake Formation (GW-7 and -8) or the process water in the tailings ponds (SW-8 and -9). It is thought that this water is potentially the source of the salt that was formerly present at the saline flat under what is now Tailings Pond No. 2.
Groundwater intercepted in GW-13, approximately half way up in the Salt Lake Formation from its base, is also dominated by the same sodium+potassium chloride chemistry as GW-14 but less concentrated in salt, suggesting a dilution of the upward migrating salt brine from the base of the Salt Lake Formation. The static water levels for GW-13 and 14 show static water level elevations within 2 feet of each other, indicating little vertical movement of groundwater through the Salt Lake Formation (**Table 3.3-12**).

Monitoring well GW-12 is a shallow (35 feet) completion located adjacent to GW-13 and 14 downstream of the Tailings Dam No. 2. It is screened in alluvium deposited in the Tygee Creek channel which has eroded into the Salt Lake Formation. The water chemistry of GW-12 is more similar to the water chemistry of the Tygee Creek surface water samples SW-6 and SW-7.

Review of the major cations and anions in groundwater samples from the study area show that groundwater quality in each of the aquifers of the area, Thaynes/Dinwoody, Wells, and Salt Lake Formations, is different from the others. This supports the concept that these aquifers are not connected to each other in the study area.

Saturation Indices

In addition to comparison of solute chemistry with Stiff Diagrams, it is possible to distinguish Dinwoody Formation and Wells Formation groundwaters from each other on the basis of saturation indices (SI) (Mayo, 2001).

Dinwoody Formation waters were found to be strongly supersaturated with respect to calcite and dolomite, whereas Wells Formation waters tended to be slightly calcite saturated and dolomite undersaturated. Salt Lake Formation waters are also distinguishable from both Dinwoody and Wells Formation waters because they are slightly saturated with respect to calcite and strongly dolomite undersaturated. These saturation index data support the concept that groundwater does not circulate between the Dinwoody, Wells, and Salt Lake Formations.

Stable Isotopes

The stable isotopic composition (deuterium and oxygen-18) of the waters in the Smoky Canyon area were determined (Mayo, 2001). The results of this test showed that most groundwater and all surface water samples in the study area had similar stable isotopic composition which is consistent with the conclusion that all this water formed at a similar temperature, representative of present day climatic conditions. Stable isotope data cannot be used to discriminate between groundwater in the Wells and Dinwoody Formations. This is not the case for groundwater in GW-13 and GW-14 which was significantly different that any other groundwater or surface water sample and indicated that this water formed during colder climatic conditions than the present. This finding supports the concept that groundwater in the Salt Lake Formation monitored by these two wells is not affected by any seepage from the tailings ponds or by any connection to groundwater in the Wells or Dinwoody Formations.

Stable isotope data for Tailings Pond No. 2 water (SW-9) was consistent with a large evaporating body of water. The Tailings Dam Toe Drain (SW-10) is a mixture of Tygee Creek water with water that has been affected by evaporation. This could indicate that some tailings pond water is present in the Toe Drain water. Additional discussion of the water quality in the Toe Drain, Tailings Pond No. 2, and Tygee Creek is found in Section 4.16.3. The Tygee Creek monitoring point immediately downstream of Tailings Dam No. 2 (SW-5) also shows it is a mixture of Tygee Creek water and a lesser amount evaporative water than the Toe Drain.

Table 3.3-12 Groundwater Quality in Alluvium and Bedrock, Smoky Canyon Mine Proposed Panels B and C, First, Second and Third Quarter Sampling Results (mg/l, unless otherwise noted) - 2000 (Maxim Technologies, Inc.)

Well No.	Sample Date	Aluminum (Al)	Antimony (Sb)	Arsenic (As)	Barium (Ba)	Beryllium (Be)	Cadmium (Cd)	Chloride (Cl)	Chromium (Cr)	Copper (Cu)
GW - 7	March	<0.1	<0.001	<0.001	<0.1	<0.001	<0.0001	10	<0.01	<0.01
	June	<0.1	<0.001	<0.001	<0.1	<0.001	<0.0001	10	<0.01	<0.01
	Sept	<0.1	<0.001	0.001*	<0.1	<0.001	0.0002*	12	<0.01	<0.01
GW - 8	March	<0.1	0.001	<0.001	<0.1	<0.001	<0.0001	21	<0.01	<0.01
	June	<0.1	<0.001	0.004	<0.1	<0.001	0.0014	7	<0.01	<0.01
	Sept	<0.1	<0.001	<0.001	<0.1	<0.001	<0.0001	8	<0.01	<0.01
GW-CW	March	----	----	----	----	----	----	----	----	-----
	June	<0.01	<0.001	<0.001	<0.1	<0.001	<0.0001	14	<0.01	<0.01
	Sept	<0.01	<0.001	0.004	0.1	<0.001	0.0003	2	<0.01	<0.01
GW-IW	March	----	----	----	----	----	------	----	----	----
	June	----	----	----	----	----	----	----	----	-----
	Sept	----	----	----	----	----	----	----		
GW-12	Sept	<0.1	<0.001	<0.001	0.1	<0.001	<0.0001	19	<0.01	<0.01
GW-13	Sept	0.2	0.01	0.006	0.3	<0.001	<0.0001	**2900**	<0.01	0.04
GW-14	Sept	<0.1	0.002	0.001	0.4	<0.001	0.0002	**8530**	<0.01	0.06
MCL		0.2	0.006	0.01	2.0	0.004	0.005	250	0.1	1.3

LEGEND: ------ Sample Not taken
GW = Groundwater Monitoring Well* = Duplicate sample indicated non-detect
CW = Culinary Water Well MCL = Maximum Contaminant Limit
IW = Industrial Well
bold = value>MCL

Table 3.3-12, continued.

Well No.	Sample Date	Dissolved Oxygen	Fluoride (F)	Iron (Fe)	Lead (Pb)	Manganese (M)	Mercury (Hg)	Nickel (Ni)	Nitrate as N	Nitrite as N	pH
GW - 7	March	10.8 **	0.12	<0.05	<0.001	<0.02	<0.0002	<0.02	0.36	<0.05	8.1**
	June	11.9 **	0.012	<0.05	<0.001	<0.02	<0.0002	<0.02	0.33	<0.05	7.9**
	Sept	14.7 **	0.15	<0.05	<0.001	<0.02	<0.0002	<0.02	0.36	<0.05	7.8**
GW - 8	March	11.0 **	0.15	<0.05	<0.001	<0.02	<0.0002	<0.02	0.33	<0.05	8.1**
	June	9.0 **	0.14	<0.05	<0.001	<0.02	<0.0002	<0.02	0.20	<0.05	8.1**
	Sept	16.2 **	0.26	0.05	<0.001	<0.02	<0.0002	<0.02	0.37	<0.05	7.8**
GW-CW	March	----	----	----	----	----	----	----	----	----	----
	June	5.4 **	0.16	<0.05	<0.001	<0.02	<0.0002	<0.02	0.37	<0.05	7.9**
	Sept	11.9 **	0.13	<0.05	<0.001	<0.02	<0.0002	<0.02	0.16	<0.05	7.8**
GW-IW	Sept	----	----	----	----	----	----	----	----	----	----
GW-12	Sept	4.0 **	0.13	<0.05	<0.001	**0.25**	<0.0002	<0.02	0.22	<0.05	8.3**
GW-13	Sept	5.0 **	0.22	<0.05	<0.001	**0.32**	<0.0002	<0.02	0.13	0.12	8.5**
GW-14	Sept	5.1 **	0.27	<0.05	<0.001	**0.70**	<0.0002	<0.02	0.07	<0.05	8.5**
MCL		NS	4.0	0.3	0.015	0.05	0.002	0.1	10.0	1.0	6.5-8.5

NS = No Regulatory Standard Set
MCL = Maximum Contaminant Limit
GW = Groundwater Monitoring Well
CW = Culinary Water Well
IW = Industrial Well
---- Sample Not taken
** = Field Parameter
bold = value>MCL

Table 3.3-12, continued.

Well No.	Sample Date	Spec. Cond (SC)	Selenium (Se)	Silver (Ag)	Sulfate (SO4)	Temp (C)	Thallium (Th)	Total Dissolved Solids (TDS)	Turbidity (NTU)	Zinc (Zn)
GW - 7	March	370 **	<0.001	<0.001	6	----	<0.002	215	2,750	<0.02
	June	300 **	<0.001	<0.001	<5	7.6 **	<0.002	245	1.3	<0.02
	Sept	450 **	<0.001*	<0.001	7	10.1 **	<0.002	250 ***	85***	<0.02
GW - 8	March	510 **	<0.001	<0.001	7	----	<0.002	246	3,750	<0.02
	June	330 **	<0.001	<0.001	45	10.8 **	<0.002	251	140	<0.02
	Sept	324 **	<0.001	<0.001	7	9.6 **	<0.002	247	9.6	<0.02
GW - CW	March	--------	---------	-------	----	-------	--------	------	-------	--------
	June	350 **	0.031*	<0.001	45	8.9 **	-------	302 ***	0.11***	0.06
	Sept	545 **	0.011	<0.001	44	14.6 **	<0.002	286	0.6	0.03
GW - IW	Sept	----	----	----	----	----	----	----	----	----
GW -12	Sept	420 **	<0.001	<0.001	24	10.6 **	<0.001	311	200	<0.02
GW - 13	Sept	8,560 **	<0.001	<0.001	5	10.5 **	<0.001	**4,740**	3,600	0.06
GW - 14	Sept	>20,000 **	<0.001	<0.001	144	9.4 **	<0.001	**15,100**	9.8	1.61
MCL		NS	0.05	0.1	250	NS	0.002	500	NS	5.0

* = Duplicate sample indicates a value of 0.001mg/l for GW-7 and a value of 0.032 mg/l for GW-CW.
** = Field Parameter
*** = Average value with duplicate sample
# = Represents stagnant well sample - well could not be purged prior to sampling due to depth.
NS = No Regulatory Standard Set
MCL = Maximum Contaminant Limit
GW = Groundwater Monitoring Well
------ Sample Not taken
bold = value>MCL

SC-GW-14 (1/4 scale)

SC-GW-13 (1/4 scale)

Star Valley Trout Ranch

(not on map)

SC-SW-18

SC-SW-5

SC-SW-10

SC-SW-3

SC-SW-7

SC-GW-12

SC-SW-6

TAILINGS Pond 2

SC-SW-2

SC-SW-9

TAILINGS POND

SC-GW-7

SC-SW-8

SC-GW-8

SO-SW-4

SC-SW16

SC-SW-20

SC-SW-14

SC-SW-17

SC-SW-12

PROPOSED B-Panel

PROPOSED OVERBURDEN DISPOSAL SITE

D-PANEL

E-PANEL

A-PANEL

PROPOSED C-Panel

SC-SW-19

SC-SW-11

SC-SW-1

SC-GW-CW

SC-SW-15

SC-SW-13

Meq/L

10 5 0 5 10

Na+K
Ca
Mg

Cl
HCO3+CO3
SO4

EXPLANATION

- Cumulative Effects Area
- Proposed Mine Disturbance
- Existing Mine Disturbance
- Tailings Pond
- Water Quality Monitoring Station

N

4000 0 4000 FEET

FIGURE 3.3-6
SURFACE WATER QUALITY MONITORING SITES WITH STIFF DIAGRAMS
SIMPLOT SMOKY CANYON MINE PANELS B&C
SUPPLEMENTAL EIS

R45E R46E

drawings\SIMPLOT\FSEIS\Figures FSEIS\Figure 3.3-6.dwg (revised 6/6/01)

Groundwater Age

Two unstable isotopes (carbon-14 and tritium) were utilized to evaluate mean residence times of the groundwaters sampled (Mayo, 2001). Carbon-14 provides information regarding the number of years that have elapsed since the groundwater became isolated from soil-zone gases and near-surface waters. Tritium is a qualitative tool that indicates if groundwater was recharged since about 1954 when tritium was released to the atmosphere through thermonuclear testing. Groundwater ages are listed as modern, mixed old/modern, and old depending on whether the sample contains anthropogenic carbon-14 and tritium which means it recharged since 1954 (modern). The following waters were modern: Culinary Well (GW-CW), Sheep Spring (SW-19), both wells in the Salt Lake Formation upgradient from the tailings ponds (GW-7 and 8), Lower Smoky Spring, Lower Smoky Well, the shallow monitoring well below Tailings Dam No. 2 (GW-12), and the Tailings Dam Toe Drain (SW-10). This is consistent with the active local recharge areas of the Thaynes, Dinwoody, and Wells Formations in the Smoky Canyon area. The modern age of the Culinary Well water indicates it is close to the recharge area which is the nearby Boulder Creek Anticline outcrop area for the Wells Formation. This also indicates that the water in this well is not recharged from an older, regional flow of Wells Formation water from the west.

Hoopes Spring was found to have a mixed old/new age indicating a mixture of modern recharge mixing with older Wells Formation water with a longer (500+ years) flow path from the recharge location. This is consistent with mixing recharge from the local Wells Formation outcrop with inter-basin flow from further west. This also indicates that Hoopes Spring is in a different Wells Formation flow regime than the Culinary Well.

Groundwater in the deeper monitoring wells at the Tailings Dam No. 2 (GW-13 and 14) was old with ages of 12,500 and 33,500 years, respectively. These ages indicate that these wells are intercepting very old water upwelling from deeper bedrock. This is consistent with the solute and stable isotope chemistry indicating that groundwater at this depth in the Salt Lake Formation has not been affected by any seepage from the tailings ponds or by any connection with other groundwater in the Wells or Dinwoody Formations.

3.3.6 Groundwater Rights and Use

The only groundwater rights currently listed with the Idaho Division of Water Resources in the area of the Proposed Action are those owned by Simplot for the culinary well and the industrial well.

3.3.7 Springs and Seeps

Figure 3.3-1 shows the locations of all of the known springs within the project area and the Cumulative Effects Area. These locations were obtained from Ralston (1979), the 1981 DEIS (USFS, 1981), USGS topographic mapping, and Maxim baseline studies during 2000. Project area springs are described here; springs outside the project area but within the Cumulative Effects Area are mentioned here but are described in detail in the Cumulative Effects section.

One of the springs in closest proximity to the Proposed Action is a small spring known locally as Sheep Spring (SW-19). It issues from the slopes above Smoky Creek near the proposed C Panel location. Observations by Simplot and agency personnel indicate that flow from this spring percolates into the ephemeral channel downhill from the spring and does not typically reach Smoky Canyon. During the data review for this project, no historic flow or water quality records were located for this spring, nor does the

USFS have such information (Lee Leffert, USFS, personal communication), nor was it referred to in the 1981 DEIS (USFS, 1981). Recent water quality analyses results showed water quality similar to other waters in the area (Maxim, 2000e).

The USFS also has stock watering rights to another nearby spring, located in Section 25 west of the mill site. That spring was briefly described (in regard to its waters rights) in the 1981 DEIS (USDA, 1981). No water quality data for this spring are available.

Upper Smoky Creek and lower Smoky Creek have in-channel springs that provide stream flow. The reach of Smoky Creek upstream of the project is supplied with flow from springs (Maxim, 2000e) which discharge groundwater from the Dinwoody Formation (Ralston, 1979). Lower Smoky Spring which provides perennial base flow to Lower Smoky Creek in Section 17 is also located in the Dinwoody Formation.

Flow conditions in Smoky Creek indicate that the upper portion of the creek is typically perennial where it is supported by groundwater discharged from the Lower Dinwoody Formation. This flow is maintained across the outcrop of the Phosphoria until the Wells Formation outcrop is crossed at which point the stream loses all of its flow except during spring runoff. The bottom mile or more of the creek in the canyon is typically dry during much of the year. The stream becomes perennial again at the Lower Smoky Spring in the SW¼, SW¼ of Section 17, T7S, R46E. The Lower Smoky Spring is located within Lower Dinwoody outcrop at least 1,000 feet west of the trace of the West Sage Valley Branch Fault. This would stratigraphically isolate it from the Wells Formation by the thickness of the Phosphoria Formation and part of the Lower Dinwoody Formation, a total thickness estimated to be about 1,500 feet (**Figure 3.3-4**). It is therefore likely that the water in Lower Smoky Spring is discharging from the Lower Dinwoody Formation and not the Wells Formation. This is supported by the fact that the water chemistry in Lower Smoky Creek is similar to the water chemistry in Upper Smoky Creek (**Table 3.3-7**).

To further assess the relationship between Lower Smoky Creek and Upper Smoky Creek water quality, the water quality monitoring data base compiled by TRC-Mariah for fall season samples taken from 1981 to 1999 was used. The water chemistry of the Lower Smoky and Upper Smoky creek monitoring sites were compared to determine if these water chemistries were the same. The water chemistries of Lower Smoky Creek were also compared with that of Hoopes Spring (Wells Formation aquifer) to see if these water chemistries were the same. The results of these comparisons are shown in **Table 3.3-13**. The bold face values in **Table 3.3-13** indicate the closest comparable value to Lower Smoky Creek water chemistry between Upper Smoky Creek and Hoopes Spring. The values in parentheses are levels of statistical significance (P Value). The higher the P value, the stronger is the significance of the equivalence between the means. A low P value indicates that the means are not equivalent.

Table 3.3-13 Comparison of Mean Water Quality for Upper Pole, Upper Smoky, Lower Smoky and Hoopes Spring Monitoring Sites (meq/l)

Parameter	Upper Smoky	Lower Smoky	Hoopes Spring
Sodium+Potassium	0.197 (0.0003)	**0.271**	**0.334 (0.02)**
Chloride	0.063 (0.002)	**0.162**	**0.181 (0.5)**
Calcium	2.873 (0.00007)	3.123	2.874 (0.00009)
Bicarb+Carbonate	**3.391 (0.8)**	**3.576**	3.217 (0.00000..)
Magnesium	**1.356 (0.04)**	**1.421**	1.774 (0.00000..)
Sulfate	**0.289 (0.8)**	**0.298**	0.733 (0.00000..)

Note: The value is the average of the 1981-1999 analytical results from TRC Mariah.
Boldface values indicate closest match to Lower Smoky Creek.
(#)= Level of Significance (P)

When the Lower Smoky water chemistry is compared with Upper Smoky (Dinwoody Formation water) and Hoopes Spring (Wells Formation water) the following results are obtained. The Lower Smoky water quality is more similar to Upper Smoky for sulfate, magnesium and bicarbonate+carbonate.

Lower Smoky is more similar to Hoopes Spring (Wells Formation water) for sodium+potassium and chloride than it is to Upper Smoky. These two sites are clearly elevated in salt concentration compared to Upper Smoky. However, this comparison is complicated by the fact that the Smoky Canyon Road is treated with magnesium chloride dust control in the summer months and some of the elevated salt in the Lower Smoky water quality may be artificially affected by road runoff in the canyon. This could also be the reason for the elevated magnesium concentration in the Lower Smoky water quality compared to Upper Smoky.

Based on the above comparison, it appears that Lower Smoky major cation/anion water chemistry is generally more similar to Upper Smoky than it is to Hoopes Spring. This comparison lends further support to the hypothesis that the water discharged from the Lower Smoky Spring does not originate in the Wells Formation but is more likely discharging from the Dinwoody Formation. This different water chemistry indicates that the Lower Smoky Spring is hydraulically separated from the Wells Formation.

The springs that provide base flow to upper Roberts Creek are located in the SE¼, Section 20, T8S, R46E (**Figure 3.1-1**). The springs are located within alluvial deposits in the drainage bottom where the surrounding area is Salt Lake Formation outcrop. West of the springs is an extensive outcrop of the Lower Dinwoody Formation and a complete and conformable section of the Phosphoria Formation before the Wells Formation outcrop is encountered further west. The springs also appear to be located along the trace of the East Sage Valley Branch Fault. The location of these springs appears to place them in the upper part of the Lower Dinwoody. They are also located east of the West Sage Valley Branch Fault which is believed to structurally and hydraulically separate the Wells Formation from the spring location. Because of this structural separation from the Wells Formation, the Roberts Creek springs are considered to be hydraulically separated from the groundwater effects of the Proposed Action and Alternatives.

The water chemistry of Upper Roberts Creek is also different from the Wells Formation water quality (**Figure 3.3-6**). Compared to the Wells Formation water quality demonstrated by data from Hoopes Spring (SW-17) and the Culinary Well (GW-CW), Upper Roberts Creek (SW-4) has a higher magnesium and sulfate concentration and a much higher concentration of sodium+potassium and chloride. This different water chemistry further indicates that the Roberts Creek springs are hydraulically separated from the Wells Formation and thus from any groundwater effects from the Proposed Action and Alternatives.

Other notable springs near the project area include a large spring complex in Lower South Fork Sage Creek near the southeast corner of Section 18, T9S, R46E. This spring discharged more than 6 cfs in the fall of 2000. Water quality monitoring shows no apparent effects to this spring from the nearby mining activities. Hoopes Spring, located near the northeast corner of Section 18, T9S, R46E, discharged more than 2 cfs in the fall of 2000. Water quality data collected from this spring shows an apparent increase in selenium concentration since 1998. These springs are located within the Cumulative Effects Area and are discussed in more detail in that section. Other large springs in the general region are Falls Spring, located approximately 3 miles north of the Proposed Action near Webster Canyon (Section 5, T8S, R46E) and springs located along Spring Creek about ½ mile north of the Falls (Section 32, T7S, R46E) (**Figure 3.3-1**). These are located in Dinwoody and Thaynes Formation strata hydraulically isolated from the potential effects of the Proposed Action and Alternatives. They are north of the project area and Cumulative Effects Area and are not discussed in this document.

Seeps discharging from overburden piles are known to occur widely throughout the phosphate production area in southeast Idaho and two of these are located at the Smoky Canyon Mine. These are located in the overburden fills for the D- and E-Panels, 1.5 and 2.5 miles south of the Proposed Action and Alternatives, respectively, but within the Cumulative Effects Area. They have small flow rates but contain appreciable selenium concentrations and are discussed in detail in the Cumulative Effects section. Finally, water discharging from a valley fill overburden disposal facility constructed by Simplot in Lower Pole Canyon has been monitored since the facility was constructed and this water has elevated concentrations of selenium and other constituents. This facility is located about one mile south of the Proposed Action and Alternatives within the Cumulative Effects Area and is discussed in that section of this document.

3.4 Soils and Watershed

Regional Setting

The project area is located in the middle Rocky Mountain physiographic province of southeastern Idaho. Much of the province is made up of interior basins. Mountains rise steeply from the semiarid sagebrush-covered plains or agricultural valleys. The mountains are generally well covered with vegetation and the higher elevations support conifer forests on the north and east facing slopes (USFS, 1990).

The proposed mining at Smoky Canyon would occur entirely within one of the headwater tributaries to Tygee Creek, therefore, a watershed analysis has been completed for the Tygee Creek Basin (JBR, 2001a). This analysis has been prepared in accordance with *Ecosystem Analysis at the Watershed Scale, Federal Guide for Watershed Analysis, Version 2.2* and is utilized to characterize specific watersheds using ecosystem elements, and to provide an overall watershed context in which to assess management actions. The watershed analysis includes brief descriptions of seven separate ecosystem

components including erosion processes, hydrology, vegetation, stream channel, water quality, species and habitats, and human uses (**Appendix 3B**).

Smoky Canyon is located in the Webster Range and the average annual runoff in the Caribou, Webster, Aspen, and Pruess Ranges is estimated at 1.07 acre-feet of water per acre of land (USFS, 1990). This rate of runoff is more than twice the average runoff of the Blackfoot River watershed, slightly higher than average for the Salt River, and more than seven times the average annual runoff of the Bear River at Soda Springs, Idaho. Runoff rate statistics indicate that this area is in an important water source area for all three drainages (USFS, 1990).

The annual water losses through evaporation exceed the annual water gains from precipitation at lower elevations and in western portions of the Forest (USFS, 1990). Vegetation distribution is controlled mostly by altitude, latitude, direction of prevailing winds, and slope exposure.

Parent materials for the soils are derived from Wells and Phosphoria formations. The limestones of the Wells Formation are characterized by some outcrops and steep breaks in rugged side slopes. The Dinwoody Formation consists of siltstones and sandstones that have weathered into long smooth slopes. The Phosphoria Formation, which contains the phosphatic ore, underlies the upper concave slopes. The Rex Chert Member of the Phosphoria Formation is prominent as cobbles and gravels in the soil profile and as major outcroppings forming the ridge crest.

3.4.1 Soil Survey

A 2nd Order soil inventory was conducted for the Proposed Action area in July, October, and November 2000, and February 2001. The study area is located on approximately 850 acres within the Smoky Canyon Mine Panels B and C project area. The Caribou National Forest Soil Survey (USFS, 1990) was used as a reference in mapping soils within the project area. Procedures and interpretations were adapted primarily from the Soil Survey Manual (USDA, 1993), National Soil Survey Handbook (USDA, 1999a), and Soil Taxonomy (USDA, 1999b).

As described in the Soil Baseline Report (Maxim, 2001b), the soil erodibility factor (K) and associated ratings were determined using a computer model of the Revised Universal Soil Loss Equation (RUSLE). The Soil Survey Manual (USDA, 1993) was used to determine drainage class, soil horizon boundary distinctness, structural class, consistence class, root size and quantity class, coarse fragment type, runoff class, and water erosion hazard class. Soil colors were determined from the Munsell Soil Color Charts (Macbeth Division, 1975) and Keys to Soil Taxonomy (USDA, 1999b) were used for soil classification. The National Soils Handbook (USDA, 1999a) was also used to determine texture class, permeability rating, available water holding capacity, restrictive rooting depth, and wind erodibility group (Maxim, 2001b).

Soil resources within the watershed Cumulative Effects Area have been evaluated using the Caribou National Forest Soil Survey (USFS, 1990) and the Soil Survey of Star Valley Area, Wyoming-Idaho (USDA, 1976) and updates to these documents based on the *Keys to Soil Taxonomy* (USDA, 1999b), *Soil Survey Manual* (USDA, 1993) and the USDA *National Soil Survey Handbook* (USDA, 1999a).

3.4.2 Field Procedures

Soil mapping units within the project area were identified and delineated in the field utilizing 1:4800, 50-foot contour interval topographic maps and aerial photographs during a Soil Baseline Inventory conducted by Maxim (2001b). Natural soils within the project area have also been inventoried, documented, and mapped at the 3rd Order level in the *Soil Survey of the Caribou National Forest, Idaho* (USFS, 1990).

At least one representative sample site was selected for each soil type. Soil profiles at each sample site were exposed and described by sequential horizon from soil surface to bedrock, to unsuitable material, or to 60 inches, whichever came first (Maxim, 2001b). Samples were collected from each horizon greater than three inches thick. Horizons three inches thick and less were sampled with the most similar adjacent horizon. Soil horizons determined in the field to be unsuitable as growth medium were not sampled. Previously disturbed areas were not described or sampled.

Data collected for the Soil Baseline Inventory include soil profile descriptions and landform characteristics. Soil profile characteristics such as percent of soil type per map unit, range of slope conditions where the map unit may occur, landform type, depth to bedrock, depth of soil suitable for reclamation or topsoil, permeability, and estimate of productivity potential were determined after completion of the site observations. Fifteen soil mapping units were identified and mapped, including nine consociations and six complexes (Maxim, 2001b). Physical characteristics were determined for each soil map unit, including color, texture, structure, coarse fragment content, consistence, roots, effervescence, horizon thickness, and horizon boundary classification. Soil profile characteristics and laboratory analyses were used to determine suitable depths of salvage for each soil type.

3.4.3 Laboratory Procedures and Analysis

Following field inventory, 55 soil samples were collected from 22 sample site locations in the study area and sent to Northern Analytical Laboratories, Inc. and Energy Laboratories, Inc. in Billings, Montana for laboratory analysis.

Laboratory analytical physical parameters include coarse fragment percent, texture, saturation percentage, and organic matter (Maxim, 2001b). Laboratory analytical chemical parameters include pH, electrical conductivity (EC), cations (calcium, magnesium, potassium, and sodium), sodium adsorption ratio (SAR), cation exchange capacity (CEC), total digestion trace elements (cadmium, copper, manganese, molybdenum, nickel, selenium, vanadium, and zinc), and water extractable trace elements (aluminum, cadmium, chromium, copper, iron, lead, manganese, nickel, selenium, and zinc) (Maxim, 2001b).

3.4.4 Soil Characteristics

Soil mapping units determined in the 2nd Order Soil Survey (Maxim, 2001b) are shown on **Figure 3.4-1.** Profile descriptions for each sample site are presented in the Maxim report. **Table 3.4-1** provides a summary of the soil map unit, identifying the classification, properties, and characteristics of the soils, and their total composition within the project area. Soils in the baseline study area are classified to the soil family level in accordance with *Keys to Soil Taxonomy* (USDA, 1999b).

Typical soils found in the project area are classified as Haplocryolls, Haplocryalfs, and Cryaquolls. Soil textures are generally loamy with a high percentage of coarse fragments. Slope steepness and coarse fragment content vary depending on the profile location. Laboratory analytical data indicate that some soils in the project area are extremely acidic, with pH values ranging from 4.4 to 7.7 (extremely acidic to slightly alkaline), but the majority of soils are slightly to moderately acidic. Soil is characterized as cryic with average organic matter content less than three percent and presence of deep, forest soil throughout much of the area.

The mapping units are mapped as land types and cover a wide range of topography from valley side slopes and channels to mountain slopes and smooth ridgetops.

The following soil mapping units have been identified within the project area and are shown at the family level on **Figure 3.4-1**.

The EC map unit is a grayish or yellowish light or dark brown (moist color 10YR3/2 to10YR5/4 with lighter colors at depth) gravelly loam located on sloping benches with eastern aspects. These soils are deep, well drained Typic Haplocryalfs with moderate permeability and more than 60 inches to bedrock. Parent materials consist of shales and sandstones. Available water holding capacity is moderate to high, with a depth to water table more than five feet. Within the project area, gravels are typically less than 20 percent by volume in the upper 32 inches of the profile and cobbles may comprise 10 to 15 percent by volume in some locations. Vegetation consists of aspen, lodgepole pine, and fir.

The ECS map unit is identical to the EC soil except for the presence of selenium in the soil profile (Maxim, 2001b).

The FR map unit is a grayish or yellowish, light or very dark brown (moist color range 10YR3/2, 10YR4/3, 10YR5/4, and 10YR6/4 with lighter colors at depth) very gravelly loam located on all aspects of concave mountain side slopes and swales. Vegetation consists of aspen, lodgepole pine, fir, grasses, and forbs. These soils are deep, well drained Typic Haplocryoils with moderately slow permeability and more than 60 inches to bedrock. Parent materials consist of shales, limestones, and sandstones. Available water holding capacity is moderate to high, with a depth to water table more than five feet. Within the project area, gravels typically average approximately 20 percent or less by volume, but may be 45 to more than 80 percent by volume throughout the profile in some locations. Cobbles range from 5 to 40 percent by volume and boulders may be up to 40 percent by volume in some locations.

The JK map unit is a dark yellowish brown to yellowish brown (moist color 10YR3/1, 10YR3/4, to 10YR5/6) gravelly silt loam located on valley side slopes with northern aspects. These soils are deep, well drained Mollic Haplocryalfs with moderately slow permeability and more than 60 inches to bedrock. Parent materials consist of shales, sandstones, and limestones. Available water holding capacity is moderate to high, with a depth to water table more than five feet. Within the project area, gravels are typically more than 30 percent by volume throughout the profile and cobbles are more than 15 percent by volume. Vegetation consists of lodgepole pine, grasses, and fir.

Table 3.4-1 Soil Mapping Unit Descriptions

Map Unit	Classification	Percentage of Map Unit	Landscape Position/ Slope	Composition of Project Area		Texture	Permeability	Approximate Soil Depth (inches)	Depth to Water Table (feet)	Depth to Bedrock (inches)
				Acres	Percent					
EC	*Fine-loamy, mixed superactive Typic Haplocryalfs*	>85	Sloping benches 10-20%	134.50	17.86	gravelly loam	moderate	>60	>5	>60
ECS	*Fine-loamy, mixed superactive Typic Haplocryalfs*	>85	Sloping benches 10-20%	5.18	0.69	gravelly loam	moderate	>60	>5	>60
FR	*Loamy-skeletal, mixed superactive Typic Haplocryolls*	>85	Concave mtn. slopes (swales) 10-55%	68.38	9.08	very gravely loam	moderately slow	>60	>5	>60
JK	*Loamy-sleletal, mixed superactive Mollic Haplocryalfs*	>85	Valley side slopes 40-50%	82.33	10.94	gravelly silt loam	moderately slow	>60	>5	>60
LDR	*Fine-loamy, mixed superactive Cumulic Cryaquolls*	>85	Lower channel 0-8%	1.14	0.15	loam	moderate	--	1.33	>60
UDR	*Fine-Loamy, mixed superactive Pachic Haplocryolls*	>85	Upper channel 15-25%	10.92	1.45	gravelly loam	moderately slow	35	>5	35
Dis	Disturbed	>85	N/A	2.15	0.29	disturbance area	--	0	--	--
FR-CP Complex				214.85	28.54					
FR	*Loamy-skeletal, mixed superactive Typic Haplocryolls*	45	Concave mtn. slopes (swales) 10-55%			very gravelly loam complex	moderately slow	>60	>5	>60
CP	*Loamy-skeletal, mixed superactive Typic Haplocryalfs*	40	Valley Side Slopes 35-45%			gravelly loam complex	moderate	>60	>5	>60
FR-CC Complex				61.72	8.20					

Table 3.4-1, continued.

Map Unit	Classification	Percentage of Map Unit	Landscape Position/ Slope	Composition of Project Area		Texture	Permeability	Approximate Soil Depth (inches)	Depth to Water Table (feet)	Depth to Bedrock (inches)
				Acres	Percent					
FR	*Loamy-skeletal, mixed superactive Typic Haplocryolls*	65	Concave mtn. slopes (swales) 10-55%			very gravelly loam complex	moderately slow	>60	>5	>60
CC	*Loamy-skeletal, mixed superactive Calcic Haplocryolls*	20	Valley side slopes 45-55%			gravelly loam complex	moderate	>60	>5	>60
ST-RO Complex				112.46	14.94					
ST	*Loamy-skeletal, mixed superactive Lithic Haplocryolls*	55	Ridge tops 45-55%			extremely gravelly loam[1] complex	moderately rapid	8	>5	5-12
RO	*N/A*	30	N/A			complex	--	0	--	--
RO-CP-EC Complex				21.84	2.90					
RO	*N/A*	40	N/A			complex	--	0	--	--
CP	*Loamy-skeletal, mixed superactive Typic Haplocryalfs*	30	Valley side slopes 35-45%			gravelly loam complex	moderate	>60	>5	>60
EC	*Fine-loamy, mixed superactive Typic Haplocryalfs*	15	Sloping benches 10-20%			gravelly loam	moderate	>60	>5	>60
RO-CP Complex				16.16	2.15					
RO	*N/A*	40	N/A			complex	--	0	--	--
CP	*Loamy-skeletal, mixed superactive Typic Haplocryalfs*	45	Valley side slopes 35-45%			gravelly loam complex	moderate	>60	>5	>60

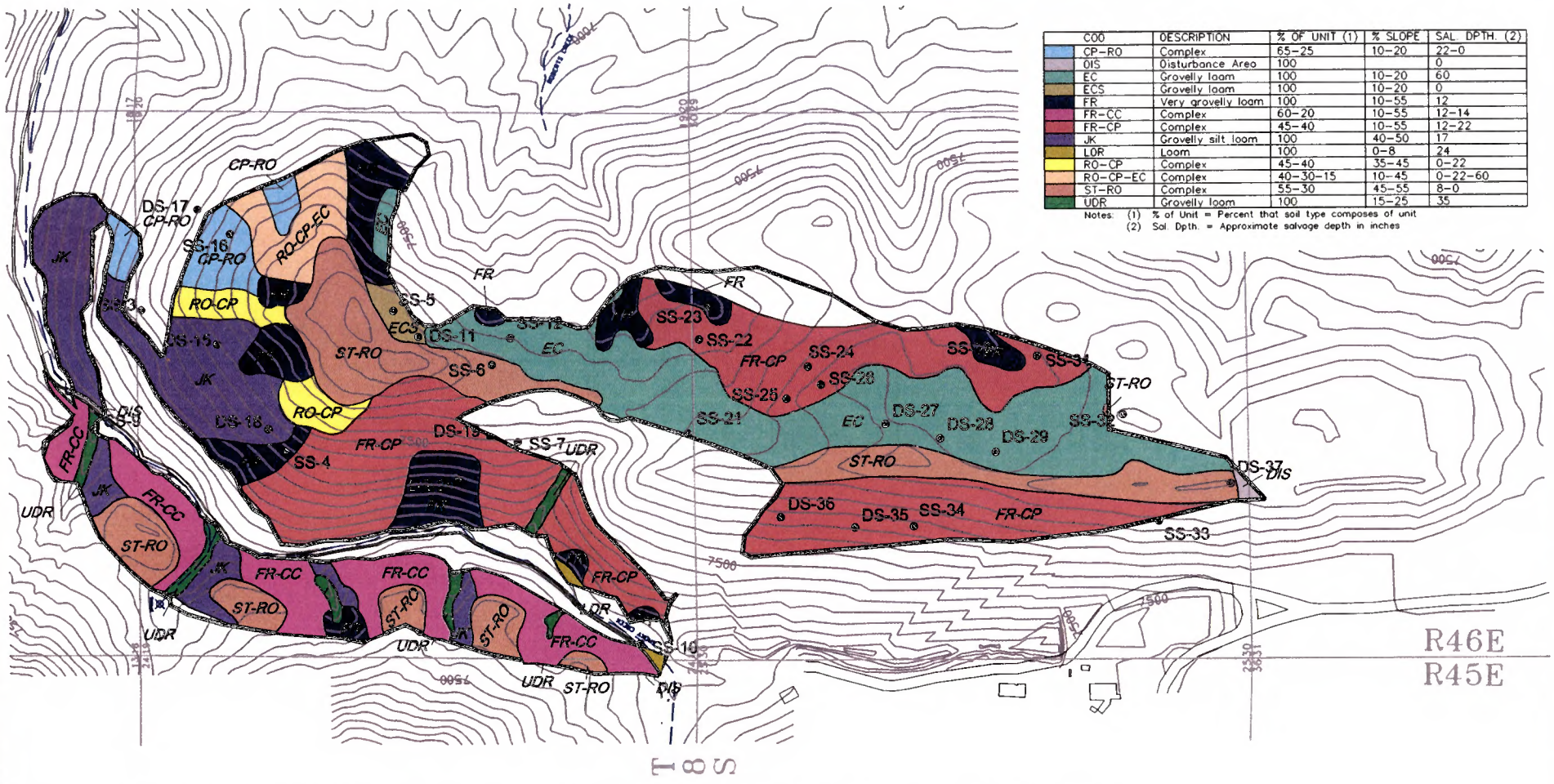
Table 3.4-1, continued.

Map Unit	Classification	Percentage of Map Unit	Landscape Position/ Slope	Composition of Project Area		Texture	Permeability	Approximate Soil Depth (inches)	Depth to Water Table (feet)	Depth to Bedrock (inches)
				Acres	Percent					
CP-RO Complex				21.27	2.83					
CP	*Loamy-skeletal, mixed superactive Typic Haplocryalfs*	65	Valley side slopes 35-45%			gravelly loam complex	moderate	>60	>5	>60
RO	*N/A*	25	N/A			complex	--	0	--	–

Source: Maxim, 2001b

[1] fractured bedrock at eight inches.

drawings\SIMPLOT\FSEIS\Figures FSEIS\Figure 3.4-1.dwg (revised 4/13/01)



COD	DESCRIPTION	% OF UNIT (1)	% SLOPE	SAL. DPTH. (2)
CP-RO	Complex	65-25	10-20	22-0
DIS	Disturbance Area	100		0
EC	Gravelly loam	100	10-20	60
ECS	Gravelly loam	100	10-20	0
FR	Very gravelly loam	100	10-55	12
FR-CC	Complex	60-20	10-55	12-14
FR-CP	Complex	45-40	10-55	12-22
JK	Gravelly silt loam	100	40-50	17
LOR	Loam	100	0-8	24
RO-CP	Complex	45-40	35-45	0-22
RO-CP-EC	Complex	40-30-15	10-45	0-22-60
ST-RO	Complex	55-30	45-55	8-0
UDR	Gravelly loam	100	15-25	35

Notes: (1) % of Unit = Percent that soil type composes of unit
(2) Sal. Dpth. = Approximate salvage depth in inches

REFERENCE: MAXIM TECHNOLOGIES, INC., REVISED DRAFT BASELINE STUDY FOR THE SMOKY CANYON MINE PANELS B & C SOIL RESOURCES, CARIBOU COUNTY, IDAHO, MARCH 2001

EXPLANATION

- SS-4 SAMPLE SITES
- DS-18 DESCRIPTION SITES
- 50 FOOT CONTOUR
- PROPOSED DISTURBANCE BOUNDARY

N

1500 0 1500

FIGURE 3.4-1
SOIL MAPPING UNITS OF THE SMOKY CANYON AREA
SIMPLOT SMOKY CANYON MINE PANELS B&C
SUPPLEMENTAL EIS

The LDR map unit is a very dark gray (moist color 10YR3/1) loam located along lower portions of the Smoky Creek channel. These soils are wetland soils and often have clay in the substratum. Vegetation consists of grasses and willows. LDR soils are shallow, poorly drained Cumulic Cryaquolls with moderate permeability and more than 60 inches to bedrock. Parent material consists of alluvium. Available water holding capacity is moderate with a depth to water table approximately 16 inches. Gravels within this mapping unit are typically less than five percent by volume.

The UDR map unit is a very dark grayish brown to dark brown (moist color 10YR3/2 to 10YR3/3) gravelly loam above 30 inches, turning yellowish brown (moist color 10YR5/4) below 31 inches. The UDR soil is located in upper ephemeral channel bottoms on all aspects. Vegetation consists of aspen, fir, and rabbitbrush. These soils are moderately shallow, well drained Pachic Haplocryolls with moderately slow permeability and approximately 35 inches to bedrock. Parent material consists of alluvium. Available water holding capacity is moderate to high with a depth to water table more than five feet. Gravels within this mapping unit are typically more than 25 percent by volume and cobbles range from 10 to more than 50 percent by volume depending upon location. At some sample locations, boulders comprise more than 25 percent by volume of the mapping unit.

The ST map unit is a black (moist color 10YR2/1) extremely gravelly loam located on ridge tops. Vegetation consists of sagebrush and grasses. These soils are very shallow, well drained Lithic Haplocryolls with moderately rapid permeability and less than 12 inches to bedrock. Parent material consists of shale, sandstone, and limestone. Available water holding capacity is very low with a depth to water table more than five feet. Gravels within this mapping unit are less than five percent by volume.

The six soil complexes identified within the project area are predominantly composed of combinations of the above mentioned map units, in addition to the RO map unit. The RO map unit consists of rock outcrop and, therefore, is not suitable for recovery and use as growth medium.

Topsoil/Growth Medium Suitability

The mountainous terrain does not favor optimal soil development. Soils on nearby mountain slopes are susceptible to increased erosion rates that constantly remove the fine particles from the surface and deposit them on the surfaces of soils occupying the alluvial or valley slopes. Soils in the mountains also tend to have high concentrations of coarse fragments which are transported to the alluvial slopes during landslide events and over time. The shallow, stony soils provide a minimal amount of quality topsoil/growth medium material for reclamation. There are no prime farmlands located within Caribou County due to high elevation. Prime farmland is classified as available land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops (USDA, 1993). The growing season in areas of high elevation in this portion of southeastern Idaho often is less than 60 days and frost may occur anytime during the year at elevations above 6,500 feet (USFS, 1990) which renders the soils unsuitable for classification as prime farmland.

The topsoil stripping depths determined for each soil type were based on the amount of salvageable unconsolidated material available in the surface soil or within the subsoil. The percentage of coarse fragments, organic matter, and selenium concentrations were additional locally important limitations considered in determining topsoil suitability. Criteria utilized by Maxim (2001b) to determine topsoil/growth medium suitability were developed and outlined by USFS staff (Lott, 1998) and are detailed in **Table 3.4-2.**

Table 3.4-2 Criteria Used to Determine Topsoil Suitability

Property	Topsoil/Growth Medium Suitability				Restrictive Feature[1]
	Good	Fair	Poor	Unsuitable	
Texture	textures finer than sands and coarser than sandy clay and silty clay, with less than 35% clay	loamy textures	sand textures and clayey textures with <60% clay	>60% clay content	excessive sands or clays
Organic Matter Content	organic matter >3%	organic matter <3% but greater than 1%[1]	organic matter 0.5 to 1.0%[1]	organic matter content <0.5%[1]	low fertility
Stoniness[2]	Class 1	Class 2	Class 3	Class 4 or 5	equipment restrictions and low fertility
Coarse Fragments (0-40 inches)	<15% by volume	15-25% by volume	25-35% by volume	>35%	equipment restrictions and low fertility
Salinity[3]	EC< 4 mmhos/cm	EC = 4 to 8 mmhos/cm	EC = 8 to 15 mmhos/cm	EC >15 mmhos/cm	excessive salts/low fertility
Depth to High Water Table	–	--	<1 foot to high water	perennial wetness	equipment restrictions
Sodium Adsorption Ratio[4] (0-40 inches)	0 to 4	4 to 8	8 to 16	>16	excessive sodium salts/low fertility
Soil Reaction - pH[5] (0-40 inches)	6.0 to 8.0	5.0 to 6.0 8.0 to 8.5	4.5 to 5.0 8.5 to 9.0	<4.5 or >9.0	excessive acidity or alkalinity
Slope Steepness	<8% slope	8 to 25% slope	25 to 40% slope	>40% slope	equipment restrictions
Calcium Carbonate (%, 0-40 inches)	----	----	>15-40	>40	excessive lime

Source: Maxim, 2001b

Notes:

1. As defined in the Soil Survey Manual (USDA, 1993) and National Soil Survey Handbook (USDA, 1996).
2. Stoniness as defined in the National Soil Survey Handbook (USDA, 1996) and the Soil Survey Manual (USDA, 1993).
3. Salinity defined using electrical conductivity (EC) expressed in millimhos per centimeter (mmhos/cm) at 25 degrees Celsius.
4. Sodium expressed as sodium adsorption ratio (SAR).
5. pH in standard units.

Based on field review of the soils mapped in the study area, the majority of soil family classifications were determined to be potentially suitable for topsoil or growth medium recovery. Samples of each soil horizon greater than three inches were collected and submitted for laboratory analysis to further determine the characteristics and limitations for each soil type. Coarse fragments, shallow water table, shallow depth to bedrock, and elevated selenium content were determined to be the most common limiting factors to suitability. **Table 3.4-3** indicates the soil factors utilized to determine soil suitability for reclamation purposes (Maxim, 2001b). **Table 3.4-4** identifies the extent of suitable and marginally suitable soils for topsoil/growth medium salvage in the project area, including the total volume of useable topsoil/growth medium.

Table 3.4-4 identifies the reclamation potential for soils recoverable within the project area based on production and fertility parameters identified in **Table 3.4-3** such as soil texture, organic matter, coarse

fragment content, pH, salinity, and sodium. Excessive coarse fragment content and low organic matter content are the two limitations which have the most potential to negatively influence fertility and production of reclaimed areas.

Erosion Potential

The overall hazard of erosion for soils has previously been determined by soil surveys conducted within the watershed area (USFS, 1990; USDA, 1976). In general, upland areas are more susceptible to erosion than lowland sites, and areas with higher coarse fragment content and lower slope steepness tend to have lower potential for water erosion hazard. Erosion hazard for soils within the project area has been determined to be high for all map units except the LDR map unit (Maxim, 2001b).

The soil suitability assessment identifies limitations and suggests that many of the areas disturbed by the proposed project would experience increased erosion potential by water. Wind erosion potential has been rated as slight for all soils within the project area (Maxim, 2001b). **Table 3.4-5** identifies the erosion potential and hydrologic characteristics of soils in the project area. These soil erodibility characteristics are described in the Soil Survey Manual (USDA, 1993) and summarized below.

The wind erodibility group (WEG) for each soil was determined based on soil texture using the National Soil Survey Handbook (USDA, 1999a) and soil information presented in the 2nd Order soil survey (Maxim, 2001b). WEG's are based on the compositional properties of the surface horizon that are considered to affect susceptibility to wind erosion. These properties include texture, presence of carbonate, and the degree of decomposition of organic soils. The wind erodibility index of each WEG is the theoretical, long-term amount of soil lost per year through wind erosion (USDA, 1993). Significant proportions of clay content, organic matter, and coarse fragment content decrease the wind erosion potential. Silt loam is the soil texture which is most susceptible to wind erosion. The majority of soils in the project area have been analyzed as having a loam, silt loam, or clay loam texture, but due to coarse fragment content over 15 percent, none of the map units identified would be subject to wind erosion.

All of the soils within the project area, with the exception of the LDR map unit, have been determined to have a coarse fragment content above 20 percent with some profile layers containing as much as 80 percent coarse fragments. None of the soils in the project area contain more than 35 percent clay. The majority of soils contain a range of 1.0 to 10.7 percent organic matter in the top few inches of the soil profile. Within the project area, the erosion hazard from wind is rated as slight.

The K-factor is a relative index of susceptibility of bare, cultivated soil to particle detachment and transport by rainfall (USDA, 1993). The K-factor may be computed from the composition of the soil, saturated hydraulic conductivity, and structure, and may be influenced by slope steepness, landform position, and surface coarse fragment content. Areas with higher coarse fragment content and lower slope steepness tend to have lower potential for water erosion hazard. The water erosion hazard for soils in the project area under native, non-cultivated conditions is low to moderate when adjusted for the generally excessive coarse fragment content of the native soils. In general, upland areas are more susceptible to erosion than lowland sites.

Table 3.4-3 Topsoil Suitability Parameters for Soils in the Project Area

Map Unit	Physical Considerations				Analytical Considerations (production potential)				Suitability Rating Based on Selenium Concentrations[1]	Topsoil Suitability Limitations
	USDA Soil Texture	Coarse Fragment Content % (by volume)	Depth to Water Table	Slope %	Organic Matter % (Range in profile)	Salinity (EC=mmhos/cm)	Sodium Adsorption Ratio (SAR)	Reaction (pH) Through Soil Profile		
EC	gravelly loam	21-43	<5 feet	10-20	0.8-7.1	<0.50	<0.50	5.3 to 5.6	Suitable	Low organic matter content below 22 inches[2]
ECS	gravelly loam	21-43	<5 feet	10-20	0.8-7.1	<0.50	<0.50	5.3 to 5.6	Questionable	Low organic matter content below 22 inches[2] and Selenium content.
FR	very gravely loam	45-80+	<5 feet	10-55	1.3-10.7	0.52	<0.25	5.2 to 5.6	Suitable	Excessive coarse fragment content below 10 inches[3]
JK	gravelly silt loam	29-62	<5 feet	40-50	0.7-7.7	<0.50	<0.50	4.4 to 5.3	Suitable, questionable below 27 inches	Low organic matter content below 17 inches[2] and Selenium content below 27 inches.
LDR	loam	<5	1.33 feet	0-8	13.5	0.68	0.26	6.9	Questionable	Water table below 16 to 24 inches[4]
UDR	gravelly loam	26-28 (>80% at 35")	<5 feet	15-25	2.6-6.6	<0.50	<0.25	4.5 to 5.3	Suitable	Excessive coarse fragment content below 35 inches[3]
Dis	disturbed area	--	--	--	--	--	--	--	N/A	Disturbance areas

Table 3.4-3, continued.

Map Unit	Physical Considerations				Analytical Considerations (production potential)				Suitability Rating Based on Selenium Concentrations[1]	Topsoil Suitability Limitations
	USDA Soil Texture	Coarse Fragment Content % (by volume)	Depth to Water Table	Slope %	Organic Matter % (Range in profile)	Salinity (EC=mmhos/cm)	Sodium Adsorption Ratio (SAR)	Reaction (pH) Through Soil Profile		
FR-CP Complex										
FR	very gravelly loam complex	45-80+	<5 feet	10-55	1.3-10.7	0.52	<0.25	5.2 to 5.6	Suitable	Excessive coarse fragment content below 10 inches[3]
FR-CC Complex										
FR	very gravelly loam complex	45-80+	<5 feet	10-55	1.3-10.7	0.52	<0.25	5.2 to 5.6	Suitable	Excessive coarse fragment content below 10 inches[3]
CC	gravelly loam complex	21-51	<5 feet	45-55	1.2-4.0	<0.50	<0.25	5.4 to 6.9	Suitable	Excessive coarse fragment content below 22 inches[3]
ST-RO Complex										
ST	extremely gravelly loam complex	56	<5 feet	45-55	9.9	0.66	0.06	6.5	Suitable	Fractured bedrock below 8 inches
RO	rock outcrop complex	--	--	--	0	--	--	--	N/A	Rock outcrop
RO-CP-EC Complex										
RO	rock outcrop complex	--	--	--	0	--	--	--	N/A	Rock outcrop

Table 3.4-3, continued.

Map Unit	Physical Considerations				Analytical Consideration (production potential)				Suitability Rating Based on Selenium Concentrations[1]	Topsoil Suitability Limitations
	USDA Soil Texture	Coarse Fragment Content % (by volume)	Depth to Water Table	Slope %	Organic Matter % (Range in profile)	Salinity (EC=mmhos/cm)	Sodium Adsorption Ratio (SAR)	Reaction (pH) Through Soil Profile		
CP	gravelly loam complex	24-42	<5 feet	35-45	0.3-5.5	<0.25	<0.50	4.8 to 7.0	Questionable	Excessive coarse fragment content below 26 inches[3]
EC	gravelly loam	21-43	<5 feet	10-20	0.8-7.1	<0.50	<0.50	5.3 to 5.6	Suitable	
RO-CP Complex										
RO	rock outcrop complex	--	--	--	0	--	--	--	N/A	Rock outcrop
CP	gravelly loam complex	24-42	<5 feet	35-45	0.3-5.5	<0.25	<0.50	4.8 to 7.0	Questionable	Excessive coarse fragment content below 26 inches[3]
CP-RO Complex										
CP	gravelly loam complex	24-42	<5 feet	35-45	0.3-5.5	<0.25	<0.50	4.8 to 7.0	Questionable	Excessive coarse fragment content below 26 inches[3]
RO	rock outcrop complex	--	--	--	0	--	--	--	N/A	Rock outcrop

Source: Maxim, 2001b

[1] Recommendation of Se concentration as determined by Reclamation Design Considerations, Selenium Monitoring Measures, *Interim Selenium Soil/Vegetation Guidelines and Standards,* USFS

[2] Indicates low fertility.

[3] Equipment restrictions and low fertility.

[4] Equipment restrictions.

Table 3.4-4 Suitable and Marginally Suitable Soils in the Project Area

Map Unit	Suitable Topsoil/Growth Medium		Marginally Suitable Topsoil/Growth Medium		Acres within Project Area	Topsoil/Growth Medium Volume (cubic yards)
	Average Depth (inches)	Constraints	Average Depth (inches) and horizon depths	Constraints		
EC	32	Low organic matter content below 32 inches	28 (32-60)	No data below 60 inches	134.50	1,084,966.60
ECS	0	Selenium content	0-60	Selenium content	5.18	41,785.25
FR	0	Excessive coarse fragment content	12 (0-12)	Excessive coarse fragment content	68.38	110,319.73
JK	17	Low organic matter content below 17 inches. Selenium below 27 inches.	0	Excessive coarse fragment content and selenium	82.33	188,612.54
LDR	0	Selenium	24 (0-24)	Water table	1.14	3,678.40
UDR	35	Excessive coarse fragment content below 35 inches	0	--	10.92	51,384.66
Dis	0	Disturbance area	0	N/A	2.15	0
FR-CP Complex					214.85	409,710.33
FR	0	Excessive coarse fragment content	12 (0-12)	Excessive coarse fragment content		
CP	0	Selenium	22 (0-22)*	--		
FR-CC Complex					61.72	88,024.24
FR	0	Excessive coarse fragment content	12 (0-12)	Excessive coarse fragment content		
CC	12	Excessive coarse fragment content below 12 inches	14 (12-26)	Excessive coarse fragment content		

Table 3.4-4, continued.

Map Unit	Suitable Topsoil/Growth Medium		Marginally Suitable Topsoil/Growth Medium		Acres within Project Area	Topsoil/Growth Medium Volume (cubic yards)
	Average Depth (inches)	Constraints	Average Depth (inches) and horizon depths	Constraints		
ST-RO Complex					112.46	66,526.33
ST	8	Fractured bedrock below 8 inches	0	--		
RO	0	Rock outcrop	0	--		
RO-CP-EC Complex					21.84	45,770.52
RO	0	Rock outcrop	0	--		
CP	0	Selenium	22 (0-22)*	Excessive coarse fragment content		
EC	32	Low organic matter content below 32 inches	28 (32-60)	No data below 60 inches		
RO-CP Complex					16.16	21,469.85
RO	0	Rock outcrop	0	--		
CP	0	Selenium	22 (0-22)*	Excessive coarse fragment content		
CP-RO Complex					21.27	40,818.40
CP	0	Selenium	22 (0-22)*	Excessive coarse fragment content		
RO	0	Rock outcrop	0	--		
TOTALS					**752.90**	**2,101,733.5**

Source: Maxim, 2001b

*Sample Site SS-7 (CP map unit) has elevated selenium.

Table 3.4-5 Erosion Potential and Hydrologic Characteristics of Soils in the Project Area

Soil Type	Permeability	Drainage Class	Surface Runoff Class[1]	Wind Erodibility [2]	Coarse Fragment Content (% volume)	K Factor Associated with Coarse Fragment [3]	Available Water Holding Capacity	Erosion Hazard [4]
EC	moderate	well	low-moderate	slight	9 to 29%	moderate to high	moderate-high	high
ECS	moderate	well	low-moderate	slight	20 to >43%	low to moderate	moderate-high	high
FR	moderately slow	well	moderate-high	slight	45 to >80%	low	moderate-high	high
JK	moderately slow	well	high-very high	slight	17 to >80%	moderate	moderate-high	high
LDR	moderate	poor	low-moderate	slight	<5%	low	moderate	slight
UDR	moderately slow	well	moderate-high	slight	26 to >28%	low to moderate	moderate-high	high
FR-CP Complex								
FR	moderately slow	well	moderate-high	slight	35 to 65%	low to moderate	moderate-high	high
CP	moderate	well	moderate-high	slight	24 to 42%	low to moderate	moderate-high	high
FR-CC Complex								
FR	moderately slow	well	moderate-high	slight	11 to 30%	low to moderate	moderate-high	high
CC	moderate	well	high	slight	21 to >70%	moderate	moderate	high
ST-RO Complex								
ST	moderately rapid	well	high	slight	56%	low to moderate	very low	high
RO	--	--	--	--	--	--	--	--
RO-CP-EC Complex								
RO	--	--	--	--	--	--	--	--
CP	moderate	well	moderate-high	slight	3 to 25%	low to moderate	moderate-high	high

Table 3.4-5, continued.

Soil Type	Permeability	Drainage Class	Surface Runoff Class[1]	Wind Erodibility [2]	Coarse Fragment Content (% volume)	K Factor Associated with Coarse Fragment [3]	Available Water Holding Capacity	Erosion Hazard [4]
EC	moderate	well	low-moderate	slight	0 to 5%	moderate	moderate-high	high
RO-CP Complex								
RO	--	--	--	--	--	--	--	--
CP	moderate	well	moderate-high	slight	50 to 60%	low to moderate	moderate-high	high
CP-RO Complex								
CP	moderate	well	moderate-high	slight	50 to 60%	low to moderate	moderate-high	high
RO	--	--	--	--	--	--	--	--

Source: Maxim, 2001b [1] Surface Runoff Class (H=high, M=moderate, L=low) [2] Wind Erodibility Group (WEG) rating
[3] Relative index of susceptibility to water erosion (0.25=low, 0.25 to 0.40=moderate, >0.40=high) [4] Hazard rating for a disturbed, unvegetated soil.

Available water capacity (AWC) is the volume of water that should be available to plants if the soil, inclusive of coarse fragments, were at field capacity (USDA, 1993; 1998). It is commonly estimated as the amount of water held between field capacity and wilting point, with corrections for salinity, fragments, and rooting depth. This is an important soil property in developing water budgets, predicting droughtiness, designing and operating irrigation systems, designing drainage systems, protecting water resources, and predicting yields (USDA, 1999a). Depending on their abundance and porosity, rock and pararock fragments reduce AWC. Soils high in organic matter have higher AWC than soils low in organic matter if the other properties are the same.

Drainage class identifies the natural drainage condition of the soil. It refers to the frequency and duration of wet periods (USDA, 1999a). Soils in the project area are generally well drained which indicates that water is removed from the soil readily but not rapidly. Internal free water occurrence commonly is deep or very deep; annual duration is not specified. Wetness does not inhibit growth of roots for significant periods during most growing seasons. The soils are mainly free of the redoximorphic features that are related to wetness (USDA, 1993). Redoximorphic features are color patterns in a soil due to depletion or concentration of pigment compared to the matrix color formed by the oxidation/reduction of iron and/or manganese (Schoenberger et al., 1998). These localized zones of enhanced or depleted pigmentation indicate a change in the iron/manganese minerals related to the wetness of the soil. The LDR map unit is poorly drained indicating water is removed so slowly that the soil is wet at shallow depths periodically during the growing season or remains wet for long periods. This is commonly the result of low or very low saturated hydraulic conductivity, nearly continuous rainfall, or a combination of these. The LDR soil has been characterized as a wetland soil (Lott, 2000).

Soil permeability is the quality of the soil that enables water or air to move through it. Historically, soil surveys have used permeability coefficient or permeability as a term for saturated hydraulic conductivity (USDA, 1998). The soil properties that affect permeability are distribution of pore sizes and pore shapes. Texture, structure, pore size, and density are properties used to estimate permeability since the pore geometry of a soil is not readily observable or measurable (USDA, 1998).

Surface runoff class refers to the loss of water from an area by flow over the land surface. The estimation of the amount of runoff is important to the hydrologic models in assessing the stream flow and water storage (USDA, 1998). The surface runoff class designation utilizes a combination of surface slope and the permeability of the soil, and assume a bare soil surface and low surface water retention due to irregularities in the ground surface.

3.4.5 Selenium and Trace Elements

Selenium has been identified as a concern in southeastern Idaho, especially in areas where phosphate mining activities have caused surface disturbance. Selenium is essential to most forms of life in small quantities but harmful to some animals at larger doses. It is often added as a supplement to the diet of domestic animals (Haws and Möller, 1997). Because selenium in soil and water is concentrated by plants, animals consuming a constant diet of contaminated plants can be exposed to high levels of selenium. These selenium levels have the potential to exceed concentrations considered hazardous to livestock. Both deficient and toxic levels of selenium cause similar effects, including reproductive depression, anemia, weight loss, and immune dysfunction (Koller and Exon, 1986 as cited in Skorupa,

1998). Similar toxic effects could occur in terrestrial wildlife, although the pathology is not as well understood.

The range of naturally occurring selenium concentrations in soils of the western United States is <0.1 to 4.3 mg/kg and the mean concentration is 0.23 mg/kg (Shacklette and Boerngen, 1984). Selenium is considered a metalloid, possessing both metallic and non-metallic properties, and can exist in an amorphous state or in any of three crystalline forms (Haws and Möller, 1997). It exists in four oxidation states including selenate (Se^{+6}), selenite (Se^{+4}), elemental selenium (Se^{0}), and selenide (Se^{-2}). Elemental selenium is present in minute amounts and selenides are typically associated with sulfides and are largely insoluble (Haws and Möller, 1997).
Selenite and selenate are produced by chemical oxidation and soil microorganisms from less soluble forms of selenium. These forms are highly soluble in alkaline soils, thus facilitating uptake of selenium by certain plants. Dissolved selenites are present in aqueous solutions at pH 3.5 to pH 9, though selenites are readily reduced to elemental selenium at pH values less than 7.0 (Bodek et al., 1988 as cited in Haws and Möller, 1997). Selenate is generally the more toxic form in soils, since selenite is adsorbed to hydrous metal oxides and is generally unavailable for plant uptake (Mayland et al., 1991). The major form of selenium found in well aerated alkaline soils is selenate, whereas selenite predominates in acidic and neutral soils (Mayland et al., 1991). Bauer (1997) also indicates that when selenium occurs in alkaline soils and becomes oxidized to selenate, the selenium becomes water soluble. The conversion of selenate to selenite and elemental selenium is very slow and appears to be kinetically inhibited (Bodek et al., 1988 as cited in Haws and Möller, 1997). Because they are easily leached from the soil, selenates are also easily available to plants and are the form most readily assimilated by plants. Consequently, selenate is the selenium species of greatest concern in soils for its possible deleterious effect on the environment (Herring, 1990).

Selenium enters the soil profile through the weathering of selenium-rich rocks. Studies conducted on Phosphoria Formation strata in southeast Idaho have shown selenium concentrations in this unit ranging from <20 to 360 mg/kg (Desborough et al., 1999). Water and wind erosion and sedimentation processes distribute these particles and deposit them into topsoil. Selenium moves through the soil until adsorbed on metal hydroxides, or organic particles.

Selenium mobility in soils is favored by alkaline pH, high selenium concentrations, oxidizing conditions, and high concentrations of other strongly adsorbed anions. Selenates are significantly more stable and soluble than selenites, especially in alkaline environments (Haws and Möller, 1997). Adsorption is influenced positively by low pH organic carbon, hydrous oxides, calcium carbonate, and cation exchange capacity, and negatively influenced by high salt, alkalinity, and high pH. Sorption of both selenite and selenate decreases with increasing pH (Munkers, 2000). Studies conducted by Mayland (1991) indicate that sorption of selenite by soil shows some analogies to the sorption of phosphate, whereas the sorption of selenate is closer to that of sulfate. Some soil anions, such as phosphate, increase plant selenium uptake because increased soil-solution anion concentrations compete with selenium anions for adsorption sites on soil particles. Other anions, such as sulfate, actually inhibit uptake by affecting plant metabolism. The antagonistic effect of selenium and sulfate can reduce selenium availability. For example, Mayland (1991) shows that the addition of lime to soils containing sulfur often mobilizes selenium by precipitating the sulfate ion. This results in greater selenium uptake by vegetation. Mayland, et al. (1991), cited Ylaranta (1983) who found selenate was reduced by added organic matter (peat) and

subsequently rendered immobile by adsorption onto clay. Munkers (2000) reviewed literature showing that selenium reducing bacteria can reduce soluble, oxidized forms to insoluble forms.

University of Idaho researchers (Bond, 2000; Munkers, 2000; and Munkers et al., 2000) found selenium in center waste shales of the Smoky Canyon Mine was present in seleno-pyrite and elemental selenium. The extractable (water soluble) selenium content was about 2 percent of the total selenium content and was present as selenite. They conducted laboratory and field plot studies of amending seleniferous phosphate mine overburden with sulfate reducing bacteria, zero-valent iron, potato starch, and cheese whey to reduce extractable selenium concentrations. All these treatments reduced extractable selenium concentrations and the greatest reductions were produced by amending with combinations of cheese whey, potato waste and iron granules.
Skorupa (1998) indicates that the presence of selenium in geologic formations does not mean it is present in toxic amounts in the soils derived from these strata. Herring (1990) states that an important consideration of selenium behavior in soils is of assimilation and availability. The most important observation is that neither assimilation or availability of the element necessarily correspond to its soil concentration. An example cited in Herring (1990) indicated that in the case of acidic soils that contain an abundance of iron, iron selenite compounds or complexes form and these are sufficiently insoluble to reduce the bioavailability of the selenium. Thus acidic soils favor the more reduced, complexed forms of selenium, such as ferric selenite, which are not readily available to plants. Oxidation by chemical and bacterial processes in alkaline soils favors the existence of selenate compounds of complexes, and these are soluble and readily assimilable by plants (Herring, 1990). The basic objective in selectively handling and reclaiming phosphate overburden would be to reduce exposure of seleniferous material to weathering and natural transport influences in order to minimize the mobilization of selenium to the environment.

Naturally occurring selenium concentrations in soil vary greatly depending on the profile location. The total concentration of selenium in soils does not directly determine the concentration of available selenium in the plants growing on those soils (Lakin, 1972 as cited in Bauer, 1997; Fisher, 1991). USFS and BLM presently consider soil/growth medium containing total selenium concentrations greater than 1.0 mg/kg as questionable for use in reclamation. Soils having extractable selenium concentrations greater than 0.1 mg/kg are currently considered not suitable and are not recommended for use in reclamation (BLM and USFS, 2000b). Laboratory analyses of the soil samples collected in the project area indicate the total selenium concentrations were generally less than 1.0 mg/kg at all sample locations (Maxim, 2001b), with the following exceptions:

- Map unit ECS at sample site SS-5 showed total selenium concentrations of 5 to 8 mg/kg;
- Map unit CP showed total selenium concentrations of 3 to 5 mg/kg at site SS-7. All other sample sites within the CP map units were analyzed at less than 1mg/kg;
- Map unit LDR at sample site SS-10 indicated total selenium concentration of 2 mg/kg; and
- Map unit JK at sample site SS-3 indicated total selenium concentrations of 4 mg/kg below 27 inches.

Extractable selenium concentrations were less than 0.1 mg/kg in all samples, indicating that the hazard for excessive selenium uptake in vegetation in undisturbed soil is low. Extractable selenium is determined by laboratory methods identified in SW-846, "Test Methods for Evaluating Solid Waste", 3rd Edition, Updates I through III (Maxim, 2001b). This method has been developed and used to identify the

portion of the total selenium content that is water extractable and, therefore, potentially available for plant uptake.

Interim soil guidelines for selenium concentrations in soil salvaged for reclamation have been developed for phosphate mining operations (BLM and USFS, 2000b). Implementation of these interim guidelines for soil salvage and use as growth medium could reduce the amount of selenium available for uptake by plants.

The interim selenium guidelines for soil suitability consist of the following:

- USFS and BLM recommend that soil or growth medium suitable for use in post-mining reclamation contains no more than 1.0 mg/kg total selenium and no more than 0.1 mg/kg extractable selenium (Saturated Paste Extraction - modified from USDA Agricultural Handbook 60, or approved equivalent).

- USFS and BLM presently consider soil/growth medium containing between 1.0 mg/kg and 5.0 mg/kg as questionable for use in reclamation. Use of questionable soil/growth medium would require agency-approved sampling and analysis for extractable selenium prior and following distribution of soil to demonstrate to agency satisfaction that the growth medium is suitable for achieving vegetation selenium standards. These methods can include test plots to determine criteria for soil salvage and application.

- Soil/growth medium containing greater than 5.0 mg/kg total selenium and greater than 0.1 mg/kg extractable selenium is presently considered unsuitable for reclamation purposes.

- For all sampling conducted, USFS and BLM recommend that samples be representative and that sampling be done in accordance with recognized best practices for sample collection, laboratory practices, sample preservation, and sample analysis procedures.

No USFS/BLM soils guidelines or recommendations have been created for other trace elements regarding their suitability in reclamation use similar to the selenium guidelines. Maxim (2001b) has conducted laboratory analyses, summarized in **Table 3.4-6**, on a number of constituents for the soil mapping units within the project area.

Table 3.4-6 Maximum Selenium and Trace Element Concentrations for Soils within the Project Area

Soil Type	Analysis Results - Total (mg/kg)[1]								Analysis Results - Extractable (mg/kg)[1]									
	Cd	Cu	Mn	Mo	Ni	Se	V	Zn	Al	Cd	Cr	Cu	Fe	Pb	Mn	Ni	Se	Zn
EC	16	28	1,230	<10	40	<1	70	348	--	0.0026	--	0.093	--	--	1.20	<0.01	<0.003	0.075
ECS	65	94	463	28	200	8	551	728	106	0.246	6.76	0.64	26.4	0.36	2.08	0.8	<0.1	7.6
FR	11	15	2,500	<10	40	1.0	38	264	78	<0.01	0.18	0.06	21.2	0.08	5.18	<0.4	<0.1	3.6
JK	<2	23	1,180	3	55	4	32	135	112	0.014	1.36	0.24	25.0	0.1	3.5	<0.4	<0.1	5.8
LDR	4	21	2,650	<2	34	2	40	194	118	0.01	0.3	1.0	39.2	0.1	5.1	<0.4	<0.1	2.4
UDR	19	30	4,430	<10	70	<1	51	408	100	<0.01	0.16	0.16	34.0	0.12	8.2	<0.4	<0.1	5.2
CP	56	92	3,510	15	204	5	416	1,080	92	0.392	4.86	1.0	41	0.1	2.18	1.2	<0.1	10.8
ST	5	24	1,230	<10	35	<1	31	223	48	0.032	0.3	0.12	13.6	<0.06	2.34	<0.4	<0.1	2.0
CC	<2	23	4,160	<2	26	<1	28	74	106	<0.01	0.14	0.10	29.8	0.08	12.9	<0.4	<0.1	3.6

Source: Maxim, 2001b.

[1] Maximum value reported at any sample site, in any single soil horizon.

— indicates value not reported.

< indicates nonspecific value below detection limit.

Note: Extractable values for Mo and V are only available for soil map units EC, CP, FR, ST, and UDR. Analyzed Molybdenum values range from <0.004 to <0.006 mg/kg and Vanadium values range from <0.02 to <0.03 mg/kg for all of the analyzed map units. Map units CP and EC had the highest values (<0.006 and <0.03 mg/kg) for both elements.

Note: Normal or background concentrations for metals tested in soils in the western U.S. are as follows:

Al	10,000 - 300,000 mg/kg	Mn	380 mg/kg
Cd	3 mg/kg	Mo	1-2 mg/kg
Cr	41 mg/kg	Ni	4-80 mg/kg
Cu	21 mg/kg	V	70 mg/kg
Pb	17 mg/kg	Zn	50-150 mg/kg
Se	range <0.1-4.3 mg/kg, mean 0.23 mg/kg		

3.5 Vegetation

Vegetation in the project area was previously described in the Draft Environmental Impact Statement (EIS), Smoky Canyon Phosphate Mine (USFS, 1981). The Draft EIS concluded that the vegetation types affected by the proposed project are common in the region and no loss of unique habitats would result (USFS, 1981). The recently completed baseline study identified seven general vegetation types in the study area: aspen, conifer, aspen/conifer, mixed shrub, sagebrush, disturbed, and riparian/wetland (Maxim, 2000d). **Table 3.5-1** shows the principal species found in each of these vegetation communities. **Figure 3.5-1** is a map of the different vegetation communities in the project area.

Table 3.5-1 Vegetation Communities and Principal Plant Species

Community Type	Scientific Name	Common Name
Conifer	*Abies lasiocarpa*	subalpine fir
Conifer	*Picea engelmannii*	Engelmann spruce
Conifer	*Pinus contorta*	lodgepole pine
Conifer	*Pseudotsuga menziesii*	Douglas-fir
Aspen	*Populus tremuloides*	quaking aspen
Mixed Shrub	*Amelanchier alnifolia*	serviceberry
Mixed Shrub	*Artemisia tripartita*	three-tip sagebrush
Mixed Shrub	*Ceanothus velutinus*	sticky-laurel
Mixed Shrub	*Prunus virginiana*	common chokecherry
Sagebrush	*Artemisia tridentata*	mountain big sagebrush
Sagebrush	*Purshia tridentata*	antelope bitterbrush
Sagebrush	*Symphoricarpos oreophilus*	mountain snowberry
Disturbed	None	None
Riparian/Wetland	*Carex* spp.	Sedges
Riparian/Wetland	*Salix boothii*	Booth's willow
Riparian/Wetland	*Salix drummondii*	Drummond's willow
Riparian/Wetland	*Salix wolfii*	Wolf's willow

Source: Maxim, 2000d

Conifer forest canopy coverage tended to be greater on north- and west-facing slopes. The Englemann spruce component is less common than pine and fir trees and this species was generally found in shaded areas of Smoky Canyon. The understory on north- and west-facing slopes was composed of pinegrass (*Calamagrostis rubescens*), elk sedge (*Carex geyeri*), wild strawberry (*Fragaria virginiana*), and meadowrue (*Thalictrum occidentalis*). Coniferous forests on east-facing slopes had more openings and the understory included sticky geranium (*Geranium viscossimum*), silvery lupine (*Lupinus argenteus*), mountain snowberry (*Symphoricarpos oreophilus*), and pinegrass (Maxim, 2000d).

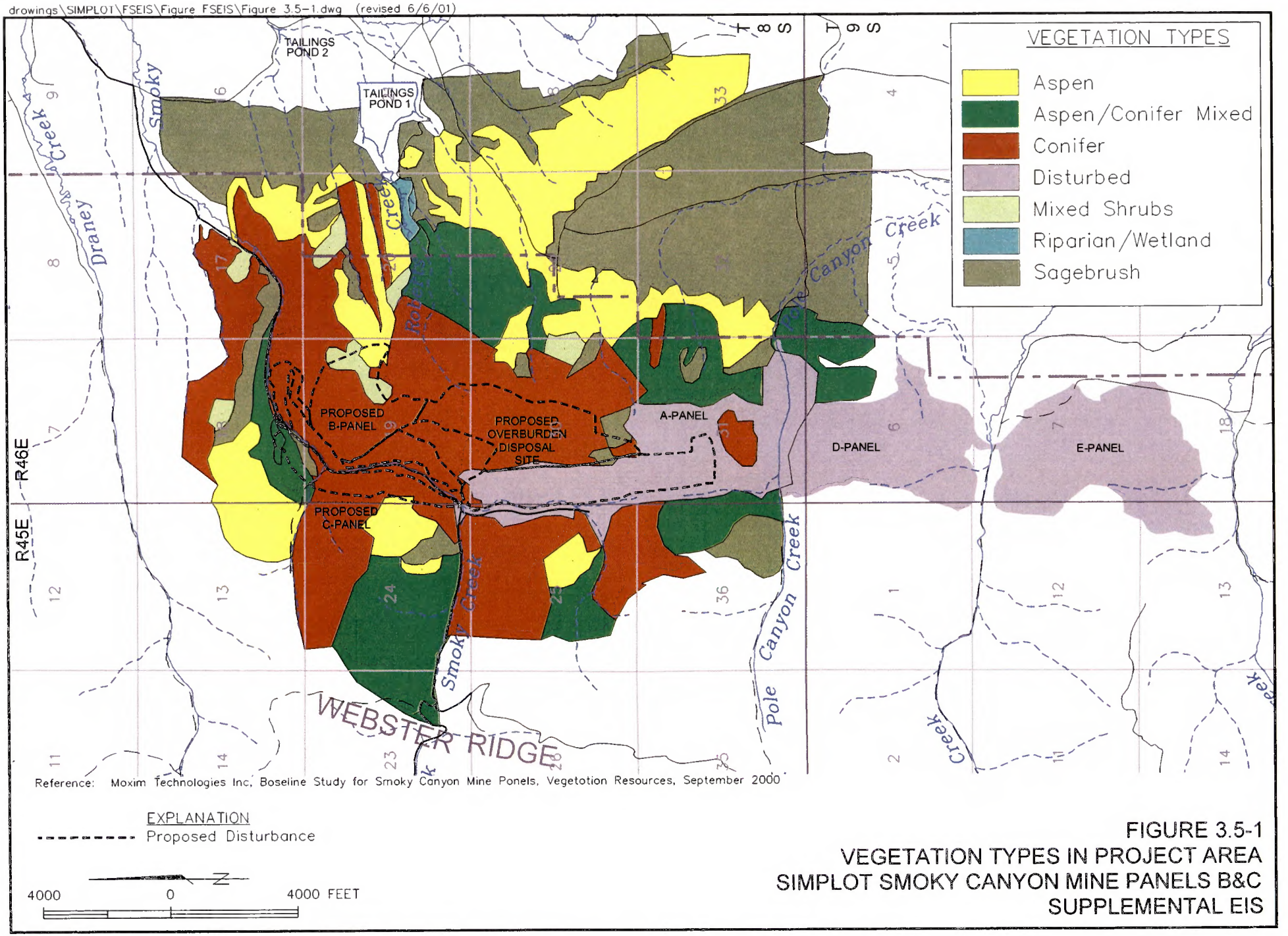


FIGURE 3.5-1
VEGETATION TYPES IN PROJECT AREA
SIMPLOT SMOKY CANYON MINE PANELS B&C
SUPPLEMENTAL EIS

Aspen cover was most commonly located on east- and southeast-facing slopes at lower elevations than conifer forest. The aspen cover type included occasional Douglas-fir trees and the understory was made up of mountain snowberry, sticky geranium, silvery lupine, Kentucky bluegrass (*Poa pratensis*), and Indian paintbrush (*Castelleja miniata*). Aspen tree stands were predominantly closed canopy forests of large mature trees (Maxim, 2000d).

The mixed aspen/conifer cover type was most often found on east- and southeast-facing slopes and tended to occur in a mosaic with aspen forest and conifer forest cover types. The Maxim (2000d) baseline study observed that many of these stands appeared to shifting from dominance by aspen to dominance by conifers (Maxim, 2000d).

Mixed shrub cover was found in forest openings and on rocky areas. Forbs and grasses were often found along with the shrub component. Shrub-associated species listed in the Maxim (2000d) baseline report include Wyeth buckwheat (*Eriogonum herecleoides*), arrow leaf balsamroot (*Balsamorhiza sagittata*), heart-leaf arnica (*Arnica cordifolia*), capitate sandwort (*Arenaria congesta*), bluebunch wheatgrass (*Agropyron spicatum*), Idaho fescue (*Festuca idahoensis)*, and oniongrass (*Melica bulbosa*).

The sagebrush cover type was typically found on lower elevations and on south-facing slopes. Mountain big sagebrush (*Artemisia tridentata*) was the most common species with mountain snowberry and antelope bitterbrush (*Purshia tridentata*) appearing at higher elevations. Other grass and forb species found in this cover type are arrowleaf balsamroot, silky lupine (*Lupinus sericeus*), bluebunch wheatgrass, Kentucky bluegrass, and western needlegrass (*Stipa occidentalis*) (Maxim, 2000d).

A total of approximately 2.4 acres of riverine-forested, riverine-shrub, and riverine-herbaceous wetlands were identified by the baseline study along Smoky Creek. A small slope-shrub wetland was identified at a developed spring on an intermittent tributary to Smoky Creek (Maxim, 2000d). Wetlands in the project area are discussed in Section 3.6.

Vegetation sampling was conducted by Maxim Technologies, Inc. (2000d) in conjunction with soil sampling on July 26, 27, and 28, 2000. Sample sites were located in areas that soil and water resource specialists had identified to have potential for selenium and other contaminant transport via surface or subsurface flow (Maxim, 2000d). A total of ten sample locations were established with a minimum of five sampling quadrats placed in each. One sample location was placed in a riparian area and nine were placed in upland or forested areas.

General sampling procedures and vegetation sample collection was performed by Maxim (2000d) in accordance with the Selenium Subcommittee's Field Sampling Plan - 1998 Regional Investigation (Montgomery Watson, 1998). A minimum of 100 grams of herbaceous plant tissue was collected at each sample location. Plant material was separated into forbs and grass samples, and the species collected were identified (Maxim, 2000d). All vegetation samples were analyzed for concentrations of cadmium, copper, manganese, molybdenum, nickel, selenium, vanadium, and zinc.

Mean concentrations of all elements were within the deficient or sufficient range for plant growth except cadmium (**Tables 3.5-2 and 3.5-3**). Maxim's analysis concluded that the mean concentration for cadmium was outside the sufficient range (0.05-0.2 mg/kg) but not within the toxic range (5-30 mg/kg). The detection limit for laboratory analysis of cadmium is 1 mg/kg, which is higher than the suggested sufficient range. An estimate of the mean cadmium in the sample sites was made by using one half the

detection limit (0.5 mg/kg) when samples were recorded as below 1 mg/kg. Therefore, the mean cadmium concentration is merely an estimate and not a true mean. Both selenium and vanadium had non-detectable concentrations in the plant tissue and therefore may be either in the deficient or sufficient range (Maxim, 2000d). Mean concentrations of copper, manganese, molybdenum, nickel, and zinc were within the sufficient range.

Table 3.5-2 Mean Concentrations (with standard deviation) of Elements for all Samples and Grasses and Forbs Individually (Dry weight, mg/kg)

Sample	Element							
	Cd	Cu	Mn	Mo	Ni	Se	V	Zn
Grass and Forb	0.55 ±0.16	5.05 ±4.11	102.90 ±70.63	1.35 ±0.88	3.05 ±2.42	ND	ND	54.90 ±20.35
Grass	0.55 ±0.16	4.9 ±5.72	113.6 ±71.03	2.4 ±1.43	2.3 ±1.42	ND	ND	55.2 ±20.28
Forb	0.55 ±0.16	5.2 ±1.69	92.2 ±72.32	1.2 ±0.63	3.8 ±3.01	ND	ND	54.6 ±21.52

From: Maxim, 2000d
ND = element was not detected in any sample

Table 3.5-3 Generalized Concentrations of Elements in Plant Tissue that are Considered Deficient, Sufficient, and Toxic for Plant Growth (Dry wight, mg/kg)

Element	Deficient Range	Sufficient Range	Toxic Range
Cadmium	--	0.05 - 0.2	5 - 30
Copper	2 - 5	5 - 30	20 - 100
Manganese	10 - 30	30 - 300	400 - 1000
Molybdenum	0.1 - 0.3	0.2 - 5	10 - 50
Nickel	--	0.1 - 5	10 - 100
Selenium	--	0.01 - 2	5 - 30
Vanadium	--	0.2 - 1.5	5 - 10
Zinc	10 - 20	27 - 150	100 - 400

From: Kabata and Pendias, 1992 as cited in Maxim, 2000d
"- -" no range exists for the element

Maxim (2000d) determined that grass and forb samples were generally similar in concentrations of trace elements (**Table 3.5-2**). Cadmium concentrations were the same for grass and forb samples with only one detectable reading for each (**Table 3.5-2**). Mean concentrations of copper and nickel were greater for forb than grass samples and concentrations of manganese, molybdenum, and zinc were higher for grass than forb samples (Maxim, 2000d).

Of the twenty vegetation samples collected, one grass sample contained a concentration of an element within the toxic range for plant growth. Sample SC-SS-10G had a concentration of 21 mg/kg of copper which falls within the range of 20-100 mg/kg suggested as toxic (Kabata-Pendias, 1992 as cited in Maxim, 2000d) (**Table 3.5-3**). Although the concentration for the sample is in the toxic range, there is some overlap in the ranges of sufficient and toxic concentrations (**Table 3.5-2**). The suggested ranges of deficient, sufficient, and toxic are based on generalized tolerances of a range of plant species.

Therefore, depending on the specific tolerance of the species collected, the cadmium concentrations may be within either range (Maxim, 2000d).

The remaining vegetation samples were not within the toxic range for any of the measured elements (Maxim, 2000d). Selenium and vanadium were not detectable in any of the samples. Cadmium was detected in only two samples with both recorded at 1 mg/kg. The mean cadmium concentration was estimated at 0.55 mg/kg and between the sufficient and toxic range. Copper ranged from 2 mg/kg to 21 mg/kg with a mean of 5.05 mg/kg and within the sufficient range. Manganese ranged from 16 mg/kg to 242 mg/kg with a mean of 102.9 mg/kg and was within the sufficient range. Molybdenum ranged from non-detectable concentrations (<2 mg/kg) to 4 mg/kg with an estimated mean of 1.35 mg/kg and in the sufficient range. Nickel concentrations ranged from non-detectable (<2 mg/kg) to 9 mg/kg with an estimated mean of 3.05 mg/kg.

The mean nickel concentration was within the sufficient range but three values (6, 8, and 9 mg/kg) were between the sufficient and toxic ranges. Zinc concentrations ranged from 28 mg/kg to 93 mg/kg with a mean of 54.9 mg/kg and all readings were within the sufficient range (Maxim, 2000d).

Corresponding soil samples depict the concentrations of elements found in soils beneath vegetation samples. Variations in the concentrations of cadmium, copper, molybdenum, selenium, vanadium, and zinc in soils were not consistently observed in the vegetation results (Maxim, 2000d). For example, high concentrations of copper were not consistently reflected as high concentrations of copper in the grass and forb samples. Elements that showed corresponding high values in both soil and vegetation samples were limited to manganese and nickel. High levels of manganese were observed in samples SC-SS-2, 4, 8, and 9 and were reflected in vegetation samples from those sites (Maxim, 2000d). High levels of nickel were found in samples SC-SS-5 and 7 which were also found in vegetation samples from the site (Maxim, 2000d). Because many of the samples had a high degree of species overlap, it is impossible to adequately determine the affinities or tolerances for specific elements by a particular plant species.

In general, plants sampled were often responsive to elevated levels of a given element but no sample indicated strong accumulation of any element and none of the species collected were known accumulators (Maxim, 2000d). Maxim (2000d) concluded that concentrations of metals in soils are not necessarily in an extractable form and therefore may not be available for plant uptake. The bioavailability of a given metal will affect the rate of plant uptake and may account for the variability observed in the vegetation sampling results. The baseline study identified no occurrences of the known primary selenium indicator plants found in lists compiled by Reeves and Baker (2000) and the Wyoming Department of Environmental Quality (WDEQ) (1997).

Noxious weeds, primarily musk thistle (*Carduus nutans*) and Canada thistle (*Cirsium arvense*), are established in the Pole Canyon grazing allotment which includes the project area. Leafy spurge (*Euphorbia esula*) is found near the allotment and presents a clear risk of establishment (Mickelsen, 2000b). The only noxious weeds identified in the baseline study, which encompassed only the project area, were Canada thistle and dyer's woad (*Isatis tinctoria*). **Table 3.5-4** shows the 34 species on the current Idaho State list of noxious weeds (NRCS, 1999).

Simplot's weed control program follows guidelines established by the USFS. The mine is inspected on a monthly basis and Simplot is notified by the USFS of any problems noted, including weed infestations. Simplot responds to these reports by treating the weed-infested areas with USFS approved chemicals

and procedures. Reclamation seed and erosion control material used on the site are certified weed-free and approved by the USFS.

Table 3.5-4 State of Idaho Noxious Weeds

Scientific Name	Common Name
Centaurea repens	Russian knapweed
Aegilops cylindrica	jointed goatgrass
Cardaria draba	whitetop
Carduus nutans	musk thistle
Centaurea maculosa	spotted knapweed
Centaurea pratensis	meadow knapweed
Centaurea diffusa	diffuse knapweed
Centaurea solstitialis	yellow starthistle
Chondrilla juncea	rush skeletonweed
Cirsium arvense	Canada thistle
Conium maculatum	poison hemlock
Convolvulus arvensis	field bindweed
Crupina vulgaris	common crupina
Cytisus scoparius	Scotch broom
Euphorbia dentata	toothed spurge
Euphorbia esula	leafy spurge
Hieracium aurantiacum	orange hawkweed
Hieracium pratense	yellow hawkweed
Hyoscyamus niger	henbane
Isatis tinctoria	dyer's woad
Lepidium latifolium	perennial pepperweed
Linaria dalmatica	Dalmatian toadflax
Linaria vulgaris	yellow toadflax
Lythrum salicaria	purple loosestrife
Milium vernale	milium
Nardus stricta	matgrass
Onopordum acanthium	Scotch thistle
Senecio jacobaea	tansy ragwort
Solanum elaeagnifolium	silverleaf nightshade
Solanum rostratum	buffalobur
Sonchus arvensis	perennial sowthistle
Sorghum halepense	johnsongrass
Tribulus terrestris	puncturevine
Zygophyllum fabago	Syrian beancaper

Source: NRCS, 1999

3.6 Wetlands

In the original Smoky Canyon Mine Draft EIS (USFS 1981), no wetlands were mapped within the Smoky Canyon project area. The 1981 EIS states that the mill site and ore stockpile would disturb approximately 1,000 to 1,500 feet of the South Fork of Smoky Creek (p. 5-26), and that this would result in the loss of a small amount of riparian habitat. The document states this section of the creek is intermittent, does not support a fishery, and is dry during most of the year (pp. 5-28 through 5-30). The document also notes that sediment catch dams would control runoff and prevent sedimentation to Smoky Creek and other streams in the project area (p. 5-29).

The baseline surveys conducted during 2000 indicate that a total of 2.4 acres of wetlands exist in the Smoky Creek drainage within the project area (**Figure 3.6-1**). As described in the 2000 wetland delineation report, Smoky Creek originates from springs about one mile above the southern boundary of the study area. Baseline data indicates that Smoky Creek appears to be perennial below these springs. The lower portion of the creek included in the study area includes both ephemeral and perennial reaches (Personal Communication, Walt Vering, Maxim Technologies, Inc.; Maxim, 2000b). During a site visit in June, 2000, Smoky Creek was ephemeral or intermittent from the area of the proposed northern haul road crossing to lower Smoky Spring.

The vegetation baseline data (Maxim, 2000d) indicates that wetlands in Smoky Canyon have been substantially affected by past human activities. Wetlands along the creek have been encroached upon by construction of the USFS road, a buried power line, tailings pipeline, and channelization of the creek. Fill placed along the natural floodplain of the creek prevents stream flows from meandering or overtopping the floodplain adjacent to the stream.

As shown in **Figure 3.6-1** and summarized in **Table 3.6-1**, wetlands along Smoky Creek include approximately 0.84 acres of riverine-forested wetland, 0.939 acres of riverine-shrub wetland, 0.609 acre of riverine-herbaceous wetland, 0.012 acres of slope-shrub wetland and approximately 0.066 acre of waters of the U.S. Based on mapping of wetlands along the creek (Maxim 2000d), the wetland at the upper crossing is of the riverine-forested type and the riverine-herbaceous type at the lower haul road crossing.

Table 3.6-1 Summary of Existing Wetlands in the Smoky Canyon Drainage

Wetland Type[1]	Acreage Present in Survey Area
Riverine-forested	0.840
Riverine-shrub	0.939
Riverine-herbaceous	0.609
Slope-shrub	0.012
Total Wetlands	2.40
Waters of the U.S.	0.066
Total Jurisdictional Area	2.466

[1] After Brinson, 1993

The riverine-forested wetland is located on Smoky Creek near the upstream end of the baseline survey area. As described in the baseline report (Maxim 2000d), this community includes a sparse overstory

of Englemann spruce (*Picea engelmannii*) with a dense shrub canopy composed of black twin-berry (*Lonicera involucrata*), Booth's willow (*Salix boothii*), Drummond's willow (*Salix drummondii*) and stinking currant (*Ribes hudsonianum*). The herbaceous stratum is dominated by common horsetail (*Equisetum arvense*), beaked sedge (*Carex utriculata*), broad-leaf bluebell (*Mertensia ciliata*), large-leaf avens (*Geum macrophyllum*), and baneberrry (*Actaea rubra*).

The riverine-shrub wetland occurs just downstream from the riverine-forested wetland, as well as near the spring located above the proposed C Panel (Sheep Spring), and in Smoky Canyon near the confluence of the tributary channel from this spring and Smoky Creek (**Figure 3.6-1**). This community is dominated by an overstory of Booth's and Drummond's willow, and includes scattered red-osier dogwood (*Cornus stolonifera*). The herbaceous community is composed primarily of beaked sedge, Nebraska sedge (*Carex nebrascensis*), aquatic sedge (*Carex aquatilis*), common horsetail, and tufted hairgrass (*Deschampsia cespitosa*).

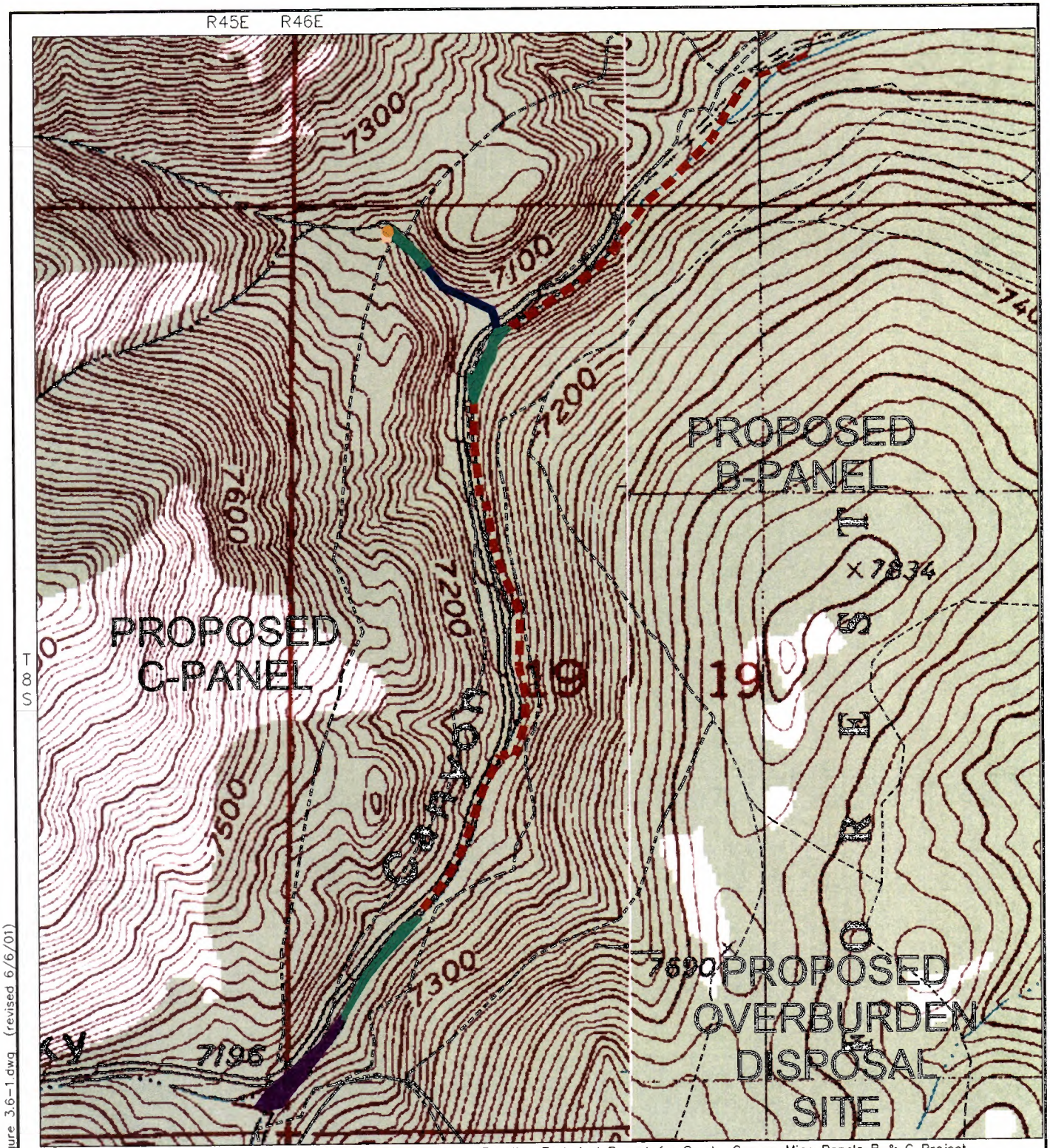
The riverine-herbaceous wetland occurs along much of the Smoky Creek channel where the floodplain is broader (Maxim 2000d). The riverine-herbaceous type is often interspersed with the riverine-shrub wetland type. Dominant species in this community include Nebraska sedge, aquatic sedge, beaked sedge, bluejoint reedgrass (*Calamagrostis canadensis*), broad-leaf bluebell, meadow foxtail (*Hordeum brachyantherum*) and common horsetail. Scattered willows, currant, and dogwood are also present in this community.

Finally, the slope-shrub wetland occurs at Sheep Spring just west of the proposed C Panel. Dominant species at this spring include stinking currant, black twinberry, Drummond's willow, baneberry, large-leaf avens, stinging nettle (*Urtica dioica*), brook saxifrage (*Saxifraga arguta*), willow-herb (*Epilobium glaberimum*), yellow monkey flower (*Mimulus guttatus*), and dagger-leaf rush (*Juncus ensifolius*).

Flow from Sheep Spring is piped to stock-watering troughs, and the spring is fenced to exclude livestock. A road crossing the drainage encroaches on this spring. This site supports a riverine-shrub community which extends for approximately 100 yards below the spring. Beyond this distance, surface flows become intermittent, and hydrophytic vegetation is lost. The channel remains defined, however, so was identified as a waters of the U.S. (Maxim 2000d).

As noted above, wetland functions and values were assessed using the methods developed for the Montana Department of Transportation. Under this methodology, wetlands can be rated as Category I, II, III or IV, with Category I wetlands considered the most important and valuable and Category IV applied to small, isolated wetlands lacking in vegetative diversity. All wetlands in the survey area were rated as Category III wetlands. Category III wetlands are more common, and generally less diverse, smaller, and more isolated than Category I or II sites. Category III wetlands can, however, provide many functions and values, although they may not be assigned high ratings for as many parameters as are Category I and II wetlands. Maxim's description of wetlands along Smoky Creek states that:

> In general, wetlands in the study are ranked high for sediment/shoreline stabilization and groundwater recharge/discharge. Most wetlands have well-developed plant communities that have deep, binding root masses that prevent streambank erosion and trap sediment during high-flow periods. Wetlands along Smoky Creek receive water from both springs and from precipitation runoff. During the drier summer months flows in Smoky Creek are maintained by discharge of shallow groundwater associated with the stream channel and from springs that discharge at the toe of slopes on the floodplain.



Reference: Moxim Technologies Inc., Droft Vegetotion Resources Baseline Technicol Report for Smoky Conyon Mine Panels B & C Project, Caibou County, Idoho, September 2000

EXPLANATION

- Proposed Mine Disturbance
- Existing Mine Disturbance

WETLAND TYPE (Widths not to scale)

- Riverine – Forested
- Riverine – Herbaceous
- Riverine – Shrub
- Slope – Shrub
- Waters of the U.S.

N

800 0 800

FIGURE 3.6-1
WETLAND DELINEATION
SIMPLOT SMOKY CANYON MINE PANELS B&C
SUPPLEMENTAL EIS

drawings\SIMPLOT\FSEIS\Figures FSEIS\Figure 3.6-1.dwg (revised 6/6/01)

Wetlands in the study area have moderate ratings for general wildlife habitat, sediment/nutrient/toxicant removal, and production export/food-chain support. Although wetlands in the study area are adjacent to a road with high traffic levels, wildlife habitat values are relatively high. Elk, moose, and deer often move through wetlands along Smoky Creek to more secure habitats farther from the road. The wetlands provide forage for wildlife as evident from browsed leaders of some shrubs. Ruffed grouse and Williamson's sapsuckers breed in the small patch of forested wetland along the stream. Although not observed in study area wetlands, amphibians such as leopard frog, chorus frog, western toad, boreal toad, and tiger salamander may breed in quiet pockets of water in wetlands.

Moderate ratings for sediment/nutrient/toxicant removal were derived largely because wetlands in the study area generally have well-developed plant communities that have a moderate capacity to retain and immobilize sediment, nutrients, and toxic materials that may enter the stream and wetlands. The reach of Smoky Creek in the study area is immediately adjacent to a road with traffic to and from the mine. The creek and associated wetlands are also downstream from a portion of the Smoky Canyon Mine, which increases the probability that sediment, nutrients, and toxicants may enter the stream. Sediment likely is introduced to the stream and active floodplain during snowplowing in winter and from dust generated by traffic. Oil and other petroleum products from vehicles may run into the stream. Nutrients and chemical elements may also run into the stream from the Smoky Canyon Mine.

Because of the relatively small area of wetlands along Smoky Creek, it is unlikely that the wetlands within the study area immobilize all sediment, nutrients, and toxicants that enter the creek. Beaver ponds, farther downstream, outside of the study area, probably immobilize sediments and other water-borne materials that are not captured by wetlands in the study area.

Wetlands in the study area were rated low for: habitat for threatened, endangered, or other special-status species; flood attenuation; surface water storage; uniqueness; and recreation/educational potential. No threatened, endangered, or other special-status species are known to use habitat in the study area. Habitat in riverine-herbaceous wetlands may be marginally suitable for the threatened plant, Ute Ladies'-tresses (*Spiranthes diluvialis*); however, field surveys conducted in August, 2000 did not find this species. Habitat is not suitable for other Federally listed species such as lynx, gray wolf, and bald eagle. The small size of the wetlands, past disturbances, and the high levels of human activity near the wetlands greatly reduce their potential habitat value for threatened, endangered or other special-status species.

Ratings for flood attenuation and surface water storage are low because of the small size of the wetlands. Most wetlands are confined to a narrow stream channel along a relatively high-gradient reach of Smoky Creek. Wetlands in the study area are also rated low for uniqueness and recreational/educational potential. The wetland types are common in the region. Recreation and educational potential are low because the wetlands are small, have had a history of disturbance, and are near a road with high traffic levels.

3.7 Wildlife Resources

The dominant habitat types within the project area and within the larger encompassing Cumulative Effects Area (**Figure 3.5-1**) are forested and sagebrush communities (Maxim, 2000d; ICFWRU, 2000; Homer, 1998) (**Table 3.7-1**). Forested areas are dominated by conifers ((e.g., Douglas-fir (*Pseudotsuga menziesii)*, lodgepole pine (*Pinus contorta*) and subalpine fir (*Abies lasiocarpa*)), quaking aspen (*Populus tremuloides*), and aspen/conifer mixtures. Sagebrush areas are dominated by mountain big sagebrush (*Artemisia tridentata vaseyana*) and various grasses. The area also contains wetlands, meadows, agricultural fields, and mixed brush communities. The majority of the meadow and agricultural field habitat is located in Sage Valley, south and east of the immediate project area. Wetland and riparian areas occur along Roberts and Smoky Creeks in the project area and along Tygee Creek to the east and north. These wetland and riparian areas provide important habitat for many wildlife species including amphibians and birds. The sagebrush communities occur within the valleys and on the lower south facing slopes. The higher elevation slopes and ridges are comprised of pockets of mixed brush, aspen stands, and intermixed coniferous forest. These various habitat types provide food, water, cover, and space for a variety of ungulates, raptors, game birds, small mammals, song birds, predators, and other wildlife.

Table 3.7-1 Vegetation Types and Current Amount (acres) in the Greater Project Area and the Cumulative Effects Area

Vegetation Type	Project Area[1]	Baseline Survey Area[2]	Cumulative Effects Area[3]
Agricultural	0	0	2,106
Aspen	14	1,384	4,700
Aspen/Conifer Mixed	13	1,208	1,939
Conifer	532	2,164	4,592
Disturbed	217	577	1,342
Mixed Shrubs	30	126	255
Riparian/Wetland	<1.0	21	514
Sagebrush	30	2,119	10,504
Water	0	0	560
Total	835	7,599	26,512

[1] Based on vegetation mapping by Maxim (Maxim, 2000d; Figure 7-1). Project Area equals the proposed Panels B and C and Overburden Disposal Site.

[2] Based on vegetation map created by Maxim (Maxim, 2000d; Figure 7-1). Baseline Survey Area includes the Maxim vegetation study boundary.

[3] Based on vegetation map created by Idaho Gap Analysis Project (ICFWRU, 2000; Homer, 1998)

3.7.1 Mammals

Several mammalian species are known or expected to occur within the project area. These species include several members of the rodent family; various bats; intermediately sized species such as skunks, coyotes, badgers, bobcats, cottontails, and jackrabbits; and large mammals including deer, elk, moose, black bear, and mountain lions. The Caribou-Targhee National Forest has identified the Rocky Mountain elk (*Cervus canadensis*) and the mule deer (*Odocoileus hemionus*) as Management Indicator Species of general forest health.

Big Game

Elk and mule deer are the two most highly visible and common large mammals that occur within the project area. Both species can be found within and around the immediate project area during spring, summer, and fall. During winter these species migrate to areas with less snow accumulation and greater forage availability. The Cumulative Effects Area currently contains approximately 6,200 acres of critical elk and deer winter range (IDFG, 2000b; Caribou National Forest, 2000). These areas are generally located on lower-elevation west- and south-facing slopes located over two miles to the east (Tygee Ridge and Buck Mountain) and to the south (between Manning, Deer, and Crow creeks) of the greater project area (**Figure 3.7-1**). The project area and areas of current and past mining activity (Panels A, D, and E) have been highly used by elk during the calving season, approximately May 25 through June 5. This use has decreased in recent years (IDFG, 2000b).

Regional studies conducted by the IDFG (Kuck, 1984) indicate that most elk in southeast Idaho tend to be nomadic but do not migrate long distances between summer and winter ranges. The mean year-round home range for elk was reported as 26 square miles, with a mean migration distance between summer and winter ranges of 4.1 miles. Unlike elk, mule deer migrate greater distances from winter and summer ranges and do not show specificity to particular ranges. Deer migrate through the Cumulative Effects Area during the fall months en route to winter range and during the spring months en route to summer range. However, no specific migratory corridors have been identified within the area. Monitoring studies conducted in 1979 and 1980 (Kvale, 1980) found that mule deer migrate north in the spring and cross in the vicinity of Smoky Canyon Mine. Concerns were expressed that future mine activities could thus adversely affect deer movement.

Optimum habitat for both deer and elk is determined by the amount, and spatial arrangement of cover and forage areas (Thomas et al., 1979). In general, elk and deer prefer edges between cover and forage areas. Large forage areas lacking sufficient adjacent cover are generally low-use areas. Foraging areas for elk and deer occur along unforested meadows, grasslands, and shrublands; on windswept ridges; and bottomlands near drainages bisecting Tygee Creek. Rubright (1980) monitored radio-collared deer and elk within the Smoky Canyon area. His work revealed that deer in this area tend to select conifer and sagebrush habitat types. In contrast, elk tend to prefer more closed canopied vegetation types, especially during the summer months, and tend to utilize aspen and riparian areas for forage, and aspen stands for calving activities.

Although the bottomland of Tygee Creek and Sage Valley provides excellent elk forage, portions of the unforested areas are occupied by mining related facilities or are too far from hiding cover to be optimal for foraging. In addition, the valley bottomland has a relatively high density of roads and agricultural fields. Many studies (Thomas et al., 1979; Lyon, 1983; and others) have shown that increased densities of open roads and levels of human activity reduce effectiveness of elk habitat. The density of open roads in the Cumulative Effects Area is about 0.70 miles of road per square mile of habitat (28.27 miles of open road / 40.54 square miles of habitat) (Caribou National Forest, 2000). At the same time, elk can become accustomed to vehicle traffic and other human activities, particularly in areas where hunting does not take place.

As a means of evaluating the potential effects of the proposed activity on elk habitat, an Elk Habitat Effectiveness Index (EHEI) was calculated for the Cumulative Effects Area and for a much smaller area defined by the boundaries of the vegetation map created by Maxim (2000d), hereafter referred to as the greater project area. This analysis produced an EHEI of 0.68 for the Cumulative Effects Area and 0.65 for the greater project area. Wisdom et al. (1986) categorized EHEI values as follows: Optimal (EHEI

= 1.9), Highly Viable (EHEI = 0.6 - 0.9), Viable (EHEI = 0.4 - 0.5), Marginal (EHEI = 0.2 - 0.3), and Possibly Non-Viable (EHEI = 0.05 - 0.1). Based on these values, current elk habitat in the area can be considered Highly Viable.

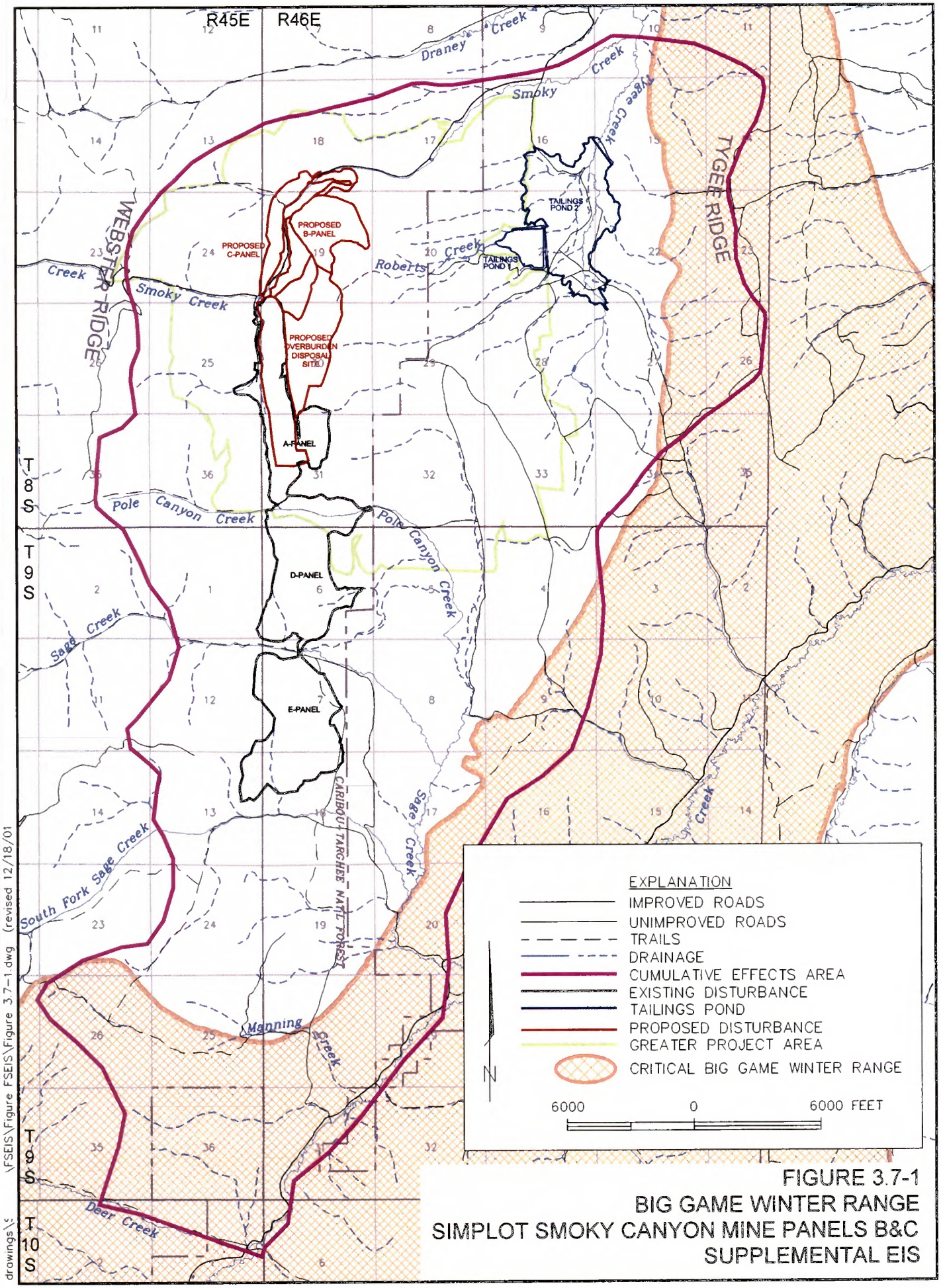
In terms of population numbers, IDFG periodically completes big game population surveys throughout the state. The proposed project area is located in IDFG Management Unit 76 which is bordered to the east by the Wyoming border, to the south by the Utah border, to the north by Highway 34, and approximately the city of Soda Springs to the west. The most recent elk population surveys conducted in Management Unit 76 were completed in 1992, 1995 (IDFG, 1999), and 1999 (IDFG, 2000a). IDFG reported elk numbers equaling 2,654, 3,213, and 3,301, respectively. The population of elk in the area appear to be increasing in numbers and are within the objective parameters defined by the IDFG (1999).

In regards to deer, the most recent population surveys within the same area were conducted in 1991 and 1994 (IDFG, 1999). Surveys identified 4,405 and 2,428 mule deer, respectively. The mule deer population is currently considered stable (IDFG, 1999).

In addition to deer and elk, moose (*Alces alces*) can also be found throughout the Cumulative Effects Area at any time of the year (IDGF, 2000b). During baseline data collection efforts, a cow and calf moose were seen within both the Smoky Creek and Roberts Creek drainages on several occasions. Several other individual moose were also seen in the area. Moose in the area do not concentrate in specific wintering areas, but are widely dispersed in aspen and conifer communities year-round (Kuck, 1984). Moose tend to stay within a small home range and are well adapted for foraging in deep snow. The most recent survey for moose populations in the area was conducted by IDFG in 1999 for Management Unit 76. A total of 140 moose were observed; population estimates for the area are between 437 - 729 (IDFG, 2000b).

Big game species can be exposed to elevated selenium levels in forage growing on phosphate mine overburden disposal sites; however, it is not known if big game species are currently ingesting sufficient quantities of selenium-contaminated forage to cause health problems. Because elk and deer are mobile and forage over areas that do not have elevated selenium concentrations, predicting amounts of contaminated forage ingested and relating this ingested quantity to health conditions is beyond the scope of this SEIS.

In an attempt to better evaluate potential health conditions associated with phosphate mining, the Idaho Mining Association Selenium Committee (Montgomery Watson, 2000b) analyzed skeletal and/or liver samples collected from greater that 225 elk in southeast Idaho. Eleven of these elk were harvested within approximately five miles of the project area. The average selenium level (dry weight) in the liver collected from these samples was 7.52 mg/kg (range = 1 - 38, SD = 11.8). Compared to control samples, three of these elk had elevated levels of selenium. The effects of various levels of selenium on elk is currently not understood. However, based upon Montgomery Watson's analysis and study area, it was concluded "that it is reasonable to hypothesize that phosphate mining is associated with elevated selenium" in elk. Osweiler et al. (1985, cited in Skorupa 1998) report a toxicological threshold range of about 45-60 mg/kg for liver selenium in domestic livestock.



drawings\FSEIS\Figure FSEIS\Figure 3.7-1.dwg (revised 12/18/01

FIGURE 3.7-1
BIG GAME WINTER RANGE
SIMPLOT SMOKY CANYON MINE PANELS B&C
SUPPLEMENTAL EIS

Predators

Forest carnivore surveys were conducted during March and April 2000 within the project area (Maxim, 2000c). During these surveys and in conjunction with other baseline studies, the following predators were recorded: coyote *(Canis latrans*), badger (*Taxidea taxus*), bobcat (*Lynx rufus*), red fox (*Vulpes velox*), and black bear (*Ursus americanus*). The majority of the predators found in the area feed on small mammals and birds and utilize most of the habitat types in the area. Although mountain lions (*Felis concolor*) were not recorded in the area, they are known to inhabit surrounding areas and typically occur in areas with high populations of elk and deer. Other evidence of black bears in the area (i.e. claw markings on aspen trees) were also noted, although they are not very common. No studies have been completed within the area concerning the uptake of selenium by predators as a result of feeding on prey species that were exposed to elevated levels of selenium in vegetation.

Bats

Two surveys for bats were conducted in the project area during July through August 2000 (Maxim, 2000c). Riparian areas and ponds were surveyed using mist nets and a tunable broadband ultra-sonic bat detector. A total of five species of bats were either captured or detected during the surveys: big brown bat (*Eptesicus fuscus*), silver-haired bat (*Lasionycteris noctivagans*), western long-eared myotis (*Myotis evotis*), long-legged myotis (*Myotis volans*), and little brown bat (*Myotis lucifugus*). The most productive survey site was a wetland area partially located within the proposed Panel C. All of the bats captured from all areas were males, Maxim concluded the probability that no maternity colonies of any of the species occur in the area. Limestone outcrops and small caves and crevices occur within the project area and provide suitable roosting sites.

3.7.2 Birds

A variety of vegetation types occurs within the project area that provides a diversity of habitats for many species of birds. While each vegetation type offers important habitat components, the riparian areas that occur along the creeks are the most heavily utilized habitat by the birds in the area. The riparian areas are important during migration, as these are often the only habitats within the arid west that have similar characteristics of more mesic habitats found outside the Intermountain region. The abundance of insects make riparian areas important foraging habitats for species that nest in the grass or shrublands adjacent to the riparian areas. The following bird species are used by the Caribou-Targhee National Forest as Management Indicator Species for specific habitat types: Northern goshawk (*Accipiter gentilis*) for old growth conifer and aspen; hairy woodpecker (*Picoides villosus*) for snag management; red-naped sapsucker (*Sphyrapicus nuchalis*) for aspen; and sage grouse (*Centrocercus urophasianus*) for sagebrush.

Raptors

The forested and riparian areas provide numerous nesting opportunities for raptors. Foraging opportunities for raptors are also plentiful and occur throughout the various habitat types found within the area. Surveys for special status raptor species were performed in the spring of 2000 (Maxim, 2000c) and included: bald eagle (*Haliaeetus leucocephalus)*, Northern goshawk, boreal owl (*Aegolius funereus*), flammulated owl (*Otus flammeolus)*, and great gray owl (*Strix nebulosa)*. Results of these surveys are referenced in the appropriate section of this report. Other raptors, such as golden eagles (*Aquila chrysaetos)*, red-tailed hawk (*Buteo jamaicensis)*, Swainson's hawk (*Buteo swainsoni)*, Coopers's Hawk

(*Accipiter cooperii)*, great horned owl (*Bubo virginianus*), American kestrel (*Falco sparverius)*, and sharp-shinned hawk *(Accipiter striatus)* may nest in the aspen or conifer stands, or forage within the various vegetation types throughout the analysis area. Northern harriers (*Circus cyaneus*), typically nest in grassland habitat (to the southeast in Sage Valley) and may also be found foraging in the project area. No studies have been completed within the area concerning the uptake of selenium by raptors as a result of feeding on prey species that were exposed to elevated levels of selenium in vegetation.

Upland Game Birds

Prior to the construction of Tailings Pond 2 (**Figure 3.7-1**) there was an active sage grouse (*Centrocercus urophasianus*) lek within close proximity of the project area (Mariah 1980, 1990). Mariah (1996) reported that sage grouse had established a lek on a knoll northwest of the new tailings pond dam site. Sage grouse were also observed in 1996 strutting in the meadow south of the original lek. Recent surveys in and around the project area identified two individual sage grouse and no active leks (Maxim, 2000c). Blue grouse (*Dendragapus obscurus*) and Ruffed grouse (*Bonasa umbellus*) are commonly found utilizing dense conifer and aspen stands in the area.

Woodpeckers

The hairy woodpecker (*Picoides villosus*) is a year-round resident of coniferous and deciduous forests. The species excavates nest cavities in snags and dead branches, and forages on both live trees and snags. Because of the species dependance on snags, the USFS uses the hairy woodpecker as a Management Indicator Species for snags. In the Rocky Mountain region, the red-naped sapsucker occurs primarily in aspen forest or coniferous forest where aspen is present (DeGraaf and Rappole, 1995). No data exists on the distribution of either hairy woodpeckers, red-naped sapsuckers (*Sphyrapicus nuchalis*) or snags within the project area or Cumulative Effects Area.

Other Birds

Many additional bird species utilize the project area at some time during the year. In addition to the species discussed above, Maxim (2000c) recorded the presence of approximately 50 additional species including various passerines, waterfowl, and shorebirds. In terms of selenium, Ratti and Garton (2000) collected 98 and 117 eggs from 27 species of birds at both non-mining and mining areas, respectively, in 1999. Many of these species were the same as those identified by Maxim (2000c). A statistical analysis was conducted on twelve species. Seven of the 12 species had significantly higher selenium levels in eggs taken from mine sites. Ratti and Garton (2000) go on to state that "57 percent (67 of 117) of eggs collected on mining sites were < 5ppm and within the background range for selenium reported for other regions, and only 12.8 percent (15 of 117) exceeded 10 ppm, which was considered a problematic level for embryo viability." Species showing significantly higher egg selenium concentrations in mining versus non-mining areas were American coot, cliff swallow, mallard and red-winged blackbird. Species showing egg selenium levels over 10 ppm were American kestrel (1 egg), barn swallow (1 egg), common snipe (2 eggs), European starling (1 egg), mountain bluebird (3 eggs), red-winged blackbird (4 eggs), song sparrow (1 egg) and yellow-headed blackbird (2 eggs). While Ratti and Garton (2000) did not find a correlation between diet and elevated egg selenium levels, a review of their data suggests a number of the species which show elevated egg selenium levels are aquatic/marsh foragers (American coot, mallard, common snipe), inhabit marsh environments (red-winged and yellow-headed blackbird, song sparrow) or may forage over aquatic ecosystems (cliff and barn swallows). The authors caution, however, that "the data are from only one year of egg collections and sample sizes are relatively small, and that although egg-selenium levels were elevated on mining sites, most were within (or close to) the background range reported for many species in other regions. Additional research designed to quantify the extent of this potential issue is being conducted as a part of the Southeast Idaho Selenium Project.

3.7.3 Reptiles and Amphibians

Amphibian dependence on water limits their distribution in the area. Perennial water is available in the South Fork of Sage Creek, the beaver ponds in the North Fork of Sage Creek, and the riparian areas along Roberts and Smoky creeks. Ephemeral water sources also occur in minor drainages that intersect Tygee Creek. These areas provide habitat that are used as breeding sites for adults, and rearing areas for the young to develop. Recent surveys conducted in the area (Shive et al., 2000) revealed the presence of the tiger salamander (*Ambystoma tigrinum*) and the boreal chorus frog (*Pseudacris maculata*). The Western toad (*Bufo boreas)* and Northern leopard frog (*Rana pipiens*), which may occur in the area but were not found during surveys, are considered as species of special concern by IDFG and the US Fish and Wildlife Service. Additional amphibians, including the Great Basin spadefoot toad (*Spea intermontanus)* and Columbia spotted frog (*Rana luteiventris*), may also occur in the area but were not recorded during the surveys. Recent survey efforts within the project area (Shive et al., 2000) noted reptiles including the rubber boa (*Charina bottae*) and the Western terrestrial garter snake (*Thamnophis elegans*). Additional reptiles, including the sagebrush lizard (*Sceloporus graciosus*), gopher snake (*Pituophis catenifer*), common garter snake (*Thamnophis sirtalis*), and short-horned lizard (*Phrynosoma douglassii*), may also occur within the area but were not recorded during the surveys.

3.8 Fisheries and Aquatic Resources

The project area lies within the northern Smoky Canyon area and is drained by Smoky and Roberts creeks. These creeks are tributaries of Tygee Creek which is a tributary of the Salt River. The Salt River has historically supported a high quality Yellowstone cutthroat (*Salmo clarki bouveri*) fishery. The Salt River system is a parent source of Yellowstone cutthroat trout. This species of fish has been identified as a species of special concern by IDFG. In addition, Yellowstone cutthroat trout were found in Smoky Creek during electrofishing surveys (USFS, 1982a).

The Salt River enters the 1.4 million-acre-foot Palisades Reservoir on the Snake River at the Idaho/Wyoming border. Stump, Tygee, Smoky and Roberts creeks, tributaries to the Salt River within the Cumulative Effects Area, are spawning areas for Yellowstone cutthroat, brook, brown, and rainbow trout and other non-game fish. The Wyoming Fish and Game Department operates a fish hatchery on Webster Creek, which is located approximately two miles north of the Cumulative Effects Area boundary and is part of the Tygee Creek drainage.

Aquatic Biology

Fish and aquatic organisms were sampled in the project area in August of 2000 (Chadwick, 2000). These studies provided baseline data on biological and physical characteristics of the streams that might be influenced by the Proposed Action.

The project area is a montane ecosystem consisting of several sub-habitat types. Streams within this area flow through steep, aspen/conifer forested canyons, wetland meadows, and typical riparian habitats including willows and grasses. Stream flows range from gentle meanders with pools and riffles to steep falls with rapids and pools and exhibit flow fluctuations throughout the year.

Yearly monitoring by TRC Mariah of the aquatic habitat associated with the Smoky Canyon Mine was initiated in 1979 and continued through 2000. Twice yearly monitoring was conducted for water quality,

benthic macroinvertebrates, and stream embeddedness on Smoky, Tygee, Pole, Sage, Middle Sage (Hoopes Spring), and South Sage Creeks. Data gathering was discontinued on Roberts Creek in 1988. Monitoring locations established by TRC Mariah are found in **Figure 3.8-1**. The following subsections are a summary of results found by Chadwick. For more detailed information, refer to *Draft - Aquatic Biological Baseline Study for the Supplemental Environmental Impact Statement, Smoky Canyon Phosphate Mine Panels B & C* (Chadwick, 2000). Locations of Chadwick's sampling sites and reaches of Smoky and Tygee Creeks are shown in **Figure 3.8-2**.

Benthos

Benthic macroinvertebrates, or benthos, are organisms which inhabit the bottoms of streams. They are principally aquatic insect larvae, snails, worms, and crustaceans and serve as a food source for fish (TRC Mariah, 2000b).

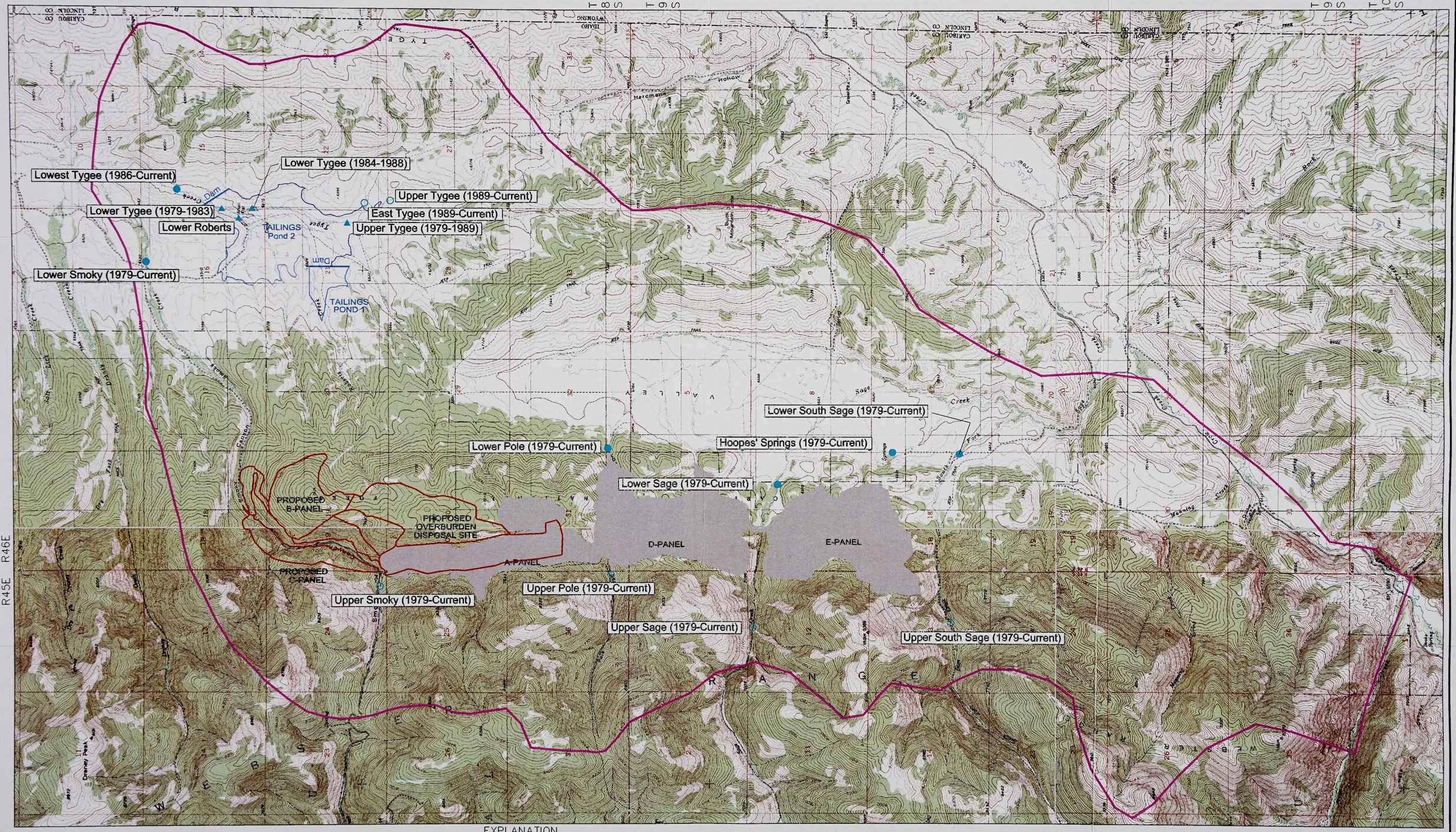
Stream macroinvertebrates are valuable indicators of water quality. Mining activities can increase the amount of sediment entering a stream, sediment plays an important role in determining stream habitat quality. Increased sediment loads can physically change the aquatic habitat. Substrates composed of cobble, rubble, and gravel are generally inhabited by stream insects available to and preferred by trout as food (Brusuen and Prather 1974, cited in TRC Mariah 2000b). As sedimentation of fine particles increases, the bottom fauna changes to taxa less desirable for trout (Cummins 1962, cited in TRC Mariah 2000b). The macroinvertebrate community is drastically affected by increased sediment loads and therefore, is an excellent biological indicator of these changes.

Several species of invertebrates are sensitive to habitat quality and are used as an indicator of overall stream health. Overall density and diversity of these sensitive invertebrate taxa, including mayflies (Ephemeroptera), stoneflies (Plecoptera), and caddisflies (Trichoptera), are commonly used to quantify relative stream health. Stress to aquatic communities may be detected by comparing the number of sensitive taxa in control or reference sites with those in potentially impacted sites.

Studies conducted by Chadwick in Smoky Creek indicated the presence of healthy, diverse populations of benthic invertebrates. Studies were conducted in areas of perennial flow near the beaver ponds, approximately one half mile west of the USFS boundary (approximately one mile east of the project area) and near the confluence of Smoky and Tygee creeks. The species composition, including sensitive taxa indicates that water quality in Smoky Creek is sufficient to maintain healthy populations of invertebrates. Roberts and Tygee creeks were not sampled for macroinvertebrates.

Fisheries

The Proposed Action area is drained by Smoky Creek and Roberts Creek which flow into Tygee Creek. Tygee Creek is tributary to Stump Creek, which in turn drains to the Salt River. Since creeks in the Smoky Canyon Mine area are tributaries to the Salt River, which in turn is a tributary of the Snake River, the cutthroat trout present may include Yellowstone cutthroat trout. Roberts Creek is not perennial and lacks sufficient intermittent flow to support a fishery as does Smoky Creek several hundred feet upstream of the beaver ponds.



Reference: TRC Moriah Associates Inc., Aquatic Monitoring Program for the Smoky Canyon Mine, Southeast Idaho: 1999 Results, March 2000

4000 0 4000 FEET

EXPLANATION

- Cumulative Effects Area
- Proposed Mine Disturbance
- Existing Mine Disturbance
- Tailings Pond
- ○ Control Sample Site
- ● Affected Sample Site
- ▲ Old Sample Site

FIGURE 3.8-1
LOCATION OF EXISTING AQUATIC SAMPLING STATIONS
SIMPLOT SMOKY CANYON MINE PANELS B&C
SUPPLEMENTAL EIS

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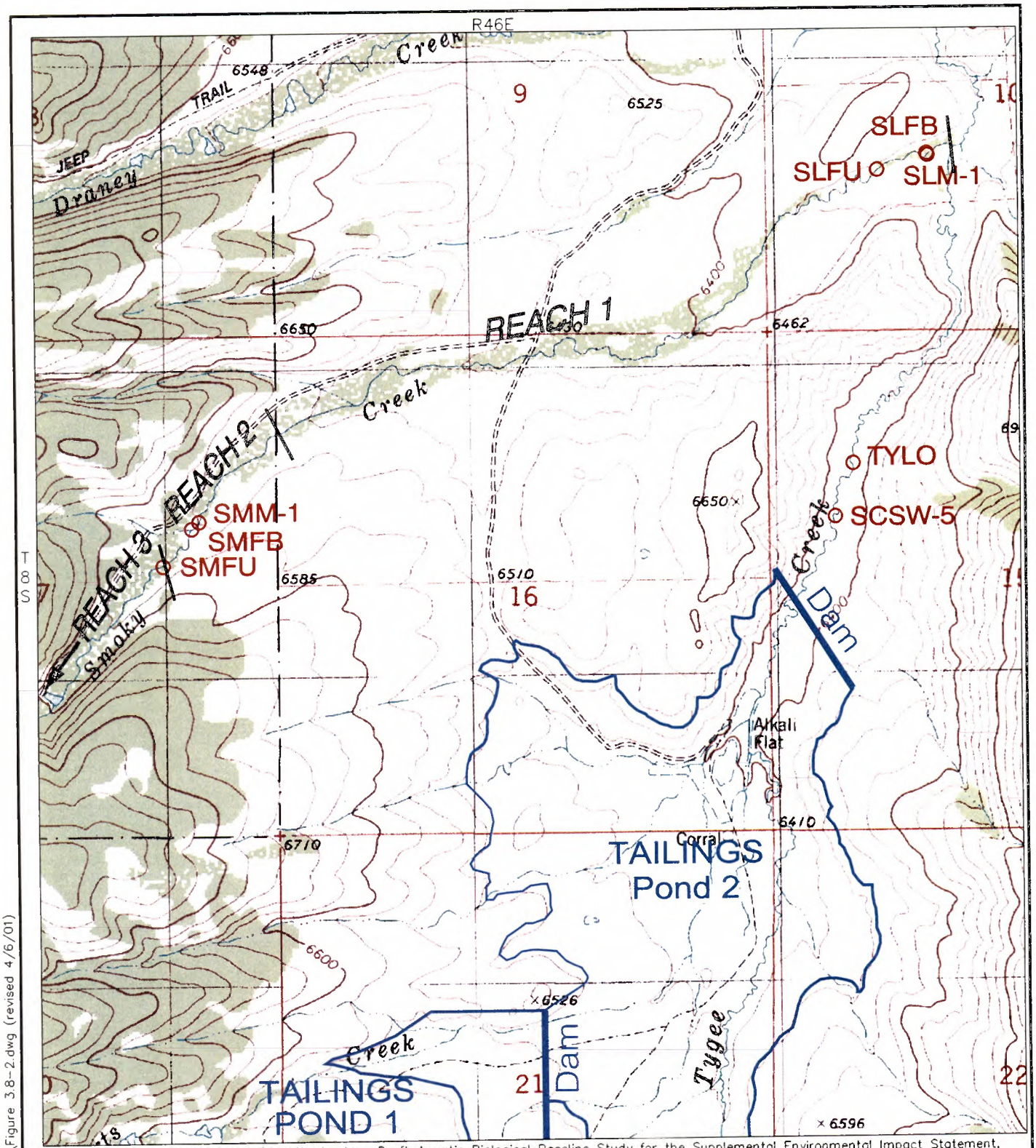


Reference: Chodwick Ecological Consultants, Inc. Draft Aquatic Biological Baseline Study for the Supplemental Environmental Impact Statement, Smoky Canyon Phosphote Mine Panels B&C, October 2000.

EXPLANATION

○ SMFU Feature Location

SLFU = Lower Reoch Top
SLFB = Lower Reoch Bottom
SLM-1 = Lower Reoch Mocroinvertebrotes
TYLO = Spot Shock (Leotherside Chub Locotion) Tygee Creek
SMFB = Middle Reoch Bottom
SMFU = Middle Reoch Top
SMM-1 = Middle Reoch Mocroinvertebrotes
SCSW-5 = Spot Shock Tygee Creek

FIGURE 3.8-2
AQUATIC BIOLOGICAL STUDY REACHES AND STUDY SITES IN SMOKY CREEK, AUGUST 2000
SIMPLOT SMOKY CANYON MINE PANELS B&C
SUPPLEMENTAL EIS

drawings\S..... ..\FSEIS\Figures FSEIS\Figure 3.8-2.dwg (revised 4/6/01)

Yellowstone cutthroat trout and introduced strains of cutthroat trout exist as both migratory and resident populations in the Salt River and tributary streams. Migratory fish move upstream from Palisades Reservoir from March through May and spawn in the Salt River tributary streams. Resident populations of trout may also live and spawn in tributary streams year round. Spawning occurs from mid-May through early July. Young cutthroat trout emerge from eggs from July through September (BLM, 2000). Some young fish migrate downstream in the Salt River to Palisades Reservoir and others remain in tributary streams as resident, non-migratory fish.

Brook trout (*Salvelinus fontinalis*), a non-native char, have been extensively stocked in the watershed (BLM, 2000). Populations of brook trout in the Salt River drainage include fish that migrate from the Salt River into smaller tributaries to spawn and resident fish that spend their entire life cycle in small streams. Brook trout spawn in fall (October to December) and fry emerge from spawning gravel in April and May (BLM, 2000).

Rainbow trout (*Oncorhyncus mykiss)* spawn in spring (March to June), usually in small tributaries with abundant gravel riffles. Eggs hatch within four to seven weeks and young fish move downstream into deeper pools (BLM, 2000). Rainbow trout may also be present in the watershed but were not captured during surveys completed in August 2000. German brown trout (*Salmo trutta*), an introduced species, are also present in tributaries of the Salt River but were not captured during surveys completed in August 2000. Numerous non-game fish may be found in the Salt River tributaries including sculpin (*Cottus* sp.), minnow, and dace species.

The following is a description of the study area of Smoky and Tygee creeks based on descriptions from the *Draft - Aquatic Biological Baseline Study for the Supplemental Environmental Impact Statement, Smoky Canyon Phosphate Mine Panels B & C* (Chadwick, 2000). Locations of Chadwick's sampling sites and reaches of Smoky and Tygee creeks are in **Figure 3.8-2.**

Smoky Creek

The main focus of the aquatic biological sampling program was Smoky Creek between its bottom end and a point upstream near the entrance to the existing Simplot Smoky Canyon Mine. In consultation with the USFS and Maxim Technologies, Inc., Smoky Creek was divided into three separate reaches, as described below.

Reach 1 extends from the bottom end of Smoky Creek, at its confluence with Tygee Creek, upstream to the USFS boundary. This reach is approximately 2.2 miles long. All of this reach is on private property and the area is heavily grazed by cattle. The bank margin and meadows downstream of the road crossing have been less intensively grazed by cattle and contain riparian grasses and a few willows. The stream channel in this area is meandering. Upstream of the road crossing, the grazing in the adjacent meadows has been more intensive and there is less riparian vegetation near the stream banks. The substrate in Reach 1 is predominantly silt and sand. Gravel is also a common substrate. The most common habitat types were runs (76.5 percent) and low gradient riffles (19.3 percent). The various types of pools accounted for only a small percentage of the surface area of Reach 1.

Reach 2 extends from the USFS boundary at the fence line upstream, approximately 0.8 miles, to the base of a series of beaver dams. The meadows adjacent to this reach have also been grazed by cattle, however, Reach 2 has a higher gradient and a straighter channel with fewer meanders than Reach 1. Gravel is the most common substrate type in Reach 2 with a higher proportion of cobble than Reach 1.

Low gradient riffles are the most common habitat type (69.4 percent) with runs also common (26.1 percent). As in Reach 1, pools are rare in Reach 2.

Reach 2 and Reach 3 are separated by a series of beaver ponds that completely cover the channel and much of the valley between the road on the north and the hillside on the south side of the valley. The bank margin in this area contains extremely thick willows and other riparian vegetation, making this inter-reach area impossible to adequately sample. Fish were observed in the beaver ponds during surveys in early August.

Reach 3 extends from the upstream end of the ponds to the point where Smoky Creek branches into Smoky Canyon near the mine entrance, approximately 2.2 miles. This reach contained several dry segments with most of the other portions containing extremely low flows. The several dry segments of the reach combined to account for approximately 0.4 mile of the 2.2 mile length of Reach 3. Almost all of the remaining 1.8 miles contained low flows, with only a trickle of water less than one foot wide in August 2000. It should be noted that these studies were done during a period of drought and more flow would be expected in normal periods of precipitation. At the extreme downstream end of the reach as it entered the beaver ponds, there was a short section, a few hundred feet in length, where groundwater surfaced abruptly and provided sufficient water to support fish. This section was heavily overgrown with willows and other vegetation, preventing habitat measurements and adequate fish sampling. However, a short section, approximately 150 feet, did allow qualitative electrofishing, and was sampled. Much of Reach 3 was dry or had very low flow in August 2000. The extreme upper end of Reach 3 did contain water, with some development of pools and riffles, but these were too shallow to support fish throughout the year.

Under current conditions, lack of perennial streamflow and presence of fine sediment limit habitat for trout spawning in the upstream portions of Reach 3 in Smoky Creek where the Proposed Action or Alternatives would take place. Much of Reach 3 from the mouth of the canyon to the Smoky Canyon Mine is located over permeable rock that causes surface flow to be lost from the stream by infiltration into the channel bottom. The result of this infiltration is lowered surface water flow available for spawning fish. Observations by mine personnel over the years that they have been passing through Smoky Canyon indicate that Smoky Creek is typically dry in this area except for high flows in the spring and after severe storms. This condition was documented during the baseline studies for the SEIS. Ralston (1979) and Ralston et al. (1977) also noted reduced or total loss of surface water flow in Smoky Creek as it crosses the permeable geologic formation.

In addition, beaver ponds located near the mouth of the canyon may act as a partial barrier for spawning fish attempting to migrate upstream (Chadwick, 2000). Water flow for most of Smoky Creek is intermittent upstream of Lower Smoky Spring. Cattle grazing has reduced willow and other riparian vegetation used by fish for cover and shade along Reaches 1 and 2 of Smoky Creek. In addition, a portion of Reach 1 of Smoky Creek has been diverted. Approximately 4,500 feet upstream from the bottom end of the stream, a new channel captures the entire flow of Smoky Creek and diverts it through pasture lands. The original channel measured approximately 1,743 feet in length and the new channel, created by the landowner, measured 1,255 feet in length. The old channel, now dry, appeared to contain habitat similar to the remainder of Smoky Creek in Reach 1. The habitat in the new channel appears similar to the habitat in unaffected areas of Reach 1. An overall reduction in sedimentation from the upper portion of Reach 3 of Smoky Creek is a result of low flow created by beaver ponds. Sediments, as a result of cattle grazing on the banks of Smoky Creek in Reach 2, is carried downstream by natural flows into areas of low gradient in Reach 1 (Chadwick, 2000).

Chadwick captured cutthroat trout, brook trout, longnose dace (*Rhinichthys cataractae*), and sculpin from Reach 1 in Smoky Creek. Cutthroat trout, brook trout, and sculpin were captured in Reach 2, and only cutthroat trout were captured in Reach 3. Chadwick concluded that cutthroat and brook trout populations in the study area were healthy with both adult and young fish observed. Breeding of cutthroat trout was likely taking place in all three Reaches of Smoky Creek. Numerous trout were observed in the beaver ponds and populations are apparently maintained by natural reproduction. No fish were observed or captured in the upstream portion of Reach 3, which had a very low water flow. The habitat for fisheries in Smoky Creek ends a few hundred feet upstream of the beaver ponds, which is more than one mile downstream of the Proposed Action. Chadwick (2000) clipped fins from cutthroat trout collected in Smoky and Tygee Creek which were in turn delivered to the IDFG for genetic analysis. Genetic analysis indicated that the cutthroat trout inhabiting Smoky and Tygee Creeks were pure strains of Yellowstone cutthroat trout with no evidence of hybridization with rainbow trout (Chadwick, 2000).

Tygee Creek

Upstream of its confluence with Smoky Creek, Tygee Creek flows from an area that contains the existing tailings pond for the Smoky Canyon Mine. The habitat on Tygee Creek is similar to Reach 1 of Smoky Creek: a low-gradient, meandering stream in a meadow. Tygee Creek was several times larger than Smoky Creek in August 2000 in terms of stream flow and width. Substrate types in Tygee Creek were not studied by Chadwick in August 2000.

Fish were collected at one location in Tygee Creek, just downstream from the Smoky Canyon Mine tailings ponds. Seven species of fish were collected in Tygee Creek, including cutthroat and brook trout, longnose dace, sculpin, redside shiner (*Richardsonius balteatus*), Utah chub (*Gila atraria*), and leatherside chub (*Gila copei*), a species of special concern in Idaho. This included relatively large cutthroat and brook trout. Due to the fact that only larger trout were collected, Chadwick (2000) concluded that both cutthroat and brook trout migrated into this section of Tygee Creek. Some leatherside chub individuals exhibited breeding colors at the time of surveys.

Bioaccumulation of Selenium and Trace Metals

Much of the following section includes information from recent compilations of research collected from the Final EIS for the Dry Valley Mine-FMC Corporation (BLM and USFS, 2000).

The bioaccumulation of selenium in fish and other aquatic organisms is dependant on the amount of selenium present in water and sediment, the chemical form in which selenium is present, as well as other factors. Selenium exists in five forms, with the three most studied in terms of toxicological effects being the two inorganic forms (selenite and selenate) and the more toxic organic form, the amino acid called selenomethionine. Water temperature, age of the organism, mode of administration, and organ/tissue specificity also modify the rate of selenium accumulation (Eisler, 1985). In aquatic habitats, higher animals show a generally marked increase in selenium residues as compared to waterborne concentrations. This indicates that bioaccumulation of selenium occurs primarily through diet.

Field studies have demonstrated that selenium can enter the food chain through plants, become bioavailable, and subsequently bioaccumulate in animals. While measured concentrations of selenium are often low in surface water, selenium can be present at elevated levels in sediment and thus become available for uptake by aquatic life through algal and planktonic food chains (Lemly, 1996). A variety of toxic effects have been associated with exposure of fish to elevated selenium levels in water and diet. The endpoints that can result from high exposure to selenium may be impairment of reproductive functioning and/or death.

Reproductive toxicity is reported to be one of the most sensitive endpoints for vertebrates exposed to selenium (Lemly, 1997; Skorupa 1998). Teratogenic (malformations in embryo or fetus) deformities in fish or congenital malformations that occur due to excessive selenium in eggs are a permanent pathological marker of selenium poisoning in fish (Lemly, 1997). Selenium is efficiently transferred from parents to offspring though the eggs (Lemly, 1993). Levels of selenium that cause teratogenic effects do not generally affect the health or survival of parent fish; the teratogenic process is an egg-larvae phenomenon. Data indicate that mortality of adult fish, even in sensitive species, occurs at exposure levels much higher than concentrations that may result in reproductive impairment (Skorupa, 1998). Teratogenesis is a direct expression of selenium toxicity and is considered an important cause of reproductive failure in fish (Lemly, 1997).

The USEPA national water quality criterion for selenium for chronic aquatic habitat exposure is currently 0.005 mg/l. The EPA national water quality criterion for selenium for acute exposure is 0.020 mg/l. Lemly and Smith (1987), who reviewed much of the available literature regarding selenium effects, reported that water concentrations greater than 0.002 to 0.005 mg/l selenium may bioaccumulate in food chains and result in adverse reproductive effects in fish. Baseline studies show that selenium concentrations in Smoky Creek are less than 0.001 mg/l (Maxim, 2000c). These concentrations are below the aquatic life standard (0.005 mg/l) for chronic exposure to selenium.

Some researchers indicate that risks to aquatic life could be expected with lower selenium concentrations. Lemly (1996) states that recent research indicates that the aquatic life standard should be lowered to 0.001 to 0.002 mg/l, especially for wetlands and impoundments where bio-accumulation is maximized (as in beaver ponds). According to Lemly (1996), reliance on mean waterborne concentrations of selenium does not adequately consider selenium loading, bio-accumulation, and toxic threat.

Generally, livers accumulate more selenium than other fish tissues, although distribution within tissues and organs varies from species to species. In some species, selenium concentrations in liver and kidneys are similar (Sorenson, 1991). Aquatic organisms can accumulate selenium to concentrations one or more orders of magnitude greater than concentrations in their water or food (Lemly, 1993).

Fishes, particularly salmonids, are sensitive to selenium concentrations and exhibit symptoms, even when tissue concentrations are relatively low (A.A Rich and Associates, 1999). In rainbow trout, significant changes in blood chemistry occurred when whole body tissue selenium concentrations were about 3 micrograms per gram (µg/g) and liver concentrations were 12 µg/g. Survival decreased when whole body selenium concentrations exceeded 5 µg/g. In chinook salmon, juvenile development and migration are impaired when whole-body tissue concentrations of selenium are about 9.5 µg/g. Mortality occurs when concentrations of selenium are greater than 10 µg/g.

In minnows, growth decreased at whole-body selenium concentrations of 6 to 8 µg/g (A.A. Rich and Associates, 1999). As a result of sensitivity of fishes to selenium, biological effects thresholds have been proposed for skeleton muscle (8 µg/g) and liver (12 µg/g) (Lemly, 1993).

Other researchers, (Skorupa, 1998) question use of selenium liver concentrations to indicate biological thresholds. According to Skorupa (1998), data on liver concentrations associated with exposures of fish to organic forms of selenium are insufficient for estimating sensitive-species thresholds.

Lemly (1993) suggested a risk threshold of 12 µg/g in liver concentrations based on experimental results that linked selenite exposure to perturbations of blood chemistry. However, the fish component for a hazard assessment protocol for selenium presented by Lemly (1993, 1996) relies on data for fish eggs or whole-body residues (as a surrogate for eggs) but not on data for hepatic tissues. As recognized by Lemly, only a weak basis exists for assessing ecological risk in nature based on hepatic selenium concentrations and, therefore, they have little interpretive value.

Trout tissue samples from Smoky Creek were obtained from the fish collected during the fish sampling in August 2000. A total of ten whole body tissues were sampled and analyzed for selenium and cadmium concentration. Whole body selenium values ranged from 1.2 to 5.6 µg/g dry weight (Chadwick, 2001). These values are below the risk threshold for bioaccumulation in fish as suggested by Lemly and others. Whole body cadmium concentrations ranged from <0.05 µg/g wet weight to 0.27 µg/g wet weight. These tissue concentrations are less than whole body tissue concentrations of 0.54 µg/g wet weight and 0.96 µg/g wet weight that produced no effect on growth and survival of young rainbow trout in the lab (Kamuda et al., cited in Chadwick, 2000).

3.9 Threatened, Endangered, and Sensitive Species

3.9.1 Threatened, Endangered, Candidate and Sensitive Species Lists

The USFS has identified a number of listed and sensitive species which have the potential to occur in the project area. These species and their USFWS or USFS status are listed in **Tables 3.9-1** and **3.9-2** and are discussed below. Species appearing on the endangered species list at the time the original Smoky Canyon Mine EIS (USFS, 1981 & 1982a) are discussed in that document on pages 2-26, 2-35, and 2-36. The status of some listed species has changed since the publication of that document; some species have been removed while others have been added or are candidates for the list. The sensitive species list had not been developed at the time the 1981/1982 EIS was written. Sensitive species were addressed in subsequent EA's prepared on different phases of the project, and are discussed below. The identification of selenium and other elements in mine waste as a potential problem are also a recent development, and was not addressed in the original Smoky Canyon Mine EIS.

Table 3.9-1 USFWS and USFS Threatened, Endangered and Sensitive Plant Species Reported to Occur in Caribou County, Idaho

Common Name	Specific Name	USFS/USFWS Status
Ute Ladies-Tresses	*Spiranthes diluvialis*	Threatened
Slick-spot Peppergrass	*Lepidium papilliferum*	Candidate
Cache's Beardtongue	*Penstemon compactus*	Sensitive
Payson's Bladderpod	*Lesquerrella paysonii*	Sensitive
Starveling Milkvetch	*Astragalus jejunus* ssp. *jejunus*	Sensitive

Table 3.9-2 USFWS and USFS Threatened, Endangered, Candidate and Sensitive Animal Species Reported to Occur in Caribou County, Idaho

Common Name	Specific Name	USFS/USFWS Status
MAMMALS		
Gray Wolf	*Canus lupus*	Endangered[1]
Canada Lynx	*Felis lynx*	Threatened
Spotted Bat	*Euderma maculatum*	Sensitive
Townsend's Big-eared Bat	*Corynorhinus townsendii*	Sensitive
Wolverine	*Gulo gulo*	Sensitive
BIRDS		
Bald Eagle	*Haliaeetus leucocephalus*	Threatened
Whooping Crane	*Grus americana*	Endangered[1]
Harlequin Duck	*Histrionicus histrionicus*	Sensitive
Trumpeter Swan	*Cygnus buccinator*	Sensitive
Northern Goshawk	*Accipiter gentilis*	Sensitive
Columbia Sharp-tailed Grouse	*Tympanuchus phasianellus columbianus*	Sensitive
Boreal Owl	*Aegolius funereus*	Sensitive
Flammulated Owl	*Otus flammeolus*	Sensitive
Great Gray Owl	*Strix nebulosa*	Sensitive
Northern Three-toed Woodpecker	*Picoides tridactylus*	Sensitive
AMPHIBIANS		
Spotted Frog	*Rana pretiosa*	Sensitive
FISH		
Yellowstone (Snake River Fine spotted) Cutthroat Trout	*Oncorhynchus clarkii* ssp.	Sensitive
Bonneville Cutthroat Trout	*Oncorhynchus clarkii utah*	Sensitive

[1] Population in/near project area is considered experimental/nonessential

3.9.2 Threatened, Endangered and Candidate Species - Plants

Ute Ladies'-tresses (Spiranthes diluvialis)

Threatened

A single listed plant species has the potential to occur in the project area. This species, the Ute ladies'-tresses, was historically found in riparian areas in Colorado, Utah, and Nevada. As of 1992, the species was known to exist at only a few locations in Colorado, and in Utah near Utah Lake and in low elevation areas in the Colorado River drainage. The species is threatened by habitat loss and modifications, but its low numbers make the species vulnerable to other threats (Federal Register 57 2048, 1992). Surveys conducted after the publication of this Federal Register notice have identified other populations of this species, including an Idaho distribution found on a section of the South Fork of the Snake River below Palisades Dam (Maxim, 2000d).

Ute ladies'-tresses are endemic to moist soils in wet meadows near springs, lakes or perennial streams. The species occurs in relatively low elevation areas where the vegetation is neither overly dense nor

overgrazed. Because the species may be sought after by collectors, the USFWS has decided not to designate critical habitat for the species, since publication of species occurrence information could make Ute ladies'-tresses more vulnerable to collection.

Maxim surveyed suitable Ute Ladies'-tresses habitats in the project area and in the Roberts Creek drainage in August of 2000. The Roberts Creek area was included in the surveys since habitat in this drainage represents the nearest suitable Ute ladies'-tresses habitat to the study area. Surveys were conducted according to USFWS survey guidelines (USFWS, 1992). Potentially suitable habitats, as identified by the USFWS (1992) were identified during wetland inventories and other surveys conducted earlier in the 2000 field season. While potentially suitable habitat for this species was present on lower Roberts Creek, no Ute ladies'-tresses were found during the baseline surveys.

Slick-spot Peppergrass (Lepidium papilliferum)

Candidate

The slick-spot peppergrass is identified as a Candidate species in the USFWS 1999 review of plant and animal species proposed for listing (Federal Register 64:57533-57547). This species occurs in sagebrush steppe ecosystems in areas which collect runon water, including "mini-playas" (also called "playettes"), "slick spots," and natric sites that have clay soils which include a high sodium content. Most occurrences of the species have been recorded in western Idaho, on volcanic plains of the Owyhee Plateau and the Snake River Plain, and in adjacent foothills. The species is found at elevations between 2,200 and 3,400 feet AMSL. A single historic occurrence of this species has been documented on the Caribou-Targhee National Forest. That occurrence was reported near Pocatello. The validity of this occurrence is in question, however, and the Caribou-Targhee National Forest is considering removing this species from the Forest's sensitive species list (Personal Communication, Rose Lehman, Caribou-Targhee National Forest Botanist, December, 2000).

No occurrences of this species are known in the project area. Baseline surveys of the project area conducted during 2000 did not identify any populations of this species or any potentially suitable habitat (Maxim, 2000c). No soil types consistent with the requirements of this species exist in the survey area.

3.9.3 Threatened, Endangered and Candidate Species - Wildlife

Gray Wolf (Canis lupus)

Threatened

Prior to European colonization, the gray wolf occupied most habitats in the northern hemisphere (Mech, 1974). Predator control and other persecution have reduced the wolf's range to Canada, Alaska, and portions of the northern tier of the continental United States. Recently, wolves have been reintroduced into some portions of their former range. The success of these reintroductions, and of wolf recovery efforts elsewhere in the northern United States, has lead the USFWS to propose reclassifying the status of most gray wolf populations to Threatened (USFWS, 2000).

Wolves are sociable animals, and usually travel and hunt in packs. Pack size generally averages from five to eight animals, though numbers as high as 36 have been reported (Rausch, 1967). Wolves usually prey on large animals, including deer, elk, moose, and beaver (Mech, 1974). Young, old, and infirmed prey is taken preferentially (Mech, 1974; Mech and Frenzel, 1971).

In 1995, in an attempt to reintroduce wolves into the Yellowstone area, the USFWS began releasing wolves captured in Canada into Yellowstone National Park. Similar reintroductions were attempted in central Idaho. The reintroduced wolves have increased in numbers and animals have dispersed into some surrounding areas. The populations established by this release effort are considered experimental, nonessential populations. In Idaho, all wolves south of Highway I-90, which runs through the Idaho Panhandle approximately 400 miles north of the project area, are also considered part of an experimental, nonessential population. Wolves east of Interstate 15, which runs through Preston, Pocatello and Idaho Falls, and passes approximately 56 miles west of the project area, are considered to be part of the Yellowstone experimental, nonessential population.

The original Smoky Canyon Mine EIS was prepared prior to initiation of the Yellowstone and Idaho wolf reintroduction efforts. At that time, the nearest potential wolf population was thought to occur in Yellowstone National Park (USFS, 1981 & 1982). In recent years, a single wolf has been reported in the Caribou County area (Personal Communication, Walt Vering, Maxim Technologies Inc., 2000). In the late fall of 2000, a single wolf which had been preying on sheep in Caribou County was killed under a lethal taking provision authorized by the Fish and Wildlife Service (Caribou County Sun, December 7, 2000). Track surveys conducted in the area of sheep kills indicated a single wolf was involved in these predations. This wolf may have dispersed from one of the Yellowstone or Idaho releases. Maxim did not detect any evidence of wolves during their baseline surveys of the area. The baseline effort included winter track surveys, conducted using the methodology described in Zielinski and Kucera (1995). During a January, 2001 track survey in the Manning Creek area, approximately six miles south of the project area, JBR recorded a single set of wolf tracks. These tracks indicated the wolf may have been following a small group of elk through the area.

Canada Lynx (Lynx canadensis)

The Canada lynx is a predator of the northern boreal forests of Canada, Alaska and the Rocky Mountains and north Cascades (Tumlison, 1987; Ingles, 1965). Preferred habitats include boreal forests with openings, bogs and thickets; old growth taiga; mixed or deciduous forest and wooded step. The species occurs at elevations up to 8,200 feet (Tumlison, 1987). Early successional stands with high shrub and seedling densities are optimal snowshoe hare (*Lepus americanus*) habitat and are therefore important to the lynx. Denning occurs in mature forest stands, which also provide important cover and travel corridors.

The Canada Lynx Conservation Assessment Strategy (2000) describes the use of Lynx Analysis Units (LAUs), which "are intended to provide the fundamental or smallest scale with which to begin evaluation and monitoring of the effects of management actions on lynx habitat." The LAUs are approximately the size of an area which would be used by an individual lynx. Within the LAUs, potential lynx habitat is identified as primary or secondary habitat. On the Caribou-Targhee National Forest, primary habitat includes subalpine fir and Englemann spruce intermixed with other species. Secondary habitat includes all lodgepole pine, Douglas-fir, aspen, and aspen/conifer forest.

A meeting between the USFWS, Salmon-Challis NF, Beaverhead-Deerlodge NF, Caribou-Targhee NF, and the BLM from Idaho and Montana held on September 5, 2001 determined that suitable lynx habitat on the Caribou is too patchy and disjunct to provide suitable resident lynx habitat. Accordingly, it was determined no LAUs will be identified on the Caribou-Targhee. Habitat on the Caribou-Targhee may, however, provide linkage habitat for lynx. Such habitat is used during lynx movement, including dispersal. According to the Canada Lynx Conservation Assessment Strategy (2000), lynx habitats in the Rocky Mountains often occur as "islands of coniferous forest surrounded by shrub-steppe habitats." This

document notes that lynx movement between these forested habitats is poorly understood, but that use of shrub-steppe habitats adjacent to boreal forests has been documented. In the broad sense, the Canada Lynx Conservation Assessment Strategy notes that connectivity between lynx habitats in Canada and the U.S. may be necessary for the persistence of some southern lynx populations. These southern populations, if isolated, may be too small to maintain themselves over the long term.

The Canada Lynx Conservation Assessment Strategy (2000) notes lynx "seem to prefer to move through continuous forest, and frequently use ridges, saddles and riparian areas." Lynx may avoid open areas, at least during daily movements within their home range.

Maxim conducted winter track surveys in the project area using methodology described in Zielinski and Kucera (1995). Any evidence of lynx or other forest carnivores noted during these and other baseline surveys in the area was recorded and reported. Maxim found no evidence of lynx in the project area. The Wildlife Resources baseline report (Maxim 2000c) notes that the local government trapper working in the area for the past 15 years had never seen evidence of lynx. This baseline document states that two unconfirmed lynx were reportedly taken in the area in the 1960s, and that an unconfirmed sighting occurred in 1997.

Bald Eagle (Haliaeetus leucocephalus)

Threatened

During the breeding season, bald eagles are closely associated with water, and occur along coasts, lakeshores, or riverbanks, where the eagles feed primarily on fish. Bald eagles typically nest in large trees, primarily cottonwoods (*Populus* sp.) and conifers, although they have also been known to nest on projections or ledges of cliff faces (Call, 1978). During winter, bald eagles concentrate wherever food is available. Areas of open water, where fish and waterfowl can be taken, are common wintering sites.

Surveys conducted as a part of the original Smoky Canyon Mine EIS (USFS,1981 & 1982a) found bald eagles winter along Crow Creek. A bald eagle roost was found on Crow Creek southwest of Fairview, approximately six miles southeast of the project area. Most bald eagle sightings made during baseline work conducted for the 1981/1982 EIS were recorded on Crow Creek. Three birds were observed in the mine area during the winter of 1978/1979. No bald eagle nesting is known in or near the project area (USFS, 1981 & 1982).

Maxim conducted an aerial winter bald eagle survey in February of 2000, following established protocols (**Figure 3.9-1**). The survey area included the Tygee Creek drainage, the headwaters of Sage Creek, Smoky Canyon, and much of the Salt River drainage between Afton and Palisades Reservoir. No bald eagles were recorded during this survey, nor were any bald eagles recorded in the area during other Maxim 2000 survey work. Maxim notes, however, that waterfowl utilized the Smoky Canyon Mine tailings ponds, and represent a prey base which could attract eagles to the area.

Whooping Crane (Grus americanus)

Endangered

The whooping crane is North America's largest crane, and one of North America's rarest birds. The total population fell to 15 individuals in 1942. Conservation efforts and captive breeding have increased the total population (including birds in captive flocks) to over 200 individuals (Erlich et al., 1992).

Whooping cranes currently breed only in Wood Buffalo National Park in southwestern Mackenzie and northern Alberta provinces, Canada. This breeding population winters in and near the Arkansas National

Wildlife Refuge on the Texas Gulf Coast. Attempts were made to establish a second breeding population at Grays Lake in Idaho by placing whooping crane eggs in sandhill crane nests, a procedure known as cross-fostering. Young whooping cranes were successfully fledged in this effort, and migrated with their sandhill crane "foster parents" to Bosque del Apache National Wildlife Refuge in New Mexico. Whooping cranes in this population failed to breed, however, and suffered mortalities due to collisions with transmission lines and fences. The efforts to create this second breeding population have not been continued, and currently only a single bird remains from this effort. This bird is considered part of an experimental, nonessential population.

When the 1981 Smoky Canyon Mine EIS was prepared, 10 to 15 juvenile whooping cranes were accompanying sandhill cranes in the Grays Lake area. Because Sage Valley, southeast of the mine, and portions of Tygee Creek, east and northeast of the mine, were utilized by sandhill cranes, the occurrence of whooping cranes in these areas was considered a possibility. No whooping cranes were observed in the area at that time. Now that only a single whooping crane remains in the Grays Lake population, this possibility is remote. Maxim did not observe whooping cranes in the area during their 2000 baseline surveys.

3.9.4 Sensitive Species - Plants

Cache's Beardtongue (Penstemon compactus)

Sensitive

Cache's beardtongue is considered endemic to the Bear River Range, which is located south of Soda Springs. The species occurs in open, rocky limestone areas in the subalpine zone. According to Cronquist et al. (1984), Cache's beardtongue occurs at elevations between approximately 7,800 to 9,800 feet AMSL, though some specimens have been found as low as approximately 6,550 feet AMSL. Idaho populations are reported to occur on carbonate substrates (Moseley and Mancuso, 1990). Flowering occurs from late June to August.

Baseline surveys of the project area did not identify any populations of this species in the area. The surveys did identify marginal potential habitat along the ridge of Panels B and C and in the ridge top waste rock disposal area (Maxim, 2000c). This species, however, generally occurs at elevations above those found in the project area.

Payson's Bladderpod (Lesquerrella paysonii)

Sensitive

In southeastern Idaho, Payson's bladderpod occurs on calcareous substrates on open gravelly ridges and gravelly openings above 9,200 feet AMSL. Occurrences at elevations as low as 6,500 feet are known in Wyoming (Personal Communication, Rose Lehman, Caribou-Targhee National Forest Botanist, December, 2000). The species is reported to favor sparsely vegetated, dissected slopes of south aspect beneath limestone outcrops. The species is known to occur along the ridge of the Caribou Mountains, and in northeastern Wyoming and Montana (Schassberger, 1991). At lower elevations, the principal threat to the species appears to be noxious weed encroachment (Maxim 2000d).

On the Caribou-Targhee National Forest, this species occurs at elevations above those found in the project area. Baseline surveys conducted in June of 2000 did not identify any populations of this species in the project area (Maxim, 2000d).

Starveling Milkvetch (*Astragalus jejunus* ssp. *jejunus*)

Sensitive

The starveling milkvetch, with the exception of a disjunct population in eastern Nevada, is endemic to southeastern Idaho and adjacent portions of southwestern Wyoming and northeastern Utah. On the Caribou National Forest, the species is usually found in very local colonies, where it occurs only on exposed areas of the Twin Creek Limestone (Moseley and Mancuso, 1990). Exposures of this whitish, barren limestone crop out in Snowslide Canyon, Whiskey Flats along portions of Crow Canyon Road and in Montpelier Canyon. While no clear threats to viability are apparent, Mancuso and Moseley (1990) note that trampling by livestock, road alterations and possibly other activities represent local threats.

Because no outcrops of the Twin Creek Limestone occur in the project area, and because this species is endemic to this formation, no habitat for this species exists in the project area.

3.9.5 Sensitive Species - Wildlife

Spotted Bat (Euderma maculatum)

Sensitive

Spotted bats occur in a variety of habitats including open ponderosa pine (*Pinus ponderosa*) forest, desert scrub, pinyon-juniper, and open pasture and hay fields (Leonard and Fenton, 1983). Most often, they are found in dry, rough desert terrain (Watkins, 1977). Spotted bats roost alone in rock crevices high up on steep cliff faces. In the summer of 2000, mist netting and ultrasonic bat detector surveys were conducted (Maxim, 2000c) (**Figure 3.9-2**) in July and August. Maxim did not detect any spotted bats in the baseline survey area. Small outcrops, but no large cliffs, exist in the area. Roosting habitat for spotted bats, therefore, would be considered minimal to nonexistent.

Townsend's Big-eared Bat (Corynorhinus townsendii)

Sensitive

This bat occurs in juniper-pine forests, shrub-steppe grasslands, deciduous forests, and mixed coniferous forests from sea level to 10,000 feet AMSL (USFS, 1991). Jameson and Peeters (1988) state that western big-eared bats occur in desert scrub and pinyon-juniper associations. This species roosts primarily in caves or cave analogs such as old mine shafts (Pierson et al., 1991), but has also been known to utilize rocky outcrops and old buildings. The bats do not migrate but remain at winter roost sites (hibernacula) from October to February. In summer females roost with their young in nursery (maternity) roosts (a group or small cluster, seldom exceeding 100 adults) in warm parts of the cave. Maternity colonies break up in July to August. Males and non-breeding females roost alone (Kunz and Martin, 1982).

Mist netting and ultrasonic bat detector baseline surveys conducted (Maxim, 2000c) in July and August 2000 did not detect any big-eared bats in the project area. Small outcrops in the area of Panel C offer some potential roosting habitat, particularly for single males. However, no big-eared bats of either sex, and no evidence of roosting or maternity colonies, were found in the area.

Wolverine (Gulo gulo)

Sensitive

Primarily an animal of extensive forests of the north, populations of wolverines do occur in the more remote and forested mountains of the continental United States. Larrison and Johnson (1981) discuss

the wolverine's occurrence in Idaho. These authors note an increase of sightings in Idaho and Washington, and speculate that this increase may indicate some expansion of the population from Canada. Pasitschniak-Arts and Lariviere (1995), however, describe notable reductions in range, and consider viable United States populations to exist primarily in Alaska and the Rocky Mountains of Montana. Banci (1987) noted that most wolverine observations in Idaho have been made in mountainous areas north of the South Fork of the Boise River, while most Wyoming observations have been made in the western third of the state.

The Center for Data Collection's (CDC) last reported sighting was in 1977. However, Betsy Hamann, Wildlife Biologist on the Caribou-Targhee National Forest provided information on a 1992 wolverine sighting near Wood Canyon in the Preuss Range, approximately 27 miles south of the project area (Personal Communication, December, 2000). Ms. Hamann stated that wolverines have also been recorded in the Bear River Range south of Soda Springs.

Wolverines generally range widely in search of food, which includes a variety of carrion, rodents, eggs and larger animals taken under favorable conditions. The species is generally solitary except during the breeding season. Breeding may occur from May to August, with delayed implantation postponing the start of active gestation until November to March (Pasitschniak-Arts and Lariviere, 1995). Young may be born from January to April, with most born before late March.

Baseline surveys of the project area for wolverine and other furbearer tracks were completed using survey methodology described by Zielinski and Kucera (1995). No evidence of wolverine presence was detected during these surveys (Maxim, 2000c).

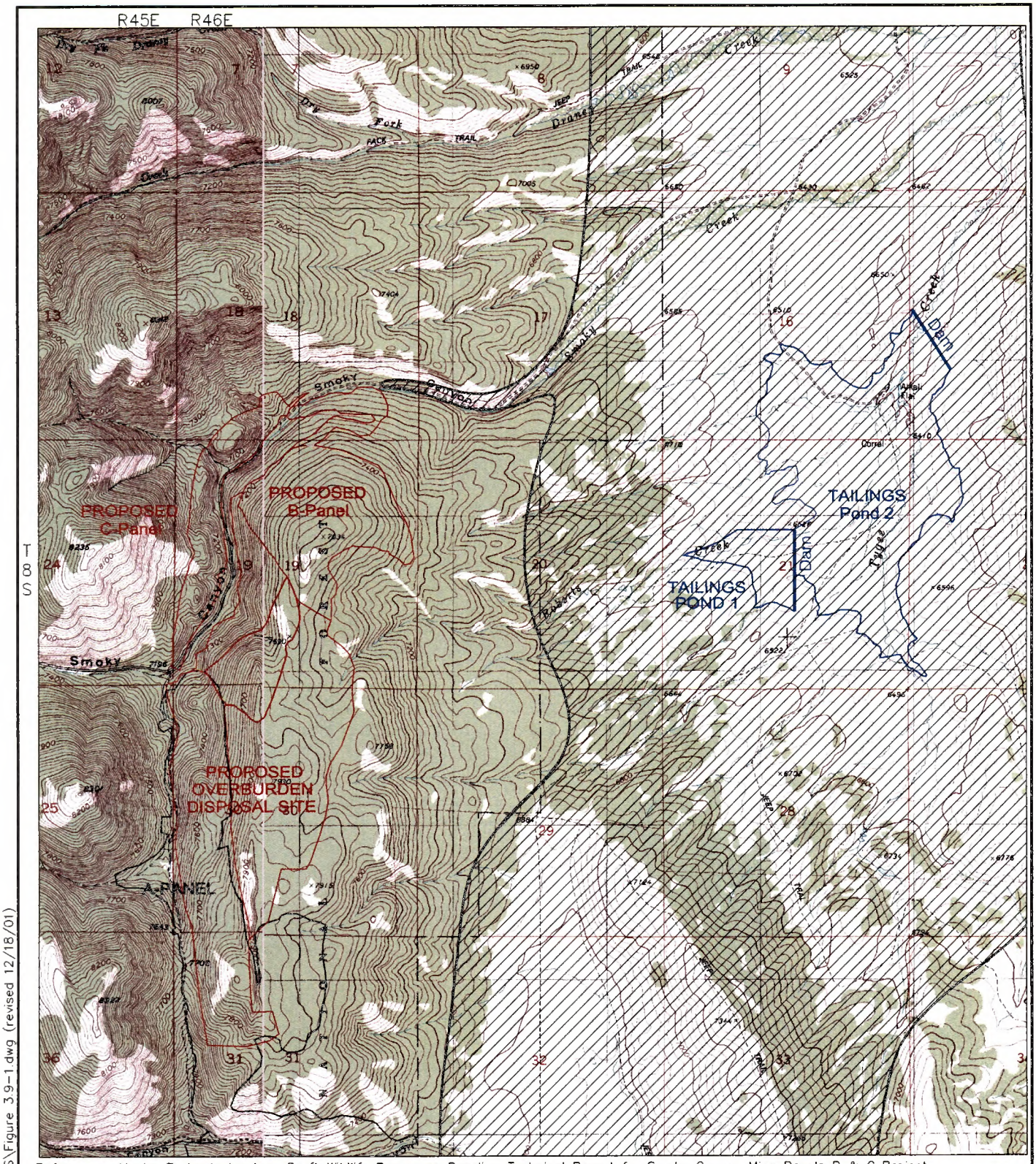
Trumpeter Swan (Cygnus buccinator)

Sensitive

Trumpeter swans were described as being widespread and abundant in North America prior to European colonization, but suffered from demand for their skin and feathers (Mitchell, 1994). Conservation measures, habitat protection and restoration have encouraged trumpeter swan numbers to rebound. Erlich et al. (1992) state that trumpeter swans were removed from the federal list of Endangered and Threatened Wildlife and Plants in 1971, when the population reached 5,000. The trumpeter swan population is still considered at risk, due to the species' low recruitment levels, continued loss of wintering habitat, the concentration of flocks in a relatively few areas, lead poisoning, and lack of migration in several wild and restored flocks (Mitchell, 1994).

Trumpeter swan habitat includes areas of open water approximately 100 yards in length or longer (suitable for takeoff), accessible forage, shallow stable levels of unpolluted fresh water, emergent vegetation, muskrat house islands or other structures on which to nest, and minimal human disturbance (Mitchell, 1994). Mitchell (1994) identifies the loss of migratory traditions in some flocks and inadequate quantity and quality of winter habitat as being the most important limiting factors for the species.

Some Yukon and northwest Territories birds migrate to the "tristate area," which includes the Montana, Wyoming, and Idaho border area. Trumpeter swans were not recorded in the project area during the baseline studies conducted for this SEIS. Swans could potentially utilize the Smoky Canyon Mine tailings ponds as resting or possible foraging or nesting habitat.



Reference: Moxim Technologies Inc., Droft Wildlife Resources Boseline Technicol Report for Smoky Conyon Mine Ponels B & C Project, Caribou County, Idoho, September 2000

EXPLANATION

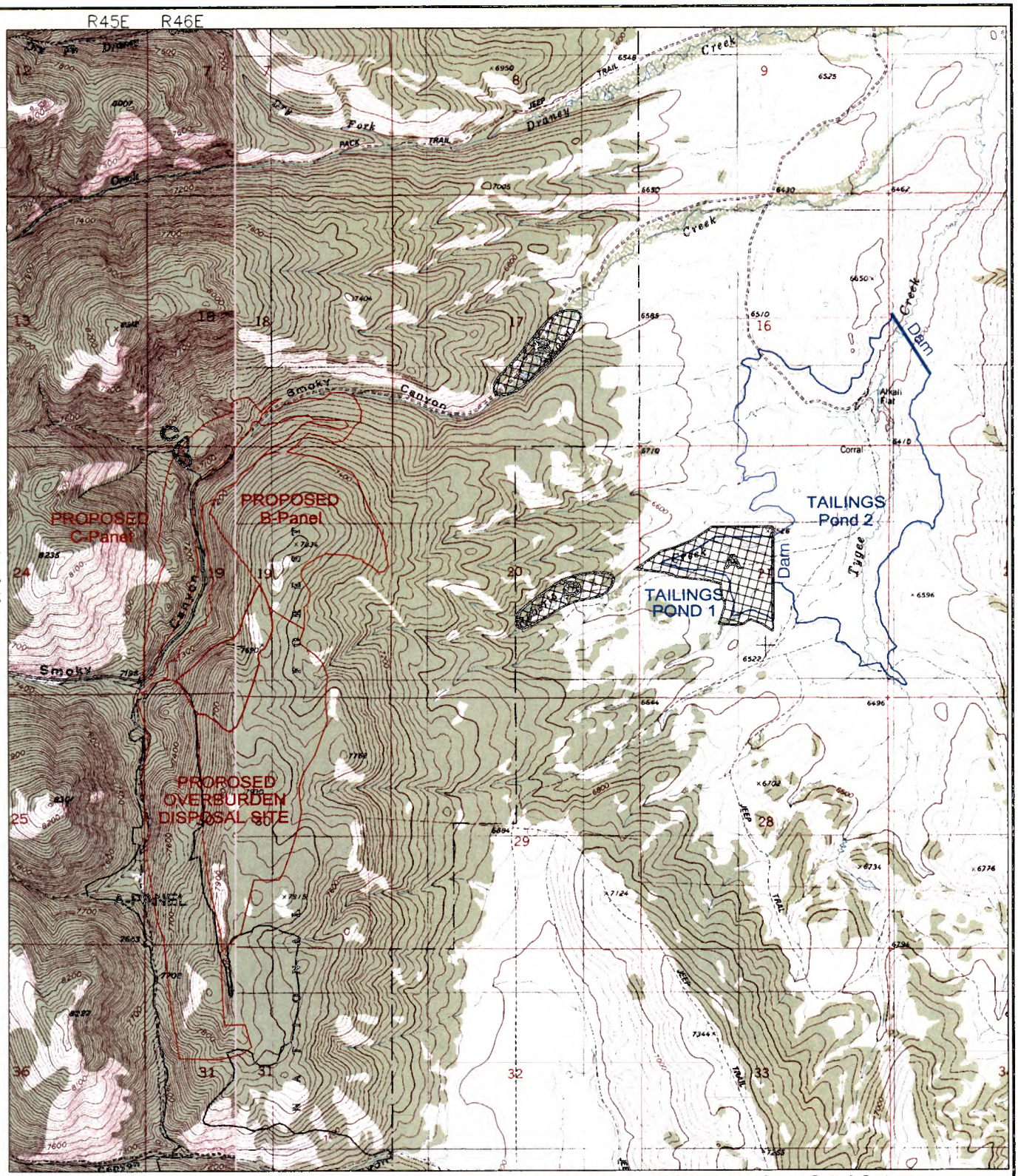
- Proposed Mine Disturbance
- Existing Mine Disturbance
- Area Surveyed for Bald Eagles

N

4000 0 4000 FEET

FIGURE 3.9-1
BALD EAGLE SURVEY AREA
SIMPLOT SMOKY CANYON MINE PANELS B&C
SUPPLEMENTAL EIS

drawings\SIMPLOT\FSEIS\Figures FSEIS\Figure 3.9-1.dwg (revised 12/18/01)



Reference: Maxim Technologies Inc., Droft Wildlife Resources Boseline Technicol Report for Smoky Conyon Mine Ponels B & C Project, Coribou County, Idoho, September 2000

EXPLANATION

- Prapased Mine Disturbance
- Existing Mine Disturbance
- Bat Survey Areas

4000 0 4000 FEET

N

FIGURE 3.9-2
BAT SURVEY LOCATIONS
SIMPLOT SMOKY CANYON MINE PANELS B&C
SUPPLEMENTAL EIS

drawings\Simplot\FSEIS\Figures FSEIS\Figure 3.9-2.dwg (revised 4/6/01)

Harlequin Duck (Histrionicus histrionicus)

Sensitive

Harlequin ducks generally nest along rocky shores adjacent to turbulent mountain streams (Bellrose, 1976). Burleigh (1972) refers to harlequin ducks as uncommon summer residents in the northern Panhandle of Idaho. Bellrose (1976) states that the southern-most breeding occurrence for Idaho was recorded on the upper Lochsa River in Idaho County, central Idaho. Most harlequin ducks winter in costal waters or in the Aleutians. Harlequin ducks forage among rocks in fast-moving streams. Cottam (1939) found that the diet of harlequin ducks appears to consist almost entirely of animal matter, primarily crustaceans and mollusks, with insects, echinoderms and fish comprising a smaller percentage of the diet.

The small streams in and near the project area do not represent typical harlequin duck foraging or nesting habitat. Streams present are either too small or low-gradient, rather than the fast-flowing rivers and streams usually utilized by harlequin ducks. Harlequin ducks may stop briefly in the project area or on the tailings ponds, but would not be expected to remain in the area for extended periods.

Northern Goshawk (Accipiter gentilis)

Sensitive

The northern goshawk nests throughout much of forested North America from Alaska and northern Canada south through the intermountain states, the northern tier of the United States and portions of western Mexico (Squires and Reynolds, 1997). In most areas, the northern goshawk occupies montane forests in spring and summer, with some altitudinal migration into foothills and valleys in the winter (Terres, 1980). Goshawks nest in a variety of habitats, but seem to prefer mature stands with a high canopy closure (Squires and Reynolds, 1997). A variety of conifers, hardwood deciduous trees, and birches may be used for nesting. Most western goshawks nest in conifers. However, aspen groves are the species' preferred nesting sites in Nevada (Ryser, 1985; Herron, in Alcorn, 1988). Shuster (1980) also found that aspens were the preferred nest tree in parts of Colorado, but that ponderosa and lodgepole pines were used as well. Squires and Reynolds (1997) state the species' main prey includes ground and tree squirrels, rabbits and hares, large passerines, woodpeckers, gamebirds, corvids, and occasional reptiles and insects.

Baseline studies included goshawk surveys of the project area in mid-May and mid-July of 2000. Amplified goshawk vocalizations were played (**Figure 3.9-3**), following BLM/USFS goshawk survey protocol (BLM/USFS, 1999). While much of the project area is considered potential northern goshawk habitat, no goshawks were observed, and no nests or other evidence of goshawks (plucking perches, etc.) were found in the project area. A goshawk nesting territory is reported to exist approximately one mile west of the project area (Maxim, 2000c). This location is within the Cumulative Effects Analysis Area (Section 4.16).

Columbia Sharp-tailed Grouse (Tympanuchus phasianellus columbianus)

Sensitive

Historically, sharp-tailed grouse occupied native shrub-grassland habitats throughout much of central and northern North America, including central Canada and much of interior Alaska (Connelly et al., 1998). The Columbian subspecies inhabits sagebrush-grassland and mountain shrub habitats from interior central and southern British Columbia south to Utah and southwestern Colorado. The range of this subspecies formerly extended west to northeastern California. The species' numbers have been greatly reduced in the southern and eastern parts of this range, largely due to conversion of native ranges to agricultural fields, as well as other forms of habitat loss (Connelly et al., 1998).

Erlich et al. (1992) state that threats to the species include overhunting, overgrazing, and conversion of native grasslands to agriculture. Connelly et al. (1998) state that the population trend data available for sharp-tailed grouse indicates the species inhabits approximately 10 to 50 percent of its former range in the United States, and over 80 percent of its former range in British Columbia. Between 1986 and 1996, sharp-tailed grouse populations appear to have increased in Idaho and Utah. Sharp-tailed grouse are managed as a game species in 18 states of the United States and two Canadian provinces. Populations are reported to respond well to conservation measures that protect food sources, nesting and wintering habitats. Connelly et al. (1998) specifically mention the Conservation Reserve Program (CRP), under which idle cropland is set aside as wildlife habitat, as a management tool which benefits sharp-tailed grouse. Negative impacts to the grouse result from habitat loss or degradation, which in turn results from conversion of native vegetation to cropland or pine plantations, overgrazing by livestock, fire suppression and haying.

Baseline studies included surveys for both sharp-tailed and sage grouse in April of 2000 (**Figure 3.9-4**). No sharp-tailed grouse were found, and Maxim notes that the species has not been reported in earlier baseline surveys conducted in the area (Maxim, 2000c).

Boreal Owl (Aegolius funereus)

Sensitive

The boreal owl ranges from the tree line across the northern tier of Canada, south through the Rocky Mountains into northern Washington, Idaho, Montana, Wyoming, and Colorado (Johnsgard, 1988). The boreal owl inhabits a variety of forest types within this range. Work in Colorado by Palmer (1986) identified a preference for mature spruce-fir forest interspersed with subalpine meadows between 9,200 and 10,500 feet AMSL. Palmer found Colorado owls tended to avoid large and unbroken stands of pine, as well as stands of quaking aspen. Conversely, Bondrup-Nielson (1978) found boreal owls in Ontario preferred mixed conifer-deciduous forest which included quaking aspen. Holt and Hillis (1987) found boreal owls in western Montana appeared to be limited to old-growth spruce-fir forest above 5,000 feet. Hayward et al. (1987) found boreal owls in the northern Rockies of Idaho and Montana were associated with subalpine fir and western hemlock (*Tsuga heterophylla*) above 5,200 feet. Boreal owls are cavity nesters, and may often select cavities excavated by northern flickers (*Colaptes auritus*).

Baseline studies were conducted by Maxim in March and April of 2000. Taped owl calls were played at calling stations following USFS survey protocol. No boreal owls were detected, and the project area was considered to represent marginal boreal owl habitat. In addition to the Maxim 2000 baseline surveys, owl surveys were conducted in the project area by TRC Mariah in May of 1999 (TRC Mariah Associates, Inc., 1999). Boreal owl responses were reported from three locations in and near the project area during these surveys. Two of these responses were obtained from near the forest edge over one mile east of the project area. One response, however, was obtained within the project area near the northeastern edge of the B Panel Pit.

Flammulated Owl (Otus flammeolus)

Sensitive

This diminutive owl, approximately six inches in length, inhabits the montane coniferous forests of North and Central America, ranging from southern British Columbia to Guatemala (McCallum, 1994; Ryser, 1985). In most areas, this owl occurs in close association with ponderosa pine (*Pinus ponderosa*) and Jeffery pine (*Pinus jefferyi*), though it has been recorded less commonly in other forest types (Johnsgard, 1988). Flammulated owls are also known to utilize successional aspen communities in some locations. This small and secretive owl is a cavity nester, and thus requires natural or woodpecker-excavated

cavities as a component of its habitat. McCallum (1994) states that while flammulated owls were believed to be rare, more recent census practices, including the use of taped calls, have found the owl to be relatively common in appropriate habitats. None-the-less, McCallum (1994) notes that the species' reproductive rate is low, and that preferred habitat appears to be restricted to forests of commercially valuable trees. Accordingly, McCallum states that timber management practices may influence species viability.

Flammulated owls seem to prefer open forest, with occupied habitat in Oregon having less than 50 percent canopy closure (Johnsgard, 1988). Herron et al. (1985) state these owls will utilize forests with a dense understory, and thus will inhabit second growth timber. However, they prefer mature ponderosa pine-Douglas fir forests with open canopies. Large diameter dead trees with cavities are used as nesting sites, and are an important component of flammulated owl habitat. Other information suggests flammulated owls avoid foraging in young dense stands where hunting is difficult. They are also known to avoid cut-over areas. Flammulated owls are almost exclusively insectivorous, preying on small to medium sized moths, beetles, caterpillars, and crickets (Reynolds and Linkhart, 1987; Johnsgard, 1988; and Bull et al., 1990). Like most insectivorous birds, but unlike most owls, flammulated owls are migratory (Winter, 1974; Balda et al., 1975; Collins et al., 1986; Gaines, 1988).

TRC Mariah conducted owl surveys in the project area in 1999. At least two flammulated owls were recorded in the area during these May surveys. One response was obtained from an area approximately ¾ mile east of the project area, while one response was obtained from the northern portion of the proposed B Panel Pit (TRC Mariah, 1999). Baseline studies of the project area were conducted by Maxim in April and May of 2000. Taped owl calls were played at calling stations following BLM/USFS (1999) survey protocol. No flammulated owls were detected in the survey area in April, but owls responded to calls at three locations during the May surveys. As shown in (**Figure 3.9-3**), a flammulated owl responded to calls from a location just northwest of Panel C. Two responses to calls were obtained east of the Panel B area. Habitat at the three locations at which owls responded to calls was characterized by large diameter Douglas-fir interspersed with aspen and lodgepole pine (Maxim, 2000c). Searches conducted following these responses to calls did not locate any flammulated owl nests.

Great Gray Owl (Strix nebulosa)

Sensitive

This owl inhabits the taiga or great circumboreal coniferous forests of Eurasia and North America, ranging south into the mountains of the western United States (Johnsgard, 1988; Ryser, 1985). The great gray owl occupies a wide range of habitats, including subalpine coniferous forest, dense boreal and montane forest, and stunted transitional forests of the Arctic tundra (Johnsgard, 1988). In the Sierra Nevada, great gray owls breed in mixed conifer and red fir (*Abies magnifica*) forests from approximately 3,000 to 8,900 feet AMSL. Nest sites are generally located in dense forest stands adjacent to meadows. In fall, great grey owls may move up or down slope. In the Sierra Nevada, they often move up into lodgepole pine forest (Johnsgard, 1988).

The great gray owl's diet generally includes a high percentage of voles and pocket gophers, with voles often making up the large majority of the winter diet. Great gray owls usually hunt in relatively open habitats. Winter (1974) found that 90 percent of monitored birds' time was spend within approximately 400 feet of an open meadow.

Baseline studies were conducted by Maxim in March and April of 2000. Taped owl calls were played at calling stations following USFS/BLM (1999) survey protocol. No great gray owls were detected, but the

project area was considered to represent potential great gray owl habitat. A great gray owl territory has been reported approximately 2.5 miles southwest of the survey area. This location is west of the Cumulative Effects Analysis Area.

Three-toed Woodpecker (Picoides tridactylus)

Sensitive

The three-toed woodpecker is a permanent resident of the taiga or circumboreal forests of Eurasia and North America, ranging southward into the continental United States (Ryser, 1985). This species is found in northern coniferous and mixed forest types up to 9,000 feet AMSL. Forests containing spruce, grand fir, ponderosa pine, tamarack, and lodgepole pine are used. A small disjunct population of three-toed woodpeckers is reported to occupy Douglas-fir habitats along the Idaho-Wyoming border (Root, 1988). Bock and Bock (1974) reported that the species shows a strong affiliation with spruce (*Picea* sp.), but note that this woodpecker also forages in small deciduous trees. Nests may be found in spruce, tamarack, pine, cedar, and aspen trees. While three-toed woodpeckers forage primarily on dead trees, live trees are utilized as well. About 75 percent of the birds' diet is wood boring insect larvae, mostly beetles, but they also eat moth larvae. Three-toed woodpeckers are major predators of the spruce bark beetle, especially during epidemics. They forage on a wide variety of tree species (Bock and Bock, 1974; Crocket and Hansley, 1978).

Baseline surveys of the project area conducted in 2000 (Maxim, 2000c) included playing taped three-toed woodpecker vocalizations (**Figure 3.9-3**), as specified in USFS survey protocols (BLM/USFS, 1999). Potentially suitable habitats were also searched for flaked bark chips characteristic of foraging three-toed woodpeckers. No three-toed woodpeckers nor evidence of the species were detected in the area. USFS and BLM (1997) reference a three-toed woodpecker sighting near the headwaters of Manning Creek, approximately six miles south of the project area. Three-toed woodpeckers responded to calls, and a pair of the birds were recorded in the Manning Creek area during JBR baseline surveys conducted in mid-April of 2001.

Spotted Frog (Rana pretiosa)

Sensitive

This species is most commonly found near permanent water in such habitats as marshy edges of ponds or lakes, in algae-grown overflow pools of streams, and near springs with emergent vegetation. The spotted frog may move considerable distances from water after breeding, often frequenting mixed conifer and subalpine forests, grasslands, and brushlands of sage and rabbitbrush. It is thought that spotted frogs hibernate in holes near springs or other areas where water remains unfrozen and constantly renewed (USFS, 1991).

Behler and King (1979) state that spotted frogs occur in mountainous areas near cold streams and lakes, and move overland in spring and summer. Peter Hovingh and Ron Panik (1992) state that spotted frogs require cold water. Both workers noted that the presence of bullfrogs (*Rana catesbeiana*) may exclude spotted frogs. Dumas (1966) found leopard frogs (*Rana pipiens*) may also eliminate spotted frogs. The relationship between spotted frogs and salmonids is less clear. Hovingh states that large salmonids will consume spotted frog tadpoles, but smaller fish may not pose this threat.

Turner (1958) found that spotted frogs in Yellowstone National Park, at an elevation of 7,800 feet, usually emerged in May, and egg laying took place by early June. Transformation was complete by late August to mid-September. Frogs in Yellowstone utilized both permanent ponds and rain and snow-melt fed ephemeral pools.

Baseline studies included amphibian and reptile surveys of the project area during the summer of 2000. These surveys were conducted during three separate sampling periods; in late May and early June, in mid-July, and in early August. Surveys were conducted on all potential amphibian habitat that included standing water at least 10 cm deep or exhibited flowing water. These areas included three stream sites (including Smoky and Roberts creeks within the survey area) and thirty lentic sites (**Figure 3.9-5**). Survey methodology included visual encounter surveys supplemented by dip netting and cover turning. Calling surveys were also performed during the first sampling period, using both an automated recording system and auditory detections conducted during road driving surveys. Finally, aquatic funnel traps were set at 19 sites during the May-June sampling, at 12 sites during the July sampling, and at four sites during the August sampling. From one to ten traps were set at each site. Traps were run for one to two nights (Shive et al., 2000).

Four reptile and amphibian species (the western terrestrial garter snake, *Thamnophis elegans*; the rubber boa, *Charina bottae;* the boreal chorus frog, *Pseudocris maculata*; and the tiger salamander *Ambystoma tigrinum*) were recorded in the area during these surveys. No spotted frogs were found. The surveyors note that "although sampling sites were visited multiple times, it is important to realize that the failure to detect a particular species from a surveyed site is not an absolute indication that the species wasn't present " (Shive et al., 2000). Information provided by the USFS indicates spotted frogs have not been recorded on the Caribou-Targhee National Forest (Personal Communication, Betsy Hamann, USFS, November, 2001, based on USFS discussions with Chuck Peterson of Idaho State University).

Yellowstone (Snake River Fine Spotted) Cutthroat Trout (Oncorhynchus clarki bouvieri)

Sensitive

The Yellowstone cutthroat trout had a historic range which included the Yellowstone River drainage in Montana and Wyoming as well as the Snake River drainage in Wyoming, Idaho, and portions of Nevada, Utah, and Washington (May, *in* Duff, 1996a). Currently, this species is found in waters of Yellowstone National Park and in headwater drainages within its historical range in Idaho and Montana (Thurow et al., 1997). This area represents about 85 percent of the species' original lake populations and about 10 percent of its original stream populations (May, *in* Duff, 1996a; Varley and Gresswell, 1988). The Yellowstone cutthroat trout's decline can be attributed to interactions with introduced fish species, habitat degradation, and excessive harvest by humans (May, *in* Duff, 1996a; Varley and Gresswell, 1988; Moore et al., 1986). Sometime after the Shoshone Falls were formed, Yellowstone cutthroat trout were isolated from contact with rainbow trout. The Yellowstone subspecies remains the native trout in the upper Snake River Basin.

The waters of the Snake River, from and including Jackson Lake to Palisades Reservoir, (including the Salt River system) support a form of the Yellowstone cutthroat trout referred to as the "fine spotted" (or finespotted) cutthroat trout. This form shows "a unique spotting pattern characterized by a profusion of very small spots covering most of the body" (May *in* Duff 1996a). While this form has the potential to be recognized as a distinct race or subspecies (referred to as the Snake River fine spotted cutthroat trout), genetic testing has not produced definitive proof that this form indeed represents a separate strain.

Fisheries surveys conducted as a part of the original Smoky Canyon Mine EIS (USFS, 1981 & 1982) investigated fish populations present in Sage, Roberts, Smoky and Tygee Creeks. A review of fisheries information presented in the original EIS found that lower Smoky, Stump, Sage and Crow creeks are

identified as important spawning habitat for trout inhabiting the Salt River system (to which these streams are tributary). Electrofishing conducted as a part of the original EIS baseline data gathering effort found that brown trout dominated the salmonid populations in the South Fork of Sage Creek and in the lower reaches of that stream, while cutthroat, brown and brook trout were present in the North Fork of Sage Creek. Cutthroat trout were the most common salmonid recorded in the North Fork of Sage Creek. Both cutthroat and brook trout were present in lower Smoky Creek, and a small number of cutthroat were found in Tygee Creek. No salmonids were found in Roberts Creek, and no fish were found in Pole Creek during these surveys. The EIS refers to the Salt River system as "the parent source of fine spotted cutthroat trout that are found in southeast Idaho" (USFS, 1981 & 1982)

Baseline studies conducted by Mariah and Associates (1995) found that cutthroat, brook, brown and rainbow trout were present in Sage Creek in 1994. This sampling determined that cutthroat trout were the dominant salmonid species present in upper Sage Creek, while brown trout dominated the trout populations in Lower Sage Creek.

Baseline fisheries and aquatic habitat studies of streams in and below the Panel B and C project area were conducted in early August of 2000 (Chadwick, 2000). These studies were conducted according to USFS protocol for inventorying fish habitat and sampling fish populations (Chadwick, 2000). The surveys found that flows in Smoky Creek were perennial from just above beaver dams located near the mouth of Smoky Canyon downstream to Smoky Creek's confluence with Tygee Creek. The upper reaches of Smoky Creek, above the beaver dams, were ephemeral or intermittent and supported only low flows. Larger flows began a few hundred feet above the beaver dams, approximately 1.25 miles below the Panel B and C project area.

Fish were present in Lower Smoky Creek from at least 150 feet above the beaver ponds to Smoky Creek's confluence with Tygee Creek. According to the baseline report, cutthroat trout and sculpin (*Cottus* sp.) dominated the fish population in the lower reaches of the creek. Brook trout and longnose dace (*Rhinichthys cataractae*) were present in smaller numbers in this lower section of the stream (Chadwick, 2000). Brook trout were the most common fish in the middle reaches of Smoky Creek; cutthroat trout and sculpin were also present.

The large beaver pond complex near the mouth of Smoky Canyon (noted above) divides the middle and upper reaches of Smoky Creek. These beaver ponds were considered to be a barrier to upstream fish movement (Chadwick, 2000). Fish were noted in the beaver ponds. Eight cutthroat trout were captured in a short (150 foot) reach of higher flow above the beaver ponds. No fish were found above this short, higher flow reach. No fish were found within the project area, which is located on the upper reaches of Smoky Creek approximately 1.25 miles above the beaver ponds.

Both cutthroat and brook trout were also found at the confluence of Tygee and Smoky creeks. Sampling below the Tailings Pond No. 2 dam documented the presence of both these trout species, as well as leatherside and Utah chub (*Gila copei* and *G. atraria*, respectively), redside shiner (*Richardsonius balteatus*), longnose dace and sculpin.

The Chadwick report (2000) states that multiple age classes of trout were present in Smoky Creek, and these trout appeared to be in good condition and not experiencing water quality or other problems.

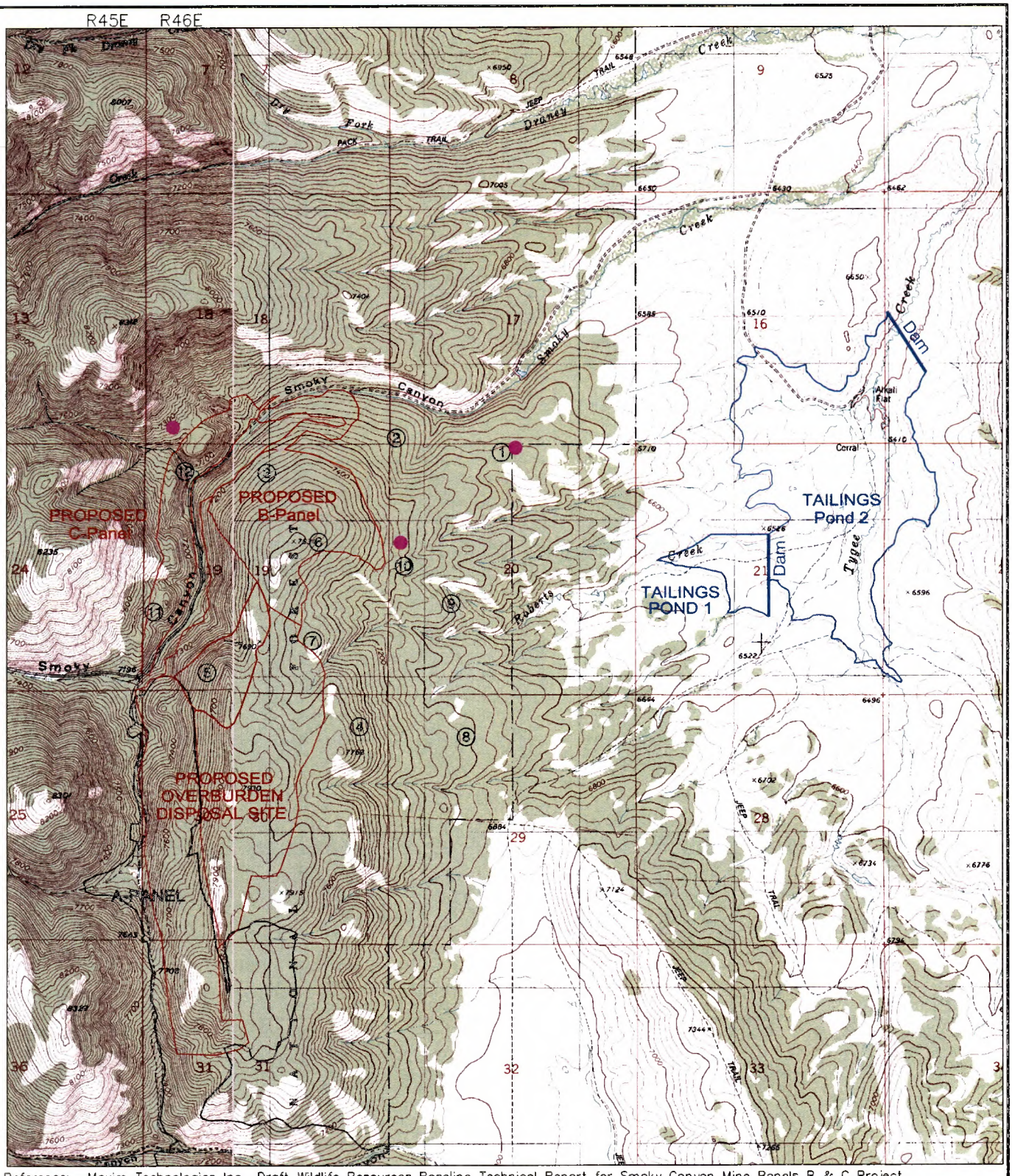


FIGURE 3.9-3
NORTHERN GOSHAWK AND THREE-TOED WOODPECKER CALLING STATIONS AND FLAMMULATED OWL CALL RESPONSES
SIMPLOT SMOKY CANYON MINE PANELS B&C
SUPPLEMENTAL EIS

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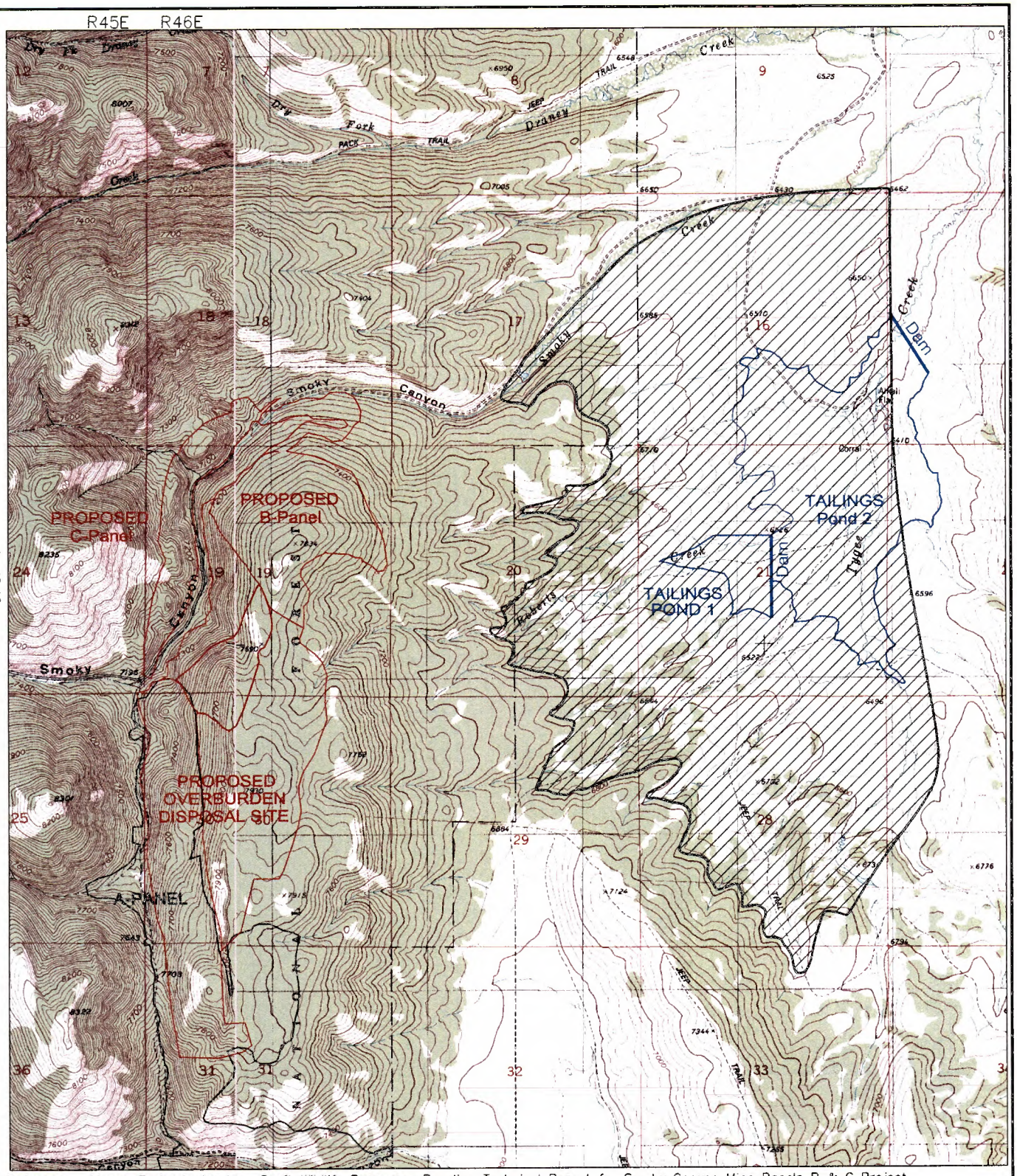

Reference: Maxim Technologies Inc., Draft Wildlife Resources Baseline Technical Report for Smoky Canyon Mine Panels B & C Project, Caribou County, Idaho, September 2000

EXPLANATION

- Proposed Mine Disturbance
- Existing Mine Disturbance
- Sage Grouse Survey Area

N

4000 0 4000 FEET

FIGURE 3.9-4
GROUSE SURVEY AREA
SIMPLOT SMOKY CANYON MINE PANELS B&C
SUPPLEMENTAL EIS

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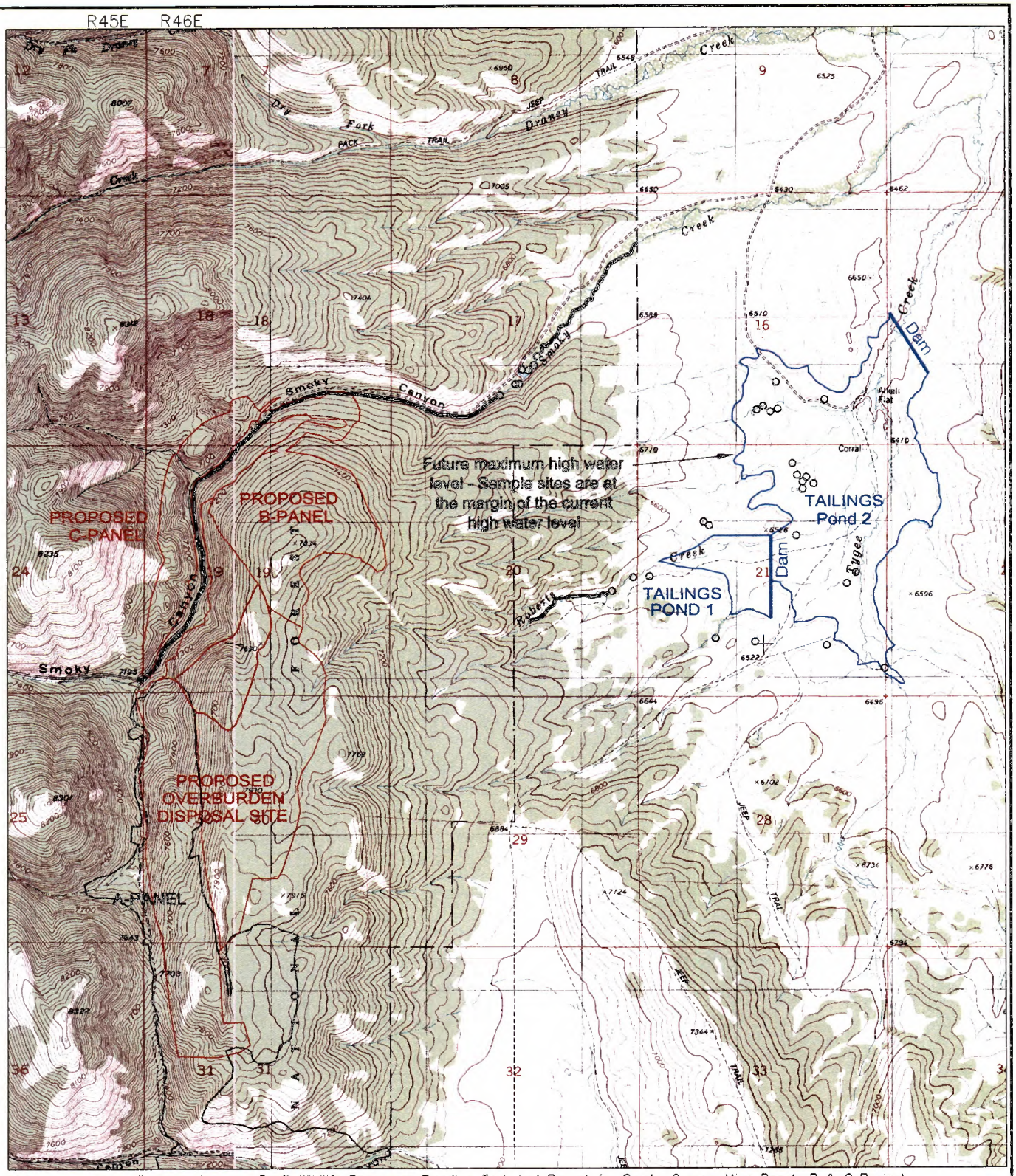

Reference: Moxim Technologies Inc., Droft Wildlife Resources Baseline Technical Report for Smoky Canyon Mine Panels B & C Project, Coribou County, Idoho, September 2000

EXPLANATION

- Proposed Mine Disturbance
- Existing Mine Disturbance
- Identified Sites
- Stream Portions Surveyed

N

4000 0 4000 FEET

FIGURE 3.9-5
AMPHIBIANS
SIMPLOT SMOKY CANYON MINE PANELS B&C
SUPPLEMENTAL EIS

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Bonneville cutthroat trout (Oncorhynchus clarki utah)

Sensitive

Only one trout subspecies, the Bonneville cutthroat trout, is endemic to the Bonneville Basin. The species is believed to have originated from an ancestral Yellowstone cutthroat trout stock, from which the Bonneville cutthroat became isolated due to volcanic activity about 30,000 years ago (Duff, 1996b). While some stream populations survive, this subspecies evolved primarily in a lake environment. Upon the desiccation of Lake Bonneville, trout were primarily restricted to perennial tributaries and connected watersheds and subbasins. Only Bear, Utah, and Panguitch lakes retained lacustrine populations. During the last 150 years, the Bonneville cutthroat trout populations have been significantly reduced through anthropogenic activities, including habitat degradation, overutilization, and the introduction of non-native fish species. Except in Bear Lake, the historic lake populations have been extirpated (Duff, 1996b).

Bonneville cutthroat trout spawn in spring from April to June. Like other cutthroat, they require a clean gravel substrate in cool, well-oxygenated water for spawning. They reach sexual maturity at two to three years of age. They eat mainly aquatic insects and terrestrial insects that fall into the water from overhanging vegetation. Larger Bonneville cutthroat trout feed on small fish.

Because all streams in the project area drain to the Snake River, and not to the Bonneville Basin, Bonneville cutthroat trout do not occur in the project area.

3.10 Grazing Management

Vegetation in the project area was previously described in the Draft Environmental Impact Statement (EIS) for the Smoky Canyon Phosphate Mine (USFS, 1981). The Draft EIS concluded that the vegetation types affected by the proposed project are common in the region and no loss of unique habitats would result (USFS, 1981). The recently completed baseline study identified seven general vegetation types in the study area: aspen, conifer, aspen/conifer, mixed shrub, sagebrush, disturbed, and riparian/wetland (Maxim, 2000d).

Most of the project area falls within the boundaries of the Pole Canyon sheep allotment (**Figure 3.10-1**). This allotment of 12,658 acres is administered by the USFS. Under current management, the allotment is grazed from June 27 through September 20 by 1,020 head of sheep, or 2,924 animal months. The range condition in the Pole Canyon allotment is currently rated good (Mickelsen, 2000). Gaining access to portions of the allotment has become a problem because of past and current mining activities and previous timber sales.

Noxious weeds, primarily musk thistle (*Carduus nutans*) and Canada thistle (*Cirsium arvense*), are established in the Pole Canyon sheep allotment and leafy spurge (*Euphorbia osula*) is found nearby and presents a clear risk of establishment (Mickelsen, 2000). The baseline study, which was restricted to the project area only, listed the noxious weed species Canada thistle and dyer's woad (*Isatis tinctoria*) (Maxim, 2000d).

The chemical analysis of vegetation reported in the baseline study (Maxim, 2000d) indicates that vegetation in the project area does not currently show elevated levels of the contaminants tested, including selenium. The mean concentrations in vegetation of the eight elements tested were well below

the toxicity thresholds for plant growth used in the study (Cd, 5 mg/kg; Cu, 20 mg/kg; Mn, 400 mg/kg; Mo, 10 mg/kg; Ni, 10 mg/kg; Se, 5 mg/kg; V, 5 mg/kg; Zn, 100 mg/kg). These thresholds were based on the work of Kabata-Pendias and Pendias (1992, cited in Maxim, 2000d). Of the 20 samples, only one sample of grass had a copper concentration (21 mg/kg) that exceeded the toxicity threshold (20 mg/kg). All other samples were below the plant growth toxicity thresholds for the eight elements tested. Both selenium and vanadium concentrations were below detectable levels in all vegetation samples. The baseline study (Maxim, 2000d) listed no occurrences of the known primary selenium indicator plants found in lists compiled by Reeves and Baker (2000) and the Wyoming Department of Environmental Quality (WDEQ, 1997).

3.11 Recreation and Wilderness

The dominant type of recreation within the vicinity of the Smoky Canyon Mine and the Proposed Action area is big game hunting. Popular big game includes elk, moose, and deer. Fishing is also conducted in the general project area; however, Upper Smoky Creek is not a preferred fishing stream because it is an intermittent stream in the mine vicinity. Additional dispersed recreation activities occurring within the general area and outside of the mine area include snowmobiling, cross country skiing, horse back riding, fowl hunting, fishing, hiking, picnicking, sight-seeing, and off-road vehicle use (Duehren, 2000; USFS, 1981).

Dispersed camping also occurs on Forest lands west of the mine site within the Webster Range. The Diamond Creek Campground is the nearest designated campground to the mine site, located approximately four miles west of the Proposed Action area east of Webster Ridge. Amenities at the Diamond Creek Campground include bathrooms, picnic facilities, trailer parking, and running water. This campground has some use during the summer months for general recreation and increased use during the fall months in support of big game hunting activities. Public access to Upper Smoky Creek and further west within the Webster Range (i.e., Diamond Creek Campground) is achieved via the Smoky Canyon Road. Public vehicle parking for snowmobile use along Upper Smoky Creek is limited.

The Diamond Creek Warming Hut is located just north of the Diamond Creek Campground. The warming hut provides a meeting place and shelter for summer and winter recreationists using ATVs and snowmobiles. Facility construction was a joint effort of the Caribou Trail Riders, the Caribou National Forest, and the Idaho Department of Parks and Recreation.

The project area and immediate vicinity does not contain any areas federally designated as Wilderness.

Idaho has approximately 8,055,000 acres of inventoried roadless areas. The proposed project would not occur within any areas currently inventoried as roadless. However, the Stump Creek Roadless area (Identification Number 04173) is located immediately north and west of the proposed Panel C. The Sage Creek Roadless area (Identification Number 04166) is located south of the Proposed Action area and within the existing mine area. Inventoried roadless areas in proximity to the proposed mining activity are shown on **Figure 3.11-1**.

The Webster Ridge Trail is located north and west of the Proposed Action area. This trail is primarily used by all-terrain vehicle (ATV) travel, with some use by hikers and horse back riders. The Webster Ridge Trail has been recently proposed by the USFS to be designated part of the Great Western Trail

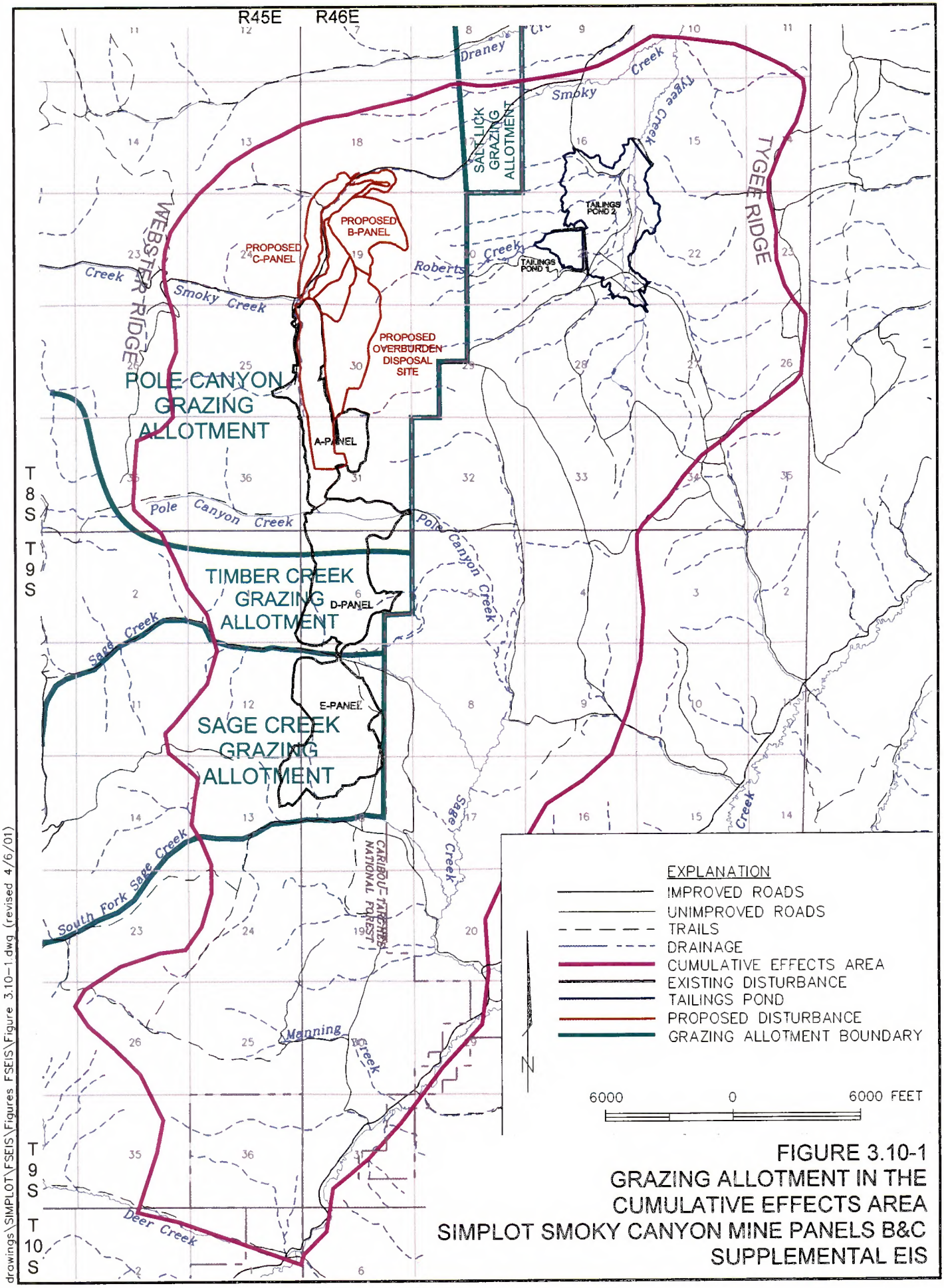

FIGURE 3.10-1
GRAZING ALLOTMENT IN THE CUMULATIVE EFFECTS AREA
SIMPLOT SMOKY CANYON MINE PANELS B&C SUPPLEMENTAL EIS

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system, which is recognized as a National Millennium Trail (**Figure 3.11-2**). Portions of the existing mine site may be visible from a few areas along this trail; however, areas of the Proposed Action would likely be screened from view due to the existing topography.

Smoky Creek is the only water feature within the Proposed Action project area. Smoky Creek is not federally designated as a wild or scenic river nor is it proposed for future study under the Wild and Scenic Rivers Act, (Pub. L. 90-542 as amended; 16 U.S.C. 1271-1287). The only rivers within the state of Idaho having the Wild and Scenic designation include the Middle Fork Clearwater, Rapid, Saint Joe, Salmon, and Middle Fork Salmon rivers.

3.12 Visual Resources

3.12.1 Overview

Existing mining activity in the project area is evidenced by pit walls, roads, mine facility buildings, power lines, and overburden disposal areas.

Visual resources are a composite of basic terrain, geologic features, water features, vegetative patterns, and land use effects that typify an area and influence the visual appeal that area may have to people. The opportunity to experience the landscape and interpret scenery and visual change is dependent upon the degree of public access and use of an area. The only public access to the project area is along the Smoky Canyon-Timber Creek Road.

The western portion of the Smoky Canyon project area is characterized by high elevations, and incised drainages with steep gradients. The eastern portion of the project area is characterized by lower elevations and meandering streams within broad valleys. Elevations range from approximately 8,500 feet in the western portion of the project area to approximately 6,360 feet on the north and south ends of the project area at Tygee and Sage creeks. Land cover in the project area is a mix of aspen and conifer forests, shrub lands, and largely unvegetated areas disturbed by mining activities. There is a strong seasonal aspect to the visual resource. Fall colors of red and yellow are brilliant along the creeks and bottoms and throughout forested areas interspersed with aspen patches.

3.12.2 Visual Resource Management

National Forest lands are typically inventoried based upon a system of Visual Quality Objectives (VQO's) as part of the forest unit planning process. The VQO's are categories of acceptable landscape alteration measured in degrees of deviation from the natural landscape (USFS,1984). They are described as follows:

Preservation (P)	Ecological change only.
Retention (R)	Human activities should not be evident to the casual Forest visitor.
Partial Retention (PR)	Human activities may be evident but must remain subordinate to the characteristic landscape.

Modification (M)	Human activity may dominate the characteristic landscape, but at the same time must utilize naturally occurring elements of the landscape including form, line color, and texture.
Maximum Modification (MM)	Human activity may dominate the characteristic landscape, but should appear as a natural occurrence when viewed as a background.

All Caribou-Targhee National Forest lands in the project area have been classified by VQO's in the Visual Management System (VMS). Visual resources of the Forest vary from distinctive, including elements such as high peaks and ridges, to minimal variation, such as foothills and valleys. The visual management program is applied to resource development activities on a project-by-project basis.

The lands occupied by proposed Panels B and C, the external overburden site, and areas to the north and east are within a Partial Retention (PR) VQO area (**Figure 3.12-1**). Activities in this area may repeat form, line, color, or texture common to the characteristic landscape but changes in their qualities of size, amount, intensity, direction, pattern, etc. remain visually subordinate to the characteristic landscape (USFS, 1981). The mine features existing in the project area do not meet the USFS PR objectives, however these objectives are interpreted by USFS staff to apply to timber management and recreation development, and to be guidelines only for mining activities. The VQO category that would be appropriate for this scale of mining activities would be M, Modification or MM, Maximum Modification.

3.12.3 Key Observation Points (KOP's)

Two KOP's were established in the project area according to access and the potential for the traveling public to view projected disturbances. Viewers are expected to include mainly recreationists pursuing dispersed outdoor activities such as hunting, fishing, wood gathering, and camping. Locations of the KOP's are shown on Figure **3.12-1**. Views from the KOP's are shown on **Figure 3.12-2** and described below. Definitions of terminology used to interpret KOP's are provided below.

KOP #1
Location: Junction of lower Smoky Canyon mine access road and tailings pond road (access blocked) SE¼SW¼ of Section 9, T. 8 S., R. 46 E.

The view point was from the junction on the south side of the mine access road looking west and south. This is the view for westbound travelers on the Smoky Canyon Mine access road.

Foreground: Barbed wire fences, gravel roads, willow riparian zone along Smoky Creek, low rounded sagebrush covered hills bordering stream floodplain, and pastures.
Color: light brown of road surfaces and exposed soils, bright green of willows, gray-green of sagebrush

Middleground: Large rolling foothills with conifer and aspen mixed forest and sagebrush openings, east side of Panel B hill visible
Color: dark and light green of forests, gray-green of sagebrush

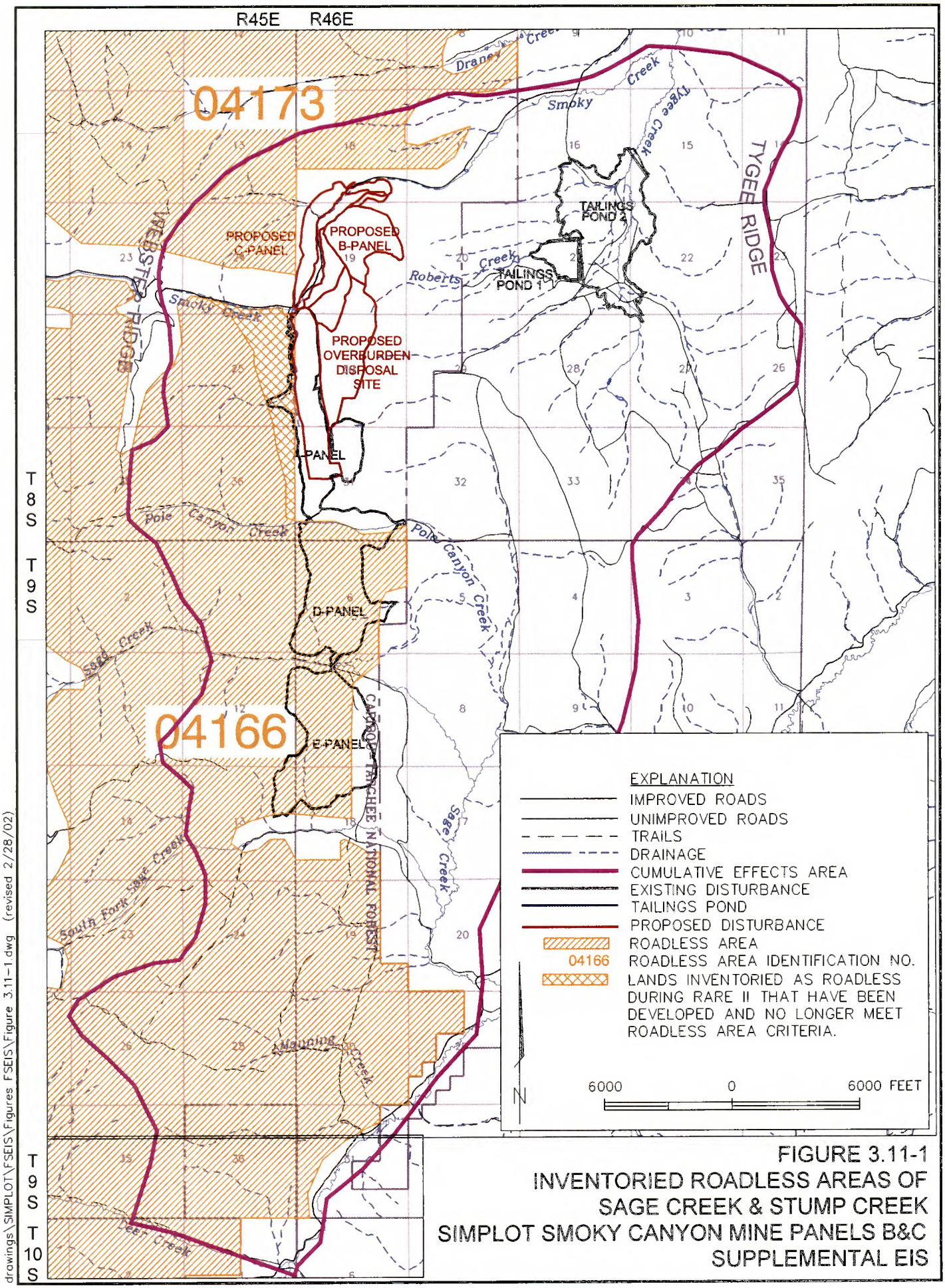

FIGURE 3.11-1
INVENTORIED ROADLESS AREAS OF
SAGE CREEK & STUMP CREEK
SIMPLOT SMOKY CANYON MINE PANELS B&C
SUPPLEMENTAL EIS

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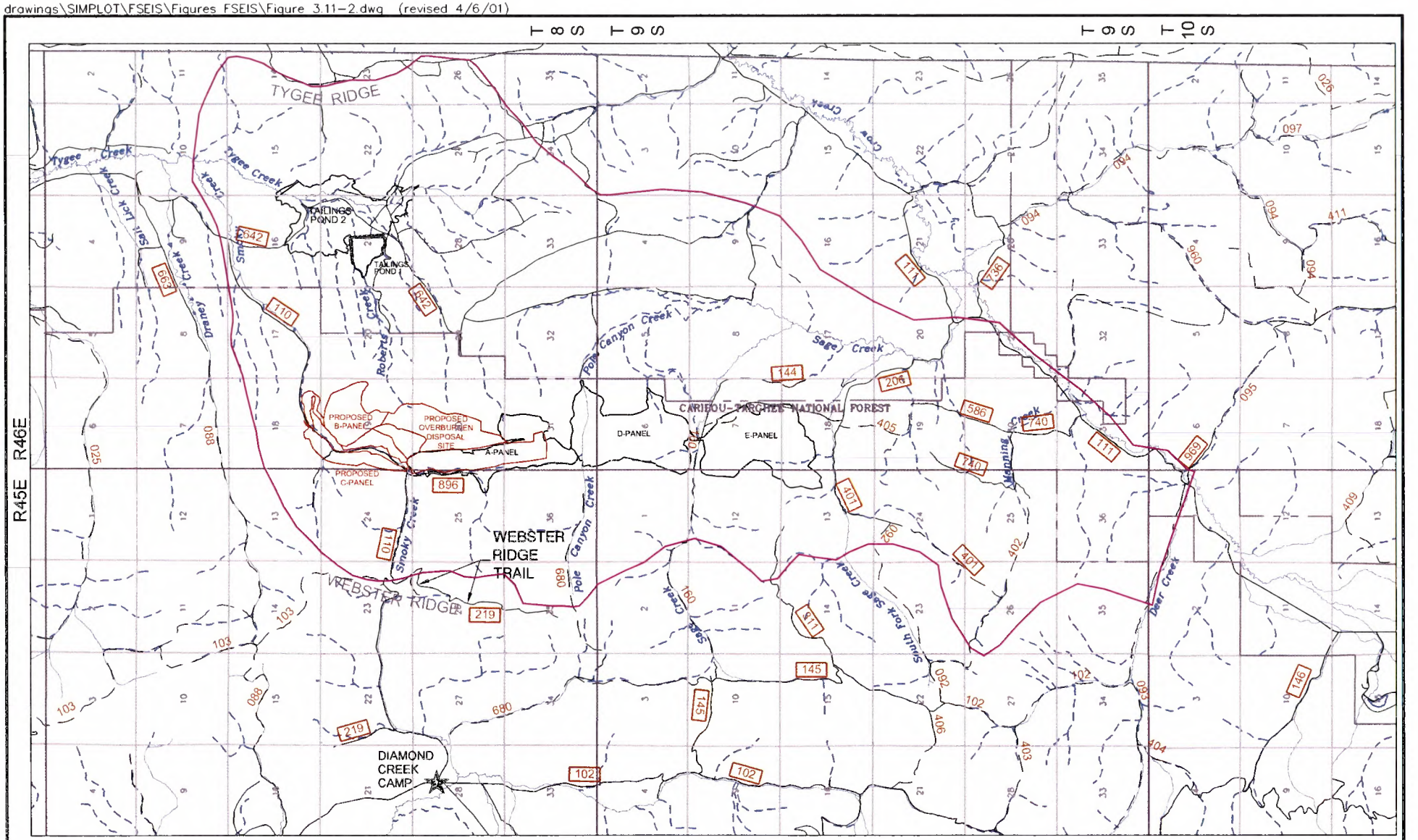

EXPLANATION
- CUMULATIVE EFFECTS AREA
- EXISTING DISTURBANCE
- PROPOSED DISTURBANCE
- DESIGNATED CAMP GROUND

USFS ROAD DESIGNATIONS
- 110 IMPROVED ROAD
- 740 UNIMPROVED ROAD
- 405 TRAIL
- 740 UNIMPROVED ROAD W/RESTRICTIONS
- 401 TRAIL W/RESTRICTIONS

N

8000 0 8000 FEET

FIGURE 3.11-2
USFS ROAD DESIGNATIONS AND ASSOCIATED RECREATIONAL FACILITIES SIMPLOT SMOKY CANYON MINE PANELS B&C SUPPLEMENTAL EIS

Background: Larger rounded hills and peaks on horizon with strong northslope conifer cover and open to partially open south slopes, small areas of revegetated reclaim visible, view to proposed Panel C is blocked.

Color: dark green of conifer forests, light brown of openings, bright green of revegetated areas

The views of travelers along Smoky Canyon Road at this point are not confined by forests.

Variety Class: Class B, common

Landform: B rolling steep slopes

Rock Form: C, no visible rock formations

Vegetation: B, mixed forest with large shrub openings

Water: B, perennial stream with meanders and pools and rapids

Sensitivity: travel route, forest road serving as secondary road for local use area, local importance, short duration, small water bodies, some local seasonal small stream fishing

Level 1: None, secondary road with no special recreation sites
Level 2: None, secondary road with no special recreation sites or recreation composite use areas
Level 3: Secondary road for travel to campsites and hunting camps

KOP #2
Location: Junction of Smoky Canyon Mine access road and Timber Creek Road.
SE¼SE¼ of Section 24, T. 8 S., R. 45 E.

The view point was from the junction on the west side of the mine access road looking east. This is the view for eastbound travelers on Timber Creek Road.

Right View: The mine access road to the mine, green mine building, revegetated overburden disposal sites, Panel A scar of steep gray-colored slope, and power line.

Left View: The mine access road visible for short distance as it descends Smoky Canyon; the vegetation is generally conifer forest with aspen patches.

Foreground: The mine access road with berms, and forested drainage.
Colors: light gray of road, mixed greens in drainage

Middleground: A long high ridge blocking views of far ground. The rounded forested hill to the left is site of proposed Panel B. The Panel A scar mentioned above is on portion of ridge. Power line generally runs parallel to ridge line but is below ridge summit.
Colors: mixed greens of forest, dark gray of panel scar

Background: View blocked.

The views of travelers along Smoky Canyon Road from the junction downhill to the valley are generally confined to the foreground by tall conifers and aspen along the road.

Variety Class: Class B, common

Landform: B various steep slopes

Rock Form: C, no visible rock formations

Vegetation: B, small aspen stands in mature conifer forest

Water: C, forested ephemeral stream channel

Sensitivity:
Travel route, forest road serving as secondary road for local use
Use area, local importance, short duration, small
Water bodies, no use

Level 1: None, secondary road with no special recreation sites
Level 2: None, secondary road with no special recreation sites or recreation composite use areas
Level 3: Secondary road for travel to campsites and hunting camps

Terminology
(From FS Handbook No. 462)

Background

The distant part of a landscape; surroundings, especially those behind something and providing harmony or contrast. Area located 3-5 miles to infinity from the viewer.

Characteristic Landscape

The naturally established landscape within a scene or scenes being viewed.

Common

Refers to prevalent, usual, or widespread landscape variety within a character type. It also refers to ordinary or undistinguished visual variety.

Foreground

The detailed landscape found within 0 to ¼ - ½ mile from the observer.

Middleground

The space between the foreground and the background in a picture or landscape. The area located from ¼ - ½ to 3-5 miles from the viewer.

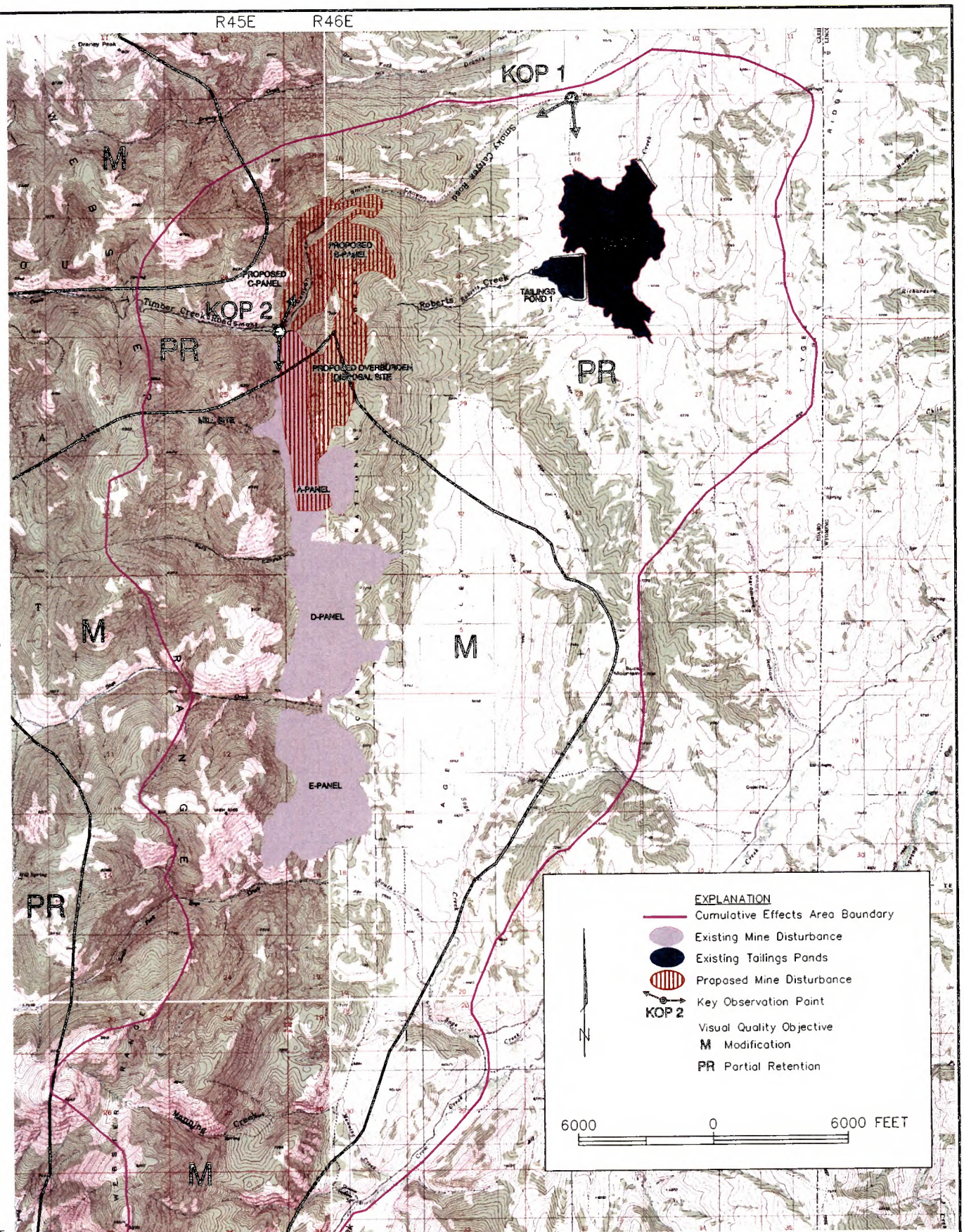

FIGURE 3.12-1
VISUAL RESOURCES
SIMPLOT SMOKY CANYON MINE PANELS B&C
SUPPLEMENTAL EIS

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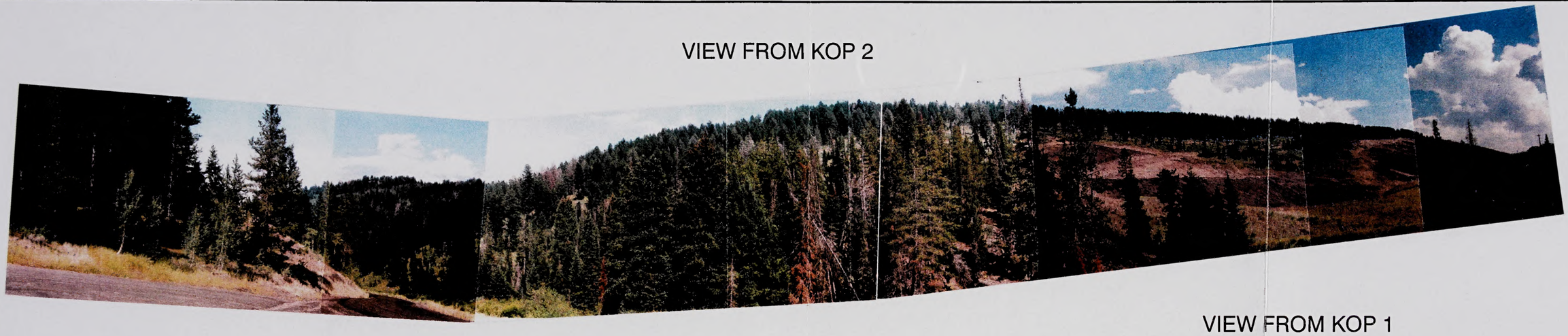
VIEW FROM KOP 2



VIEW FROM KOP 1

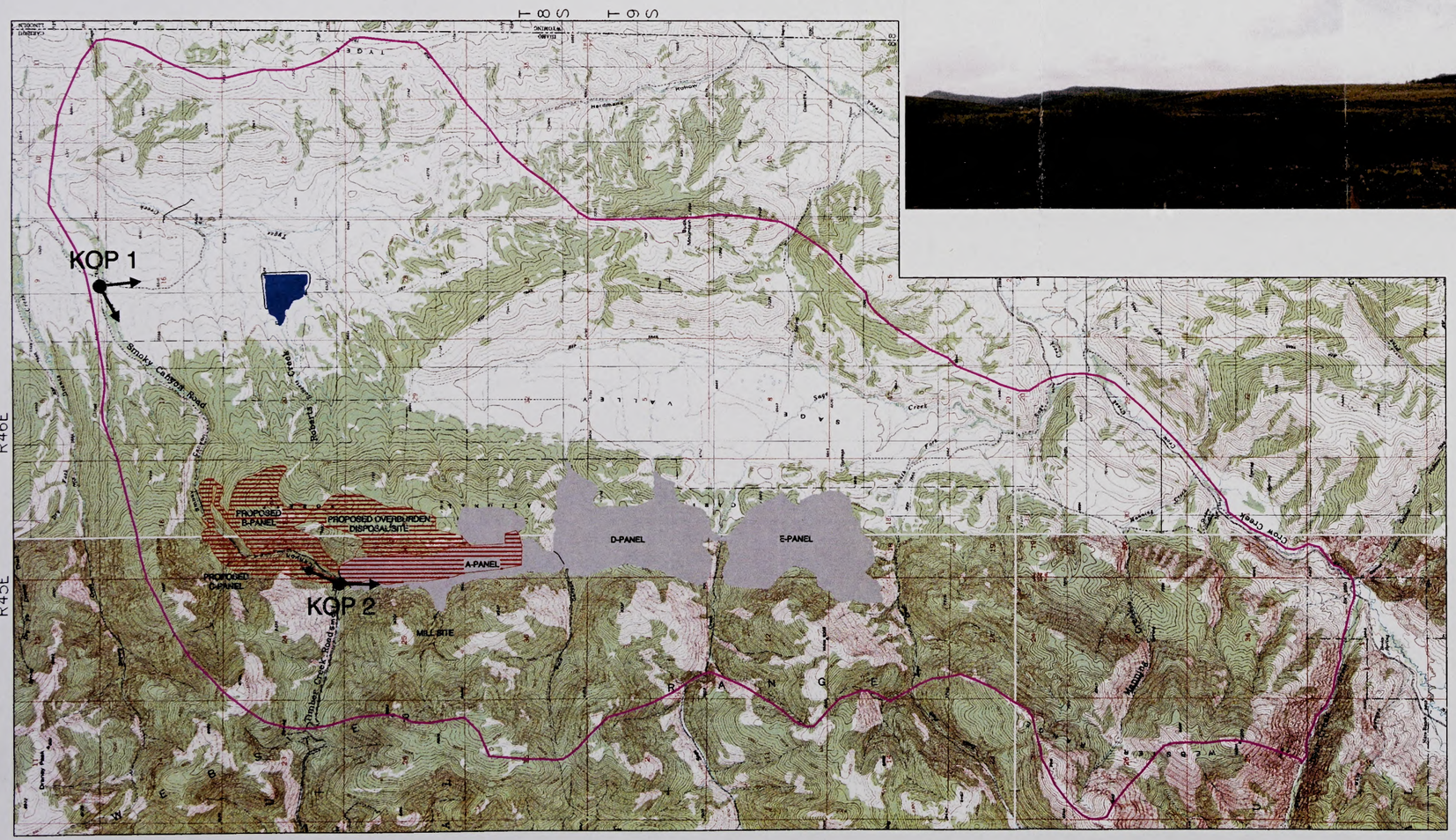


FIGURE 3.12-2
KOP VIEWPOINTS
SIMPLOT SMOKY CANYON MINE PANELS B&C
SUPPLEMENTAL EIS

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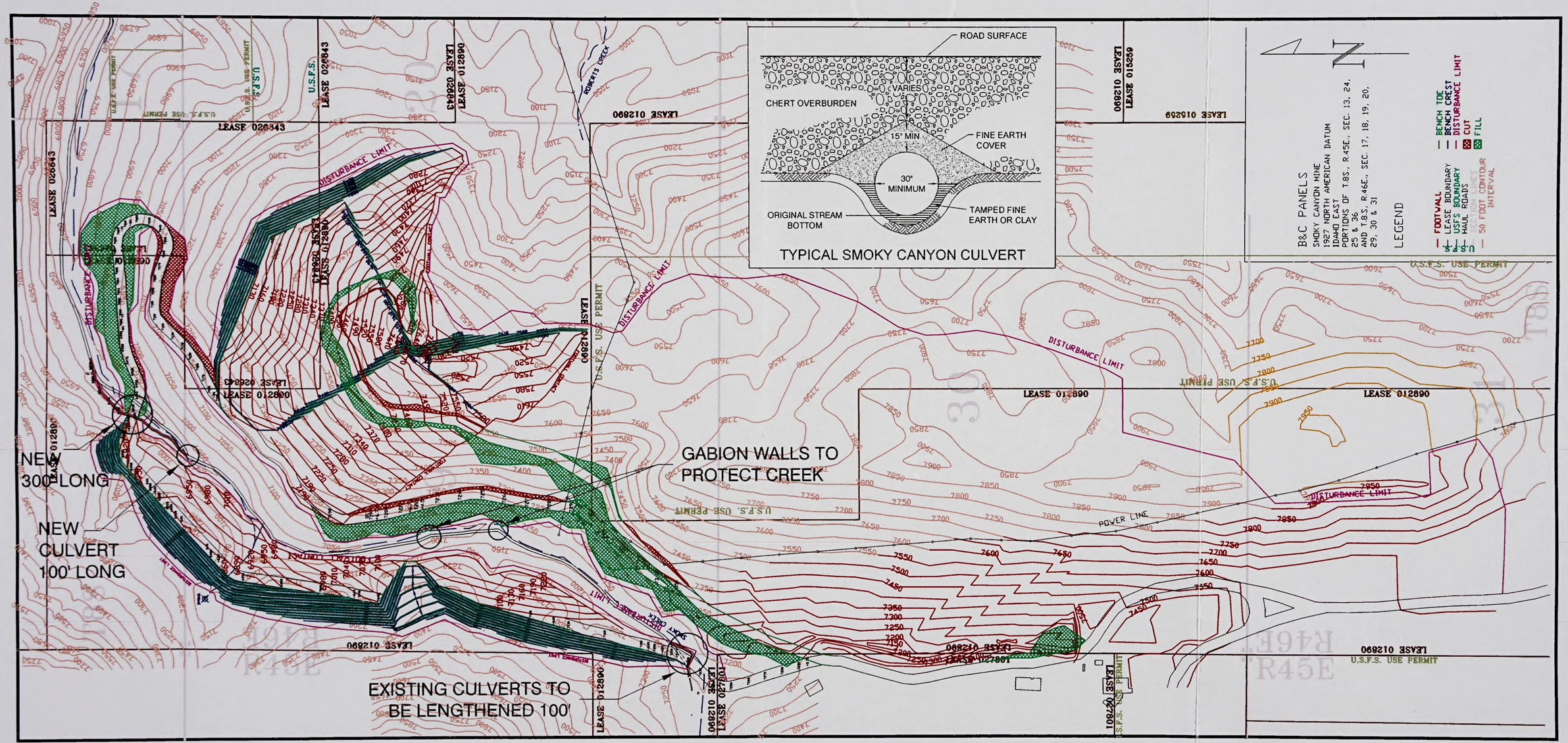
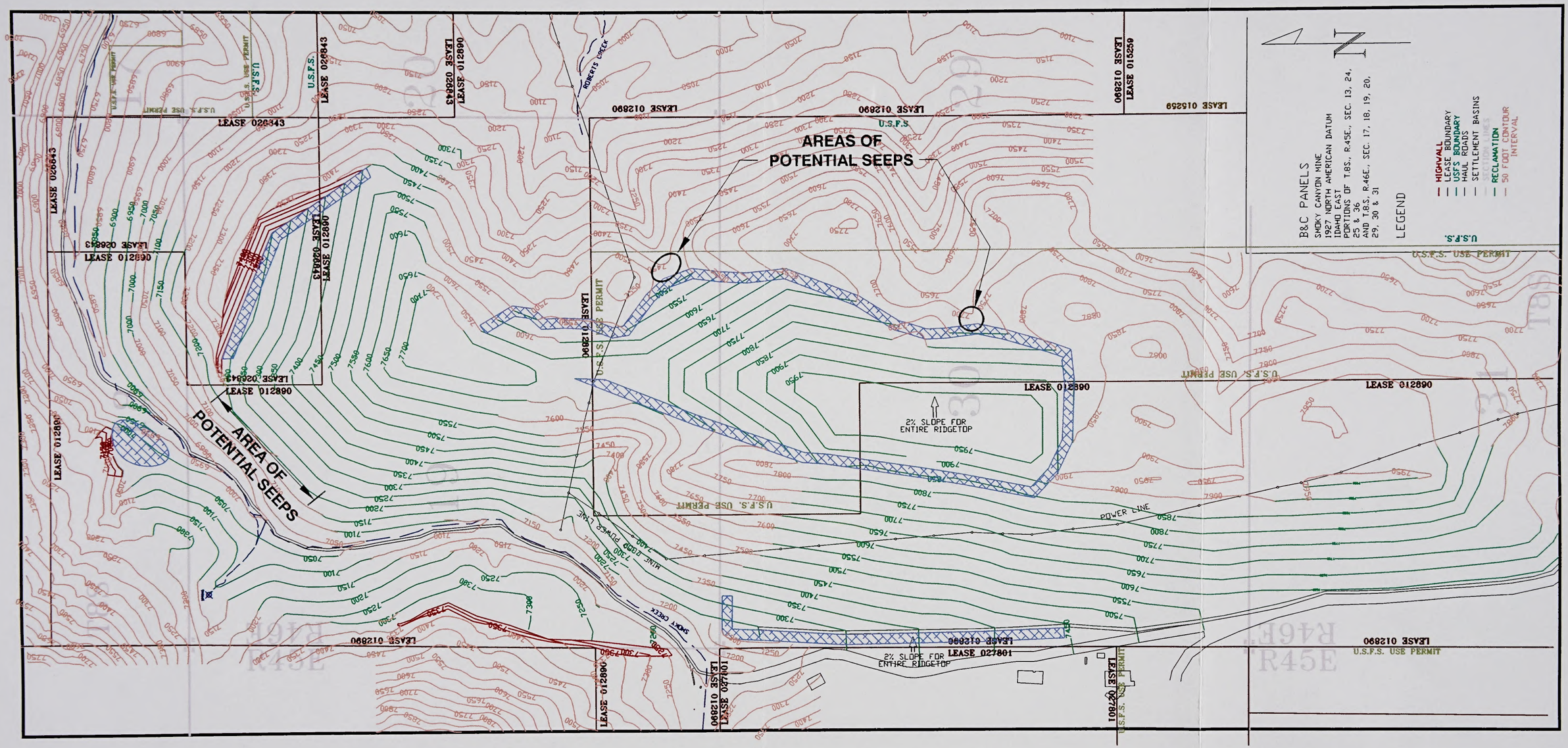


drawings\SIMPLOT\FSEIS\Figures FSEIS\Figure 4.3-1 (revised 3/4/02)

FIGURE 4.3-1
PROPOSED ACTION MINE PLAN
SIMPLOT SMOKY CANYON MINE PANELS B&C
SUPPLEMENTAL EIS



EXPLANATION

RUNOFF RECHARGE AREA

1000 0 1000 FEET

FIGURE 4.3-2
PROPOSED ACTION POST RECLAMATION PLAN
SIMPLOT SMOKY CANYON MINE PANELS B&C
SUPPLEMENTAL EIS

drawings\SIMPLOT\FEIS\Figures FSEIS\Figure 4.3-2 (revised 1/10/02)

3.13 Cultural Resources and Native American Concerns

Cultural resources provide data regarding past technologies, settlement patterns, subsistence strategies, and other research topics pertaining to history. Some resources are considered significant due to their ability to provide further information; these are the cultural resources that need to be preserved and are recommended as eligible for the National Register of Historic Places (NRHP). Eligible properties have to meet at least one of four criteria; association with events that have made a significant contribution to the broad patterns of history, association with a significant person, embody distinctive characteristics of a type, period, or method of construction or represent a significant and distinguishable entity, and/or can yield additional information important to history or prehistory.

3.13.1 Prehistoric and Historic Inhabitants in Southeastern Idaho

The following history was taken from the Final EIS for the Caribou National Forest Phosphate Leasing Proposal (BLM and USFS, 1998):

> Prehistoric cultural overviews for southeastern Idaho and the northeastern Great Basin in general, have been offered at various scales of resolution (e.g., Butler, 1978 & 1986; Carambelas, Lupo, and Schmidt, 1994; Franzen, 1981; Gehr, Lee, Johnson, Merrit, and Nelson, 1982; Madsen, 1982; Meatte, 1990; Ringe, Holmer, and Reed, 1987; Swanson, 1972 & 1974). The prehistory and history is taken from Caribou National Forest/Idaho Bureau of Land Management (BLM, 1997). Overviews limited to the history of southeastern Idaho also have been prepared to address the needs of cultural resources management (Fiori, 1981; Sommers and Fiori, 1981; Wegars and Bruder, 1992) and to identify a number of significant themes for the region. The following prehistoric overview largely is excerpted from Carambelas, Lupe, and Schmidt, (1994), and Sant and Douglas, (1992), while the historic overview primarily is extracted from Fiori (1981) and Wegars and Bruder (1992).
>
> **PREHISTORY**
> The prehistory of southeastern Idaho can be divided into at least three periods, each of which is defined by distinct artifact types and most of which are characterized by different settlement and subsistence patterns. These periods include the Paleo Indian, Archaic, and Protohistoric.
>
> **Paleo Indian Period (ca. 14,500 to7,000 B.P.)**
> The Paleo Indian period largely is defined by three types of projectile points (Clovis, Folsom, and Plano); each one is thought to delimit a separate subperiod (12,000 to 11,000 B.P., 11,000 to 10,600 B.P., and 10,600 to 7,800 B.P., respectively [Butler 1986:128-129]). Only the latter two point types have been recovered from radiocarbon-dated contexts. However, Sant and Douglas (1992), citing Butler (1965) and Titmus and Woods (1988), note that Clovis points have been found at sites in southeastern Idaho, including Bannock Creek, Rainbow Beach, and Lake Channel. Other Clovis-like points have been recovered from sites near Fairfield and Twin Falls (Butler 1986:128). Folsom points have been recovered from well-dated deposits at the Wasden Site (Owl Cave) and a number of surface sites. Butler (1986:128-129) states that the Plano subperiod is the longest lived and the most abundantly represented in central and eastern Idaho, both in

terms of surface finds and excavated sites. Plano-style points, of which there are many (see Sant and Douglas, 1992), have been found in the stratified deposits at the Wasden Site (Owl Cave) and Wilson Butte II...

The association of Folsom spear points with large mammal remains strongly suggests that Paleo Indian groups who occupied the region focused their subsistence efforts almost exclusively on large, migratory animals. Given this, it may be reasonable to assume that Paleo Indian groups in southeastern Idaho also traveled over large annual ranges (Goodyear, 1979; Letourneau, 1992) and exhibited a high degree of residential mobility (Binford, 1980; Kelly and Todd, 1988)...

Archaic Period (7,000 to 300 B.P.)

The two most defining characteristics of the Archaic period are the introduction of stemmed (Pinto series) and notched (Northern Side-notched and Elko series) projectile points and the apparent broadening of the resource base. The shift from large, lanceolate-shaped points to small, stemmed and notched points is believed to be related to the introduction of the atlatl and dart from two separate regions, the Great Basin and the Plains (Butler [1986:130] citing Gruhn, 1961). Ground stone artifacts and small mammal remains at some sites suggest that Archaic groups exploited a wider array of resources than Paleo Indian groups (Sant and Douglas, 1992), perhaps because of the declining numbers or extinction of many large mammals. However, large mammals still appear to be the primary food resource of Archaic groups. Based on the observed variation in artifact assemblages and settlement and subsistence practices, the Archaic period can be divided into three subperiods (Sant and Douglas, 1992).

The Early Archaic (7,000 to 4,500 B.P.) is characterized by at least two of the same elements that define the Paleo Indian period, a subsistence economy oriented toward large mammals and a relatively high degree of mobility (Sant and Douglas, 1992). Large side-notched and bifurcate stemmed points (Northern Side-notched or Bitteroot and Pinto series, respectively) mark this period, and the Elko point also is introduced during this time. Groups appear to have broadened their resource base during the Early Archaic, somewhat, but a relatively substantial shift in subsistence practices is unapparent (Sant and Douglas, 1992 citing Swanson, 1974). Toward the latter part of the Early Archaic, some groups in southwestern Idaho became more sedentary, as evidenced by the construction of large semi subterranean houses near Givens Hot Springs at approximately 4,300 B.P. (Butler, 1986:130-131 citing Green, 1982).

A number of new projectile point types marks the Middle Archaic subperiod (4,500 B.P. to 1,300 B.P.), along with the appearance of earth oven features (Sant and Douglas, 1992 citing Franzen, 1981; Ringe, Holmer, and Reed, 1987; and Butler 1986). Bifurcate stemmed (Pinto and Gatecliff series), large corner-notched (Elko series), and lanceolate (Humboldt) projectile points increase in frequency, while the frequency of large side-notched points (Northern Side-notched or Bitterroot) decreases. Toward the middle of the Middle Archaic, projectile points begin to exhibit narrower neck widths; large corner-notched points (e.g., Elko, Besant, and Pelican Lake) become more abundant; and some small types (Rosesprings, Eastgate, or Rosegate [Thomas, 1981]) appear in the archaeological record. These observations likely signal the introduction of the bow and arrow into the region. Holmer (1986) and Ringe, Holmer, and Reed (1987), cited by Sant

and Douglas (1992), note that bow and arrow technology probably was introduced into southern Idaho by 1650 B.P. By 1300 B.P., it was the most common weaponry system in use.

Subsistence and settlement patterns in southeastern Idaho remained fairly consistent between the Early and Middle Archaic (Sant and Douglas, 1992, citing Gruhn, 1961, Ranere, 1971, Swanson, 1972, and Swanson, Butler, and Bonnidsem, 1964). However, some very interesting changes occurred in southwestern Idaho during this time, including an increased use of plant resources, exploitation of anadromous fish, increased sedentism, and formalized burial (e.g., Bucy, 1971 & 1974; Meatte, 1990:66-67; Pavesic, 1985; Warren, Wilkenson, and Pavesic, 1971).

Archaeologically, the Late Archaic is defined by the introduction of ceramics and small triangular and side-notched points. These artifact classes, particularly the ceramics, signal the occupation of at least two groups or "cultural manifestations" (Butler, 1986:131) in southeastern Idaho: the Fremont (ca. 1300 to 650 B.P.) and the Shoshonean (ca. 700 B.P. to present)...

Shards of Great Salt Lake Gray, a northern Fremont ceramic, have been recovered from a number of dated and undated sites along the Snake River Plain, including Wilson Butte Cave, Clover Creek, and a site at the foot of Kanaka Rapids (Butler, 1986:131-132). Because the Fremont typically are thought of as horticulturalists, and since evidence for horticulture has yet to be found in southeastern Idaho (Holmer, 1986:243; Ringe, Holmer, and Reed, 1987), the presence of these artifacts has been problematic to some (Sant and Douglas, 1992). It is possible that Fremont artifacts arrived in southeastern Idaho through trade, as suggested by Sant and Douglas (1992). However, if northern Fremont populations primarily were hunters and gatherers, rather than horticulturalists, as some have argued (Madsen, 1982:217-218; Sharp, 1989; Simms, 1990), then the presence of Fremont artifacts in southeastern Idaho probably is a consequence of Fremont hunter-gatherers occupying the area.

Shoshone and Bannock occupation of southeastern Idaho coincides with the expansion of Numic speaking people from the southwestern Great Basin to the North and East. Brown-ware ceramics and Desert Side-notched and Cottonwood triangular projectile points are thought to be temporally and ethnically sensitive artifacts. Artifacts recovered from the Wahmuza site indicate continuous Shoshonean occupation since 700 B.P. (Geminis, 1986 cited by Sant and Douglas, 1992). Like the northern Fremont in southeastern Idaho, the Shoshone and Bannock groups are characterized as relatively mobile hunter-gatherers.

Proto historic and Ethnohistoric Periods (300 B.P. to Present)

The changes to Shoshone and Bannock lifeways in southeastern Idaho over the past few hundred years appear to be due to the introduction of the horse (Manning and Deaver, 1992; Murphy and Murphy, 1986; Stewart, 1938:201). Stewart, (1938:201) states that the horse transformed the Shoshoni economy by facilitating the use of new hunting techniques, which ultimately yielded more resources and enabled people to live in large, relatively permanent settlements. Rather than being tethered to their food caches, groups

could forage over greater distances and transport food to central location (Stewart, 1938:201).

Two horse-owning groups may have passed through the Dairy Syncline and Manning Creek Tracts during their annual forays. Stewart, (1938:218-219, Figure 12) notes that the Cache Valley Shoshone hunted and gathered along the Bear River and crossed the Wasatch Mountains (very close to both project areas) during bison hunting excursions to Wyoming. Bannock and Shoshone groups living at Fort Hall also may have passed through the area while hunting elk, deer, and mountain sheep and gathering berries along the Bear River (Murphy and Murphy, 1986:288, 292) or traveling to Wyoming to hunt bison (Stewart, 1938:198-216, Figure 10), or both. During the nineteenth century, however, these hunting and gathering forays began to change.

Westward expansion and increasing conflicts with Euroamericans eventually forced most of the Shoshone and Bannock into the reservation system. The Western Shoshone signed a treaty in 1863 with the United States Government which set aside large tracts of Indian land in Idaho, Nevada, Oregon, Utah, and Wyoming (Manning and Deaver, 1992). In 1867 and 1868, the Fort Hall and Wind River Valley Reservations, respectively, were established, and by 1868 the Shoshone had relinquished all their lands in Idaho and Wyoming except for lands specifically set aside as reserves (Clements and Forbush, 1970:21) cited by Manning and Deaver, 1992). The Bannock were assigned to the Fort Hall Reservation in 1869, and from 1879 to 1907 a number of other Native American groups were relocated to Fort Hall (Manning and Deaver, 1992).

The archaeological record of the Shoshone and Bannock presently living in southeastern Idaho is much different from the one created in the nineteenth century. Many sacred sites are located throughout the region; those that can be identified include burials, rock art, monumental rock features and formations, rock structures or rings, sweat lodges, timber and brush structures, eagle catching pits, and prayer and offering locales (Manning and Deaver, 1992). Much of the landscape in southeastern Idaho also is sacred to local Native American groups and, thus, is not defined by archaeological remains.

HISTORY

Euroamericans in southeastern Idaho are documented as early as the early 1800's, with fur trappers and explorers being the first to pass through the region (Fiori, 1981:115-127). Under the command of Robert Stuart in the early-1800's, one group of Astorians made their way from the Bear River to the Salt River and thence to the Snake, a route which likely took them through Georgetown Canyon, Crow Creek, and Star Valley. Other well-know explorers visited Soda Springs, including Bonneville and Wyeth in the mid-1830's, Fremont in the early-1840's, and Goodhart in the early-1860's (Barnarde, Bybee, and Walker, 1958:106-108).

During the early I840's, emigrants began moving *en masse* to Oregon, primarily along the Oregon Trail. In Idaho, they could choose to follow the Oregon Trail, via Fort Hail and Fort Boise, or the California Trail at Soda Springs, Fort Hall, or Raft River (Fiori, 1981:170). Brigham Young led Mormon pioneers into the Salt Lake Valley in 1847 and by early-1860, had dispatched settlers into southeastern Idaho (Fiori, 1981:148).

Miners and railroad workers came to southeastern Idaho between the 1860's and 1890's. In 1866, the Oneida Salt Works began operating and quickly boasted of the purest, cleanest salt in the United States (Barnard, Bybee, and Walker, 1958:109-112). The Caribou mines were worked from the 1870's through the 1890's, during which time Keenan and Caribou City became thriving boom towns. Sulphur mining commenced in the early 1880's. In response to railroad construction in the West, Majors Tie Camp was established in 1868 by Alexander Majors, who directed the cutting of thousands of trees along the Bear River. Majors floated the resulting ties down the Bear River to Corrine, Utah, where they were used for the Transcontinental Railroad.

In reaction to the mining boom, small herds of cattle were driven into the region during the early 1860's. Larger herds were located to southeastern Idaho during the 1870's and 1880's, as crowding on the Plains prompted cattlemen to consider the rich grazing lands of Idaho (Fiori, 1981:144). Barnard, Bybee, and Walker (1958) noted that the Kunz family established a dairy on Slug Creek between 1885 and 1890. Sheep were brought to the region by missionaries and emigrants as early as the 1830's and 1840's, but it was only after the discovery of gold in Idaho in the 1860's that larger herds were driven to the area (Fiori,1981:145-146). Large herds of sheep were established in Caribou County during the late 1890's and early1900's (Barnard, Bybee, and Walker, 1958).

Many non-White, non-Native Americans began arriving in southeastern Idaho during the 1860's. Throughout the 1860's and 1870's; Chinese emigrants came to the area to mine gold. Statistics provided by Paul (1963:144), cited by Fiori (1981:182), indicate that more than one-quarter of the population in Idaho was comprised of Chinese in 1870. At Caribou City, the Chinese comprised nearly one-half the population only one year after the discovery of gold, and Keenan housed a Chinese population of between 300 and 400 (Barnard, Bybee, and Walker, 1958:113).

Many of the Chinese in Idaho shifted from mining to railroad construction during the latter part of the nineteenth century, but when the railroads were complete, their numbers decreased (Fiori, 1981:182). Hostile attitudes and legislation aimed directly at the Chinese likely contributed to the overall decline in the Chinese population but probably only minimally in southeastern Idaho (Sommers and Fiori, 1981:212). Whatever the case, the Japanese began to fill the void left by the Chinese, working as miners, farmers, railroad workers, and domestic servants as well as establishing their own businesses (Fiori, 1981:183). The Japanese population increased dramatically with the completion of the Minidoka War Relocation Center in 1942, and many Japanese remained in Idaho after their release from the center in 1945 (Fiori, 1981:184).

Near the turn of the century, the population of other ethnic groups began to increase. Greeks, Germans, and Russians began coming to Idaho in large numbers about 1900, and Basque sheep herders moved to the area after 1925 (Carambelas, Lupo, and Schmidt, 1994:12).

Timber resources in southeastern Idaho are not as abundant as in other parts of the state but still played a role in the development of the area. As communities were established, lumber was harvested locally through primitive means such as the pit saw (BLM, 1981). As the demand for lumber grew, other means of lumbering were needed. A water powered sawmill was the next technology introduced into the region,

built by Samuel Parkinson and Thomas Smart in 1863 in Franklin. A steam sawmill was brought into the area in 1871. Approximately 30 sawmills were operating in southeastern Idaho by 1883.

3.13.2 Previous Research

Twenty-six cultural resource inventories have been conducted within the Cumulative Effects Area. These projects are associated with phosphate mine expansion and exploration, timber sales, utilities, land exchange, and a stock pond development. Initially, cultural resource inventories were conducted from 1978 to 1980 to identify any resources in the area that could be affected by the proposed project. Sites were located, defined, and recommendations for the protection of these cultural resources were made. These inventories were summarized in the 1981 Smoky Canyon DEIS (USFS, 1981).

The DEIS summarized that four potential archaeological sites and a few isolated finds were encountered in or near the mine operations area. These sites were prehistoric in nature. Additional fieldwork conducted along the slurry line routes encountered an additional five sites and several isolated artifacts. These sites were all considered significant due to the paucity of prehistoric sites in this high elevation environment. Also, historic sites associated with sawmills and lumbering activities were noted. Other known historic sites near but not within the lease area include the Lander Trail, Crow Creek Wagon Road, Fairview Cutoff, and Oneida Salt Works. The DEIS summed up the investigations by stating: "These investigations have concluded that the area is largely free of cultural resources except for several areas that can be avoided. A total of ten sites warrant further investigation to determine their cultural resources value. Among these are three sites in the lease area, one site in the access road, one field site and two sections in the slurry pipeline corridor, the tailings pond area, and two sections of the tailings line route."

The most recent inventory (Gray, 2000) recorded one aspen carving cultural resource site within the proposed area of disturbance. See **Table 3.13-1** for complete listing of inventories conducted in the general project area.

Table 3.13-1 Previous Cultural Resource Inventories

Project Description	Author/Year	Findings
Diamond Creek GIS Area (CB-91-218)	Christensen, Brad 1991	None
Archaeological Survey, 161kV Transmission Line Smoky Canyon Area	Druss, Mark 1982	None
Intensive Field Study of Archeological Resources at Drill Locations and Proposed Roads, Smoky Canyon Lease I-012890	Druss, Mark, Max Dahlstrom, Steve Wright, Claudia Hallock, and Paula Rosa 1979 (ISU)	None
Archeological Investigations in the Smoky Canyon Area	Druss, Mark, Max Dahlstrom, Claudia Druss, and Steve Wright 1980 (ISU)	10CU86, 10CU88, 10CU89, 10CU90, 10CU76
Class III Cultural Resource Inventory of Area to be Disturbed by Tailings Reservoir No. 2 at Simplot's Smoky Canyon Mine, Idaho	Mariah Associates, Inc. 1988	Saltworks site
A Cultural Resource Inventory: Smoky Canyon Mine Lease, Caribou National Forest, Idaho	McGuire, David J. 1982 (Mariah Associates, Inc.)	None

Table 3.13-1, continued.

Project Description	Author/Year	Findings
A Class III Cultural Resource Inventory of Proposed Tailings Reservoir No. 2 at Simplot's Smoky Canyon Mine (CB-88-244)	McNees, Lance and Craig Smith 1988 (Mariah Associates, Inc)	One site (10CU132)
Hartman Ranch, L.L.C Land Exchange	Myler, Terrie 1997 (ISU)	One Isolated Find
A Cultural Resources Snow Monitor of Four Proposed Drill Pads and Two Access Roads	Polk, Michael 1987 (Sagebrush Archaeological Consultants)	None
Diamond Creek GIS Update (CB-93-306)	Robertson, Mary 1997 (Forest Service)	USFS No. CB-157 (Cabin)
Diamond Creek GIS Update (CB-93-306)	Robertson, M. 1993 (Forest Service)	One site (10CU183) cabin
Galland Special Use Permit Pipeline	Robertson, M. 1996 (Forest Service)	None
Simplot Company Panel B Exploration, Extension of 1996 Operations Request (CB-97-432)	Robertson, M. 1997 (Forest Service)	None
Simplot Company Federal Phosphate Lease I-030369 Modification (CB-97-433)	Robertson, M. 1997 (Forest Service)	None
Manning Creek Exploration Plan Modification (CB-94-333)	Satter, Norris 1994 (Bureau of Land Management)	None
A Cultural Resource Inventory of Two Segments of a Proposed Powerline in Star Valley, Wyoming	Walker, Danny 1981 (University of Wyoming)	None
Archaeological Investigations in Eastern Idaho: The Lower Valley Power and Light Tincup Loop Transmission Line CRM-CB-119)	Walker, Danny N. 1982 (University of Wyoming)	20 Sites
Stage I Investigation and Analysis of Archaeological Resources in Pit Area, Mill Sites, and Dump Site, Smoky Canyon Lease I-012890	Druss, Mark, Max Dahlstrom, Claudia Hallock, and Steve Wright 1980 (ISU)	10CU76, 10CU77, 10CU78, 10CU79
Survey Report #3: Smoky Canyon Project	Druss, Claudia and Steven E. Wright 1981(Basin & Range Research)	None
Smoky Canyon Mine Panels B and C Project - Cultural Resource Inventory and Assessment, Caribou County, ID	Gray, Dale 2000 (Frontier Historical Consultants)	Aspen Carving Site (10CU - not assigned, temp #DG-1)
Manning Creek Drilling Project (CB-92-262)	Hamilton, J. 1992 (Forest Service)	None
Pine Creek Pond (CB-85-162)	Montpelier District Forest Service 1985	None
South Fork Sage Creek Timber Sale (CB-94-337)	Robertson, Mary 1994 (Forest Service)	None
North and Upper Manning Timber Sale (CB-93-307)	Robertson, Mary 1993 (Forest Service)	None

Table 3.13-1, continued.

Project Description	Author/Year	Findings
Smoky Canyon Panel B Exploration (CB-97-434)	Robertson, M. 1997 (Forest Service)	None
Simplot Panel B Exploration, Lease I-012890 (CB-96-421)	Robertson, M. 1997 (Forest Service)	None

A total of ten sites are located within the Cumulative Effects Area with one inside the area of the Proposed Action. Three sites are within mine disturbance areas, already cleared for mining activities. One multi-component site is on the north edge of Panel A, a historic site is within Panel A, and another historic site is within Tailings Pond 2. An additional site, prehistoric in nature, is on the north and west edge of Panel D, near Pole Canyon Creek. This site was considered eligible for the NRHP and avoidance or mitigation measures were recommended.

Review of historic (pre1950) General Land Office (GLO) maps revealed possible historic features within the Cumulative Effects Area. The majority of these features have not been confirmed on the ground but may exist and could possibly be impacted by the proposed activities.

One of the historic GLO features, the Smoky Canyon Road, is within the proposed disturbance area. The segment of road within the proposed disturbance needs to be recorded and its integrity and research potential needs to be evaluated. Another historic feature adjacent to the proposed disturbance is the saw mill which has been previously recorded. This site has been tested and subsequently deemed ineligible for the NRHP, therefore there will be no adverse effect to this property.

Further, the Saltworks feature, in another portion of the current project area, has been previously recorded and deemed ineligible. The remaining historic features are within the Cumulative Effects Area and may incur secondary impacts as a result of the proposed action. It may be necessary to conduct a field inventory of these features in order to determine whether the resources currently exist on the ground.

3.14 Social and Economic Resources

The affected environment of the Smoky Canyon Phosphate Mine is southeastern Idaho and southwestern Wyoming, specifically, Bannock and Caribou counties, Idaho and Lincoln County, Wyoming. The mining operation and mill and slurry pipeline pumping facilities are located in Caribou County, Idaho, and a phosphate fertilizer plant is located Bannock County, Idaho. The mine is about five miles from the Idaho-Wyoming border and the majority of the employees at the mine site live in the Star Valley area of Lincoln County, Wyoming. This section describes the socio-economic environment of the three counties. This includes social life, land ownership, population, demographics, employment, wages and income, housing, government finance, agriculture, and the economics of the Idaho phosphate industry.

3.14.1 Social Resources

The initial Anglo settlers in Caribou County were the Morrisites, a group of dissidents from the Latter Day Saints (LDS) Church that settled around Camp Connor in 1863. The Morrisites left the area when Camp

Connor was abandoned in 1865. Members of the LDS Church, at the direction of Brigham Young, settled in 1870. The Oregon Short Line Railroad reached Soda Springs in 1882 and Soda Springs became a local center for shipping wool and livestock. The phosphate deposits were discovered in 1889 by prospectors hunting for gold and the first commercial fertilizer mine opened in 1906. In 1919, Soda Springs became the county seat of Caribou County, the youngest county in Idaho. In 1951, Monsanto Chemical Company built a plant north of Soda Springs to recover elemental phosphorus (Conley, 1982).

There are two explanations for the name of the Star Valley. One states the name was derived from one of the early settlers proclaiming the area "The star of all the valleys." The other explanation is that it was originally called "starved valley," as a result of difficult winters experienced by the early settlers. After the area had been explored by fur trappers and crossed by pioneers utilizing the Lander Cutoff of the Oregon Trail, the first permanent settlers arrived in the 1870's from Utah. Settlement was accelerated after passage of the Edwards Anti-Polygamy Act of 1882. Idaho lawmen couldn't cross the state line and the area was sufficiently remote from the other settled areas in Wyoming that state's lawmen rarely bothered the settlers. Perhaps the most famous resident of the area was the outlaw Butch Cassidy, who spent the winter of 1889 in Afton. In terms of geography, social life, and attitudes, the area more closely resembles southeastern Idaho and northern Utah than Wyoming. The Star Valley is populated by small towns approximately five to ten miles apart and separated by grazing and crop land, similar to southeastern Idaho and northern Utah, in contrast to most areas of Wyoming, which are characterized by cities and towns separated by large open areas utilized for ranching and natural resource extraction (Burt, 1991).

Caribou County, Idaho and the Star Valley were originally settled by members of the LDS Church and it still plays a significant role in the social structure of the two areas. Residents of Caribou County, Idaho and the Star Valley often travel to Pocatello, Idaho, Evanston, Wyoming, and Salt Lake City, Utah for goods and services that are not available locally. In recent years, the Star Valley has experienced a noticeable influx of residents from the Jackson Hole area of Wyoming.

Natural resources are important parts of the residents' lifestyle, recreational activities, and the economy of the three counties. However, in recent years, local leaders have taken steps to diversify the economy and lessen the dependence upon natural resources and the worldwide commodities markets.

Land Ownership

The three counties are contiguous, with Bannock County, Idaho being the farthest west and Lincoln County, Wyoming being the farthest east. Bannock County, Idaho is surrounded by Bingham, Caribou, Franklin, Oneida, and Power Counties, Idaho. Caribou County, Idaho is surrounded by Lincoln County, Wyoming, and Bear Lake, Franklin, Bannock, Bingham, and Bonneville Counties, Idaho. Lincoln County, Wyoming is surrounded by Teton, Sublette, Sweetwater, and Uinta Counties, Wyoming, Rich County, Utah, and Bear Lake, Caribou, and Bonneville Counties, Idaho. Bannock County, Idaho comprises the Pocatello Metropolitan Statistical Area. The other two subject counties are not part of any metropolitan statistical area. Government is a significant landowner in each of the three counties. Bannock County has the highest percentage of privately owned land of the three counties. Lincoln County is the largest of the three counties and is over three times as large as Bannock County, the smallest of the three.

Population

Bannock County, Idaho is the most populous of the three counties. In 1998, Bannock County, Idaho contained 77.8 percent of the estimated population for the three counties. The population of Bannock County, Idaho is concentrated in the city of Pocatello. Pocatello had a 1998 estimated population of

53,074, or 70.9 percent of the Bannock County, Idaho population. Chubbuck, a suburb of Pocatello is the next largest city in the county.

Soda Springs is the largest city in Caribou County, Idaho, with a population of 3,258, or 43.9 percent of the Caribou County, Idaho population. Grace and Bancroft are the next largest cities in Caribou County, Idaho.

Lincoln County, Wyoming has two centers of population. Kemmerer, in the southern part of the county, is the county seat. Kemmerer and surrounding communities account for about 30 percent of the population. Kemmerer had an estimated population of 2,931 in 1998, while the nearby towns of Diamondville and Opal had populations of 888 and 94, respectively (Wyoming State Almanac, 2000). The other population center in Lincoln County, Wyoming is the Star Valley in the northwest portion of the county. Incorporated communities in the Star Valley are Afton, Alpine, and Thayne. Unincorporated communities in the Star Valley include Auburn, Bedford, Etna, Fairview, Freedom, Grover, Osmond, Smoot, and Turnerville. Approximately 180 of the Smoky Canyon Mine's 207 employees reside in the Star Valley. The two populated areas of Lincoln County, Wyoming are separated by the Salt River Range, which is managed by the USFS as part of the Bridger-Teton National Forest.

Demographics

The three subject counties are relatively uniform demographically. The average demographics for the three counties are highly influenced by Bannock County, Idaho, due to it containing 77.8 percent of the population of the three counties. The presence of Idaho State University in Bannock County, Idaho also influences the demographics. Bannock County, Idaho is 94.7 percent white, while Caribou County, Idaho and Lincoln County, Wyoming are 98.4 percent and 99.0 percent white, respectively. Hispanic is the most populous minority in each of the three counties. Bannock County, Idaho is 2.7 percent Native American, as a result of the location of the Fort Hall Indian Reservation in northern Bannock County.

Community Service Providers

Social services in the Star Valley are provided by the Wyoming Department of Family Services and the Lincoln County Health Department. The Wyoming Department of Family Services operates a seven person office in Afton. Personnel include one county manager, one social work supervisor, one public assistance economist, two social workers, one social service aid, and a secretary. The office focuses on two main areas. One area is economic assistance such as food stamps, medicaid, and aid to families with dependent children. The other area is social work such as child protection services, foster care, adult protection, and mental health (Matthews, 2000).

The Lincoln County Health Department operates an office in Afton, Wyoming. The office is staffed with five persons; a manager, three nurses, and a clerical person. Since a significant portion of the Star Valley's residents operate farms and ranches, and often do not have medical insurance, the Health Department Office is heavily utilized by the areas residents. Services include maternal and child health programs, public health services such a blood pressure clinics and immunizations, and education on subjects such as radon and cancer prevention (Reidle, 2000).

Public Schools

Four different school districts serve the three counties. Bannock County, Idaho is served by the Pocatello School District and Caribou County, Idaho is served by the Soda Springs School District. Lincoln County is served by two different school districts. The Lincoln County School District #1 serves the southern portion of Lincoln County and has district offices in Diamondville, Wyoming. The Lincoln County School

District #2 serves the Star Valley and has district offices in Afton, Wyoming. This is the district most affected by the Smoky Canyon Mine.

Pocatello School District had a total 1998-99 school year enrollment of 12,884 students, while the Soda Springs School District had a total enrollment of 1,173 students. At the beginning of the 1999-2000 school year the Lincoln County School District #1 and the Lincoln County School District #2 had total enrollments of 837 and 2,490, respectively. The Lincoln County School District # 2 and Soda Springs School District have both experienced declining enrollments in recent years.

In addition to public schools, Pocatello, Idaho is the site of Idaho State University. The university is a fully accredited four year institution with approximately 12,500 students. The university offers degrees ranging from one-year certificates to doctoral programs. The university also offers classes at several other sites, including the city of Soda Springs in Caribou County, Idaho.

Law Enforcement

Law enforcement in the three counties is provided by the Idaho State Highway Patrol, the Wyoming State Highway Patrol, the three respective Sheriff's Departments, and various municipal law enforcement agencies.

The respective state's highway patrols provide law enforcement on the interstate highways and state highways. The county sheriffs are responsible for unincorporated portions of the counties and contract with some of the municipalities for law enforcement services.

The Bannock County Sheriff's Department employees approximately 120 persons. The Sheriff's Department provides law enforcement to unincorporated areas of the county and contracts with four municipalities for law enforcement. The Patrol Division consists of 19 deputies, the Detention Division consists of 56 deputies, and the Detective Division consists of 8 detectives. Other divisions include the Court Services Division, the Training Division, and the Civil Division. The county opened a new jail in 1994, which can house 253 inmates. The Pocatello City Police Department employs 81 full time officers (Bannock County Sheriff's Department, 2000).

The town of Afton has a six person police department; one chief, one sergeant, and four full time police officers (Afton, 1998).

Fire Protection

Fire protection in the three counties is provided by the Afton Volunteer Fire Department, the Caribou County Volunteer Fire Department, the Soda Springs Volunteer Department, and the Pocatello Fire Department. In addition, land managing agencies, primarily the USFS and BLM provide fire fighting units for fighting wildland fires. The town of Afton, Wyoming has a 30 member volunteer fire department (Afton, 1998). The Soda Springs Fire Department has 15 active members while the Caribou County fire department has 25 members. The Pocatello Fire Department is a full time department and staffs five fire stations.

Health Care

There are three hospitals in Bannock County, Idaho, one in Caribou County, Idaho, and two in Lincoln County, Wyoming. Bannock County, Idaho is the site of the Bannock Regional Medical Center, the Pocatello Regional Medical Center, and Portneuf Valley Hospital. Pocatello Regional Medical Center is

a 110-bed hospital owned and operated by Intermountain Health Care, Inc. The Portneuf Valley Hospital is a 12-bed psychiatric hospital that offers mental health services.

The Star Valley Hospital, located in Afton, Wyoming, is the hospital closest to the Smoky Canyon Mine and has 15 beds. The hospital is operated by the Lincoln County government. Prior to the fall of 1999, the hospital was operated by Intermountain Health Care, Inc. The Star Valley Care Center nursing home is also located in Afton, Wyoming, with a capacity of 24 beds. Six physicians and three dentists practice in Afton, Wyoming. The South Lincoln Medical Center is located in Kemmerer, 98 miles from Afton, and has 16 beds (Lincoln County, 1998).

Water Supply

Public water supply in the area is supplied by wells. The Pocatello, Idaho water system has a maximum daily capacity of 51.7 million gallons. The maximum daily usage is 34.3 million gallons while the average daily usage is 12.9 million gallons. Storage capacity for the system is 22.6 million gallons. The Soda Springs water system has a maximum daily production capacity of 7.0 million gallons. The maximum daily usage is 5.5 million gallons while the average daily usage is 2.5 million gallons. Storage capacity for the system is 1.0 million gallons (IDC, 2000).

In the Star Valley, the individual towns have municipal water systems. The town of Afton water system is fed by springs in the Salt River Range east of the town. Residents of the unincorporated areas of the Star Valley rely on wells for water (Afton,1998).

In Bannock County, 88.1 percent of housing units are connected to a water system. In Caribou County, 69.5 percent of housing units are connected to a water system while 71.4 percent are connected in Lincoln County. In Lincoln County, 2.4 percent of housing units lack complete plumbing.

3.14.2 Economic Resources

Employment and Income

Unemployment in the three subject counties has trended downward during the 1990's (**Table 3.14-1**). Total employment in Bannock County increased from 32,907 to 38,470 from 1993 to 1998, respectively, while the unemployment rate dropped from 6.4 percent to 4.8 percent. Over the same time period, the unemployment rate in Caribou County dropped from 7.1 percent to 5.8 percent and the unemployment rate in Lincoln County dropped from 8.0 percent to 6.8 percent.

Table 3.14-1 Labor Force and Unemployment

Description	1993	1997	1998
Bannock County, Idaho			
Civilian Labor Force	35,165	38,744	40,407
Employment	32,907	36,607	38,470
Unemployment	2,258	2,137	1,937
Unemployment Rate	6.4%	5.5%	4.8%
Caribou County, Idaho			
Civilian Labor Force	3,258	3,324	3,371
Employment	3,026	3,118	3,175
Unemployment	232	206	196
Unemployment Rate	7.1%	6.2%	.8%
Lincoln County, Wyoming			
Civilian Labor Force	6,143	6,236	6,312
Employment	5,653	5,831	5,917
Unemployment	490	405	395
Unemployment Rate	8.0%	6.5%	6.8%

Source: Idaho Department of Labor, Pocatello Job Service Economic Profile Wyoming Department of Employment, Labor Market Information

Nonagricultural employment in Bannock County, Idaho was relatively stable during the 1980's, rising from 30,196 in 1980 to 30,330 to 1990 (**Table 3.14-2**). From 1990 to 1998, nonagricultural employment increased from 30,330 to 39,584, an average annual increase of 3.4 percent. In 1998, the largest industrial section in Bannock County, Idaho (in terms of employment) was services with 9,767 employees or 24.7 percent of total employment, followed by retail trade (22.0 percent) and government (21.9 percent). Manufacturing, the sector which includes the Simplot fertilizer plant, was responsible for 7.7 percent of total nonagricultural employment in Bannock County, Idaho.

In 1980, nonagricultural employment in Caribou County, Idaho was 4,160. It dropped to 3,393 in 1990 and recovered to 3,950 in 1998. In 1997, manufacturing was the largest industrial sector (in terms of employment) with 795 employees, or 20.1 percent of the total, followed by government (16.4 percent), retail trade (14.4 percent), and services (14.9 percent). Mining, the sector which includes the Simplot Smoky Canyon Mine, was responsible for 11.7 percent of total nonagricultural employment in Caribou County, Idaho.

Employment in Lincoln County, Wyoming, total nonagricultural employment was 5,740 in 1980, increased to 9,504 in 1985, dropped to 6,203 in 1990, and increased to 7,032 in 1998. Government was the largest industrial sector with 1,418 employees or 20.2 percent of the total, followed by retail trade (19.8 percent), and services (18.4 percent).

Table 3.14-2 Employment by Industrial Sector

Description	1980	1985	1990	1995	1998
Bannock County, Idaho					
Nonagricultural employment	30,196	29,535	30,330	35,931	39,584
Ag. serv., forestry, fishing, and other	126	159	217	D	D
Mining	31	43	24	D	D
Construction	1,556	1,410	1,453	2,138	2,634
Manufacturing	3,135	2,915	1,994	2,470	3,040
Transportation and public utilities	3,417	2,905	2,423	2,259	2,222
Wholesale trade	1,398	1,386	1,523	1,771	1,582
Retail trade	5,902	6,226	6,396	7,407	8,725
Finance, insurance, and real estate	2,855	2,701	2,460	2,529	2,571
Services	5,382	5,738	6,849	8,316	9,767
Government	6,394	6,052	6,991	8,214	8,660
Caribou County, Idaho					
Nonagricultural employment	4,160	3,568	3,393	3,819	3,950
Ag. serv., forestry, fishing, and other	57	62	65	70	76
Mining	904	613	520	458	463
Construction	371	237	161	298	307
Manufacturing	872	751	682	769	795
Transportation and public utilities	88	107	136	218	224
Wholesale trade	140	140	127	156	136
Retail trade	525	452	457	529	567
Finance, insurance, and real estate	196	157	150	135	146
Services	405	419	452	531	588
Government	602	630	643	655	648
Lincoln County, Wyoming					
Nonagricultural employment	5,740	9,504	6,203	6,780	7,032
Ag. serv., forestry, fishing, and other	32	43	77	80	110
Mining	1,359	782	666	623	521
Construction	575	3,780	445	629	689
Manufacturing	467	515	669	480	558
Transportation and public utilities	503	0	568	541	544
Wholesale trade	196	0	80	117	103
Retail trade	821	1,238	1,081	1,409	1,395
Finance, insurance, and real estate	287	259	307	372	401
Services	576	868	1,048	1,177	1,293
Government	924	1,260	1,262	1,352	1,418
Tri-County Area					
Nonagricultural employment	40,096	42,607	39,926	46,530	50,566
Ag. serv., forestry, fishing, and other	215	264	359	150	186
Mining	2,294	1,438	1,210	1,081	984
Construction	2,502	5,427	2,059	3,065	3,630
Manufacturing	4,474	4,181	3,345	3,719	4,393
Transportation and public utilities	4,008	3,012	3,127	3,018	2,990
Wholesale trade	1,734	1,526	1,730	2,044	1,821

Table 3.14-2, continued.

Description	1980	1985	1990	1995	1998
Retail trade	7,248	7,916	7,934	9,345	10,687
Finance, insurance, and real estate	3,338	3,117	2,917	3,036	3,118
Services	6,363	7,025	8,349	10,024	11,648
Government	7,920	7,942	8,896	10,221	10,726

D: Not disclosed to avoid revealing individual company data.
Source: U.S. Department of Commerce, Bureau of Economic Analysis, Regional Economic Information System.
Note: May not necessarily agree with data reported by state employment agencies.

Major employers in Bannock County, Idaho are Idaho State University, Union Pacific Railroad, American Microsystems, Inc., Ballard Medical Products, J. R. Simplot, FMC Corporation, and Heinz Frozen Foods (IDC, 2000). Major employers in Caribou County, Idaho are J. R. Simplot, Monsanto, Inc., Agrium Conda Phosphate, Conda Mining, Dravo Corporation, FMC Corporation, Soda Springs School District, Kerr-McGee, Mark III, Inc., and Caribou Memorial Hospital (IDC, 2000). Major employers in the Star Valley are Lincoln County School District #2, Lincoln County Government, Lower Valley Energy, the Simplot Smoky Canyon Mine, Aviat, Star Valley Cheese, Freedom Arms, and Maverick Corporation (Lincoln County Profile, 1998).

Caribou County, Idaho has the highest average monthly wage of the subject counties. From 1980 to 1998, Caribou County's average monthly nonagricultural wage increased at an annual rate of 3.2 percent. The average monthly wage in Bannock County, Idaho and Lincoln County, Wyoming increased at 3.1 percent and 1.6 percent, respectively. Lincoln County, Wyoming's average wage peaked at $1,977 in 1985, dropped to $1,700 in 1990 and has since recovered to $1,887. Caribou County, Idaho has the highest median household income, followed closely by Lincoln County, Wyoming. Similarly, Caribou County, Idaho has the fewest number of households in the lower income brackets and the Bannock County has the highest number of households in the lower income brackets.

Local Government Finances

Local government finances for the three counties are summarized in **Table 3.14-3**. These data include all local governments - not only county governments, but also any municipalities, school districts, and special districts within the counties. Bannock County, Idaho had the highest general revenue, and lowest per capita taxes. Caribou County, Idaho had the lowest general revenue and Lincoln County, Wyoming had the highest per capita taxes. Each county spent the largest percentage of its budget on education, with health and hospitals, and highways following. Lincoln County, Idaho had the highest outstanding debt per capita, followed by Caribou and Bannock counties, Idaho.

Agriculture

Agriculture plays a significant role in the economies of each of the three counties. Caribou County, Idaho produced nearly $43 million worth of agricultural products in 1997. The value of production is dominated by crops in Bannock and Caribou Counties, Idaho, while livestock accounts for the majority of production in Lincoln County, Wyoming. While crops dominate the value in the two Idaho Counties, cattle are also significant. Cattle accounts for 27.4 percent of the total value of production in Bannock County, Idaho and 21.9 percent in Caribou County, Idaho.

Table 3.14-3 Local Government Finances

Description	Bannock County, ID	Caribou County, ID	Lincoln County, WY
General Revenue (million $)	151.1	19.9	62.6
Intergovernmental Transfers (million $)	67.2	8.6	18.7
Total Taxes (million $)	28.1	5.5	17.9
Per Capita Taxes ($)	410	772	1,371
Per Capita Property Taxes ($)	400	727	1,226
Direct General Expenditures (million $)	132.2	19.9	57.1
Per Capita Direct General Expenditures ($)	1,928	2,798	4,371
Education	37.9%	43.1%	39.8%
Health and Hospitals	26.4%	17.1%	10.4%
Police	7.2%	4.0%	4.1%
Public Welfare	1.0%	0.6%	0.0%
Highways	4.8%	10.7%	4.6%
Total Outstanding Debt (million $)	17.7	13.8	166.4
Per Capita Outstanding Debt ($)	258	1,934	12,743

Source: U.S. Bureau of the Census, 1992 Census of Government, as cited in Gaquin and Littman, 1999.

Phosphate Mining Industry

Phosphate is an essential component of the nitrogen-phosphorus-potassium fertilizers that are consumed by the world's agricultural industry. Phosphate rock minerals are the only significant global source of phosphorus. The United States is the world's leading producer and consumer of phosphate rock, which is used to produce fertilizers and industrial products. More than 93 percent of phosphate rock mined in 1998 was used to produce fertilizers and animal feed supplements. In 1998, there were 18 operating phosphate mines in the United States, the majority of which were located in Florida and North Carolina. The eastern mines accounted for 88 percent of production, while four mines in Idaho and one in Utah accounted for the remainder. All of the eastern production was used for manufacturing fertilizer production while the western production was used to manufacture both fertilizer and elemental phosphorus. The major fertilizer products are, in order of importance, diammonium phosphate (DAP), monoammonium phosphate (MAP), granular triple super phosphate (TSP), and wet process phosphoric acid (WPPA). Two operations in Idaho produce elemental phosphorus, which is used as a feed material for industrial chemicals. About 65 percent of the elemental phosphorus is used to produce thermal process phosphoric acid, which is used in industrial applications including detergent and food additives, water- and metal-treatment chemicals, vitamins, soft drinks, toothpaste, photographic film, light bulbs, bone china, optical glass and other consumer goods. The remaining elemental phosphorus is used to produce phosphorus trichloride, pentasulfide, and other compounds which are used in herbicides, insecticides, flame-retardant chemicals, and plasticizers (USGS, 1998).

Southeastern Idaho is home to four large phosphate mining operations. These are operated by Simplot, Agrium, Inc., Monsanto, Inc., and Astaris (FMC) Corporation. The phosphate rock is converted into either phosphate fertilizer or elemental phosphorus at processing plants near Soda Springs, Idaho and Pocatello, Idaho.

The phosphate mining industry pays royalties to the federal government for ore mined from federal leases on public lands at the rate of five percent of the value of phosphate mined. Since the phosphate plants are vertically integrated, there is no market to determine the value of the phosphate rock. The value of phosphate rock mined is determined by the formula:

$$\text{Value per ton} = 0.6093 \times \text{Grade},$$

with the value given in dollars per ton and the grade expressed as percent P_2O_5. The multiplier is adjusted annually according to changes in the price indices for the Chemical and Fertilizer Mineral Mining (SIC 147), Phosphate Rock (SIC 1475), and Phosphatic Fertilizer (SIC 2874) industries published by the Bureau of Labor Statistics.

The four Idaho phosphate operations pay between four and five million dollars annually in royalties to the federal government (**Table 3.14-4**). For 1999, phosphate royalties represented 97 percent of federal mineral lease payments in Idaho. Fifty percent of federal mineral lease payments are returned to the states. Phosphate represents about 20 percent of the value of nonfuel minerals produced in Idaho.

Table 3.14-4 Idaho Phosphate Sales and Royalties for Operations on Federal Land

Description	1997	1998	1999
Sales Volume (tons)	4,888,501	5,881,357	5,766,795
Sales Value ($)	80,758,040	102,629,672	94,057,370
Royalties ($)	4,037,902	5,131,484	4,702,869

Source: Mineral Revenue Collections, Fourth Quarter Report, Minerals Management Service, Years as indicated.

During the federal 1999 fiscal year (ending September 30, 1999) $2,502,480.58 in royalties from Caribou County, Idaho phosphate mines were returned to the State of Idaho by the Minerals Management Service (MMS). Ten percent of the funds returned to the State of Idaho are returned to the impacted counties, in this case Caribou County, Idaho (MMS, 2000).

The Simplot Smoky Canyon Mine produced approximately 2.3 million tons of ore in 1998 (USGS, 1998), about 1.4 percent of the national production of phosphate rock and 28.5 percent of western United States production.

In 1997, the Idaho phosphate mining industry, which includes the actual mining operations, but not the fertilizer and elemental phosphorus plants, employed 561 workers and had an annual payroll of $27.4 million. The value added by mining was $74.5 million, while the value of shipments and receipts was $111.5 million (Bureau of the Census, 1997).

Mining is responsible for a significant portion of property taxes paid in Caribou County, Idaho. In 1999, total property taxes levied in Caribou County were $7.1 million. Of this, $1.26 million, or 17.7 percent, was paid by the mining industry. These taxes included property taxes on machinery and equipment and a net profits tax, which is considered a property tax by the Idaho State Tax Commission, in lieu of taxes on ore bodies (Dornfest, 2000).

Approximately 40 percent of the wage and salary employment in Caribou County, Idaho is due to the phosphate operations (**Table 3.14-5**). The employment due to the phosphate industry in Bannock County, Idaho is lower due to a more diversified economy and Bannock County, Idaho being more

populous. No employment is reported for the phosphate industry in Lincoln County, Wyoming since all of the actual operations are in Idaho, although a majority of the employees at the Smoky Canyon Mine actually reside in Lincoln County, Wyoming. In 1998, the phosphate industry was directly responsible for an estimated 3.5 percent of total employment in the three counties.

In addition to the figures shown in **Table 3.14-5**, the Astaris and Simplot phosphate operations in Power County, adjacent to Bannock County, provide a total of 908 jobs. [Note: Since the Draft SEIS was published, Astaris announced the closure of their elemental phosphorous processing plant near Pocatello, Idaho for economic reasons.]

Table 3.14-5 Idaho Phosphate Industry Employment

Description	1995	1996	1997	1998
Bannock County	165	164	158	165
Percent of Total	0.6%	0.5%	0.5%	0.5%
Caribou County	1,146	1,150	1,107	1,169
Percent of Total	40.0%	38.4%	36.6%	39.2%

SIC Codes: 1 - Mining, 28 - Manufacturing Chemical and Allied Products.
Source: Idaho Department of Labor

The phosphate industry provides some of the highest paying jobs in southeastern Idaho. In Caribou County, Idaho, manufacturing, which includes the fertilizer and elemental phosphorus plants, was the industrial sector with the highest monthly wage during 1998. The average monthly wage for the manufacturing sector was $5,768, followed by mining with an average monthly wage of $4,029. The average monthly wage for Caribou County, Idaho for all industrial sectors was $2,733 during 1998 (Bureau of Economic Analysis, 2000).

3.15 Transportation

The affected or existing environment describes the transportation resources that could be affected by the proposed actions relative to the identified issues. Information identified in the 1981 Smoky Canyon EIS (USFS, 1981 & 1982) is incorporated into this section.

The transportation network within the Caribou-Targhee National Forest is composed of 2,437 miles of road, of which 535 are arterial and collector roads and 1,902 are local single-access roads. The roads vary in standard from double-lane paved to primitive soil-surfaced roads. Approximately 250 miles, or 10 percent of the system, are closed to traffic due either to off-road vehicle restriction or blockage due to natural causes. In addition, seasonal closures are being utilized in areas which would normally sustain heavy damage during periods of inclement weather (USFS, 1984a).

The Forest maintains about 300 miles of road each year, and current maintenance agreements with associated counties provide for the maintenance of an additional 275 miles. The Forest averages 10 miles of construction or reconstruction annually, most as a result of timber sale activities. About five miles of short-term roads are constructed each year to accommodate fuel-wood access or oil/gas exploration. Short-term roads are returned to production once the short-term need is filled (USFS, 1984a).

Forest Development Road #20110 (the Smoky Canyon Road) bisects Panels B and C through Smoky Canyon. It's current use includes continued forest access to upper Smoky Creek and further west to Timber Creek and the Diamond Creek area. Today, primary use of the road is for mine access traffic and it is heavily used by mine employees, commercial vendors, and suppliers. Other forest uses such as timber sales and recreation would be maintained through relocations and maintenance for the Smoky Canyon Road.

From Auburn to the state line and then continuing nearly another 5.2 miles, the road is about 24 feet wide with an asphalt surface (Spencer, 2000). Then it transitions into an improved surface, gravel, double-lane road to the intersection with the mine haul road. A five-strand barbed wire fence is on either side and numerous cattle guards exist on this road. As Smoky Canyon Road turns west, it transitions into a single lane, native surface road to the Diamond Creek Road. Drainage is handled by ditches and culverts and is a common reason the USFS Ranger may request maintenance on the section covered by the Road Use Permit (Tate, 2000).

Travel to and in the Forest is greater when improved roads exist. This includes all traffic from private vehicles seeking recreation or lands access to commercial vehicles with business interests. Factors such as speed, travel time, comfort, convenience, and safety are all affected by improved access. Standard methods of qualitative planning for roads which includes capacity analysis, the estimation of maximum number of people or vehicles which can be accommodated by a given highway, is not applicable to analysis for this situation. There are no safety statistics for the Smoky Canyon Road (Tate, 2000; Spencer, 2000; Louis, 2000).

Traffic volumes estimated on Figure 5-1 of the 1981 EIS are fairly close to current use because car pooling is encouraged, with approximately three quarters of the employees regularly participating (personal communication Louis, 2000). Mine traffic is present seven days a week. There are no traffic counts for the Smoky Canyon Road (personal communication Tate, 2000; de Henaut, 2000; Spencer, 2000; Louis, 2000).

There are no engineering and design plans for the Smoky Canyon Road west of the mine (personal communication Tate, 2000; Hudson, 2000; Spencer, 2000). Estimated specifications are typical for this Level 2, high clearance Forest Service Road. It was improved in 1982 -1983 during the slurry line construction, per the Road Use Permit, Supplemental Agreement and Amendment between the USDA and Simplot. This permit requires the continued maintenance of the gravel road by Simplot throughout its term.

Normal maintenance includes removal of debris, blading, and shaping of roadway surfaces and ditches, repair of any roadway structures, restoration of eroded fills or berms, removal of snow and installation of safety signs as appropriate (Road Use Permit, 1982). These activities are performed by Simplot for the purpose of transporting employees and equipment for the construction and operation of the Smoky Canyon Mine. Reimbursement for maintenance costs associated with timber operations by others are covered in the Road Use Permit Amendment.

Except for normal maintenance, there are no repairs or general upgrades planned for the Smoky Canyon Road under the existing operations.

3.16 Environmental Justice

Federal Actions are required to address disproportionately high or adverse human health or environmental effects on minority populations and low-income populations. As described in Section 3.14, Bannock County, Idaho contains about 78 percent of the population for the three counties analyzed. Included in Bannock County is the Fort Hall Indian Reservation; the Native American population is 2.7 percent of the county total. There would be no impacts to environmental justice under the Proposed Action or any of the Alternatives other than No Action which may temporarily decrease income to Native Americans employed at the mine.

Final Supplemental EIS

Smoky Canyon Mine
Chapter 4 - Environmental Consequences

Chapter 4
Environmental Consequences

4.1 Geology, Minerals, and Topography

Summary

Potential impacts associated with the Proposed Action and Alternatives include extraction of mineral resources and paleontological resources, changes to topography, potential instability of man-made slopes, and mobilization of selenium and trace metals.

Mineral resource direct impacts are primarily the removal of approximately 93.77 million tons (MMT) of phosphate ore and overburden. The impacts to mineral resources under Alternatives A and B would be similar to that in the Proposed Action. However, implementation of more costly mitigation methods or alternatives could result in less phosphate being mined, decreasing the amount of mineral recovery. An indirect impact to mineral resources would also occur from backfilling the pits, due to its effect on the economics of recovering deeper reserves in the future.

Paleontological resource impacts are related to the removal of the ore and overburden which would disturb any fossils within this rock and would be identical under the Proposed Action and Alternatives A and B. Invertebrate fossils destroyed by mining activities would be of similar type to the typical fossils found in the Phosphoria Formation. Fossils are wide spread within the Phosphoria Formation in southeast Idaho and the local impacts are considered to be minimal in comparison.

Geotechnical stability of highwalls in the Proposed Action and Alternatives is expected to be similar to current conditions which is to say the highwalls are expected to be resistant to large scale failure. Highwall stability is a long-term factor only for highwalls that are proposed to be left long term following reclamation. The Proposed Action would have a total of 5,900 feet of remaining highwall up to 250 feet high. Alternative A would have a total of 5,200 feet of remaining highwall up to 200 feet high. Alternative B would have a total of 3,100 feet of remaining highwalls up to 150 feet high.

Stability of overburden fill slopes would be produced by regrading all such slopes to angles of approximately 3h:1v or less. Such slopes have generally proven to be stable at the Smoky Canyon Mine and at other mining operations. Short-term stability of overburden slopes during construction would be provided by compliance with proven operating practices related to controlling slope height, loading and water content.

An evaluation of potential geochemical contamination is included as part of this analysis. This evaluation includes a baseline geochemical study that characterizes the concentration of selenium and trace metals in overburden that would be mined from the proposed pits. This was done with Synthetic Precipitation Leaching Procedure (SPLP) testing to identify the potential leachable constituents in the different types of overburden. Column testing was then conducted to better simulate future meteoric water leaching of the overburden fills and determine the resulting leachate chemistry for impact analyses. Finally, actual field data from the Smoky Canyon Mine and other phosphate mines in southeast Idaho were used to judge how representative the column test data were and to select an upper bound selenium concentration

to check the impact analyses. It is recognized that portions of the Meade Peak Formation have high concentrations of selenium and therefore mining activities have the potential to create selenium contamination. The management practices incorporated into the mine plan would prevent selenium contamination of the surface environment.

Acid Rock Drainage (ARD) potential has been shown to be minimal for the Proposed Action and Alternatives because the acid neutralizing potential (ANP) of the weighted average overburden is more than 10 times the acid generating potential (AGP).

The volume (cubic yards) of the seleniferous overburden handled is the same for the Proposed Action and Alternatives A and B. Thus the total quantity of seleniferous overburden potentially susceptible to leaching is also the same. However, the surface area that the seleniferous overburden is spread over for Alternatives A and B would be up to 244 acres less than the Proposed Action. This has a direct bearing on the total area of aquifer potentially impacted by seepage through the seleniferous overburden.

Topography would change in the immediate areas of the pits and external overburden disposal site, depending on which alternative is selected. Areas to be mined would be transformed into open pits and then partially backfilled with overburden, while external overburden disposal areas would be transformed into topographic highs relative to their existing condition. Original topography of the pit areas would be permanently altered through lowering of the pre-existing contours and remaining highwalls. The highwalls would vary in height from 50 to 250 feet, and would consist of a benched slope of approximately 45 degrees.

The final configuration of Panel C is the same for the Proposed Action and Alternatives A and B. The remaining highwall in Panel B would be 2,800 feet long and 250 feet high for the Proposed Action, 2,100 feet long and 200 feet high for Alternative A, and would be entirely eliminated for Alternative B. The Panel A backfill would be the same for the Proposed Action and both alternatives.

The external overburden disposal facility would contain about 20.8 million loose cubic yards (MMLCY) for the Proposed Action,14.3 MMLCY for Alternative A and would be entirely eliminated for Alternative B. Reclaimed overburden slopes would be at gradients of approximately 3h:1v or less to approximate original natural slopes.

Issue Indicators

Issue indicators include analysis of waste rock for selenium and potential metal contaminants, testing the materials for ARD potential, and metal mobilization potential risk using standard methods including SPLP and column leach tests. Metal mobility data results are compared to applicable groundwater and surface water quality standards to identify contaminants of potential concern (COPCs). ARD risk is assessed using BLM guidance where the ratio of acid neutralization potential or the rock is compared to the acid generation potential.

Geotechnical stability of the mine highwalls and overburden disposal facility slopes is evaluated by comparison with past experience at the Smoky Canyon Mine and standard mining operational practices.

Previous and potential management practices are reviewed against a geochemical release model to determine their appropriateness.

4.1.1 Direct and Indirect Impacts

Proposed Action

Under the Proposed Action, geology and mineral resources would be directly impacted by the removal of approximately 93.77 MMT of phosphate ore and overburden. All of the ore would be concentrated at the existing Smoky Canyon mill facilities before being transported by existing pipeline to Pocatello, Idaho for fertilizer production.

Indirect impacts to the mineral resource would also occur by reducing the potential for recovery of the remaining, deeper phosphate resource in the future. This indirect impact would result from placement of the backfill in the mined out pit. Thus, recovery of the remaining, deeper ore would require an increase in the value of phosphate ore that would be sufficient to offset removal of this backfill in addition to pit enlargement. Phosphate prices would need to increase sufficiently to make re-mining these pits economic, whether or not the pits were backfilled.

Depending on intensity, distance from epicenter, and condition of structures, an earthquake may result in damage to buildings, surface rupture and displacement, landslides, change in water flow from springs and wells, and/or failure of earthen dams and overburden disposal facilities. The highest potential for structural damage occurs within an area 75 miles from the epicenter of a major earthquake (UBC, 1991). Highwalls and external overburden disposal slopes are expected to be stable for facilities designed and operated in accordance with the practices currently in use at the Smoky Canyon Mine, and in consideration of the potential seismic risks. The placement of pit backfill would provide additional support for highwalls. This would further reduce the potential for instability of residual pit highwalls. Because the backfill slopes would be 3h:1v, there are no geotechnical impacts anticipated with the stability of the backfill.

The Proposed Action and Alternatives A and B were analyzed with respect to potential impacts associated with geotechnical instability. These impacts can be controlled by incorporation of sound operational practices. Operational practices have been developed to address each of the factors related to geotechnical stability. Where underlying slopes are too steep, material would be placed at the toe of the overburden pile or backfill to buttress the slopes. To minimize shock loading on questionable overburden slopes, trucks would be stopped short of the edge of the overburden pile or backfill and the overburden would be dozed off. Overloading would be reduced by limiting overburden fill lifts to 50 feet in height. To reduce incorporation of water in the overburden pile or backfill, water or mud would not be purposely mixed with overburden. Reclamation recontouring would be performed concurrently or shortly after slope construction. Overall, the potential for overburden fill instability is seen as minimal if current operational practices are implemented.

Impacts to paleontological resources would occur from the disturbance of the 93.77 MMT of Phosphoria Formation rock during the mining of Panels B and C. Invertebrate fossils in these units are not known to be restricted only to the Smoky Canyon area and are as likely to be found throughout the outcrop area of the Phosphoria Formation in southeastern Idaho.

Mining ore and overburden as part of the Proposed Action and Alternatives would cause the rock that is currently in an in-place buried condition to be fractured into particles of various sizes. These rock particles would be exposed to atmospheric conditions that are different than the in-place conditions. This would initiate weathering of the rock particles which includes oxidation and addition of moisture from

precipitation. Once the overburden particles are placed in their final overburden disposal site, the exposure to surface conditions would be reduced and weathering would be controlled by the rate of atmospheric and precipitation penetration of the mass of the overburden fill.

Weathering of Meade Peak member shales can cause oxidation of contained organic materials and minerals that are known to contain metals and selenium. Oxidation of sulfide minerals can potentially lead to ARD if the AGP is greater than the ANP. Metals and selenium that are dissolved from the overburden during weathering are available to be flushed from the overburden by surface runoff water and/or infiltration. Surface runoff carrying dissolved metals, selenium and other COPCs can potentially be discharged to surface waters if not controlled by storm water management systems. Infiltrating water can potentially be discharged from the overburden fills as seeps or springs or can continue to percolate downward in the foundation soil and rock where it can eventually recharge the underlying groundwater.

At other locations in southeast Idaho the potential for oxidation of selenium-bearing minerals and organic matter in these geologic units, and subsequent mobilization of selenium, and metals including arsenic, cadmium, chromium, copper, lead, manganese, nickel, iron, aluminum, and zinc has been identified (BLM and USFS, 2000). Seepage from existing overburden disposal facilities can contain metals (BLM and USFS, 2000). These metals have presumably been mobilized due to oxidation of constituents in the Meade Peak Member of the Phosphoria although no ARD has been documented (BLM and USFS, 2000).

Overburden to be mined in Panels B and C is comprised primarily of the Rex chert (33.3 percent), Hanging Wall Phosphatic Shale (7.2 percent), Hanging Wall mudstone (24.4 percent), Footwall Mudstone (4.8 percent), Middle Waste Shales (30.3 percent), and some limestone of the Grandeur Member of the Park City Formation.

Acid Rock Drainage Potential

Based on testing of Smoky Canyon Mine samples of different overburden lithologies, measured ANP:AGP ratios in the formation-specific samples range from 3.2 in the Hanging Wall Phosphatic Shale to 75.5 in the Footwall Mudstone. The average ANP:AGP ratios for the Rex Chert, Hanging Wall Mud, and Middle Waste Shale were 65.0, 17.7, and 7.4, respectively (Maxim, 2000b).

Using average ANP:AGP ratios measured for each geologic unit, a weighted average ANP:AGP ratio was calculated for each overburden unit based on the tons of each unit to be mined. The quantity of ANP and AGP is expressed in units of equivalent tons of calcium carbonate per kiloton of rock being tested. The weighted average ANP:AGP ratio for all overburden to be mined under the Proposed Action and Alternatives is 10.6:1, which is above the level of 3:1 that indicates a potential concern for producing ARD (**Table 4.1-1**). Based on the acid generating potential testing, there would be limited risk of producing ARD for the Proposed Action and Alternatives.

Table 4.1-1 Acid Base Accounting Data Summary - Formation Specific Overburden

Lithology	% of Total	Average ANP T CaCO3/kton	Average AGP T CaCO3/kton	ANP/AGP Ratio
Middle Waste Shale	30.3	157	21.3	7.4
Hanging Wall Mudstone	24.4	122	6.9	17.7
HW Phosphatic Shale	7.2	135	42.5	3.2
Footwall Mudstone	4.8	498	6.6	75.5
Rex Chert	33.3	39	0.6	65.0
Weighted Average	100.00	124	11.7	10.6

SPLP Testing

Using SPLP analyses for multiple samples of each of the rock types that would be included in the overburden from the Proposed Action and Alternatives, a weighted average SPLP result was prepared for the entire overburden volume (Maxim, 2000b). The weighted average concentration in leachate for all of the metals and metalloids analyzed in the SPLP extracts as well as the comparable water quality standards are shown in **Table 4.1-2**.

Table 4.1-2 Weighted Average for SPLP Data for Panels B and C Combined (mg/l)

	Weighted Average (mg/l)		Idaho Water Quality Standard (mg/l)	
	Average	95%	Groundwater	Aquatic Life Criterion
Aluminum	**0.48976**	**2.65755**	0.2	NS
Antimony	0.00253	0.00338	0.006	NS
Arsenic	0.00492	0.01229	0.05	0.190
Barium	0.96620	1.51896	2.0	NS
Beryllium*	0.00085	0.00100	0.004	NS
Cadmium	0.00140	**0.01591**	0.005	0.0017
Chromium	0.01634	0.04772	0.1	0.314
Copper	0.00892	**0.04141**	1.3	0.021
Iron	**0.63406**	**3.39268**	0.3	NS
Lead	0.00293	0.00511	0.015	0.005
Manganese	0.02027	**0.13265**	0.05	NS
Mercury*	0.00051	0.00060	0.002	0.000012
Nickel	0.02072	0.07881	0.1	0.283
Selenium	**0.01524**	**0.16001**	0.05	0.005
Silver	0.00337	**0.00493**	0.1	0.0034
Thallium*	0.00256	0.00300	0.002	NS
Zinc	0.18696	**0.70715**	5.0	0.188

Note: Cold Water Aquatic Life Criterion are for chronic (continuous) conditions and are calculated for a hardness of 200 mg/l. Groundwater and aquatic standards do not apply to overburden leachate but are listed as a point of reference to identify constituents of concern for further impact analysis. Aquatic standards may apply if the seep has a surface water connection to a stream.

* All data were at or below detection limits.

Boldface values identify concentrations greater than water quality standard.

NS = No regulatory standard has been set.

The weighted average results of the SPLP testing on overburden representing that to be produced in the Proposed Action and Alternatives indicate that COPCs that were leached from the overburden samples above either the groundwater quality standards or the aquatic life criterion include: aluminum, cadmium, copper, iron, manganese, selenium, silver and zinc. The other metals did not leach out of the samples above the water quality standards and are not considered to be chemicals of potential concern for this project.

The initial SPLP extraction solution is a weak acid simulating rain water which provides a favorable environment for leaching metals that are more soluble in acid solutions. Tumbling the sample simulates mechanical weathering of the sample. If the solid material being tested has a neutralizing effect on the solution, its pH may increase over the period of the test, which would tend to decrease the concentrations of these same metals in the test solution. In the Smoky Canyon SPLP testing the final pH of the test solutions are noted as being neutral to alkaline indicating that the initial acid conditions in the test were neutralized and the reported values of the metals in solution are those for neutral to alkaline conditions. As previously described in the acid rock drainage discussion, the ANP:AGP ratio for the overburden is high enough to indicate that leaching solutions in the overburden are not likely to be acid. Thus the reported SPLP concentrations for most of the metals are those representative of pH conditions similar to what would be expected in the field.

Column Leaching Test Data

The SPLP data preliminarily identified the COPCs including: aluminum, cadmium, iron, selenium and zinc. However, there were questions remaining after the SPLP testing. The elevated concentrations of aluminum, iron and zinc in the SPLP extract solutions were thought to be too high for the neutral to alkaline final pH values of these solutions. It was postulated that these elevated concentrations in the leach solutions could have been caused by colloidal particles in the extract solution due to the soft nature of the shale samples and the sample agitation during the test procedure. This physical agitation is not representative of field overburden leaching conditions and was thought to overstate the concentrations of these COPCs in the overburden seepage. On the other hand, the high extract solution to sample weight (20:1) dilution and short duration (18 hours) of the SPLP test was thought to possibly understate the concentrations of cadmium and selenium, especially when their concentrations in the SPLP data were compared to field samples of overburden seeps obtained at Smoky Canyon Mine and other phosphate mines in southeastern Idaho. For these reasons, and to be consistent with agency experience on past projects (Dry Valley Mine Record of Decision) column testing was needed for the final selection of COPCs.

Ten columns were constructed including 8 columns of drill cuttings from Panel B and C drill holes representing each of the major lithologic units for the overburden; one column of composited surficial samples from the existing Panel A overburden disposal area; and a control column of silica sand. Samples were screened to reject large clasts (>2-inch diameter) and clay fines. Columns were filled with sample material in 6-inch lifts that were lightly compacted. The filled columns were inoculated with a water/sediment slurry obtained from overburden seeps at the Smoky Canyon Mine to add indigenous bacteria. Reagent grade distilled water was used to leach the columns and was added at a controlled rate to prevent saturation of the columns. The columns were allowed to drain freely and leachate water was collected in cleaned jugs. The columns were leached one pore volume at a time with each pore volume of leachate collected as a composite sample. Between pore volumes, humidified air was applied for 24 to 48 hours to promote oxidation of minerals. Ten pore volumes were run through the columns (Maxim, 2001a).

The pore water chemistry of each pore volume for each of the major lithologic overburden types was multiplied by the weight percentage that each lithologic unit represented of the whole mass of overburden planned to be mined in Panels B and C to develop a weighted average leachate chemistry that would be representative of the entire overburden mass. These data for pore volume one are shown in **Table 4.1-3**.

The weighted average chemistry results show that the concentrations of aluminum, iron and zinc were not elevated in the column tests like they had been in the SPLP results. In fact, these parameters were typically below their detection limit concentrations in all columns. This indicates that these parameters could be dropped from the list of COPCs. Other parameters that were either below detection limits in all samples or below their applicable Groundwater Quality Standards or Aquatic Life Criterion were: antimony, arsenic, barium, beryllium, chloride, fluoride, lead, mercury, pH, silver, and thallium.

Selenium was speciated into the selenite (+4) and selenate (+6) as well as total. More than 66 percent of the total selenium value was found to be selenate and about 25 percent was selenite. The percentages of these species are considered to be approximate because of the difficulty in preventing oxidation of the leachate sample during collection.

The bold face values in **Table 4.1-3** indicate which COPCs had concentrations in the column test data which were greater than applicable surface water or groundwater quality protection standards and therefore posed a potential environmental impact if runoff or seepage containing these COPCs was discharged from overburden into either surface water or groundwater. The potential environmental impacts of these COPCs (cadmium, manganese, selenium, sulfate, TDS) are further evaluated in the Water Resources section of this chapter. Mercury and thallium were not considered for further analysis because all of the individual sample concentrations were at or below detection limits.

Table 4.1-3 Column Test Weighted Average Results for Future Smoky Canyon Overburden (mg/l)

Parameter	Middle Waste Sh	Rex Chert	Footwall Mud	Hanging Wall Md	H.Wall Phos.Sh	Total	GW	Aquatic
	SCC5 & SCC7	SCC-9	SCC-10	SCC-1	SCC-3	Wtd Avg	Standard	Standard
Ratio to Total	0.303	0.333	0.048	0.244	0.072	1		
Aluminum	0.1	0.1	0.1	0.1	0.1	0.100	0.2	NS
Antimony	0.003	0.003	0.001	0.001	0.002	0.002	0.006	NS
Arsenic	0.005	0.001	0.004	0.004	0.004	0.003	0.01	0.19
Barium	0.200	0.2	0.2	0.2	0.2	0.200	2	NS
Beryllium	0.002	0.002	0.002	0.002	0.002	0.002	0.004	NS
Cadmium	0.0042	0.0005	**0.0081**	0.0008	**0.0035**	**0.0023**	0.005	**0.0017**
Chromium	0.021	0.005	0.005	0.012	0.005	0.012	0.1	0.314
Copper	0.010	0.01	0.01	0.01	0.01	0.010	1.3	0.021
Iron	0.100	0.1	0.1	0.1	0.1	0.100	0.3	NS
Lead	0.001	0.001	0.001	0.001	0.001	0.001	0.015	0.005
Manganese	0.132	**0.097**	**0.420**	**0.150**	**0.480**	**0.164**	**0.05**	NS
Mercury	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.002	0.000012
Nickel	0.064	0.05	0.05	0.05	0.59	0.093	0.1	0.283
Selenium IV	0.116	0.002	0.004	**0.035**	**0.008**	0.045	**0.05**	**0.005**
Selenium VI	0.183	0.004	**0.095**	**0.180**	**0.240**	**0.123**	**0.05**	**0.005**
Selenium	0.323	0.006	**0.109**	**0.232**	**0.273**	**0.181**	**0.05**	**0.005**
Silver	0.003	0.003	0.003	0.003	0.003	0.003	0.1	0.0034
Strontium	0.330	0.2	0.2	0.4	2.0	0.418	NS	NS
Thallium	0.002	0.002	0.002	0.002	0.002	0.002	0.002	NS
Zinc	0.071	0.05	0.05	0.05	0.05	0.056	5	0.188
Nitrate	0.240	0.1	0.9	0.5	0.3	0.293	1	NS
Sulfate	**286**	84	**274**	**396**	**670**	**273**	**250**	NS
TDS	**615**	270	**666**	**816**	**1270**	**599**	**500**	NS

Bold Face Concentrations were at or greater than water quality criteria.

* Surface Water Aquatic Life Standard for allowable continuous concentrations for cadmium, chromium, copper, lead, nickel, silver and zinc are hardness dependent and are calculated assuming a hardness of 200 mg/l and a water effect ratio of 1.0.

NS = No regulatory standard has been set.

Groundwater and aquatic standards do not apply to overburden leachate but are listed as a point of reference to identify constituents of concern for further impact analysis.

Typical for column leach tests, the first pore volume through the material in the columns had the highest concentrations of most parameters and subsequent pore volumes had lower concentrations. Complete chemistry results were obtained for leachate samples for Pore Volumes 1, 2, 3, 5, 7, 9, and 10. The leachate laboratory results from each pore volume were entered into spreadsheets like that shown in **Table 4.1-3** to calculate the weighted average values of the various parameters based on the weight percent of the different lithologies in the proposed overburden fills for the B and C Panels. The weighted average values for the COPCs for the pore volumes are shown in **Table 4.1-4**.

Table 4.1-4 Weighted Average Concentrations for COPCs in Pore Volumes (mg/l)

Pore Volume	Cadmium	Manganese	Total Selenium	Sulfate	TDS
PV 1	0.0023 (0.005)	**0.164** (0.05)	**0.181** (0.05)	**273** (250)	**599** (500)
PV 2	0.001	**0.102**	**0.064**	153	364
PV 3	0.0008	**0.054**	0.047	99	263
PV 5	0.0009	0.048	0.047	83	236
PV 7	0.0009	0.048	0.047	82	244
PV 9	0.001	0.035	0.041	67	206
PV 10	0.001	0.035	0.044	65	271

Note: Values shown in parentheses are the Groundwater Standard values. The standards shown for manganese, sulfate and TDS are secondary standards based on aesthetics. The standards shown for cadmium and selenium are health-based. Groundwater and aquatic standards do not apply to overburden leachate but are listed as a point of reference to identify constituents of concern for further impact analysis.

Bold Face Concentrations were greater than Groundwater Standards.

The weighted average column leach data indicate that concentrations of all the COPCs decrease with increasing pore volumes. This is apparently due to the removal of readily soluble minerals early in the leaching process and lesser amounts being leached in later pore volumes due to decreasing amounts of soluble minerals being available for leaching. Cadmium concentrations were all less than the Groundwater Quality Protection Standard value. Sulfate and TDS concentrations were less than their respective Groundwater Standards by the second pore volume. Selenium and manganese concentrations were less then their applicable Groundwater Standards by the second and third pore volume respectively. These data suggest that the concentrations of the COPCs in overburden leachate for the B and C Panels are expected to start out elevated, where they can be a potential source of groundwater contamination over the Groundwater Standards, and then drop to concentrations that are much lower than their respective Groundwater Standards. The evaluation of these potential impacts to surface water and groundwater resources is found in Section 4.3.1.

Field Data

The column leach data provided reasonable weighted average leachate chemistry values to use in groundwater impact analyses (Section 4.3). To determine how these laboratory data compared to actual field measurements of selenium concentrations in existing overburden seeps, available field data were collected from the Simplot Smoky Canyon mine site and other phosphate mines in southeast Idaho and collected in a data base (**Appendix 4B**). Many of these existing overburden seeps are located in overburden disposal areas that are not constructed like the overburden fills for the Proposed Action and Alternatives, i.e they incorporate more water from sources other than precipitation infiltration. In this respect, they represent hydrologic conditions worse than are expected to occur in the proposed

overburden fills. Regardless, the selenium water chemistry from these sources was examined to provide a frame of reference for the estimated selenium concentration for seepage from the proposed overburden fills to be used in the groundwater impact analyses. The detailed discussion of these data is found in Section 4.3.1 Groundwater Impacts.

Proposed Action - Topography

Topography would also be impacted under the Proposed Action by the relocation of the ore and overburden. **Figure 2.2-1** shows the proposed mine plan, including pits and overburden disposal facilities. Approximately 69 percent of the overburden would be placed as pit backfill in Panels A, B, and C, reducing the topographic impacts of the open pits. In addition to completing the backfill of the southern half of the Panel A pit, the northern half of Panel A would also be backfilled.

After reclamation, Panels B and C would be bounded by highwalls and backfill slopes. Backfill slopes in Panel B would be approximately 3h:1v, and those in Panel C would be about 5h:1v. Backfill in the Panel C northern sub-pit would slope to the east and be contoured to create a small drainage that flows east into Smoky Creek. The southern end of this sub-pit backfill would merge into the backfill in the Panel C southern sub-pit. Backfill in the southern sub-pit would slope to the south. **Figure 2.2-4** shows the topography of the reclaimed mine under the Proposed Action after pits have been backfilled and overburden storage areas have been shaped.

One highwall would be located at the northern end of Panel B and face to the south and southwest. Panel C would have two residual highwalls separated from each other by a distance of about 3,000 feet. The highwall in the northern sub-pit of Panel C would face to the east and south. The highwall in the southern pit of Panel C would be oriented along a north-south line, and face east.

The lowest point in the backfilled Panel B would be at an elevation of about 7,200 feet. The lowest point in the backfilled Panel C north sub-pit would be at the edge of the highwall and would be at about 7,050 feet in elevation. The low point in the backfilled southern sub-pit would be at the northern extent of the highwall, at an elevation of about 7,300 feet.

The highwall in the backfilled B pit would be 2,800 feet long and have a maximum height of 250 feet (**Table 4.1-5**). The two areas of exposed highwall in Panel C would total approximately 3,100 feet in length, with a maximum height of about 150 feet in each of the sub-pits. The highwalls would have overall slopes of approximately 45 degrees or slightly steeper.

The backfill in Panel B would have 3h:1v slopes. The backfill slope in Panel B would rise about 500 feet in height beginning at its northern edge against the highwall, until reaching the upper limit of the backfill. The uppermost portion of the backfill would be characterized by a small, generally flat, but slightly inclined surface, occupying about 14 acres at an elevation of about 7,700 feet. This is about 100 feet lower in elevation than the current ridge top at this point.

The remaining 31 percent of the overburden removed would be placed in an external overburden disposal site located between the existing Panel A1 overburden disposal site and Panel B. Reclamation of this overburden pile would create an extension of the existing topographic high, formed by the Panel A1 overburden pile, of about one and one-half miles to the north. The resulting topography of this feature would be a gently sloping south trending ridge.

The top of this overburden pile would be slightly inclined at an elevation of about 7,950 feet, or about 250 feet higher than the flat area at the top of the backfilled Panel B. This post mining elevation is about 100 feet higher than the pre-mining ridge top at this point. The northern half of this overburden pile would slope gently down to tie into the Panel B backfill at an elevation of about 7,700 feet.

Alternative A - Handling of Overburden to Minimize External Disposal of Selenium-Containing Waste

This alternative would incorporate all the components of the Proposed Action but would require Simplot to selectively handle and replace all seleniferous shale and mudstone overburden as backfill in the mine pits of Panels A, B, and C.

Geology and Mineral Resources

Under Alternative A, direct impacts to geologic and mineral resources would be the same as for the Proposed Action. That is, approximately 93.77 MMT of phosphate ore and overburden would be removed. The phosphate ore is a non-renewable resource, and, if recovered now, would not be available in the future. Because of increased costs associated with additional rehandling of overburden in Alternative A, there could be a decrease in the actual amount of ore recovered. Because the pits would receive more backfill under Alternative A, indirect impacts associated with limitations on future ore recovery would be slightly greater. As with the Proposed Action, these indirect impacts are minimal.

The geotechnical factors and operational practices employed for any mining at the Smoky Canyon Mine indicate that highwalls and external overburden disposal slopes for Alternative A should be stable from large scale failures. Alternative A would return 6.4 MMLCY more overburden as backfill to Panel B than the Proposed Action. This increase in backfill relative to the Proposed Action would result in a post-reclamation highwall in Panel B that would be about 700 feet shorter and 50 feet lower than the Proposed Action which would reduce potential instability of the highwall.

The volume of the external overburden disposal site in Alternative A would be approximately 6.4 MMLCY smaller than the Proposed Action. This smaller volume would result in a lower height for the side slopes which would increase their stability.

The total volume of seleniferous overburden handled, and made subject to potential leaching, would the same for the Proposed Action and Alternative A. However, the potential area of seleniferous overburden disposal, and potential area of where leaching of this overburden could occur, would be about 480 acres for Alternative A compared to 722 acres for the Proposed Action.

Impacts to paleontological resources would be the same for Alternative A and the Proposed Action based on the same volume of rock being mined.

The oxidation of selenium minerals and mobilization of selenium in the surface and subsurface environment under Alternative A would be similar to the Proposed Action. The surface area of potential seleniferous overburden would be up to 244 acres less in Alternative A than the Proposed Action because no seleniferous overburden would be left in the external overburden disposal site. This is a 33 percent reduction in potential area for seleniferous overburden disposal available for potential seepage of infiltration. All areas of seleniferous overburden disposal would be capped with 8 feet of chert and 1 to 3 feet of topsoil.

Table 4.1-5 Operational Effects to Topography

Alternative	New Effects to Topography					Post-Reclamation Effects to Topography		
	Open Pit	Haul Roads	Water Mngmt.	External Ovrbrdn. Fill	Total Acres	MMLCY Disposed in External Overburden Disposal Facility	Length/height (ft) of Remaining Panel B Highwall	Length/height (ft) of Remaining Panel C Highwall
Proposed Action	274	85	15	244	618	20.82	2800 / 250	3100 / 50-150
Alternative A	274	85	15	244	618	14.318	2100 / 200	3100 / 50-150
Alternative B	274	85	15	244*	618	0	None	3100 / 50-150
No Action	0	0	0	0	0	0	None	None

* The external overburden disposal site would be disturbed to temporarily store overburden until it is returned to the pit backfills.

Topography

Topographic impacts under Alternative A would be very similar to those under the Proposed Action. **Figure 2.3-1** shows the topography of the mine under Alternative A, after pits have been backfilled and overburden disposal facilities have been shaped. Under Alternative A, approximately 76 percent of the overburden would be placed as pit backfill; the remaining 24 percent would be placed in the external overburden disposal facility, compared to 31 percent of the overburden for the Proposed Action. This represents a decrease in the volume of overburden placed in the external overburden disposal facility relative to the Proposed Action. Because of the increased backfill volume, the residual highwall in Panel B would be reduced relative to the Proposed Action. Under Alternative A, this highwall would be approximately 2,100 feet in length and have a maximum height of about 200 feet compared to 2,800 feet long and 250 feet high for the Proposed Action. The backfill in Panel C and resulting topography would not change from the Proposed Action.

Alternative B - No External Overburden Disposal

This alternative would incorporate all the components of the Proposed Action but would require Simplot to selectively handle and replace all chert, shale and mudstone overburden as backfill in the mine pits of Panels A, B, and C.

Geology and Mineral Resources

Under Alternative B, direct impacts to geologic and mineral resources would be the removal of approximately 93.77 MMT of phosphate ore and overburden. The phosphate ore is a non-renewable resource, and, if recovered now, would not be available in the future. Because of the increased costs associated with additional re-handling of overburden in Alternative B, there could be a decrease in the actual amount of ore recovered. Because the pits would receive more backfill under Alternative B, indirect impacts associated with limitations on future ore recovery would be greater than under the Proposed Action or Alternative A. These impacts are considered minimal because phosphate prices would need to increase significantly to make future re-mining of these pits economic.

The potential for unstable highwalls is reduced in Alternative B compared to the Proposed Action and Alternative A. The Panel C highwall would be the same in this alternative as the others so the stability of that highwall is the same for all the alternatives. Because no overburden is disposed external to the pit in Alternative B there will be no external overburden disposal facilities and the additional Panel B backfill would result in completely covering the highwall there.

The total volume of seleniferous overburden handled, and made subject to potential leaching, would the same as the Proposed Action and Alternative B. The potential area of seleniferous overburden disposal, and potential area of where leaching of this overburden could occur, would be 486 acres for Alternative B, compared to 480 acres for Alternative A and 722 acres for the Proposed Action.

Impacts to paleontological resources would be the same for Alternative B and the Proposed Action or Alternative A based on the same volume of rock being mined.

The oxidation of selenium minerals and mobilization of selenium in the surface and subsurface environment under Alternative B would be similar to the Proposed Action and Alternative A. The surface area of potential seleniferous overburden would be up to 244 acres less in Alternative B than the Proposed Action because the temporary external overburden stockpile would be removed and returned to the pit backfills. This reduction is the same for Alternatives A and B. This is a 33 percent reduction in potential area for seleniferous overburden disposal available for potential seepage of infiltration

compared to the Proposed Action. All areas of seleniferous overburden disposal would be capped with 8 feet of chert and 1 to 3 feet of topsoil.

Topography

Topographic impacts under Alternative B would be less than under the Proposed Action or Alternative A. **Figure 2.3-2** shows the topography of the mine under Alternative B, after pits have been backfilled and overburden disposal sites have been shaped. Because all overburden would be placed as backfill, the post-reclamation Panel B pit would more closely represent the pre-mining topography. Under this alternative there would be no residual highwall in Panel B. The residual highwalls in Panel C would be the same as under the Proposed Action and Alternative A. Similarly, the entire external overburden disposal facility would be rehandled and removed so that the area between Panel A disposal site and Panel B would be approximately the same topographically after mining as before mining.

No Action

Under the No Action Alternative, Simplot would not be allowed to proceed with mining of ore in Panels B and C until mining and reclamation plans acceptable to the BLM and USFS were developed and approved. Under the No Action Alternative, there would be no direct impacts to geologic, mineral and topographic resources, because the 93.77 MMT of phosphate ore and overburden that were proposed for removal would not be mined. This ore would be conserved and available for mining in the future. Thus, the indirect impacts associated with economic limitations on future mining would be temporarily eliminated.

The No Action Alternative would not result in any alteration to topography at Panels B and C until a mining and reclamation plan is approved.

Direct and indirect impacts from oxidation of selenium minerals and mobilization of selenium in the environment under the No Action Alternative would be less than those under the Proposed Action and Alternatives A and B. Because the overburden would not be mined under this alternative, there would be no impact relative to existing conditions until mining is approved. The oxidation of selenium from minerals in the Phosphoria Formation would continue at natural rates resulting in concentrations found in the background data.

The No Action Alternative would result in no geotechnical slope stability impacts until mining is approved.

4.1.2 Irreversible and Irretrievable Commitment of Resources

Phosphate ore would be removed from the Smoky Canyon ore reserves and this would be an irreversible and irretrievable commitment of resources. This is a relatively minor loss when compared to total phosphate reserves available for future use in southeast Idaho. The amount of impact for this resource would be the same for the Proposed Action and Alternatives A and B.

Impacts to the local topographic conditions under the Proposed Action and the Alternatives would be irreversible and irretrievable. These impacts would be the same for the area of Panels A and C for the Proposed Action and Alternatives A and B. For Panel B the topographic impacts would be greatest for the Proposed Action and less for Alternative A and even less so for Alternative B but all of these impacts would be permanent. The topographic impacts from the Proposed Action and Alternative A on the

external overburden site would be permanent and approximately the same. Alternative B would eliminate this topographic impact.

Any loss of paleontological resources that occurred under the Proposed Action or Alternatives A and B would be identical, and would be considered irreversible and irretrievable. These impacts to paleontological resources are considered minor.

There would be no irreversible and irretrievable commitment of geology, mineral, and topography resources under the No Action Alternative.

4.1.3 Residual Adverse Impacts

Selenium, metals and other potential contaminants would continue to be present in overburden disposal areas of the Proposed Action and Alternatives. These potential contaminants would continue to be dissolved and mobilized in seepage for thousands of years following reclamation of the facilities (JBR, 2001a). The extent of the residual adverse impacts from this seepage would depend on the amount of seepage, its contaminant concentration, any natural attenuation of these contaminants and the ultimate impact point of the contaminants. Control factors included in the Proposed Action and Alternatives would address the severity of these impacts by use of caps, vegetation and other management practices to reduce the weathering and leaching of overburden.

Because of the unreclaimed highwalls in Panels B and C, there would be continued potential for geotechnical instability of exposed highwalls under the Proposed Action and Alternatives. The potential for highwall instability in Panel C would be the same for the Proposed Action and the Alternatives. The potential for highwall instability in Panel B would be reduced under Alternative A by reducing the highwall height by about 50 feet. Alternative B would eliminate this potential due to the elimination of the highwall by the complete backfill of Panel B.

4.2 Air Resources and Noise

Summary

The air quality in the surrounding area is considered excellent and the major producers of air pollutants are the 12 mine sites within the study area. Air quality information was assessed using regulatory based guidelines, data collected on site, and guidance documents. Alternatives A and B would impact air quality more than the Proposed Action. The increases in loading, unloading, hauling, and active disturbance activities described in the Alternatives would all contribute to the increase and duration of airborne particulates.

Noise impact areas are usually limited to a distance of 800 yards from the source, if residential housing is not involved. While still slightly audible, mining equipment noise appears to have little impact at a distance greater than two miles. With the existing topography, vegetation growth, and the lack of noise receptors in the study area, the impact of noise from the Proposed Action and Alternatives would be minimal. Smoky Canyon Mine activity noise levels would be temporary, thus, would have minimal long-term affects. Wildlife, such as raptors, may elect to relocate nests due to the noise produced from heavy equipment and associated construction activity. Noise impacts would remain virtually the same when comparing the alternatives to the Proposed Action. Only the duration of noise impacts would be affected.

Concentrations of selenium minerals in airborne dust produced during the operations would be well below the Threshold Limit Value (TLV) for selenium and selenium compounds within the mine working area and lower than this where the general public may be present beyond the mine boundaries.

Issue Indicators

Air emissions from the Proposed Action and Alternatives are regulated by State of Idaho and EPA regulations. Concentrations of regulated pollutants must comply with National Ambient Air Quality Standards and Prevention of Significant Deterioration increments.

4.2.1 Direct and Indirect Impacts

Proposed Action

The current Smoky Canyon Mine facility operates a process mill and mine site which has the potential to emit various air pollutants. An evaluation was conducted to compare existing emissions with the Proposed Action, Alternative A, Alternative B, and the No Action Alternative. Smoky Canyon mine operates under an IDEQ permit issued July 6, 1983. This permit addresses the steam boiler, fugitive dust control measures, haul truck speed limits, blasting and drilling dust suppression, and other air pollution mitigative requirements. Air borne particulate matter is the most common air pollutant emission associated with mining operations.

Particulate matter is generated by stationary sources, such as the mill facility; fugitive sources, such as extracting ore and overburden from the pits; or from mobile sources, such as the haul trucks. Because of the moisture content and wet ore process, very little particulate matter is generated within the mill. Particulate matter is mainly generated by extraction of the ore and overburden.

A limited amount of criteria pollutants, nitrogen oxides (NOx), sulfur dioxide (SO_2), carbon monoxide (CO) and volatile organic compounds (VOCs) are mobilized during operations, which occurs from fossil-fuel powered mining equipment.

This evaluation segregates air pollutant emissions into three categories: stationary, fugitive, and mobile. Each category is further subdivided into the specific regulated air pollutant. For this evaluation, an annual and cumulative effects comparison were performed. Certain assumptions were made such as, Panel B being developed and mined prior to Panel C. These assumptions were repeated for all applicable alternatives.

The annual air pollution generated from the mill site would remain constant for any action selected because of the capacity of the mill. The ore reserves, and thus the duration of mill operation, were assumed to be equal for the Proposed Action and Alternatives A and B. Particulate emissions from the extraction and ore/overburden handling and transportation would peak in years 2003 and 2004, showing a steady decrease, ending in year 2007. **Table 4.2-1** shows the results of air emissions estimates for the Proposed Action and Alternatives. An estimated 486 tons of total suspended particulates (TSP) would be mobilized into the atmosphere annually, at peak processing and extraction conditions for the Proposed Action.

Table 4.2-1 Annual Fugitive and Mobile Air Emission Estimates

Pollutant	Existing (tons/yr)	Proposed Action (tons/yr)	Alternative A (tons/yr)	Alternative B (tons/yr)	No Action (tons/yr)
TSP	415	486.5	1242	1548	310
PM_{10}	194	233.5	384	552	131
NOx	27.3	26.9	27.0	27.1	13.2
SO2	32	31.6	31.8	32	15
CO	159.5	159.2	160	160.1	79.5
VOC	9.5	8.5	8.5	8.5	5.7
NH3	0.7	0.7	0.7	0.7	0.7

Figure 4.2-1 shows the estimated releases of particulate air pollution. The varying levels of particulate pollution shown on **Figure 4.2-1** results from varying degrees of hauling distance and operation of haul trucks. These emissions include both the particulate emissions from the combustion of diesel fuel as well as the dust from haul road traffic. The emissions shown in Table 4.2-1 are based on the peak operating years 2003-2004, except for the 'Existing' estimates which are based on 2000 operations.

An EPA approved air dispersion model (ISCST3) was run to determine the impact the Proposed Action would have on the nearest community. Receptor sites were located in a polar grid at 5-mile and 10-mile intervals. Actual Pocatello meteorological data, recorded from 1987 to 1991 were used to determine if the Proposed Action would impact nearby communities, using EPA's National Ambient Air Quality Standards (NAAQS) as a guideline. The particulate matter impact is 27 percent higher compared to existing operations, at the 5 mile radius receptors. However, the impact from the Proposed Action is only 6 percent of the NAAQS at these locations.

The same model was run to predict if Class I Areas (i.e. Bridger Wilderness Area) would be affected by the Proposed Action. All stationary, fugitive, and mobile pollutants were simulated in the model as being emitted based on their approximate size and emission characteristics using maximum emission rates. Polar receptor grids were placed at distances representative of the distances to Class I Areas within the study area. The Class I PSD increments of 4 ug/m^3 and 8 ug/m^3 were not exceeded for the annual and 24-hour averaging periods, respectfully. The air dispersion model showed that the impact from the worst-case alternative (Alternative B) had insignificant impact at distances of 70 and 100 miles from the study area. The other criteria pollutants, NOx, SO_2, CO and VOC would have minimal impact and are very similar to existing conditions.

The assay concentration of selenium in seleniferous overburden at the Smoky Canyon Mine is between 150 and 300 mg/kg (Munkers, 2000). Dust produced during mining operations could contain this concentration of selenium. Past monitoring results obtained from the Mine Safety and Health Administration (MSHA) indicate Simplot controls dust at the mine to well below the applicable nuisance dust Threshold Limit Value (TLV) of 10 mg/m^3. Using the upper selenium concentration in the overburden, if dust concentrations were at 10 mg/m^3, the selenium concentration in air would be 0.003 mg/m^3 which is 1.5 percent of the allowable TLV for selenium and selenium compounds (0.2 mg/m^3). This demonstrates that mine employees would not be exposed to particulate selenium concentrations over the selenium TLV. The general public would be exposed to concentrations on the margins of the operations that are much lower.

Noise impacts were assessed by researching typical noise levels for the equipment and operations common for mine sites. Site measurements were also taken with a sound meter at or near the largest noise producers at the mine site. These levels were projected outward from the source to the limits of the study area. The typical noise level values used for outdoor and community noise evaluations were determined to be the best assessment of the impact from mining activities at Smoky Canyon Mine. Because a specific frequency is not associated with the noise of haul trucks, other noise standardizing methods are used. For this determination, decibel readings of the loudest noise generators were assessed; typical background noise levels were also measured. These readings were used to characterize the impacts of noise in the project area.

Table 4.2-2 shows the noise measurements recorded at the Smoky Canyon Mine on June 8, 2000. This was considered a typical operating day at the mine site. These measurements were taken with regard to the loudest noise producing activities associated with the study area.

Table 4.2-2 Noise Level Measurements at the Study Area

Noise Producing Action	Noise Level (dBA)
Haul trucks pulling up loading ramp at the pit from 8m	85, 87, 85
Inside cab of moving pickup truck	73-77
Car at 35 mph, Smoky Canyon Road, from 10m	73
Pickup Truck at 35 mph, Smoky Canyon Road, from 10m	67
Standing on Smoky Canyon Road, gentle wind, loading occurring less than two miles away	52 - 60
Standing on Smoky Canyon Road, quiet, with strong wind gust, loading occurring less than two miles away	67 - 69

When the background or ambient noise levels were measured, they ranged from 52-69 dBA. The impact from loudest activity recorded, loaded haul trucks, is reduced by the surrounding foliage and topography. Noise generated by these haul trucks is either absorbed by the surrounding environment or masked by background noise levels. While still slightly audible, haul truck noise appears to have little impact at a distance greater than two miles.

Blasting of overburden and ore did not occur during the noise level measurements. There were 214 blasts recorded for 1999 at the mine site. Blasting represents a non-repetitive, high pressure, low intensity noise. The duration is very short with little variation in pitch, loudness, or vibration.

All of these sound measurements are at or below the OSHA eight-hour exposure limit for hearing protection. These noise generating sources located at Smoky Canyon Mine are classified as episodic, thus an eight-hour exposure level is unlikely. With the existing topography, fairly dense vegetation growth, and the lack of noise receptors in the study area, the impact of noise from the Proposed Action and Alternatives would be minimal.

With the Proposed Action and Alternatives A and B, the source of noise would shift approximately 4.5 miles to the north of present mining activities in Panel E. Haul truck noise from the Panel B and C operations would be heard by someone standing along the Smoky Canyon road. However, the intensity, power, and pressure would be classified as a slight impact. This noise would not be noticeable to persons driving their vehicles along the Smoky Canyon Road.

drawings\SIMPLOT\FSEIS\Figures FSEIS\Figure 4.2-1.dwg (revised 1/23/02)

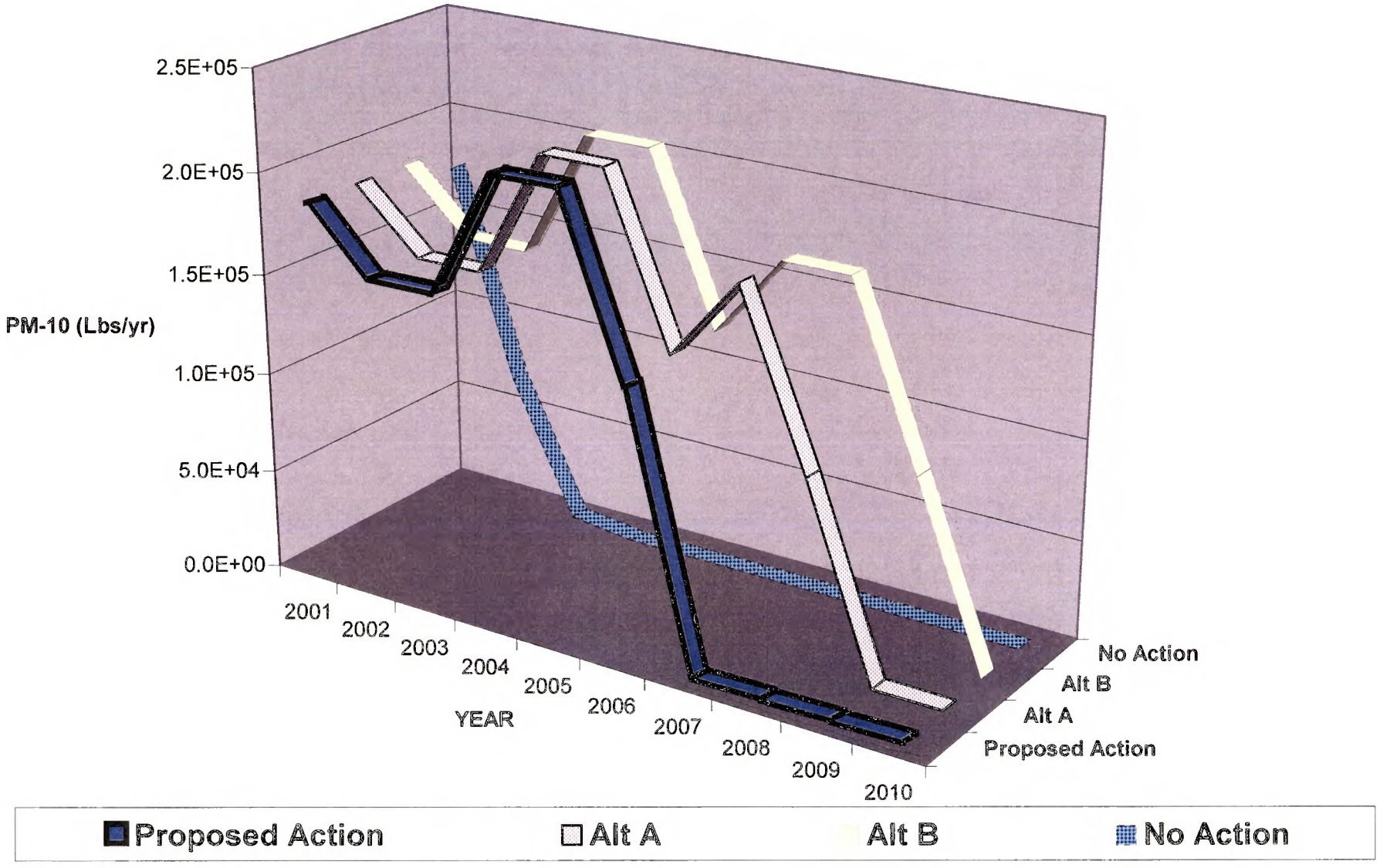


FIGURE 4.2-1
MOBILE FUGITIVE EMISSIONS - HAUL TRUCKS
SIMPLOT SMOKY CANYON MINE PANELS B&C
SUPPLEMENTAL EIS

Alternative A - All Seleniferous Overburden to Pit Backfill

Alternative A would have greater emissions than the Proposed Action because of the extra overburden handling to backfill the pits. The extra loading, hauling, and unloading of the overburden would increase the amount and duration of the particulate and combustion emissions. The annual TSP impact of Alternative A would be 1,242 TPY compared to 486 TPY for the Proposed Action. Mobile emissions, like the Proposed Action, would peak between years 2003 and 2004, but annual emissions would decrease at a slower rate, thus extending ambient air impacts out an additional 10 months.

Air dispersion modeling showed no significant Class I impact for Alternative A. A 27 percent higher impact at the 5 mile receptor sites was predicted, when compared to existing conditions. However, all modeling results were well within the NAAQS limits.

There would be no difference in the noise intensity between Alternative A and the Proposed Action. The duration of the noise producing mining activities would be extended by 10 months compared to the Proposed Action.

Alternative B - No External Overburden Disposal

The maximum annual air emission impact for Alternative B would be in years 2003 and 2004. The peak year estimates indicate that TSP emissions from Alternative B would be 1,548 TPY compared to 486 TPY for the Proposed Action and 1,242 TPY for Alternative A. The other criteria pollutants would have a similar impact as the current operating scenario. The extra re-handling of overburden would extend the emissions out to year 2009.

Alternative B showed a 34 percent higher impact at the 5 mile receptor sites, but was well within the NAAQS limits. Air dispersion modeling did not show the Class I area would be affected by operations associated with Alternative B. The impact to the Class I area was less that 50 percent of the PSD Increment limit for both the annual and 24-hour averages for PM_{10}.

There would be no difference in the noise intensity between Alternative B and the Proposed Action. The duration of the noise producing mining activities would be extended by 21 months compared to the Proposed Action.

No Action

The current operation of the mine site is similar to the No Action Alternative because operations will continue on Panel E; Panel B and Panel C have not been developed. With the projected ore extraction rate, and a delay in mining of Panels B and C, Panel E mining would be completed between year 2002 and 2003. By year 2003, a 25 percent decrease in particulate emissions is estimated. Mobile and combustion emissions would likely decrease by 25 percent or more. Ore reserves would be depleted by the end of year 2003 and emissions of active and passive disturbance would continue until pit reclamation is completed. Class I Impacts and the 5-mile radius impacts would be non-detectable.

4.2.2 Irreversible and Irretrievable Commitment of Resources

Air pollution readily dissipates with time and space. These secondary impacts from mining operations have little or no irreversible impacts. Weather factors, such as wind or rainfall will return the air quality to background quality by dispersion of air pollutants. With the absence of heavy soot, acidic, or lead

based emissions from the operations, irreversible or residual impacts from air pollution are minimal to non-existent.

There would be no irreversible or irretrievable noise impacts. When the source of the noise is moved away or ceases altogether, the impacts would also cease.

4.2.3 Residual Adverse Impacts

Even with application of normal fugitive dust control methods in the mining operations, there would be residual fugitive dust emissions during the period of active mining and reclamation activities. These emissions would comply with Simplot's air quality permit requirements. At the cessation of mining and other earthwork activities, the air quality in the area of the Proposed Action is expected to approach baseline conditions.

Persons near the mining activities will notice noise produced by these operations depending on the noise source and proximity to the listener. The source of this man-made noise would cease at the conclusion of the proposed mining activities. Therefore, there would be no residual adverse impacts to air quality or noise.

4.3 Water Resources

Summary

Direct and indirect impacts on water resources would result from the Proposed Action and Alternatives. The surface water impacts would primarily result from surface disturbances related to the proposed mining activities within the drainage areas of Smoky and Roberts Creeks. These disturbances would produce increased sediment loadings which would be controlled by use of sediment collection basins, silt fences, sediment traps, concurrent reclamation of disturbed areas, runoff diversion and collection ditches and other best management practices. Any sediment removed from the basins would be disposed in mine pits. Rehandling of seleniferous overburden would increase its potential short-term exposure to weathering and erosion compared to overburden that is not rehandled. Overburden rehandling would be 4 percent for the Proposed Action, 16 percent for Alternative A, and 36 percent for Alternative B. Sediment containing selenium and metals mobilized during erosion of the overburden would be a temporary impact that would be eliminated when these areas are covered with 8 feet of chert and 1 to 3 feet of topsoil during reclamation. The largest contributor of sediment would be road construction in Smoky Canyon. Sediment from this activity would be chemically benign because the road fills would be made of chert and limestone.

Diversion and collection of runoff from the disturbed area in the proposed mine water management facilities would permanently reduce the area that would contribute runoff by about 7.6 percent to Smoky Creek and approximately 11.2 percent to Roberts Creek. The low flow volume for the perennial reaches of Roberts and Smoky Creeks would not be directly affected by these reductions because the lower reaches of these streams are maintained by flow from springs. The Tygee Creek Basin, to which both of these streams flow, would experience a permanent reduction in watershed area of about 2 percent, which is not expected to significantly affect the annual flow from the basin.

There is no difference in the amount of disturbed acreage between the Proposed Action and Alternatives A or B thus the annual amount of increased sediment loading from disturbed area and surface runoff reduction from sediment control facilities would be the same for all three conditions. The time period of these impacts would be extended by about 10 months for Alternative A and 21 months for Alternative B.

Overburden would be removed from the open pits and placed in an external overburden disposal site and pit backfills that would be subject to infiltration from precipitation and snowmelt. This infiltration of meteoric water would dissolve soluble chemical constituents from the overburden as it passes downward through the material. Column leaching tests of overburden samples have indicated that certain chemical constituents may be leached in seepage from the overburden in concentrations that are above either drinking water standards or cold water aquatic life criteria. These COPCs included cadmium, manganese, selenium, sulfate and TDS. This seepage could be subject to physical and chemical attenuation (decrease in concentration) within the unsaturated bedrock lying between the overburden and the water table in the Wells Formation as it percolates downward under the influence of gravity. The seepage would then enter the aquifer where it would be diluted and further attenuated by chemical interactions with the aquifer water and rock matrix as the water flows down gradient in the Wells Formation.

Groundwater modeling of the potential impacts from seepage was conservative in that it did not assume any physical or chemical attenuation of the seepage. Attenuation may occur but existing data do not allow for its quantification.

The model results indicate that a total aquifer area of approximately 550 acres is estimated to have groundwater selenium concentrations greater than the MCL for the Proposed Action. The portion of the total groundwater impact area west of the south half of the A Panel where the proposed mitigative measures cannot be built was about 100 acres. Predicted manganese concentrations were greater than secondary MCLs in this same vicinity but impacted a smaller area. The groundwater modeling shows that selenium concentrations at the Culinary Well are estimated to remain within applicable drinking water standards. The model results show that detectable concentrations of the COPCs contributed by the seepage through the overburden were estimated to occur approximately 0.5 to 0.66 mile downgradient to the west and northwest of the proposed activity and 0.5 mile to the east.

To account for potential variability in the actual selenium concentration in the overburden seepage, a starting concentration of 0.72 mg/l was also used in the groundwater impact analysis. This concentration correlates to the highest average selenium concentration measured at the Smoky Canyon Mine for an overburden seep and is also greater than 87 percent of the average selenium concentrations measured in overburden seeps in southeastern Idaho. These modeling results showed that the proposed mitigative measures were effective in limiting the area of concentrations of selenium and manganese over their MCLs to under the mine area. The area of concentrations greater than the selenium MCL west of the south half of the A Panel were expanded by about 58 acres in these modeling results. In addition, there was an area of about 41 acres west of the C Panel that was predicted to have concentrations greater than the selenium MCL. Both of these areas are places were the proposed groundwater impact mitigation measures cannot be built.

Lower Smoky Spring provides a perennial water source for lower Smoky Creek. Available data indicate that the spring may not discharge water from the Wells Formation, which is the aquifer that would be impacted by the Proposed Action and Alternatives. If this is the case, there would be no possibility of water quality impacts from Panels B and C to Smoky Creek from groundwater discharged at the spring. However, to be conservative, groundwater modeling of the fate and transport of chemical constituents derived from the overburden seepage assumed that the maximum discharge from this spring (about 1 cfs) was 100 percent obtained from the Wells Formation. Using seepage water quality predicted by column testing in the groundwater model and the 0.72 mg/l selenium concentration, concentrations of the COPCs in groundwater were estimated at the spring location. All of these concentrations were below detection limits and none of the concentrations were greater than the applicable cold water aquatic life criteria.

Modeled groundwater impacts for both Alternative A and B are essentially identical. Both Alternative A and B would result in the same 33 percent reduction in seepage through overburden compared to the Proposed Action. Groundwater modeling showed essentially the same water chemistry impact below the pit backfill areas compared to the Proposed Action. However, concentrations of COPCs in the seepage from Panel B may actually be higher in Alternative A than the Proposed Action due to the geochemical effects of rehandling some seleniferous overburden and its greater thickness in Panel B. Available data does not allow this effect to be quantified. Higher COPC concentrations in the seepage water could result in proportionately higher concentrations in the groundwater under Panel B. This effect in Alternative B would be similar to Alternative A. The elimination of seleniferous material in the external overburden area for both Alternatives A and B results in a total area of about 322 acres where groundwater selenium concentrations are estimated to be greater than MCLs. The portion of this impact area west of the A Panel (100 acres) for the Alternatives is the same as the Proposed Action. Selenium concentrations in the Culinary Well were the same as for the Proposed Action. The concentration of detectable amounts of the COPCs contributed by seepage through the overburden in the Alternatives was estimated to extend approximately the same distance downgradient as the Proposed Action with the exception that the impact due to the external overburden disposal area would be eliminated.

Impacts to water quality in the Wells Formation aquifer from seepage through the proposed overburden facilities would be expected to be an irreversible and irretrievable commitment of this groundwater resource. Over a long period of time (thousands of years) concentrations of chemical constituents in overburden seepage should decrease as soluble chemical species are leached out of the material and their concentrations decrease in the overburden. However, concentrations in the seepage are estimated to be less than MCLs within 200-300 years.

Mining of the Panel C pit highwall within about 200 feet below the existing Sheep Spring would not impact the recharge area for the spring but could affect the groundwater flow beneath the spring. It is impossible to predict if this effect would change the flow of this spring.

The amount of Wells Formation groundwater currently pumped for culinary and process uses at the Smoky Canyon facilities is less than originally evaluated in the Smoky Canyon Mine DEIS (USFS, 1981). The Proposed Action or Alternatives would not alter this amount.

Issue Indicators

Potential discharges of surface water with sediment and dissolved contaminants from the Proposed Action and Alternatives are analyzed to determine the water quality impacts on receiving surface waters. These predicted concentrations are compared to surface water quality standards in compliance with Idaho regulations based on the Clean Water Act.

Potential mobilization of COPCs from overburden due to infiltration are evaluated through SPLP and column tests and then compared to field data. The quantity of infiltration is estimated with the EPA HELP3 infiltration model. The total estimated seepage load of contaminants is added to the groundwater table under the proposed disturbances and the fate and transport of these contaminants in the groundwater are modeled with the USGS model ModFlow. Concentrations of the COPCs are estimated at specific points of groundwater and surface water use and compared against the applicable groundwater and surface water quality standards.

4.3.1 Direct and Indirect Impacts

Proposed Action - Surface Water Impacts

Sediment and Channel Related Impacts

Runoff from the haul roads, overburden disposal areas, pit backfills, and other disturbed areas would have potential for erosion, with subsequent sediment loading to Smoky Creek and Roberts Creek. This potential would be controlled because the runoff would be directed into sediment basins or into the mine pits which would hold without discharge runoff from the 100-year, 24-hour storm on top of snowmelt.

The Smoky Canyon Mine SWPPP general design requirement is to contain without discharge the runoff from the 100-year, 24-hour storm on top of snowmelt and the 26 new or enlarged ponds constructed as part of the Proposed Action would also be designed under the same criterion. A total of six ponds would be constructed along the base of the C Panel and would capture runoff from about 92 acres. Up-gradient, undisturbed area runoff above the C Panel would be collected in the open pit during mining. A total of 13 ponds would be constructed to contain runoff from about 460 acres in the B Panel area, with about 76 acres draining to a low point in the pit bottom. Five new basins would be constructed in the A Panel area, and two existing A Panel ponds (A-P1 and A-P5) would be enlarged, to contain runoff from 360 acres of the overburden disposal area.

In addition to the settlement basins, other BMPs described in the SWPPP, including silt fences, straw bales, diversions, etc. would be implemented in conjunction with the Proposed Action and Alternatives. These structures would manage runoff and would control erosion/sediment impacts to the Roberts or Smoky Creek drainages from the disturbed areas. The expected design life of properly designed and constructed settlement basins and other structures would be well within the time-frame in which mining and reclamation activities would occur.

Compliance with the terms of EPA's *Multi-Sector General Permit* for storm water discharges under the NPDES program would control impacts to surface water quality from sediment produced from erosion of disturbed areas associated with mining. Further, many of the suggestions provided in the Idaho Department of Lands (1992) *Best Management Practices for Mining in Idaho* and the Idaho Mining Association (2000) *Existing Best Management Practices at Operating Mines* have been, and will continue to be, followed at the Smoky Canyon Mine, and these would also control sediment and erosion impacts to water quality.

Potential sedimentation impacts from the Proposed Action and Alternatives were evaluated by reviewing past sedimentation impacts from the existing mining operations using stream monitoring data and mine records, and relating these to the proposed project. Given the similarity of the existing operations to the proposed operations, this evaluation method was determined to provide the best indication of future sediment impacts. In addition, use of the existing stream monitoring data factors in the effects of best management practices which serve to mitigate sediment impacts and also incorporates the existing sedimentation impacts of other land uses such as livestock grazing, recreational travel on the public road through Smoky Canyon, and road maintenance.

When determining an appropriate quantitative measure by which to track sediment in a specific water body, EPA in its Total Maximum Daily Load (TMDL) program suggests five potential types of indicators: water column indicators such as suspended sediment and turbidity; streambed indicators such as percent fines and embeddedness; channel condition indicators such as pool/riffle ratio and width/depth ratio; biological indicators relating to habitat quality; and riparian and hillslope indicators such as in-stream woody debris and land slide potential (EPA, 2001). Choice of one or more of these indicators is based upon the types of available data (or ability to collect such data), and upon presumed sensitivity of a given indicator to types of activities in the watershed and the specific watershed characteristics.

Three types of data related to current sedimentation impacts were assessed in order to have the best chance of meaningful results: suspended sediment load, which integrates stream flow rate and total suspended sediment (TSS) concentration; turbidity, which indirectly relates to sediment loading; and embeddedness, which is a measure of fine sediments covering channel bed gravels. Data from Smoky Creek, Pole Canyon Creek, Sage Creek, and Lower Sage Creek were each assessed separately, using data collected both before and during mining, and upstream and downstream of mining site locations. Data included in the analysis were obtained from the biannual TRC Mariah sampling episodes, in-house Simplot data that has been reported by TRC Mariah, and recent Maxim sampling. In order to help reduce bias in the statistical comparisons, only data for which there were pairs of upstream and downstream observations were included. Comparisons of means were made using 't' tests; the level of significance of the test is a measure of how likely it is that the two compared samples are drawn from the same populations. If two compared samples (one representing a situation where mining has not had the potential to have an impact, and the other representing a situation where mining has occurred) appear to be from the same population, the assumption would be that mining has not altered the conditions.

Embeddedness represents an integration of both suspended and bed sediment loading over time, and thereby can reduce some of the inherent temporal and flow rate variability of suspended sediment concentrations found in water column samples. Embeddedness often has a high degree of spatial variability, as it is affected by channel morphology, geology, landscape position, and channel feature. In addition, the measurement process used to obtain the available embeddedness data consists of assigning a discrete integer between 1 and 5 based upon a subjective observation. Comparisons of embeddedness for the same site over time are more relevant than comparisons of up- and downstream locations but the lack of pre-mining measurements in the available data only lends itself to the latter site to site comparison.

While suspended sediment loading and turbidity may also vary between upstream and downstream sites due to non-mining reasons, such as contributions from other sources or gradient changes that cause deposition, along-stream measurements taken at equivalent times are generally more consistent than embeddedness would be expected to be, so up- and downstream comparisons should be more reliable using these indicators. The typically large temporal variability in sediment loading data means that large

sample sizes are needed to develop statistically relevant conclusions. Ideally, sufficient pre-mining data would allow pre-mining differences, if any, between upstream and downstream sites to be established, and to allow comparisons of the below mining sites both prior to and during mining. However, as with embeddedness data, sufficient pre-mining data were generally unavailable for the Smoky Canyon Mine. As a result, most of the data comparisons from which impact assessments can be made are based upon mining samples taken both upstream and downstream of the mining activity.

With the 't' tests results shown in **Tables 4.3-1** and **4.3-2**, the basic hypothesis which is being tested is that the mean values of the two tested sample sets are equivalent. The higher the P value, the more difficult it is to reject the hypothesis, and it can be assumed that there is no difference in the sample set means for the two sites. By extension, if the hypothesis of equal means is rejected (P value is low), then the evidence supports the conclusion that the sample set means are different. Where the test is comparing an upstream versus a downstream site during the time that mining is ongoing, and the equivalency hypothesis is rejected (low P value), it supports a conclusion that mining has impacted the downstream site.

An examination of the suspended sediment load results is given in **Table 4.3-1**. The Smoky Creek upstream versus downstream comparison shows, with a fair degree of confidence, that suspended sediment load has increased at the downstream location since mining activities began in this watershed. This comparison is made with a large sample size, and the mean of the downstream site is more than twice that of the upstream site. The sediment load comparisons between upstream and downstream sites for Pole Canyon Creek and Sage Creek have very high P values, and support the conclusion that suspended load in these streams has not changed since mining began in their watersheds.

The comparisons of mean turbidity values for Sage Creek are shown in **Table 4.3-2**. Sufficient, although small, sample sizes were available to run the "t" tests under pre-mining conditions for both Sage Creek and South Sage Creek and the results indicate that turbidity did not increase in the downstream locations before mining began in their watersheds. After mining began in the Sage Creek watershed, the results support the conclusion that turbidity has increased the downstream location. This increase above background results in a low actual turbidity value (9 NTUs) downstream of the mining activities. Comparison of mean turbidity values for Smoky Creek and Pole Creek in **Table 4.3-2** support the conclusion that turbidity has increased by 7 NTUs downstream of the mining activities. Again, this increase above background still results in low actual turbidity values (20 and 13 NTUs respectively) downstream of the mining activities.

Embeddedness comparisons are also shown in **Table 4.3-2**. The results of the comparisons for Pole Canyon Creek and Sage Creek indicated with statistical confidence that the downstream sites were more embedded than the upstream sites. The results for Smoky Creek indicated there is no difference in embeddedness between the upstream and downstream sites.

On a stream by stream basis, the results are mixed. For Smoky Creek, the results indicate that sediment load and turbidity have increased downstream but embeddedness has not increased. Conversely, for Pole Creek and Sage Creek, results indicate that turbidity and embeddedness have increased downstream, but not sediment load. (As noted previously, mining, grazing, and roadway usage and maintenance are among the types of land uses occurring in these watersheds that may be contributing variously to these sediment-related differences.)

Table 4.3-1 Results of "t" Tests for Suspended Sediment Load Comparisons of Streams in the Project Area

Parameter	Variable A	Variable B	N	Mean A	N	Mean B	P
Load, lbs/day	Upper Smoky, during mining	Lower Smoky, during mining	60	306	60	721	.08
Load, lbs/day	Upper Pole, during mining	Lower Pole, during mining	44	332	44	274	.74
Load, lbs/day	Upper Sage, during mining	Lower Sage, during mining	13	3,304	13	4,407	.76

N = sample size
P = level of significance
lbs/day = pounds per day, suspended sediment load

Table 4.3-2 Results of "t" Tests for Turbidity and Embeddedness Comparisons of Streams in the Project Area

Parameter	Variable A	Variable B	N	Mean A	N	Mean B	P
Turbidity, NTU	Upper Sage, pre-mining	Lower Sage, pre-mining	18	5	18	6	.48
Turbidity, NTU	Upper S Sage, pre-mining	Lower S Sage, pre-mining	18	20	18	13	.49
Turbidity, NTU	Upper Smoky, during mining	Lower Smoky, during mining	83	13	83	20	.02
Turbidity, NTU	Upper Pole, during mining	Lower Pole, during mining	64	6	64	13	.04
Turbidity, NTU	Upper Sage, during mining	Lower Sage, during mining	47	5	47	9	.05
Turbidity, NTU	Lower Sage, pre-mining	Lower Sage, during mining	18	5	47	9	.18
Embeddedness	Upper Smoky, during mining	Lower Smoky, during mining	16	1.8	16	1.6	.54
Embeddedness	Upper Pole, during mining	Lower Pole, during mining	14	3.5	14	1.9	<.01
Embeddedness	Upper Sage, during mining	Lower Sage, during mining	12	4.2	12	3.5	.03

N = sample size
P = level of significance
NTU = Nephelometric Turbidity Unit

Overall, turbidity measurements seem to provide the strongest continuity of results; the other two indicators are more inconclusive. Therefore, turbidity has been selected to describe potential sediment impact as a result of the proposed mining activity. The 't' test results show that all three during-mining comparisons were indicative of a downstream increase. Assuming similar changes in turbidity as shown in **Table 4.3-2** would occur in Smoky Creek from the Proposed Action and Alternatives, average turbidity may increase downstream of mining by between 4 and 7 NTUs. When added to the existing mean Lower Smoky Creek turbidity (20 NTUs) the increase in turbidity could raise the mean total to approximately 24 to 27 NTUs. This represents a small predicted increase which would not be anticipated to negatively impact downstream water uses.

It must be noted that the above analyses are based upon periodic water monitoring which makes no attempt to obtain data during times when mine sediment ponds are discharging. As a result, the assessment considers average, overall site conditions; during an actual sediment pond release, however, short term isolated increases may also occur above and beyond those discussed above.

In order to provide an assessment of this, the agencies and Simplot were asked to provide information regarding the performance of the existing runoff and sediment control facilities. Discharges from these facilities may occur under two separate scenarios. One scenario is a spillway discharge that occurs after a given sediment pond fills, either due to a greater than design event, or an accumulation of events that exceed the storage capacity. The other scenario would be due to a failure of water management facilities such as ditches that improperly direct runoff, or ponds that do not function as planned.

The available information indicates that both these scenarios occur at least occasionally, and could introduce sediments downstream of the SWPPP facilities, contributing to potentially higher turbidity values on a short term basis than the average increase predicted above. Since 1997, the BLM inspection files (Jeff Cundick, personal communication) indicate two instances of pond discharges resulting in sediment loading to the Sage Creek drainage. No data are available by which to assess the amount of sediment contributed as a result of these discharges. Simplot's records indicate that, between fourth quarter 1998 and second quarter 1999, pond discharge or runoff from uncontrolled disturbed areas occurred in six instances. Their records further indicate that in some of those instances, the release did not progress all the way to the stream as a result of the discharge; in those cases, sediments presumably deposited below the pond outfall and above the stream channel. The records also indicate that TSS concentrations in those discharges ranged from 15 to 331 mg/l, with an average of 140 mg/l. Should such levels be released to area streams as a result of the proposed mining, short term increases in turbidity would occur; the upper end of the range of reported values exceeds the 100 mg/l TSS benchmark value that EPA has established for sediment loading from Simplot's activities (JR Simplot, 2000). It is important to note that Simplot's stated intent is to contain all discharge from their disturbed areas in the sediment ponds, up to and including runoff from a 100-year, 24-hour event on top of snow melt. It can be assumed that similar discharges could occur in the future from the SWPPP facilities under the Proposed Action or Alternatives, with similar short term pulses of turbidity potentially introduced to downstream waters.

One area where the Proposed Action may affect sediment loading potential differently than have the previous mine activities is the close proximity of the northern half of the C Panel footwall and about 200 linear feet of the B Panel haul road fill. Coming within 50 feet of the stream for the former, and immediately adjacent to the stream for the latter, these areas have the potential to provide a sediment source. Should erosion/sediment control from these areas not be successful, their close proximity to Smoky Creek could allow such eroded materials to enter the stream. The 50-foot vegetated buffer, as

well as the sediment control for the C Panel footwall would help to control this potential, and the proposed gabion retaining walls associated with the B Panel haul road (described further below) would control such erosion.

Another potential source of sediment loading and channel impacts is the road construction activity that is being proposed across Smoky Creek itself. The placement of culverts for two haul road crossings and one access road crossing can initiate channel instability, with consequent changes in substrate and downstream sediment contributions (**Figure 4.3-1**). Smoky Creek has been previously impacted throughout much of the reach in the Project Area by realignment and channelization however, the presence of existing jurisdictional wetlands throughout the reach indicates that it is at least in sufficient equilibrium to maintain wetland communities along it.

All of these construction activities would require permits which contain stipulations to protect the stream during construction; thus any sediment loading during construction would be expected to be minimal and short term. This would, in turn, protect water quality in the streams into which Smoky Creek flows, namely Stump Creek and the Salt River. These approvals would include a U.S. Corps of Engineers evaluation under Section 404 of the Clean Water Act and issuing a permit. The U.S. EPA and U.S. Fish and Wildlife Service would be consulted by the Corps as part of this process. A Stream Channel Alteration Permit would be required under State Rules administered by the Idaho Department of Water Resources.

All new culverts would have the hydraulic capacities to match or exceed those of the existing culverts, and they would be properly designed to pass the 100-year storm flow, installed, and maintained to prevent channel scour and instability in Smoky Creek such as has been achieved by the existing culverts in the canyon. If that is the case, channel instability should not result from their placement.

Both of the reaches where gabion structures would be placed would be along the east side of Smoky Creek to keep the toe of the B Panel haul road fill out of the stream (**Figure 4.3-1**). Approximately 200 total feet of standard gabion wall would be required. The potential for the retaining structures to be undermined during high flows (particularly for the southern, upstream location where it appears that the gabions will be on the outside of a meander bend) must be considered in the design. While these structures are an improvement over haul road fill encroaching upon the channel, they do have the potential for failure over time, either due to failure of the wire as a result of abrasion or corrosion, or failure of the structures themselves due to hydraulic forces. Such failure, if it occurred, could result in increased sediment loads to Smoky Creek. However, the limited time frame during which the gabions would be installed would be expected to be within a typical gabion life-span under normal stream conditions.

These gabions and new road culverts would be removed during reclamation and some limited sedimentation would occur in conjunction with the removal operations. This would need to be monitored for erosion and mitigated if necessary. In addition, the new road fills and gabions would be built with chert and/or limestone to preclude selenium loading to the creek from any sediment associated with these features. Long term, after removal of these structures and accomplishment of reclamation objectives, sediment loading should be restored to natural conditions, with no impacts to Smoky Creek or downstream (including Wyoming) waters.

Selenium and Other Chemical Constituents

While impacts from the Proposed Action in regard to sediment loads from disturbed areas would be analogous to those that have occurred under existing operations, impacts in regard to selenium must be assessed differently. The Proposed Action consists of design and operational measures that are different from the past operations, i.e., selective handling of overburden would occur. Seleniferous materials would be exposed in the short term as overburden fills are being constructed. Because of the proposed cap, no long term exposure of these materials to runoff or erosion would occur. These differences have been proposed with the specific intent of reducing selenium-related impacts. (See Cumulative Effects Analysis for a detailed discussion on existing selenium impacts elsewhere at the Smoky Canyon Mine.) Therefore, a similar type of comparative upstream/downstream analysis as was done to predict general disturbed-area sediment impacts is not appropriate for predicting selenium-related surface water impacts.

Instead, the following discussion relies upon the results of the IMA Regional Investigations Study (IMA, 1999a) as a facility-specific basis for assessing and predicting selenium impacts to surface water. The IMA reports found that, throughout the Southeast Idaho Phosphate Resource Area as a whole, elevated selenium levels are associated with surface water in the following types of mine facilities: mine pit ponds, tailings ponds, French drains, and overburden dump seeps (IMA,1999a).

Mine Pit Ponds

Both the C Panel and the B Panel pits would be temporary impounding features and thus may seasonally contain runoff water until they are backfilled during reclamation activities. Selenium concentrations in the pit ponds would be similar to previously measured concentrations in the nearby A-Panel pit pond (0.064 and 0.097 mg/l). These temporary pit ponds would not be present long enough to develop aquatic habitats or discharge surface flows to Smoky Creek. The short life of these ponds and the lack of aquatic habitat development would control bioaccumulation of dissolved parameters. The ephemeral water in these ponds may be used as drinking water by wildlife. This is not expected to be a continuous use because the mining or backfilling operations in the pits would discourage wildlife use and the presence of other natural water sources in nearby upper Smoky Creek. When water is the only selenium exposure route, toxic thresholds for wildlife are 1.0 to 2.0 mg/l (USDI, 1998). D. Z. Piper and others (2000) indicated that adequate dietary levels of selenium for sheep were 0.4 to 1 mg/kg and 0.3 to 2 mg/kg for horses. Harr and Muth (1972) showed that selenosis in mammals may result from dietary exposures of drinking water of 0.5 to 2 mg/l. The selenium concentration of the existing A Panel pit pond is lower than these dietary and drinking water toxicity thresholds for wildlife and future pit ponds in the B and C Panels are also expected to have selenium concentrations less than this level. The water in these ponds would evaporate and infiltrate into the bedrock but would not be discharged to Smoky Creek.

French Drains

The Proposed Action does not include this type of feature, nor does it include any feature analogous to a French drain. Therefore, elevated selenium levels as have occurred elsewhere due to water flowing through French drains would not occur here.

Overburden Disposal Areas

Seeps from the bases of overburden piles are not uncommon at southeast Idaho phosphate mines. These occur where infiltration of water downward through the overburden encounters a lower permeability zone either within the overburden pile or in the natural materials in the foundation of the pile. The percolating water tends to migrate laterally along these lower permeability zones exiting the overburden pile at its outer surface, typically at the downhill toe of the pile slope. Data collected from publicly available monitoring records (**Appendix 4B**) indicates that the selenium concentrations of these

overburden seeps ranged from 0.0149 to 1.617 mg/l. Such levels are below toxicity thresholds for wildlife drinking water (1-2 mg/l) (BOR, 1998) but above cold water aquatic criterion for surface waters (0.005 mg/l) and the drinking water standard (0.05 mg/l).

Two overburden seeps have been monitored at the existing Smoky Canyon mine operations located in the D and E Panel overburden disposal facilities. Their flows are a few gallons per minute and their average selenium concentrations are 0.716 and 0.31 mg/l respectively. These overburden fills were constructed prior to development of the currently proposed management practices for the B and C Panel overburden management and are physically different than the proposed overburden fills.

The C Panel overburden backfill does not have the potential for developing seeps along the toe of the backfill slope because the base of the backfill is the footwall of the pit which dips in the opposite direction from the downhill toe of the backfill. Thus any lateral seepage along the base of the backfill will migrate away from the toe of the backfill slope. The proposed backfill in the former A Panel open pit also has little potential to develop overburden seeps at the base of the slope because the overburden slope is over the backfilled pit area and any infiltration in the slope will continue downward into the former pit and not migrate laterally at the base of the slope. The eastern half of the B Panel backfill has little potential to develop overburden seeps because the toe of the backfill would abut the highwall there.

The main areas for concern for overburden toe seeps are along the toe of the backfill slope in the western portion of the B Panel backfill where seeps could have the potential to run overland down the natural slope to Smoky Creek (**Figure 4.3-2**). Other locations are the east slopes of the external overburden disposal area that encroach down two ephemeral headwater drainages. Simplot has proposed management practices to mitigate the potential for development of overburden toe seeps in these locations.

The Proposed Action contains a number of design considerations that are meant to control the potential for selenium-containing overburden seeps to occur. These include: capping the seleniferous materials with 8 feet of chert and 1 to 3 feet of topsoil to enhance evapotranspiration of soil water before it contacts seleniferous shale and reduce infiltration of precipitation into the seleniferous overburden; reducing the size of the external overburden disposal site by backfilling the pits; locating the overburden so that run-on is reduced; locating settlement ponds off overburden disposal areas so that they do not infiltrate into seleniferous material; and grading overburden to minimize ponding of precipitation. All of these design considerations have been specified in a report entitled "*Existing Best Management Practices at Operating Mines Southeast Idaho Phosphate Resource Area Selenium Project*" (IMA, 2000) as having the potential to reduce overburden seeps. In addition, Simplot has proposed to incorporate other management practices that are intended to control generation and discharge of seepage from overburden disposal facilities. The management practices proposed to be incorporated in the proposed mining activities by Simplot are included in **Appendix 2B**. The overburden design and construction management practices that are intended by Simplot to control the potential for seeps appearing at the downhill face or toes of the pit backfills or the external overburden disposal area, include the following:

- All low permeability topsoil and subsoil would be removed from a band 100 feet wide on the west side and 150 feet wide on the east side of the external overburden disposal site footprint to expose permeable material or outcrop of the Wells Formation (**Figure 2.2-6**). A soil berm 3 to 5 feet high would also be constructed at the outside margin of this recharge area to help hold water within the recharge area and allow it to percolate downward. This area would be covered with permeable chert cap material during regrading of the overburden slopes. Topsoil would not

be applied on top of the chert in this area to preserve the long-term permeability of the chert and to enhance percolation of runoff into the chert. This runoff would percolate through the chert and into the permeable foundation material where it would recharge the groundwater in the Wells Formation. Any water percolating laterally through the shale overburden toward the outside toe of the external overburden disposal site would also be intercepted and infiltrated by this runoff recharge area, reducing the potential for appearance of this lateral recharge at the outside toe of the chert slope.

- Any low permeability shale remaining on the footwall of the B Panel slope would be removed to expose permeable Grandeur Limestone for a distance of at least 100 feet from the downhill edge of the footwall. This is intended to assist infiltration along the bottom of the pit backfill; prevent lateral migration of seepage toward the toe of the pit backfill slope in this area; and greatly reduce the potential for development of seeps there.

- Any low permeability soils that are present in the channel bottoms of the two ephemeral drainages on the east side of the external overburden disposal pile would be removed for a distance back (uphill) from the final reclaimed toe of these slopes. This will eliminate any zones of low permeability in this portion of the foundation of the overburden slope and reduce the potential for seeps occurring at the base of these overburden slopes.

- Low permeability topsoil material would be removed from the entire external overburden disposal site. This would help direct seepage from the overburden downward at the base of the fill instead of migrating laterally.

- Seleniferous overburden will not be placed within the external overburden fill closer than 200 feet from the final toe of the external overburden disposal site. This setback will reduce the potential that seleniferous seepage from the interior of the overburden fill can migrate laterally to the external toe of the fill.

- All low permeability subsoil would be removed to expose permeable foundation material in a strip at least 30 feet wide located under the outer edge of the seleniferous overburden. This infiltration strip would collect and infiltrate any lateral seepage from the seleniferous overburden before it can leave the interior of the fill (**Figure 2.2-6**).

- A berm would be constructed between the infiltration strip and the runoff recharge area. It would be constructed of subsoil or other low permeability materials and compacted with a dozer. It would interrupt any high permeability zone produced at the base of the first lift of the overburden fill and reduce the potential for lateral seepage leaving the interior of the overburden fill (**Figure 2.2-6**).

- The external overburden disposal area and both proposed pit areas have been surveyed for environmental resources and there were no seeps or springs noted within the proposed footprints of any of these overburden disposal areas. This will ensure that seep and spring water will not be incorporated into these overburden fills.

- The external overburden disposal site and the Panel B pit are located on a ridge above any defined stream channels so there should be no contribution of water to these fills from stream channels.

- The surface area of the overburden disposal sites has been minimized to the extent reasonably possible and they have been designed with sloping surfaces to eliminate ponding of runoff and reduce the potential for infiltration of precipitation.

- Run-on to the Panel C backfill will be reduced by building a permanent diversion channel along the uphill side of the pit area. This will minimize run-on to this pit backfill area (Figure2.4-2).

- The channel below Sheep Spring will be restored over the C Panel backfill. The overburden under this channel, and for a distance of 50 feet on either side will be chert to avoid percolating water under the channel coming into contact with overburden shales. The channel itself will be lined with 2 feet of clay to reduce infiltration of stream flow into the underlying chert backfill. Any shale remaining on the footwall of the open pit under this chert backfill area will be scraped off before the chert is installed to ensure any water percolating through the chert will continue downward into the Wells Formation.

To summarize the above in regard to the types of mine facilities known to be associated with elevated selenium and their expected occurrence under the Proposed Action the following are noted: (1) The Proposed Action and Alternatives would include mine pit ponds and tailings ponds which are expected to contain elevated levels of selenium and other trace elements, but these facilities would not discharge to surface waters; (2) the Proposed Action and Alternatives would not include French drains; and (3) the potential for development of overburden seeps would be reduced by the overburden handling and design practices called for in the Proposed Action and Alternatives.

Runoff Management

The Montgomery Watson study (1999) found that elevated selenium concentrations also occurred in streams downstream from some phosphate mining activities in southeast Idaho. This contribution of selenium to downstream surface waters can be in the form of suspended sediment containing selenium and other trace elements or water in which these constituents are dissolved. The off-site migration of sediment and water from mining sites is controlled with ponds that are designed to hold the runoff and suspended sediment (Montgomery Watson, 2000b).

Sediment ponds may contain water that has become elevated in selenium in either of two ways. First, sediment ponds have been located (including at the Smoky Canyon Mine) within dump footprints or in pits where "clean" runoff water can pick up selenium from the pond substrate. Second, runoff water directed to the ponds can pick up selenium if it traverses exposed seleniferous materials.

As long as the runoff water that picks up selenium by either of these mechanisms is retained in ponds and evaporates or infiltrates, no selenium moves from the mine site to surface waters. However, this runoff could be released in either of two ways. First, should the ponds' design criteria be exceeded, runoff would discharge from the spillways and make its way toward surface water. Second, impounded runoff could infiltrate through the pond bottom substrate, eventually issuing downslope as a seep or making its way to the underlying groundwater.

In order to minimize the potential for sediment ponds to contribute selenium either via direct surface discharge or via contribution to seeps, ponds should be placed outside of overburden footprints (Montgomery Watson, 2000b). Simplot's proposed water management plan would comply with that BMP. In addition, several other recommendations (Montgomery Watson, 2000b) on selenium-minimizing

management practices would be followed as described above in the discussion on overburden seeps (**Appendix 2B**).

Alterations in water temperature of surface streams would not be anticipated due to the Proposed Action. None of the processing or mining activities would have any direct effect on water temperature because water with elevated temperature will not be discharge to surface water. The withdrawal of some of the disturbed area runoff from the overall runoff within the Smoky Creek or Roberts Creek drainage areas would not have an effect on the temperature of the stream; nor would it have an effect on stream temperatures of Stump Creek or the Salt River.

Currently, hydrocarbon-related impacts to water quality are controlled through non-structural BMPs in the SWPPP (i.e. storage of chemicals under cover, catch basin cleaning and maintenance, modified materials handling procedures), as well as structural measures such as diversion ditches, culverts and secondary containment. These and other procedures in Simplot's Spill Prevention Control Countermeasures (SPCC) Plan and their SWPPP should similarly control impacts from hydrocarbons under the Proposed Action and Alternatives to Smoky Creek or downstream waters.

Placement of culverts and gabions in Smoky Creek would not contribute metals from mine overburden to Smoky Creek or downstream including Stump Creek and the Salt River. This is because the road fills and gabions in the canyon will be constructed of non-mineralized rock and alluvium.

The haul roads from the B and C Panel pits parallel and cross Smoky Creek in two locations (**Figure 4.3-1**). There is the potential for some dust being lost from the loads in the haul trucks. This dust would be deposited on and adjacent to the haul roads where it could be washed away in runoff. The runoff from the road surfaces would be collected in the mine surface water management system and directed to settling basins or silt traps where the dust would be collected as sediment. Dust that settles on the outer slopes of the roads would be washed into the permeable surface of the road fills. Dust releases from all haul truck operations for the Proposed Action within Smoky Canyon that could wash to the Creek were estimated to total 29,000 pounds per year. This includes dust blowing off the loads in the trucks and dust raised from the haul road surfaces themselves. Most of this dust is raised from the haul road surfaces by the passing vehicles. Using a mean daily flow of 5 cfs for the Lower Smoky Creek monitoring station (USFS, 1981), the total annual amount of dust lost from the haul trucks is estimated to contribute up to 3 mg/l TSS to the mean flow in Smoky Creek. The TRC-Mariah water quality data for Lower Smoky Creek shows spring season TSS concentrations ranging from less than 2 mg/l to 240 mg/l with an average of 62.9 mg/l. The benchmark standard for sediment ponds in Simplot's EPA stormwater permit is 100 mg/l. Using a mean selenium assay concentration of 150 mg/kg for the dust contained in the 3 mg/l TSS yields a total selenium concentration in the water of 0.00045 mg/l which is less than the cold water aquatic life criterion of 0.005 mg/l. The actual selenium concentration in the dust would be lower because most of the dust would originate from the road surfaces and would consist of chert.

Flow Alterations in Smoky Creek

Smoky Creek is perennial at the upper road crossing, with flows decreasing in a downstream direction due to percolation losses into the Wells Formation, with the stream eventually drying up in its lower portion during the dry seasons (summer and fall) before reaching the mouth of the canyon. The proposed Panels B and C would be located adjacent to the reach where Smoky Creek is losing flow through percolation.

Infiltration of precipitation through the proposed pit backfills for the Panels B and C is expected to migrate vertically through the backfills. At the base of the fills the permeable upper Wells Formation would be exposed in the bottoms of the proposed open pits. Percolation through the pit backfills would migrate downward through fractures and primary porosity in the Wells Formation until the water table is encountered. This is consistent with theories of groundwater movement above the water table (Fetter, 1994). It also conforms to structural geology concepts that rocks along the axis of structural folds typically have an abundance of fractures (Billings, 1972). This water table was encountered in monitoring well GW-9 adjacent to the proposed C Panel pit at an elevation of approximately 6,797 feet which is 250 feet lower than the elevation of Smoky Creek in this area. This is over 63 feet lower than the elevation of the bottom of the proposed C Panel open pit and over 330 feet lower than the elevation of the bottom of the proposed Panel B open pit (**Figure 2.2-2**).

For the above described reasons, there is no evidence of groundwater discharge to Smoky Creek in the vicinity of Panels B and C. Infiltration of precipitation in the proposed pit backfills is not expected to discharge to Smoky Creek which is a losing stream in this reach. Percolation of Smoky Creek water into the Wells Formation is not expected to discharge to the proposed open pits since the water table elevation in the area of the proposed open pits is beneath the bottom elevation of the pits.

The diversion and retention of runoff and snow melt to the pits or to sediment basins has the potential to reduce runoff volumes and peak flows to Smoky Creek. Sediment control basins and pits would withhold runoff from about 600 acres within the Smoky Creek drainage, representing about 14 percent of the total watershed area. While there is not a one-to-one correlation between contributing area and runoff peak or volume, a similar level reduction in both average runoff and peak flow may be expected in Smoky Creek due to the runoff retention for all events up to the runoff event associated with the 100-year, 24-hour precipitation event. Typically, disturbed areas produce a higher than background runoff rate, and when the increased flows are allowed to enter streams, channel changes and sediment impacts can be severe. Runoff and erosion control, while reducing runoff to the stream by some amount, is preferable to allowing higher than background runoff rates into the streams.

The runoff recharge that would occur in order to provide a groundwater quality mitigation would result in removing 280 acres (7.6 percent) of contributing watershed from the 4,200-acre Smoky Canyon basin and 179 acres (11.2 percent) from the 1,600-acre Roberts Creek basin. Reduction of contributing watershed area may have a similar scale reduction in average annual flows in those basins. Over the long term, there could be some resultant changes in channel morphology (the streams' size and shape). Both of these streams have previously had their flows altered and likely their morphology due to road construction, grazing, diversions, etc. The Tygee Creek basin, to which both of these streams drain, and which is the focus of the Watershed Analysis contained in Appendix 3B, is approximately 24,000 acres in size. The reduction in contributing area in the Tygee Creek basin due to the runoff recharge would therefore be approximately 2.0 percent which is not a significant change. The low flow volume for the perennial reaches of Roberts and Smoky Creeks would not be directly affected by these reductions because the lower reaches of these streams are maintained by flow from springs.

Lower Smoky Spring

If the lower Smoky Spring that supplies water to lower Smoky Creek became impacted by selenium and other trace elements, lower Smoky Creek and downstream waters could also be impacted. Groundwater modeling for the Proposed Action has shown that long-term concentrations of selenium and other trace elements are calculated to remain below Cold Water Aquatic Life Criterion in the discharge from Lower Smoky Spring (see following discussion on groundwater impacts). Therefore, the applicable cold water

aquatic criteria are expected to continue to be met in Smoky Creek. Similarly, cold water aquatic life criteria should also be complied with in downstream waters receiving flow from Smoky Creek including Tygee Creek, Stump Creek, and the Salt River.

Surface Water Uses

Use of the BMPs included in the Proposed Action is expected to maintain the existing downstream irrigation and stock water uses in lower Smoky Creek unhindered by mining operations. The flow alterations caused by impounding and diverting runoff water would not preclude the existing adjudicated uses. Further downstream, as Smoky Creek joins Tygee Creek and continues on into the Salt River, there would similarly be no impact from mining activities to beneficial uses of those surfaces waters.

As described below, the stock watering right to Sheep Spring above the C pit that would require rerouting would still be expected to support its adjudicated use.

Simplot's use of water for mining or milling would not change under the Proposed Action.

Groundwater Impacts

Impacts from Water Withdrawal

The mine currently pumps groundwater for process and culinary use through two water supply wells located north of the mill (IW and CW, **Figure 3.3-3**). The Industrial Well has an approximate pumping capacity of 1100 gpm and the Culinary Well is typically pumped at 70-100 gpm. The Industrial Well was commonly pumped until about 9 years ago when Tailings Pond No.2 was built. At that time, the larger drainage area above Tailings Dam No.2 provided enough capture of precipitation to meet the process water supply needs of the mill without needing to pump groundwater. As a consequence, the Industrial Well has rarely been pumped for nine years and is only pumped when additional process water is required. The Culinary Well has continued to be pumped at a rate of approximately 70-100 gpm and this will not change for the Proposed Action or Alternatives.

The 1981 DEIS for the Smoky Canyon Mine (USFS, 1981) evaluated impacts from the withdrawal of 3,000 gpm of groundwater, approximately 30 times higher than is typical for the recent and proposed processing operations. The 1981 DEIS indicated that the upper Wells Formation transmissivity and recharge was sufficient to allow a 3,000 gpm withdrawal without affecting the other existing water rights and spring flows in the area.

In his recommendations on siting an industrial supply well at Smoky Canyon, Ralston (1980) indicated that a static water level in the water supply well that was higher than the elevation of the springs would indicate little chance of impacts on the springs in the immediate area because it would indicate a poor connection between the well and the springs. The static water level at the Culinary Well was subsequently found to be at an elevation of approximately 6,937 feet, which is about 300 feet higher than the elevation of Hoopes Spring (el. 6,640 feet), South Fork Sage Creek (el. 6,640 feet) and Lower Smoky Spring (el. 6,700 feet). Hoopes Spring is approximately 4.3 miles south-southeast of the Culinary and Industrial Wells.

In his report on testing of the Culinary Well, Ralston (1981) measured flows in the Lower Smoky, Roberts, and Hoopes Springs during the pump testing of the well and did not measure any decrease in the spring flow. Based on aquifer parameters calculated in the pump test, he determined that a 1,000 gpm well could not operate continuously at this location but could operate on an on-off schedule. He calculated

that the water level decline at this pumping rate would be less than 0.1 foot at a distance of 2,000 feet from the well.

Withdrawal of groundwater from the water supply wells should have no measurable impact on the springs in the Dinwoody and Thaynes formations because these are separated hydraulically from the Wells Formation by the Meade Peak member of the Phosphoria Formation. These include all the springs immediately west of the Smoky Canyon mining operations in the Webster Range and the springs located along the Range north of Smoky Canyon. This is demonstrated by comparison of the measured low stream flows for the Upper Smoky Canyon monitoring station contained in the 1981 DEIS (0.2 cfs) with the flow rates measured during the fall and winter in the 1995-1999 period (0.1 to 0.2 cfs).

Groundwater Flow to Open Pits

Exploration drilling in the vicinity of the Panel B and C pits did not intercept groundwater above the base of the Meade Peak Member. Monitoring well GW-6, located adjacent to the deepest portion of the proposed Panel B pit, (**Figure 3.3-3**) has been dry to a total depth of 169 feet (el. 6,835 feet) which is approximately 295 feet deeper than the proposed deepest portion of the open pit in Panel B (el. 7,130 feet). Monitoring well GW-9, located adjacent to the north portion of the proposed Panel C (C-2 Pit) indicated that the depth to groundwater was approximately 492 feet (el. 6,797 feet) which is 63 feet deeper than the deepest portion of the proposed C-2 Pit (el. 6,860 feet). The water level data from these two wells indicate that groundwater is not expected to be intercepted in the proposed open pits (**Figure 2.2-2**).

Shallow groundwater from alluvium in Smoky Canyon is not expected to flow into the open pits. The deepest portion of the Panel B pit is higher in elevation than the bottom of Smoky Canyon so groundwater flow from the canyon alluvium up to the pit is impossible. The stream channel in Smoky Canyon along the proposed Panels B and C is known to be a losing stream and water is lost from the stream to its channel bottom. This water is thought to move downward into the permeable Wells Formation (Ralston, 1979). Thus any connection between the Smoky Canyon channel alluvium and the bottoms of the C-1 and C-2 pits would be via flow in the Wells Formation. As indicated above, both of these proposed pit bottoms are above the Wells Formation water table thus water should not move from the canyon alluvium to the Panel C pits through this pathway (**Figure 2.2-2**).

An approximately 800 foot long length of the C-2 Pit footwall along the bottom of Smoky Canyon would be excavated up 30 feet below the existing ground surface. This could be below any seasonal shallow water table present in the alluvium in this localized area. To prevent groundwater from the alluvium entering the pit along this area, Simplot plans to leave a 50-foot wide barrier of solid Meade Peak Member shale between the alluvium and the pit footwall.

Small and temporary seeps can occur along the highwalls of the pits. These are thought to drain isolated fractures and perched saturated zones in the Phosphoria Formation. These have not been major sources of water flow to the pits and the same is expected to be the case for the Panels B and C.

Infiltration Through Overburden

Seepage calculations through the proposed pit backfills and the external overburden disposal site were performed by using the U.S. Environmental Protection Agency model HELP3 (Hydrologic Evaluation of Landfill Performance, Version 3.07, USCOE, 1994). This model was developed by the U.S. Corps of Engineers, Risk Reduction Engineering Laboratory to assess seepage of precipitation through solid

waste disposal sites. The model utilizes input data on weather, soil and waste conditions, cover and base liner designs and interior drainage systems. It uses a number of internal solution techniques to account for the effects of surface runoff, surface storage, snowmelt, infiltration, evapotranspiration, vegetative growth, soil moisture storage, lateral drainage and unsaturated vertical drainage through waste and infiltration barriers. The detailed description of these calculations is contained in **Appendix 4C**. The results of the seepage analysis are shown in **Table 4.3-3**.

Table 4.3-3 Calculated Annual Average Seepage

Area	Seepage Rate (inches/year)	Seepage/Acre (cubic feet/year)
C Panel Backfill, 5h:1v	4.06	14,737
A and B Panel Slopes, 3h:1v	4.05	14,701
B Panel Top, 50h:1v to 25h:1v	4.16	15,101
External Dump Top, 50h:1v to 25h:1v	4.10	14,883
External Dump Slope 3h:1v	4.04	14,665

Predicted Infiltration Chemistry

Meteoric water infiltrating overburden that is placed in the external overburden disposal site or the pit backfills may leach soluble selenium and other trace elements from the rock. The chemistry of infiltrating water in overburden will be gradually changed from the initial precipitation or snow melt to the final discharge water quality according to a number of factors including the amount of infiltrating water, chemistry of the overburden, surface area of the rock particles contacted by the water, pH conditions, availability of oxygen, clay content, and a complex set of interrelated chemical factors such as cation exchange, oxidation-reduction, precipitation, co-precipitation, sorption, and micro-biological effects.

Overburden is exposed to surface weathering conditions when it is removed from the pit, transported, and placed in an overburden disposal site. The exposure to these conditions can begin to leach soluble minerals from the overburden and start oxidation of minerals in the overburden that can mobilize sulfate, soluble forms of metals, and in the case of seleniferous overburden, selenium. Infiltrating precipitation water transports oxygen into the overburden and provides the media for a variety of chemical reactions to occur. The infiltrating water also provides the pathway for the transportation of soluble constituents within the mass of the overburden. Metals, selenium and other constituents that may be mobilized from the overburden through the action of oxidizing conditions and infiltrating water are transported by the water movement to other locations within the overburden deposit and potentially, to the environment outside of the overburden. Along this pathway, the concentrations of dissolved constituents may subsequently be changed by dissolution, sorption, or precipitation reactions as chemical conditions change along the flow path.

The annual amount of infiltration into the overburden is limited by the cap design. For the Smoky Canyon site, the average quantity of annual infiltration through the shale overburden is estimated to be approximately 4 inches of water per year (**Table 4.3-3**). The infiltration rate or speed of this quantity of water is quite variable and controlled by the material properties of the overburden fill. The infiltrating water is likely to follow preferential flow paths through the material accelerating the leaching of some overburden while other material is more slowly leached. The result of this would be an unpredictable pattern of different seepage rates and chemistries across the entire area of overburden.

It is difficult to estimate the final chemistry of water discharged from the bottom of an overburden pile because of the variability and uncertainty in predicting these causal factors. One test method which has been used is the EPA Method 1312, Synthetic Precipitation Leachability Protocol (SPLP), which is designed to simulate the tendency of waste materials to mobilize metals during leaching of stockpiles by precipitation. This method was used to identify the potential contaminants of concern in the overburden to be mined under the Proposed Action and compare their concentrations in the various lithologies (Maxim, 2000b). Following statistical analysis of the laboratory data, average SPLP values were calculated by Maxim for all analytical parameters for each of the five lithologies in the overburden. A cumulative weighted average SPLP was then calculated for all the future overburden to be mined during the Proposed Action and Alternatives.

SPLP data identified COPCs including: aluminum, cadmium, iron, selenium, and zinc. The elevated concentrations of aluminum, iron, and zinc were thought to be caused by colloidal particles in the extract solutions which would not be present in natural conditions where the agitation caused by the test procedure would not be present. For these reasons and to be consistent with BLM experience on past projects, column testing was determined to be necessary to develop the final selection of COPCs. Ten columns were constructed including 8 columns of drill cuttings from Panel B and C drill holes representing each of the major lithologic units for the overburden.

The weighted average chemistry results for the first pore volume from the columns showed that the test leachate concentrations were over applicable water quality criteria standard for cadmium, manganese, selenium, sulfate and TDS. Mercury and thallium were not considered for further analysis because all of the individual sample concentrations were at or below detection limits.

The column testing results indicated that concentrations of COPCs were greatest in the first pore volume and decreased in subsequent pore volumes (**Table 4.1-4**). Ground water impact modeling conducted for the Draft SEIS used the weighted average concentrations of the COPCs for Pore Volume 1 (**Table 4.1-3**) held constant over the time period modeled (100 years). This produced a conservative but unrealistic estimate of ground water quality impacts. To better model the likely change in seepage chemistry over time, the weighted average column test results for the COPCs were plotted on graphs with the weighted average pore volume value representing the mid-point of each pore volume. Best fit polynomial curves were calculated for the pore volume data for each COPC using Excel™ and MathCAD™ . The best fit curve for selenium is shown in **Figure 4.3-3** and shows that the predicted maximum value at the beginning of Pore Volume 1 is 0.33 mg/l . The values at the beginning of Pore Volumes 2 and 3 are 0.1 and 0.05 mg/l respectively. The values for pore volumes after this are essentially asymptotic ranging from about 0.041 to 0.047 mg/l. The best fit curve of selenium concentrations in **Figure 4.3-3** represents the results of the column testing and provides a more accurate representation of the laboratory data than either focusing on one pore volume value or averaging the results of various pore volumes together. The curve is not affected by any field observations.

The column tests did not predict the concentrations of the COPCs at various points in time, rather they predicted concentrations with increasing amounts of leaching of the overburden i.e. pore volumes. Each pore volume represents an amount of water necessary to complete fill the porosity of a column of rock. This does not mean that the column of rock will ever be fully saturated. Using the estimated porosity of the shale overburden in the proposed overburden fills and an average fill thickness of 100 feet, it was estimated that it would take approximately 91 years for a pore volume of water to infiltrate into the top of the overburden fill, at 4 inches of infiltration per year (see **Table 4.3-3**). The design thickness of the

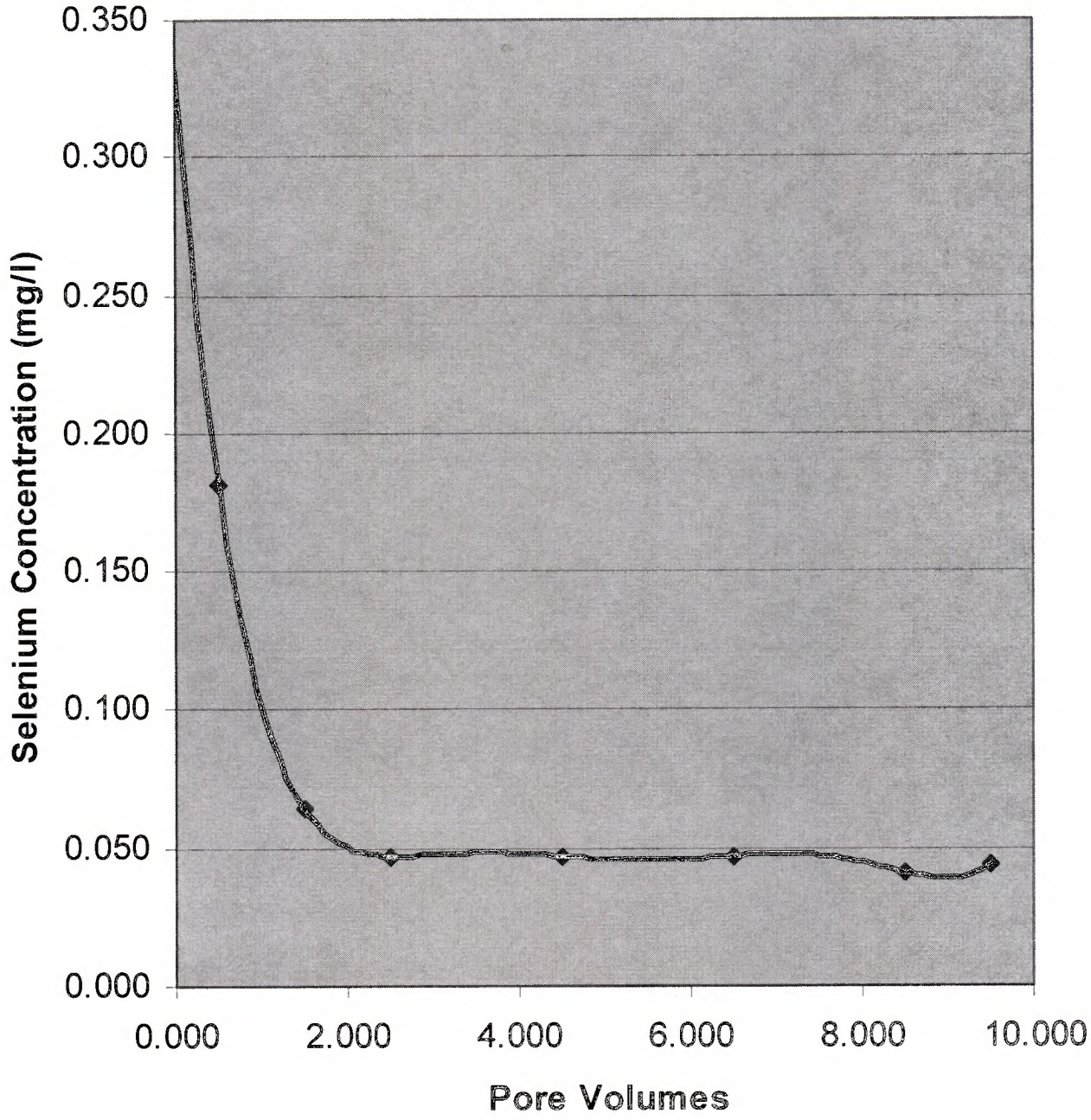


FIGURE 4.3-3
BEST FIT CURVE
WEIGHTED AVERAGE SELENIUM COLUMN TEST DATA
SIMPLOT SMOKY CANYON MINE PANELS B&C
SUPPLEMENTAL EIS

drawings\SIMPLOT\FSEIS\Figures FSEIS\Figure 4.3-3.dwg (1/16/02)

overburden fills vary from zero at the fill margins to up to 200 feet thick in parts of the Panel A backfill. It was therefore assumed that it would take an average of 100 years to infiltrate each pore volume through the overburden in the field. Thus the predicted COPC concentrations for the first pore volume would represent about 100 years of infiltration in the field. Inspection of **Figure 4.3-3** shows that the concentrations of selenium in the leachate from the overburden is predicted to have an initial concentration of 0.33 mg/l at the beginning of the time period and decrease to about 0.1 mg/l at the end of Pore Volume 1, about 100 years from the beginning of the leaching. These are the concentrations that were used for the ground water impact analysis which was done for a 100-year time period.

Although the laboratory column test data were considered to be indicative of the potential contaminants mobilized in seepage from the proposed overburden disposal areas, there are other analytical data obtained from the field at the Smoky Canyon Mine that were also reviewed to determine what constituents might be mobilized from the future overburden disposal facilities.

Water quality data for two seeps that have developed in external overburden disposal fills at the Smoky Canyon mine have been provided by the Idaho Department of Environmental Quality (IDEQ), the USFS, and sampling conducted by Simplot. These seeps occur in the Panel D external overburden fill and the Panel E external overburden fill. The average selenium concentrations in these seeps from grab samples taken in 1999 through June of 2001 were 0.716 mg/l for the Panel D seep and 0.31 mg/l for the Panel E seep (**Appendix 4B**). Grab samples of the two seeps obtained by JBR in December 2000 for complete chemistry showed the analytical results listed in **Table 4.3-4**.

Data collected at the overburden seeps at Simplot indicate concentrations of cadmium, manganese, selenium, sulfate and TDS were over the groundwater quality standards, indicating these parameters are of interest in the groundwater impact analysis.

To determine the regional range of selenium concentrations in overburden seeps, all publicly available data on such waters were obtained from the USFS, IDEQ, published reports, and Simplot data (**Appendix 4B**). The data as obtained from the data sources were then evaluated. Multiple sample data values from the same sampling locations were averaged so that each sample location was represented by one concentration value. Data values that were less than 0.005 mg/l were deleted to eliminate sites that were apparently not impacted by contact with seleniferous overburden. These edited data were plotted to determine their range of concentrations which were found to vary from 0.005 mg/l to 2.0 mg/l. Of the revised data set, 20 out of 23 sampling locations (87 percent) had selenium concentrations less than 0.33 mg/l.

Simplot has been monitoring water quality in Pole Creek above and below the Pole Canyon overburden disposal facility since 1979. These samples are collected in May and October of each year. While analyses of samples from the Upper Pole Creek monitoring station have consistently shown background water quality is being maintained above the Pole Canyon overburden disposal area, the samples taken from below the facility have shown impacted water quality.

Essentially all the water flowing at the Lower Pole Creek sampling station is discharged from the French drain at the base of the overburden fill. This French drain was built in the late 1980s as part of the overall overburden fill to provide a conveyance for Pole Creek under the fill. The design of the drain was for coarse (large diameter) rock to be placed at the bottom of the fill by natural sorting of material dumped on the outer face of the fill as it was extended into the canyon. A number of tracer studies of the French drain by the University of Idaho have shown that the drain is apparently plugged (personal communication

with Dr. Greg Möller, 2000). Failures in the materials used to construct the dump were documented on several occasions. Slope failures moved fine particles to the lower portions of the fill which was intended to only consist of coarse, blocky rock. The large amount of water that discharges from the French drain outlet in the spring and summer of each year indicates that the overburden fill that transmits this water is seasonally flushed with large quantities of Pole Creek water. This would provide enhanced conditions for oxidizing and leaching of soluble minerals from the overburden in the base of the fill.

Table 4.3-4 Water Chemistry of Panel D and Panel E Seeps (12/2000) (mg/l)

Parameter	Panel D Seep	Panel E Seep	Groundwater Standard	Aquatic Life Standard
Aluminum	<0.10	<0.01	0.2*	NS
Arsenic	<0.001	<0.001	0.05	0.19
Barium	0.065	0.057	2	NS
Cadmium	**0.0063**	<0.0001	0.005	0.0017
Chromium	<0.01	<0.01	0.1	0.314
Copper	0.006	<0.004	1.3	0.021
Fluoride	0.81	0.45	4	NS
Iron	0.035	<0.01	0.3*	NS
Lead	<0.001	<0.001	0.015	0.005
Manganese	**0.76**	0.016	0.05*	NS
Mercury	<0.0001	<0.0001	0.002	.000012
Nickel	0.086	<0.005	0.1	0.283
Nitrate	0.98	9.3	10	NS
pH	7.0	7.9	6.5-8.5*	6.5-9.5
Selenium	**0.28**	**0.24**	0.05	0.005
Silver	<0.001	<0.001	0.1*	0.0034
Sulfate	**620**	110	250*	NS
Thallium	<0.001	<0.001	0.002	NS
TDS	**1500**	**620**	500*	NS
Zinc	0.23	<0.005	5*	0.188

Boldface parameters in the table indicate those elements that were greater than the Idaho Groundwater Quality Standards. It is noted that these standards may not apply to the sample points in question but are listed as a point of reference to identify constituents of concern for further impact analysis. NS = No regulatory standard has been set.

* Groundwater Standards are the maximum contaminant levels (MCL) based on protection of human health except those noted with an asterisk which are based on aesthetics, not health. Note that these concentrations are those for only the December, 2000 samples taken of these sources which were analyzed for full chemistry. Other grab samples have been taken of these sources and the averages of those values are shown in the appendix titled, "Selenium Data for Southeast Idaho".

It should be noted that these conditions are not typical of overburden disposal fills that are constructed outside of stream channels, which are drained and only subject to infiltration of meteoric precipitation. However, the water discharging from the base of the Pole Canyon overburden disposal facility is considered representative of potential worst-case conditions because it not only receives meteoric water;

the lower elevations of the dump are continuously recharged with stream water from Pole Creek. This recharge from the stream can vary widely throughout the year as stream flows change. The Lower Pole Creek monitoring data for the Spring season are considered more representative than the Fall data because the lower monitoring station was dry more than half the time during the monitoring period.

The biennial TRC Mariah water quality data for the 1991 - 2000 period were analyzed to calculate the means for the same parameters of interest as the column test data; these results are shown in **Table 4.3-5**. In addition to the means, the highest values measured during the 1991-2000 monitoring period, which occurred in 1999, are also shown in the table.

Table 4.3-5 Lower Pole Canyon Creek Spring Season TRC Mariah Data 1991-2000 (mg/l)

Parameter	Mean Value	Lowest Value	Highest Value [1)]	Groundwater Standard	Aquatic Standard
Aluminum	**0.805**	0.04	**4.74**	0.2 *	NS
Arsenic	0.0044	<0.001	0.006	0.05	0.19
Barium	0.022	<0.02	0.047	2	NS
Cadmium	**0.0084**	<0.005	**0.022**	0.005	0.0017
Chromium	0.015	<0.01	0.06	0.1	0.314
Copper	0.011	<0.01	0.02	1.3	0.021
Iron	**1.038**	0.02	**6.58**	0.3*	NS
Lead	0.0289**	<0.02	<0.04	0.015	0.005
Manganese	**0.147**	<0.005	**0.287**	0.05*	NS
Mercury	0.00017**	<0.0001	<0.002	0.002	.000012
Nickel	**0.108**	0.04	**0.23**	0.1	0.283
Selenium	**0.3597**	**0.07**	**1.0**	0.05	0.005
Silver	0.007**	<0.005	<0.01	0.1*	0.0034
Sulfate	19.1	8	40	250*	NS
TDS	245	308	210	500*	NS
Zinc	0.4367	0.26	0.96	5*	0.188

Reference: TRC Mariah 2001a and b

1) Highest values were all measured in 1999 and were lower in 2000.

It is noted that the groundwater and aquatic standards may not apply to the sample point in question but are listed as a point of reference to identify constituents of concern for further impact analysis.

* Secondary standard for aesthetics. Other Groundwater Standards are health based.

** All values in the mean were non-detect. Although the mean is numerically above a water quality standard there is no evidence the analyte concentration is above the standard.

NS = No regulatory standard has been set.

Boldface values and parameters in the table indicate those elements that had concentrations greater than the Idaho Groundwater Quality Standards. Data other than collected by TRC Mariah show different selenium values.

The Pole Canyon Creek results are similar to the results for the Panel D and E seeps in that cadmium, manganese and selenium have mean concentrations that are greater than the Idaho Groundwater Quality

Standards. It is noted that the groundwater and aquatic standards may not apply to the sample points in question but are listed as a point of reference to identify constituents of concern for further impact analysis. In addition, the Pole Canyon results show that the mean concentration of nickel is slightly higher than its groundwater primary standard and the aluminum and iron mean concentrations are greater than their respective groundwater secondary standards.

The Pole Canyon Creek data are considered indicative of extreme field conditions where seleniferous overburden is saturated by large quantities of surface stream water. This would be expected to promote major changes in overburden chemistry through oxidation of minerals, release of soluble cations and anions, and subsequent leaching of these chemicals from the weathered material. The large flow rates out of the French drain of this facility also indicate that high flow velocities are likely present in the material which could transport colloidal constituents that can lead to elevated concentrations downstream. The proposed design of the overburden disposal sites for the Proposed Action and Alternatives would prevent this extreme leaching action from occurring. The B and C Panel backfills and external overburden disposal site are designed to avoid the perennial saturation and drainage of large quantities of stream water that is occurring at the Pole Canyon overburden disposal fill. The data for the lower Pole Canyon Creek are not considered to be representative of potential seepage from the proposed new overburden facilities.

Groundwater Quality Impacts

A groundwater solute transport computer model was prepared to simulate migration of chemicals contained in infiltration from the overburden disposal facilities in the Proposed Action and Alternatives. The two-dimensional flow model and transport model were constructed for the Wells Formation aquifer using the computer codes MODFLOW and Mt3DMS respectively.

The model domain is approximately 10 miles by 10 miles extending from the east boundary located along the approximate trace of the West Sage Valley Branch Fault which was modeled with an impermeable core (no-flow boundary) and a high hydraulic conductivity damage zone on the west side of the fault. Thus groundwater can move parallel to the fault but not cross it to the east. This is supported by work by Ralston (1979) and Mayo et al. (1985). The north boundary of the model is about 2.5 miles north of the center of the Panel B pit and the west boundary is about 4.5 miles west of the Panel B pit. Groundwater is unimpeded at both these boundaries consistent with the conceptual groundwater model of the area that groundwater flows generally north and west from the Proposed Action area.

The model grid was extensively modified for the work done for this FSEIS compared to the DSEIS. This was in response to comments on the DSEIS that requested a more realistic impact analysis which incorporated the proposed mitigation measures. The more refined model grid also allowed more accurate representations of the boundaries of the potential seleniferous overburden disposal areas in the grid which improved the accuracy of the contaminant loading for all the overburden areas. Finally, the more detailed model grid allowed better refinement of the natural recharge areas of the Wells Formation in the model boundaries and incorporation of specific recharge from Smoky Creek where it flows over the Wells Formation between the proposed Panels B and C. All of these improvements to the model grid greatly improved its accuracy in modeling the impacts of the proposed mining on the ground water.

The following assumptions were made in setting up the model:

1. Infiltration chemistry for runs of the model consisted of column test values for the COPCs: cadmium, manganese, selenium, sulfate and TDS. The model runs were conducted in 1-year

increments and the results accumulated for the 100-year time frame with the concentration of the leachate chemistry read from the best-fit curves of the weighted average pore volume chemistries for each COPC. For selenium, this meant the seepage chemistry inputs varied from 0.33 mg/l in year 1 to about 0.1 mg/l in year 100.

2. Percolation through the overburden for the Proposed Action was the quantity estimated with the HELP3 model for the A, B, and C Panels backfill and the external overburden disposal area. Percolation for Alternative A and B was the quantity for the A, B, and C Panel backfills only to simulate the lack of seleniferous overburden in the external overburden disposal area.

3. Steady-state conditions for the percolating water consisted of the estimated infiltration rates impinging directly on the water table with no attenuation of water or chemical constituents in the overburden fill or the vadose zone between the base of the fill and the water table.

4. Infiltrated water moves vertically through the overburden fills and then through the vadose zone of the Wells Formation which is assumed to be homogeneous. Once in the saturated zone, groundwater flow is laminar through a homogeneous and isotropic aquifer.

5. Seepage water was mixed with the upper 500 feet of the aquifer consistent with the description of the upper Wells Formation as the major water yielding zone to the nearby Culinary Well and Industrial Wells which obtain water from the upper 350 to 600 feet of the Wells Formation.

6. Dispersion and dilution in a homogeneous and isotropic aquifer are the only processes that reduce concentrations; effects of bedding and any chemical or sorption attenuation are ignored. The molecular dispersion was set at E-9 (Zheng and Bennett, 1995).

7. Impacts at the Culinary Well were determined by a model run in which the well was pumped at a continuous rate of 100 gpm for 25 years and then not pumped thereafter.

8. Lower Smoky Spring derives all its flow from the Wells Formation aquifer and flows at a continuous rate of 1 cfs. This is a conservative assumption because much of the geological and water chemistry information on this spring indicates it is not supplied by Wells Formation water.

9. Groundwater flow is bounded on the east by the West Sage Valley Branch Fault. The fault is a no-flow boundary although water can flow laterally along the west side of the fault zone.

10. Groundwater west of the Boulder Creek Anticline axis flows west. Groundwater between the split axis of the anticline at the site of the proposed mining activity flows north. Groundwater east of the east anticline axis flows east. The gradient was assigned a value of 0.01 based on groundwater flux sensitivity analysis and specific head boundaries set to the east, north, west and south to maintain the assigned gradients.

11. Transverse dispersivity is equal to 30 percent of the longitudinal dispersivity which was set at 100. These are typical literature values for similar aquifers (Zheng and Bennett, 1995).

12. Hydraulic conductivity (K) is 0.51 feet/day consistent with pump test data for GW-CW and the porosity is 0.1 (Ralston, 1981).

13. Background chemical concentrations were set at zero so modeled concentrations are to be added to assumed or measured background concentrations at the specific points of observation.

14. Runs simulated time periods up to 100 years.

15. Chemical mass is distributed evenly within the full 500-foot aquifer thickness used in the model.

The model description is provided in Mayo (2001). Solute concentrations at specific locations within the model domain were calculated. These specific locations are: The Simplot mine Culinary Well, a point directly under the Panel B pit backfill area, and Lower Smoky Spring. Modeled groundwater concentrations directly under the Panel B at 100 years following construction of the Proposed Action are shown in **Table 4.3-6**. The boldface values in this table indicates that manganese and selenium concentrations contributed by seepage are estimated to be greater than Idaho Groundwater Quality Standards directly under the Proposed Action area and the concentrations of the other COPCs are not estimated to be greater than the standards. It is noted that the groundwater standards may not apply to all the aquifer in question but are listed as a point of reference to describe the significance of the impacts.

Table 4.3-6 Groundwater Modeling Results for the Proposed Action Below Panel B (mg/l)

Parameter	Model Input Conc.	Modeled Groundwater Conc.	Groundwater Standard
Cadmium	0.004 - 0.001	0.001	0.005
Manganese	0.21 - 0.12	**0.077**	0.05*
Selenium	0.33 - 0.09	**0.081**	0.05
Sulfate	371 - 191	127	250*
TDS	799-437	281	500*

* Secondary Standard based on aesthetics.

Boldface values indicate modeled concentrations greater than the applicable Groundwater Quality Standards [IDAPA 16.01.11.200]. It is noted that the groundwater standards may not apply to this specific point in the aquifer but are listed as a point of reference to describe the significance of the impacts.

Modeled results for the column test chemistry at the Culinary Well and lower Smoky Spring at 100 years are shown in **Tables 4.3-7** and **4.3-8** for the Proposed Action. With the incorporation of the mitigation proposed by Simplot (runoff recharge areas), and the improved model accuracy, the modeled selenium and manganese concentrations outside the actual mine area are lower compared to previous results discussed in the DSEIS. This also incorporates a change in understanding of the basis of the existing COPC concentrations in the Culinary Well. It appears from the historic monitoring data for the Culinary Well, provided by Simplot after the DSEIS was prepared, that the natural background concentrations for the COPCs in the Culinary Well were established prior to 1994 and that after that date, the water chemistry in the well has been impacted by the existing mining operations. It is apparent that the ground water flow direction in the vicinity of the Culinary Well is from east to west so the source of potential contamination for the well is the water infiltrating in the bottom of the open Panel A pit. This source of contamination will be eliminated by the backfilling of the open pit thus the seepage chemistry after that time will be controlled by the seepage through the pit backfill, which is the chemistry used in the ground water impact model. Thus, the true background chemistry for the Culinary Well is not the baseline

chemistry measured in 2000 and previously reported in **Table 4.3-7** of the DSEIS, but the chemistry data collected by Simplot prior to 1994. The baseline water quality concentrations from 1984 have been used in **Table 4.3-7** of this FSEIS. When the modeled values for lower Smoky Spring are added to the average values for lower Smoky Creek (SW-2), and then compared against the Cold Water Aquatic Life Criterion, it can be seen that none of the concentrations of the COPCs are predicted to be greater than their applicable Aquatic Life Criterion in lower Smoky Creek.

Using the input chemistry from the column test leachate results, the concentrations of the COPCs were calculated throughout the modeled domain by the groundwater computer model. Various concentrations of interest were selected and the locations of these concentrations were then contoured. The contours of the concentrations at 100 years equivalent to the Groundwater Quality Standard (MCL) and to the detection limit values for each COPC were plotted on maps of the Proposed Action and vicinity (**Figures 4.3-4 to 4.3-9**).

Table 4.3-7 Groundwater Modeling Results for the Proposed Action at the Culinary Well (mg/l)

Parameter	Model Input Conc.	Modeled Conc.	Culinary Well Baseline 8/28/84	Modeled Plus Baseline Conc.	Groundwater Standard
Cadmium	0.004 - 0.001	0.00028	<0.0003	0.0003	0.005
Manganese	0.21 - 0.12	0.02	<0.03	0.02	0.05*
Selenium	0.33 - 0.09	0.022	<0.003	0.022	0.05
Sulfate	371-191	34	45†	79	250*
TDS	799-437	75	247	322	500*

* Secondary Standard based on aesthetics.
† Value from 2000 baseline study, was not measured in 1984.

Table 4.3-8 Groundwater Modeling Results for the Proposed Action at Lower Smoky Spring (mg/l)

Parameter	Model Input Conc.	Modeled Conc.	SW-2 Baseline Conc.	Modeled Plus Baseline Conc.	Aquatic Life Standard
Cadmium	0.004 - 0.001	0.000015	0.0001	0.00012	0.0017
Manganese	0.21 - 0.12	0.0009	0.03	0.031	NS
Selenium	0.33 - 0.09	0.0012	0.0016	0.003	0.005
Sulfate	371-191	1.56	17	18.56	NS
TDS	799-437	3.38	250	253	NS

NS = No regulatory standard has been set.

Figure 4.3-4 shows the detection limit contours for cadmium, sulfate and TDS for the Proposed Action. These contours represent the furthest distance out from the Proposed Action that the groundwater quality impact from these COPCs would be detectable using the following detection limits: cadmium = 0.0001 mg/l, sulfate = 1 mg/l, TDS = 1 mg/l. This shows detectable impacts from sulfate and TDS extending approximately 0.66 mile downgradient to the west and northwest of the boundary of the Proposed Action and about 0.5 mile to the east. Concentrations are "detectable" based on the analytical methodology

and sampling protocols used and are not indicative of any human health or ecological impacts. They are used here only to indicate the area of aquifer estimated to have any detectable concentrations of the COPCs contributed by the modeled activities.

These distances for the revised Proposed Action which includes the runoff recharge areas at the margins of the overburden fills are the same toward the west as they were for the DSEIS. Toward the east, the distance of detectable impacts for the revised Proposed Action are greater because of the additional recharge water at the crest of the anticline which moves the groundwater further east during the modeled time frame (100 years). Modeled concentrations of selenium in the groundwater at Lower Smoky Spring were still lower than aquatic criteria.

Figures 4.3-5 and 4.3-6 show the calculated impact from manganese and selenium respectively. They both show that concentrations greater than the groundwater quality standard would generally occur below the mine area of the Proposed Action and would not extend outside this area with the exception of the impacts in the southern (already backfilled) portion of the A Panel where the runoff recharge area mitigation could not be applied. Groundwater concentrations greater than the selenium MCL were predicted to occur in about 550 acres for the Proposed Action of which about 100 acres were west of the south half of the A Panel where the proposed mitigative measures cannot be built. Predicted manganese concentrations were greater than secondary MCLs in this same vicinity but impacted a smaller area. These are significantly smaller areas of concentration greater than the MCLs than were previously estimated in the DSEIS and are due to the mitigative effects of the recharge areas in the revised Proposed Action design. It is noted that the groundwater standards may not apply to all the aquifer in question but are listed as a point of reference to describe the significance of the impacts. The groundwater quality impacts for manganese and selenium are estimated to be detectable out to about 0.5 to 0.66 mile downgradient to the west and northwest, which is about the same as for the previous Proposed Action impacts in the DSEIS. The distance for the detectable concentrations for these COPCs to the east is greater in the revised design because the additional recharge at the crest of the anticline moves the groundwater further east in the modeled time frame (100 years). It should be noted that there are no known surface water discharges from the Wells Formation aquifer within the areas described by the detection limit contours for either manganese or selenium.

The model results show that the migration of the groundwater quality impacts to the east is limited. This, plus the fact that there are a number of thrust fault flow barriers to the east of the mine site, shows that there should be no impacts to groundwater along the Tygee Creek valley east of the mine.

It should be mentioned that the above described impact predictions assumed the following conditions are achieved immediately after completion of the Proposed Action:

- Seepage from all the overburden is at a steady rate equal to the full calculated seepage from the overburden after 100 years.
- Annual seepage through the entire unsaturated zone is at steady state equal to the annual seepage from the overburden.
- There is no chemical attenuation of any of the COPCs in the flow path through the overburden, unsaturated zone, and aquifer.
- There is no surface recharge of the Wells Formation through any area covered by Phosphoria Formation.

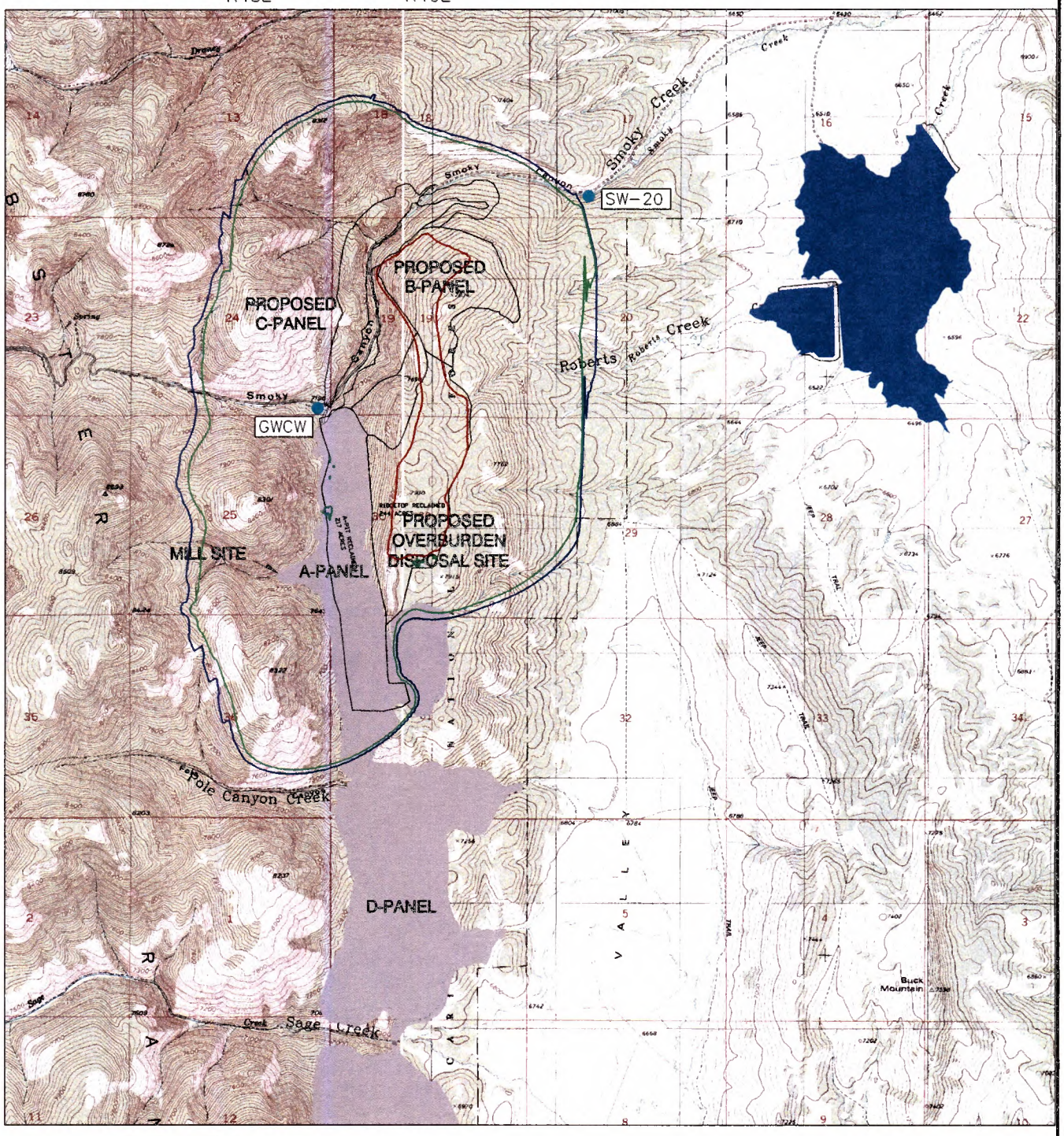


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FIGURE 4.3-4
GROUNDWATER MODEL RESULTS FOR
CADMIUM, SULFATE, TDS - PROPOSED ACTION
SIMPLOT SMOKY CANYON MINE PANELS B&C
SUPPLEMENTAL EIS

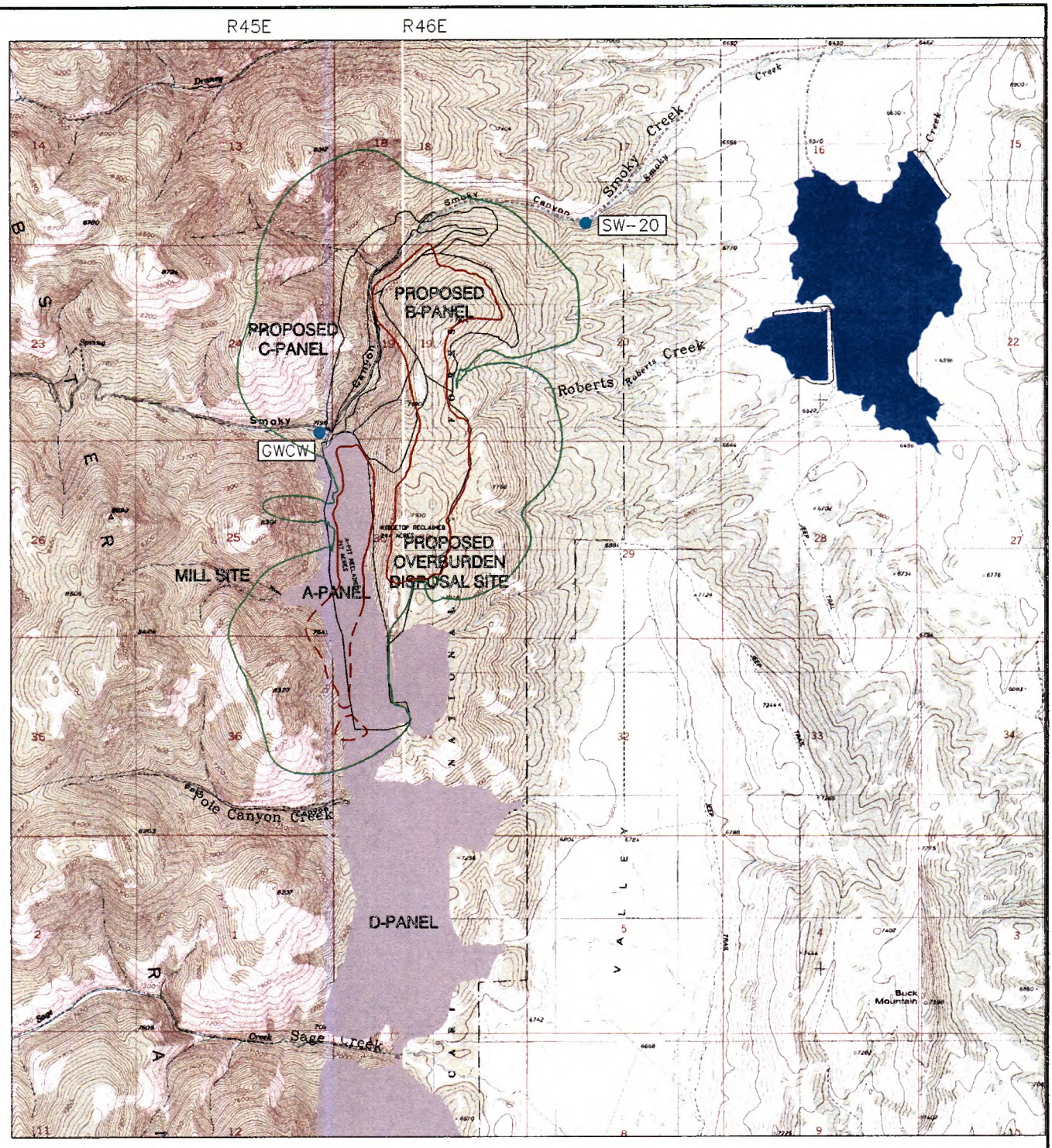

FIGURE 4.3-5
GROUNDWATER MODEL RESULTS FOR MANGANESE - PROPOSED ACTION
SIMPLOT SMOKY CANYON MINE PANELS B&C SUPPLEMENTAL EIS

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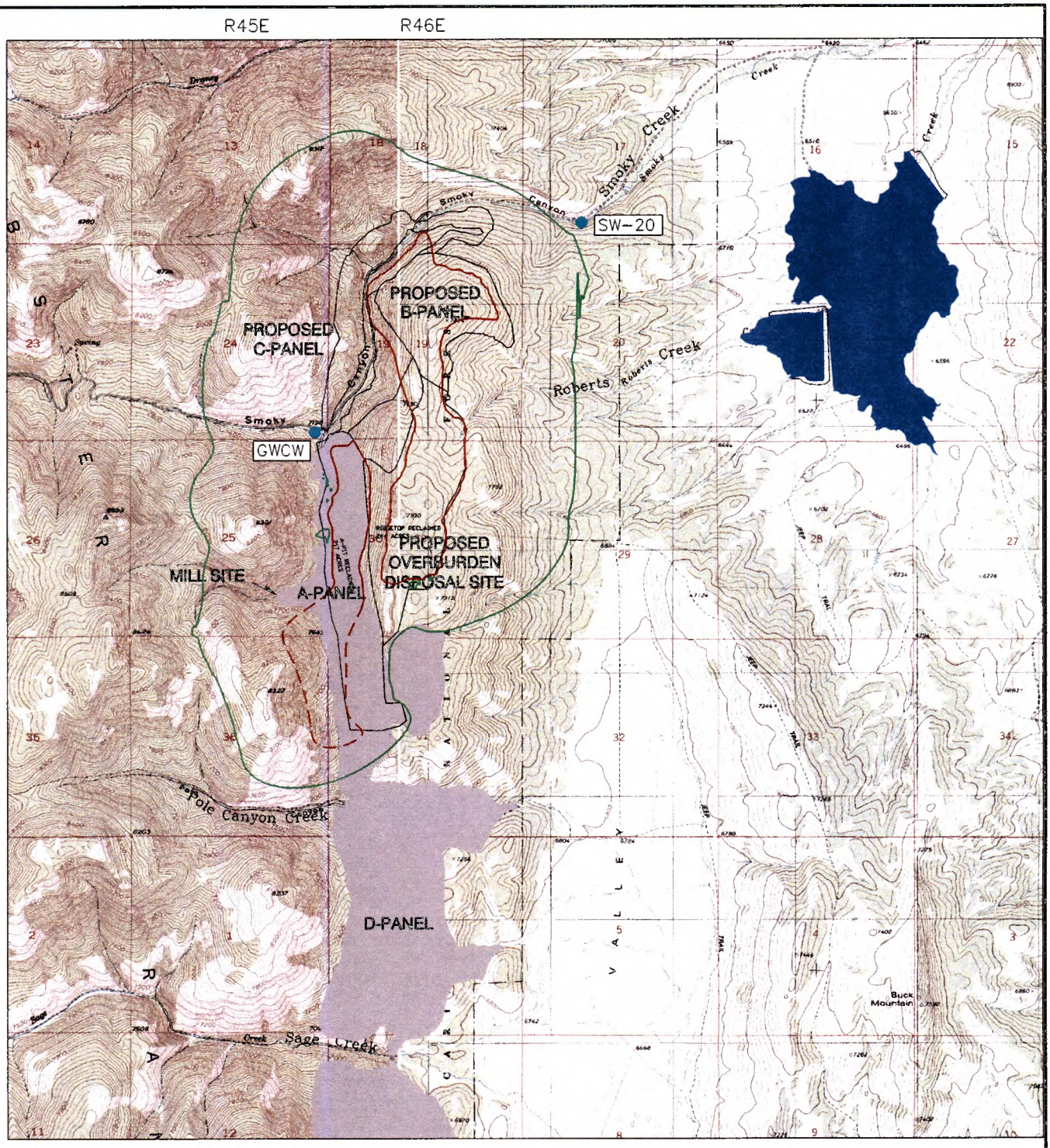

FIGURE 4.3-6
GROUNDWATER MODEL RESULTS FOR SELENIUM - PROPOSED ACTION
SIMPLOT SMOKY CANYON MINE PANELS B&C
SUPPLEMENTAL EIS

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- There is no groundwater flow in the Wells Formation toward the south.
- Lower Smoky Spring is fully connected to the Wells Formation and flows continuously at 1 cfs.
- The input chemistry used in the model from the column testing is that from a best fit curve for the weighted averages calculated for each of the pore volumes.

All the model predictions are as good as the selections made on the aquifer parameters used in the model and the input chemistry of the overburden leachate. There is considerable uncertainty in these inputs. The effects of the uncertainty of the aquifer parameters are discussed in the modeling report (Mayo, 2001). The following parameters were tested for sensitivity: hydraulic conductivity, recharge, longitudinal dispersivity, and porosity. The model is sensitive to hydraulic conductivity but this value was fixed to be consistent with past pump tests. The model is also sensitive to recharge rate but this was fixed to be equal to that predicted by the HELP modeling. When dispersivity was divided by 10, the size of the contaminant plume was slightly smaller. When it was multiplied by 10 the plume was significantly larger but the area of highest concentration was slightly smaller. When porosity was halved the area of the plume was significantly larger. When the porosity was doubled the plume area was slightly smaller and the area of highest concentration was slightly less. The uncertainty in the model input chemistry, i.e. the overburden leachate, was accounted for by using the best fit curve values for the pore volumes. This provides a conservative prediction of the input chemistry to the modeling.

The chemical transport model used to predict groundwater impacts is relatively simple in design, and the model predictions are strongly controlled by a few key input values, as follows:

- Changes in the rate of infiltration through overburden would increase or decrease the amount of contaminant mass introduced into the aquifer and result in proportionately higher or lower concentrations in the contaminant plume.
- Changes in the area that seleniferous overburden materials will cover at the ground surface (i.e., overburden footprint) will affect the size and contaminant concentrations in the plume. The larger the area the larger the initial impact to the groundwater. The converse is true for decreased areas of overburden footprint.
- The higher the concentration of COPCs in the overburden leachate then the higher the concentration will be in the groundwater at the time that leachate is added to the groundwater in the model. The model incorporates changing leachate concentrations predicted by the best fit curve to the column test data. The leachate concentrations start out high early in the modeled period and decrease over time.
- The lag time for the rate of leachate migration, and selenium transport, from the overburden fills to groundwater in the Wells Formation has not been accounted for in the model. The assumption is that as soon as the leachate leaves the overburden, it is introduced into the groundwater. In fact, there will be lag time for the leachate to migrate through the vadose zone between the original ground surface and the water table. This lag time is unknown but would generally be less in the pit backfills where the overburden near the highwall is being placed vertically closer to the water table than in the external overburden disposal site where this vertical distance is the greatest for the site.

- The higher the flux of groundwater passing through the aquifer the more dilution that will occur. In general most of the water in the model is accounted for as recharge to the exposed portion of the Wells Formation around the B and C Panels and east of the A Panel at about 4 in/year. This is augmented by recharge from Smoky Creek and the runoff recharge areas.

As described in **Table 4.1-4** and shown on **Figure 4.3-3**, the concentrations of the COPCs in the overburden seepage are expected to decrease over time. The concentrations are greatest in Pore Volume 1, and these are the concentrations that were used for the groundwater impact analysis. The concentrations of the COPCs are expected to decrease further in Pore Volume 2 and 3 until they reach constant concentrations which are 2 to 4 times lower than in Pore Volume 1. Thus the groundwater impacts shown in this FSEIS are expected to decrease over time commensurate with the passage of Pore Volumes 2 and 3 through the overburden. Over this extended time, the concentrations of the COPCs in the groundwater would decrease in proportion to the decreasing concentrations in the seepage chemistry. Sensitivity analysis conducted with the groundwater model have indicated that a 55 percent reduction in the concentration of selenium in the overburden seepage would result in concentrations everywhere in the groundwater under the mine disturbance area that are not higher than the groundwater quality standards. This would occur during the passage of Pore Volume 2 through the overburden. Because of the finite quantity of selenium in any real overburden fill, concentrations in seepage from that fill are expected to decrease over the long term. The actual long-term curve of concentrations in seepage from any overburden fill in the field will follow a curve which is expected to be different for each site and would likely be different than that shown in **Figure 4.3-3**. This is due to differences in geochemistry of the overburden, precipitation conditions, leaching conditions, rate of oxidation and other chemical reactions in the overburden, and other factors. Unlike column tests, field conditions are non-uniform and concentrations of COPCs at any one monitoring point would not represent the entire mass of an overburden fill. Sequential column tests have commonly been used related to operating large heap leach facilities in the mining industry and sequential pore volume leachate concentrations commonly show decreasing concentrations over time which become asymptotic. Field monitoring data from final closure of heap leach facilities have also displayed patterns of decreasing COPC concentrations over time in final rinse water. Only long-term monitoring of representative samples of natural seepage from existing overburden fills can provide the data necessary to plot the actual curve of COPC concentrations for each facility.

The use of the best fit column test data to analyze groundwater impacts is considered to be reasonably conservative. To try to verify the modeling results for the Proposed Action obtained from using the column test data, the model was checked using data obtained from field investigations at the Smoky Canyon Mine. The average selenium concentration of the Smoky Canyon D-Dump Seep was 0.716 mg/l (Appendix 4B). This is the highest average value of the overburden seeps at the Smoky Canyon Mine and is also higher than about 87 percent of the revised data for overburden seeps in the regional Southeast Idaho database (Appendix 4B). Rounding this value produced a value of 0.72 mg/l which was then used as the beginning concentration of the best fit curve of selenium concentrations, replacing the value of 0.33 mg/l which was derived from the column test data. The rest of the column test data along the best fit curve were retained (see **Figure 4.3-7**). The groundwater model was then rerun using this revised curve of selenium concentrations.

The results of this model run were compared to the previously described Proposed Action results obtained using the best fit curve using selenium data from the column tests. The results from the 0.72 mg/l model run indicated that the proposed mitigation of groundwater impacts using the runoff recharge areas was still effective with the higher starting selenium concentrations. The proposed runoff recharge

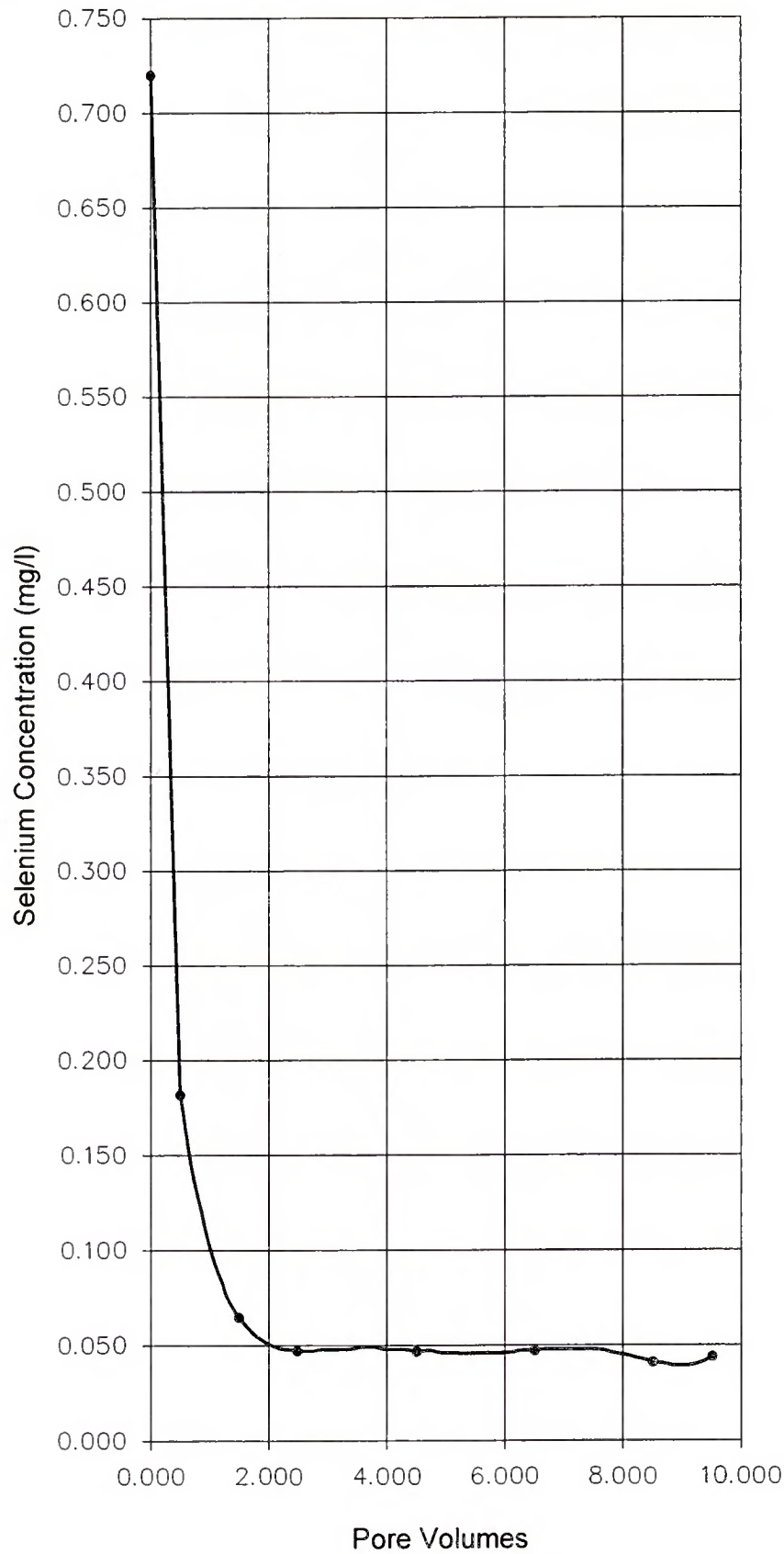

FIGURE 4.3-7
BEST FIT CURVE
WEIGHTED AVERAGE SELENIUM COLUMN TEST DATA
USING 0.72 mg/l AS STARTING POINT
SIMPLOT SMOKY CANYON MINE PANELS B&C
SUPPLEMENTAL EIS

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areas along the west side of the Panel A backfill, the east side of the external overburden disposal area, and the northeast side of the Panel B backfill attenuated the groundwater impacts in these locations and there were no concentrations greater than MCLs past these points. Groundwater at the Culinary Well was still predicted to comply with the MCLs. The unmitigated groundwater impacts extending west of the south half of Panel A were still predicted and were expanded approximately 58 acres. A small area (about 41 acres in size) of concentrations greater than the MCL was predicted to extend west of the C Panel backfill. Selenium concentrations in the groundwater at the location of Lower Smoky Spring were still predicted to be lower than the aquatic life criterion.

These model results incorporated the empirical monitoring data obtained from Smoky Canyon Mine overburden seeps and verified the effectiveness of the proposed groundwater impact mitigation.

Impacts on Water Quality of Springs

Water quality impacts on springs from the operations could occur if groundwater that is affected by the Proposed Action or Alternatives flowed to an existing spring. This water would then be released to the existing surface stream fed by that spring. In addition, if new seeps or springs resulted from the Proposed Action and Alternatives, the discharged water could also flow into the surface environment.

The existing springs that are potentially hydraulically down-gradient of the proposed mining operations are the lower Smoky Spring at the mouth of Smoky Canyon and the unnamed spring flow in Upper Roberts Creek above the Tailings Pond No.1. For reasons already stated, the springs in the Dinwoody and Thaynes outcrop area to the west and north of the Proposed Action area are hydraulically isolated from the effects of the Proposed Action or Alternatives by the fact that they are fed by groundwater that is contained in geologic strata above the units that will be affected by the mining.

The locations of the proposed external overburden dump and the pit backfills are directly over outcrop of the Wells Formation. Infiltrating precipitation in these overburden fills is expected to seep vertically downward through these fills and into the underlying Wells Formation. This infiltration is expected to migrate vertically downward through the unsaturated zone in the Wells Formation until the water table is encountered, after which the groundwater in the saturated zone is expected to migrate along bedding and fractures. This downward migration of seepage at the base of the overburden fills is likely because the permeability of the Wells Formation is high enough to readily allow infiltration without development of a saturated zone at the base of the overburden fills. Monitoring wells installed through the entire thickness of the Panel A external overburden disposal facility (GW-10) and the Panel A pit backfill (GW-11) indicated the lack of measurable saturated zones at the base of these fills.

The main potential pathway for seepage originating in the overburden disposal area and pit backfills of the Proposed Action and Alternatives to migrate to lower Smoky Spring is to percolate downward to the Wells Formation water table and then laterally under the influence of hydraulic gradient and bedding. To determine the potential for this pathway to be possible, one must first determine if water discharging in lower Smoky Spring originates in the Wells Formation.

Ralston (1981) evaluated the potential for significant east trending faulting occurring coincidently with Smoky Canyon. He concluded there were a number of small faults in the general vicinity of Smoky Canyon but that there was not a fault zone extending down Smoky Canyon. This interpretation is consistent with geologic information provided by Simplot (personal communication with Ken Reighard, 2000). Ralston also concluded that no groundwater discharge from the Wells Formation was evident along Smoky Canyon.

Geologic mapping by Conner (1980) located the axis of the Boulder Creek Anticline (**Figure 3.1-1**). In the vicinity of the Proposed Action and Alternatives, a split in the fold axis apparently produces a north-south zone of lower structural elevation in the area of the proposed external overburden disposal facility and Panel B. Conner showed this to be a small syncline between the two anticlinal axes. Drilling by Simplot has shown that this down-dropped area is also bounded by north trending normal faults. The consequence of this feature is that recharge into the Wells Formation in most of the area of the Proposed Action and Alternatives is expected to be preferentially directed north and west.

Another control on groundwater flow in the Wells Formation in the area of Smoky Canyon is the difference in elevation of the Phosphoria/Wells Formation contact in upper Smoky Canyon on the west limb of the Boulder Creek Anticline (el. 7,900') and the elevation of the same contact on the east limb of the Snowdrift Anticline (el. 7,100') four miles to the west. This is shown on cross section C-C" in the USGS geological report on the Stewart Flat quadrangle (USGS, 1967). This supports the interpretation that Wells Formation groundwater in the area of the Proposed Action and Alternatives flows from east to west (**Figure 3.1-2**). The northward plunge of the Boulder Creek Anticline also introduces a northward flow to the Wells Formation aquifer in the project vicinity (**Figure 3.3-5**).

Further to the south in the Hoopes Spring/South Fork Sage Creek area, the Phosphoria/Wells Formation contact on the west limb of the Boulder Creek Anticline is lower (el. 7,500 feet) than the same contact on the east limb of the Snowdrift Anticline on Freeman Ridge (el. 8,100 feet) (Section E-E', USGS, 1967). The elevation of Hoopes Spring and the springs in lower South Fork Sage Creek are even lower (el. 6,640 feet). This would indicate that groundwater in the Wells Formation aquifer under the South Fork Sage Creek drainage area is flowing eastward from the higher recharge elevations along Freeman Ridge toward the major groundwater discharges at Hoopes Spring and the large springs in lower South Fork Sage Creek. Ralston (1979) concluded that these springs were supplied by Wells Formation water that was recharged from a larger area than just the area east of the Webster Range.

As discussed previously, water quality data comparisons between lower Smoky Creek and other Dinwoody or Wells Formations water indicate that its solute water quality is more like Dinwoody (Upper Smoky Creek) than Wells Formation water (**Table 3.3-13**). Geologic mapping and cross sections produced by previous workers indicate lower Smoky Spring is located within Dinwoody Formation rocks separated from the Wells Formation by much of the lower Dinwoody Formation and all of the Phosphoria Formation. Exploration drilling done by Simplot in the lower Pole Canyon area shows the Wells Formation water table there to be lower in elevation than lower Smoky Spring. Stable isotopic data for deuterium and oxygen-18 in lower Smoky Spring show the water discharged from the spring is not clearly equivalent to stable isotopic data for the Wells Formation aquifer. Taken together, all these data seem to indicate water from the Wells Formation is not likely discharging from lower Smoky Spring.

Because of the importance of this question, Lower Smoky Spring was considered to be connected to the Wells Formation aquifer for the purposes of the groundwater impact analysis .

Also as discussed previously, solute water chemistry for the springs that provide base flow for Roberts Creek is different from Wells Formation water quality and the location of these springs indicate these are geologically isolated from Wells Formation rocks by the West Branch Sage Valley Fault and by the Salt Lake Formation. It is not considered possible that impacts to the Wells Formation aquifer by the Proposed Action and Alternatives could affect Roberts Creek water quality.

Seeps and springs have been noted in other overburden disposal areas at the Smoky Canyon Mine. These have reportedly resulted from localized wet zones in the overburden. If these conditions occurred under the Proposed Action or Alternatives, new seeps could occur along outer slopes of the proposed overburden disposal areas. Simplot has indicated in its proposed operating procedures that care would be taken to reduce the potential for overburden seep formation in the proposed overburden disposal areas (Section 2.4.3). In addition, baseline studies conducted during 2000 for this SEIS did not identify any seeps or springs, or vegetation associated with such features within the proposed overburden disposal areas.

An area where new overburden seeps could potentially occur with negative impacts on surface water quality would be along the northwest toe of the B-3 and B-4 Pit backfill (**Figure 4.3-2**). Infiltrating precipitation migrating downward through the backfilled overburden that might discharge along the toe of the backfill could have elevated concentrations of selenium or other constituents. This backfill toe is approximately 450 feet away from Smoky Creek but any prolonged seep discharge along the toe could eventually flow overland downslope to Smoky Creek. This would be controlled by the fact that the 8-foot chert thickness on top of any seleniferous backfill would require any seleniferous overburden to be placed approximately 100 feet back from the toe of the final overburden slope (**Figure 2.2-5**). In addition, Simplot would scrape all remaining shale off the top of the underlying Granduer Limestone beneath this 100-foot wide chert-only backfill zone along the toe of the slope to promote vertical infiltration downward into the Wells Formation and deep groundwater instead of along the pit floor and out the toe of the slope (Personal Communication, Jim Louis, 2000).

Simplot would also remove any low permeability soils that are present in the channel bottoms of the two ephemeral drainages on the east side of the external overburden disposal area (**Figure 4.3-2**) for a distance of at least 150 feet back (uphill) from the final reclamation slope toe. This would eliminate any zone of low permeability in this portion of the foundation of the overburden slope and, combined with other practices described in Section 2.2.3, would reduce the potential for seeps occurring at the base of these slopes.

Impacts on Flow of Springs

Use of groundwater for the Smoky Canyon Mine operations has not resulted in decreases of flows of nearby springs and continued pumping at current rates is not anticipated to change this condition.

The spring known as Sheep Spring would be outside of the area directly impacted by the proposed development of the Panel C pit. However, its proximity (approximately 200 feet uphill of the high wall) would require that its flow be piped away from the influence of the disturbance. This has been done at another spring elsewhere on the property (above the Panel E pit). The beneficial use of this USFS-managed spring would be maintained.

Sheep Spring discharges from the Lower Dinwoody Formation. Its recharge is uphill to the west of Panel C so mining in the panel would not disturb the recharge area for this spring. Blasting and other mining activities in proximity to the spring, about 200 feet away from the highwall, could affect flow in the spring. This will need to be monitored by regular observations of the spring flow before and during mining.

Alternative A - No External Disposal of Seleniferous Overburden

Under this alternative, all seleniferous overburden would be disposed of in the open pit areas of Panels A, B, and C. Seleniferous overburden material would not be disposed of in the external overburden disposal area which would continue to be used for other overburden materials.

Surface Water/Springs

The turbidity impacts to surface water quality from Alternative A would be the same as for the Proposed Action because the disturbed area and the SWPPP facilities would be the same. The mean downstream turbidity increases would be expected to be in the range of 4 to 7 NTUs with higher, short-term increases occurring if discharges occur from the sediment control ponds. These facilities are designed to not discharge under conditions up to the 100-year, 24-hour precipitation event on top of snow. Because of the 10 month longer mining duration under this alternative, the turbidity impacts produced during active mining would be extended by the same time period.

The proposed management practices to control formation of potential overburden seeps would be the same for this alternative as for the Proposed Action. The potential for overburden seeps in the external overburden disposal area to carry elevated concentrations of selenium and other contaminants would be much lower because seleniferous overburden would not be incorporated into this facility under this alternative. The potential for overburden seeps to occur, and carry elevated concentrations of selenium and other contaminants in the other pit backfill overburden disposal areas of Alternative A, would be the same as the Proposed Action.

The additional 10 months in which mining and reclamation activities would take place under this alternative would provide an extended period of time over which erosion from disturbed areas could occur. During this time, approximately 16 percent of the total overburden would be rehandled which would subject seleniferous overburden to more weathering and potential erosion compared to the Proposed Action. The sediment and erosion control structures and the operation of the water management plan would continue to function and provide water quality protection for Smoky and Roberts Creeks. While the duration of overburden erosion may be greater under this alternative, annual sediment loading to the streams would be similar to that predicted for the Proposed Action. The additional time required for these structures to operate would still be expected to be within a reasonable design life expectancy, so the potential for failure would not be noticeably increased by the added 10 months.

Groundwater Resources

The consolidation of all seleniferous overburden within the pit backfills would reduce the surface area of the seleniferous overburden disposal by242 acres for Alternative A and 236 acres for Alternative B due to changes in acreage for highwalls in Panel B for Alternative A and B (**Table 4.3-9**).

Table 4.3-9 Comparison of Areas Containing Seleniferous Overburden

Area Description	Proposed Action (Acres)	Alternative A (Acres)	Alternative B (Acres)
Panel A Pit	217	217	217
Panel B Pit	168	170	176
Panel C Pit	93	93	93
Ridge top Overburden Disposal (Excluding A-Panel Pit Backfill)	244	0	0
Total	722	480	486

The seepage rate of infiltration water through the seleniferous material is shown in **Table 4.3-10**.

Table 4.3-10 Annual Estimated Seepage Rate Through Seleniferous Overburden

Area Description	Proposed Action (Ac-Ft/Yr)	Alternative A (Ac-Ft/Yr)	Alternative B (Ac-Ft/Yr)
Panel A Pit	73.24	73.24	73.24
Panel B Pit	56.7	57.38	59.4
Panel C Pit	31.47	31.47	31.47
Ridge top Overburden Disposal (Excluding A-Panel Pit Backfill)	82.15	0	0
Total	243.56	162.09	164.11

For practical purposes, the estimated seepage rate through seleniferous overburden for Alternatives A and B are essentially the same. The average infiltration from seleniferous overburden into the subsurface from Alternatives A and B is estimated to be 80.56 Ac-Ft/Yr less than the Proposed Action.

Groundwater modeling was conducted for this alternative to estimate groundwater impacts from infiltration through the seleniferous pit backfill in Panels A, B and C and no seleniferous material in the external overburden disposal area. The modeling results for Alternatives A and B are shown in **Tables 4.3-11** through **4.3-13**.

The groundwater chemistry results estimated for Alternative A for the point directly below the Panel B backfill are essentially the same as those for the Proposed Action. This is to be expected because the groundwater concentrations in this location are controlled by infiltration from directly above and from the south. Seleniferous material will be backfilled in the Panel B pit in both the Proposed Action and both Alternatives but the contribution of selenium from the external overburden disposal site to the south of Panel B will not be present in Alternative A.

The actual groundwater concentration under Panel B for Alternative A may be higher than that predicted by increased seepage concentrations from the Panel B backfill in Alternative A compared to the Proposed Action. This could be due to a longer flow path of seepage through the seleniferous overburden in the Panel B backfill due to its greater thickness in Alternative A compared to the Proposed Action. This longer flow path could subsequently result in a longer contact time of the percolating water with the seleniferous rock which could increase the selenium concentration in the seepage exiting the bottom of the overburden fill. The available column test or field data does not allow quantification of how selenium concentrations would vary with thickness of the overburden in the external overburden site or the pit backfills. This effect has therefore not been accounted for in the groundwater modeling.

Another un-quantified geochemical effect may be related to the rehandling of the seleniferous overburden that would be stored temporarily in the external overburden site and then relocated to the Panel B backfill. This additional handling would tend to further break down the particles of the overburden being moved and increase its exposure to surface weathering and oxidation conditions. These effects could increase the amount of soluble selenium compounds in this mass of rock compared to it being mined and permanently placed in an overburden fill where it can be permanently buried away from surface conditions. These effects could also result in higher concentrations in seepage from the Panel B backfill

in Alternative A compared to the Proposed Action. Higher selenium concentrations in the seepage water could result in proportionately higher concentrations in the groundwater under Panel B compared to the Proposed Action.

Table 4.3-11 Groundwater Modeling Results for the Alternatives A and B Beneath Panel B (mg/l)

Parameter	Model Input Conc.	Modeled Groundwater Conc.	Groundwater Standard
Cadmium	0.004 - 0.001	0.001	0.005
Manganese	0.21 - 0.12	**0.077**	0.05*
Selenium	0.33 - 0.09	**0.081**	0.05
Sulfate	371-191	126	250*
TDS	799-437	279	500*

* Secondary Standard based on aesthetics.
Boldface values indicate modeled concentrations greater than the applicable Groundwater Quality Standards [IDAPA 16.01.11.200].

The Alternative A modeling results for the Culinary Well and Lower Smoky Spring are shown in **Tables 4.3-12 and 4.3-13**. When the 1984 concentrations of the parameters in the Culinary Well are added to the estimated concentrations predicted by the model, they are slightly less than those estimated for the Proposed Action and are still less than the groundwater quality standard.

Table 4.3-12 Groundwater Modeling Results for Alternatives A and B at the Culinary Well(mg/l)

Parameter	Model Input Conc.	Modeled Conc.	Culinary Well Baseline 8/28/84	Modeled Plus Baseline Conc.	Groundwater Standard
Cadmium	0.004 - 0.001	0.00028	<0.0003	0.0003	0.005
Manganese	0.21 - 0.12	0.02	<0.03	0.02	0.05*
Selenium	0.33 - 0.09	0.022	<0.003	0.022	0.05
Sulfate	371-191	34	45†	79	250*
TDS	799-437	75	247	322	500*

* Secondary Standard based on aesthetics.
† Value from 2000 baseline study, was not measured in 1984.

None of the modeled groundwater concentrations at Lower Smoky Creek were greater than the cold water aquatic life criteria for any of the input values when the modeled results are added to Lower Smoky Creek (SW-2) values (**Table 4.3-13**). This is the same result as estimated for the Proposed Action.

Table 4.3-13 Groundwater Modeling Results for Alternatives A and B at Lower Smoky Spring (mg/l)

Parameter	Model Input Conc.	Modeled Conc.	SW-2 Baseline Conc.	Modeled Plus Baseline Conc.	Aquatic Life Standard
Cadmium	0.004 - 0.001	0.00001	0.0001	0.00011	0.0017
Manganese	0.21 - 0.12	0.0006	0.03	0.03	NS
Selenium	0.33 - 0.09	0.0008	0.0016	0.0024	0.005
Sulfate	371-191	1.06	17	18	NS
TDS	799-437	2.31	250	252	NS

NS = No regulatory standard has been set.

Figure 4.3-8 shows the extent of the aquifer impacted by detectible contributions of cadmium, sulfate and TDS from Alternative A or B. The extent of this area to the west, northwest, north and northeast is essentially the same as the Proposed Action whereas the extent under the external overburden fill is less because the external overburden disposal site is not a source of groundwater contamination under this alternative.

Figures 4.3-9 and 4.3-10 show that the aquifer area under the Alternative A or B disturbance where the concentrations of manganese and selenium would be greater than their groundwater standards (MCL) is less than for the Proposed Action, eliminating the entire area of the external overburden disposal facility. The area where groundwater selenium concentrations would be greater than the MCL for Alternatives A and B was estimated to be approximately 322 acres. The portion of this impact area west of the A Panel (100 acres) is the same for Alternatives A and B as the Proposed Action. The extent of the aquifer impacted by detectable contributions of manganese and selenium is also less than the Proposed Action for the same reason.

To locate all seleniferous overburden in the pit backfills under Alternative A, Simplot has estimated that 16 percent of the total overburden excavated from the pits would be temporarily stored and then rehandled. This rehandling of the mineralized overburden would further expose it to atmospheric oxygen which could enhance the oxidation of the minerals and mobilization of soluble selenium and other constituents. This could result in higher concentrations of these constituents in the seepage water percolating out the bottoms of the overburden than for the Proposed Action where only about 4 percent of the total overburden will be rehandled. This change in the seepage chemistry, and the resulting groundwater concentrations cannot be quantified with the existing information but could result in higher groundwater concentrations than have been estimated.

Alternative B - No External Overburden Disposal

In this alternative, all overburden would be returned to the pit areas of Panels A, B and C. The entire external overburden disposal area would be used for temporary stockpiling of all types of overburden but all this overburden would be removed from the external overburden disposal area at the completion of pit backfilling activities.

Surface Water/Springs

The additional 21 months in which mining and reclamation activities would take place under this alternative as compared to the Proposed Action would provide an extended period of time over which

erosion and discharge of turbidity from disturbed areas could occur. During this time, approximately 36 percent of the total overburden would be rehandled which would subject seleniferous overburden to more weathering and potential erosion compared to Alternative A or the Proposed Action. In comparison with Alternative A, it would result in an additional 11 months over which erosion and increased downstream turbidity could occur. However, through the additional 21-month time period, the sediment and erosion control structures and the operation of the water management plan would continue to function and provide water quality protection for Smoky and Roberts Creeks. The additional time required for these structures to operate would still be expected to be within a reasonable design life expectancy, so the potential for failure would not be noticeably increased by the added 21 months.

The potential for development of overburden seeps in this alternative would be less than the Proposed Action or Alternative A because the permanent external overburden disposal facility would be eliminated under this alternative. This eliminates the potential for any overburden seeps on the east side of the external overburden disposal area. The potential for overburden seeps in the other areas including Panels A, B and C would be the same in this alternative as for the Proposed Action and Alternative A.

The temporary nature of the external overburden stockpiling area, and the ultimate reestablishment of natural contours and ground slopes in that area, would reduce the potential for long term erosion off of those surfaces because of the reduced slope gradients and the presumably faster/better revegetation success.

Groundwater Resources

The area of long-term infiltration through seleniferous overburden in Alternative B is the same as Alternative A. Both alternatives avoid permanent disposal of seleniferous overburden in the external overburden disposal area. During the period of less than 21 months that seleniferous overburden could possibly be stored in the external overburden disposal area, it would be exposed to infiltration of precipitation but this infiltration would not be expected to penetrate through the overburden and the unsaturated zone under the overburden and affect groundwater quality. The amount of infiltration through seleniferous overburden into the Wells Formation aquifer is therefore considered to be the same for both Alternative A and B **(Table 4.3-10)**. This means that the impacts to groundwater quality under Alternative B are the same as Alternative A (**Tables 4.3-11 to 4.3-13**).

To locate all overburden in the pit backfills under Alternative B, Simplot has estimated that 36 percent of the total overburden excavated from the pits would need to be temporarily stored and then rehandled. As in Alternative A, this rehandling of the mineralized overburden would further expose it to atmospheric oxygen which could enhance the oxidation of the contained minerals and mobilization of soluble selenium and other constituents. The reasons for increased selenium concentrations in the seepage from the Panel B backfill in Alternative B are similar to that described in Alternative A. This could result in higher selenium concentrations in the groundwater under Panel B compared to the Proposed Action which would be similar to Alternative A.

No Action

Surface water resources within the Project Area would remain as they currently are until a mine plan is approved. The tailings pond would continue to be used until existing pits are completed and the tailings pond is reclaimed. Any existing selenium effects both within the Project Area and outside it in Simplot's operations to the south would continue until studies and remediation plans are finalized.

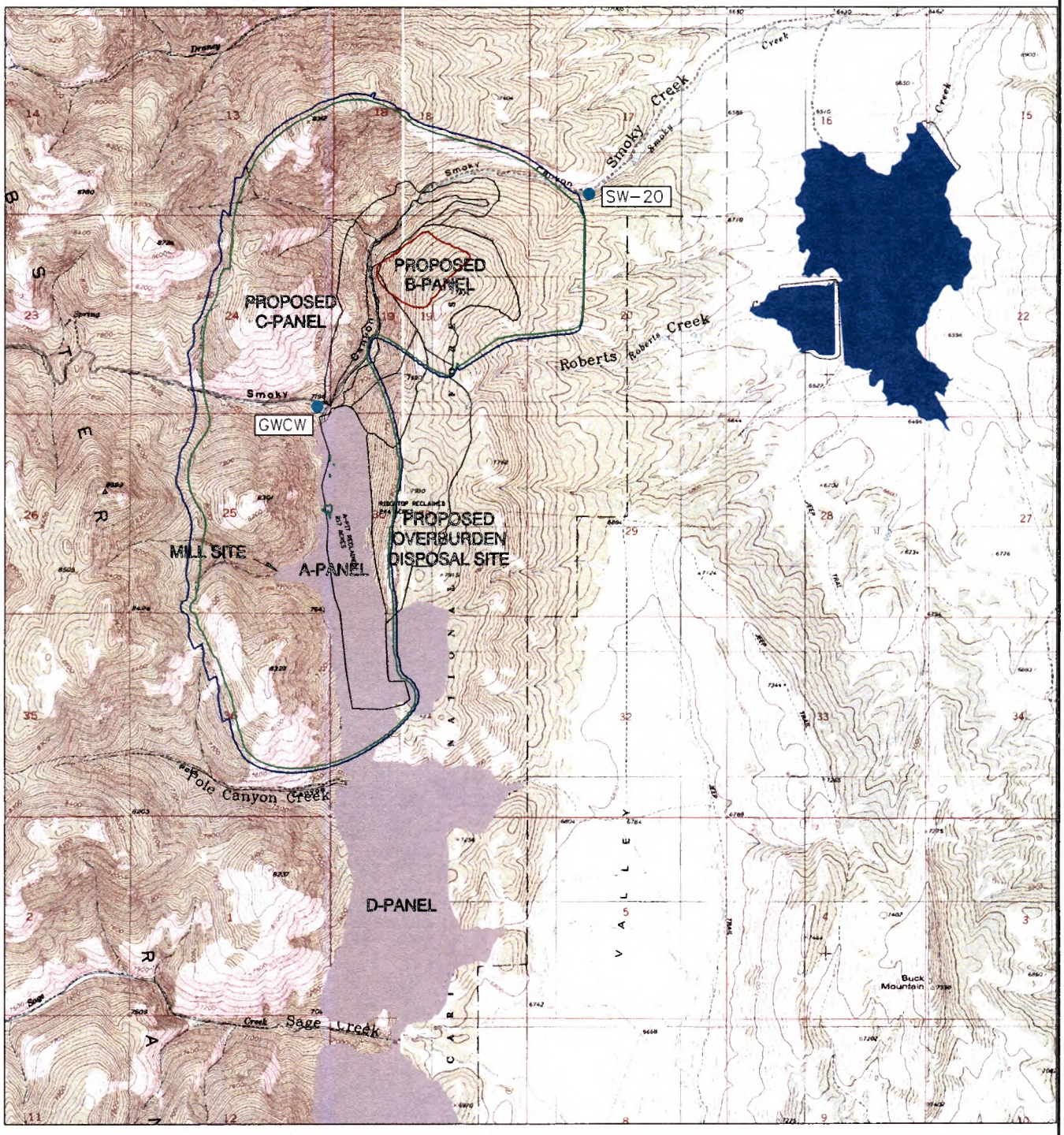

FIGURE 4.3-8
GROUNDWATER MODEL RESULTS FOR
CADMIUM, SULFATE, TDS - ALTERNATIVES A AND B
SIMPLOT SMOKY CANYON MINE PANELS B&C
SUPPLEMENTAL EIS

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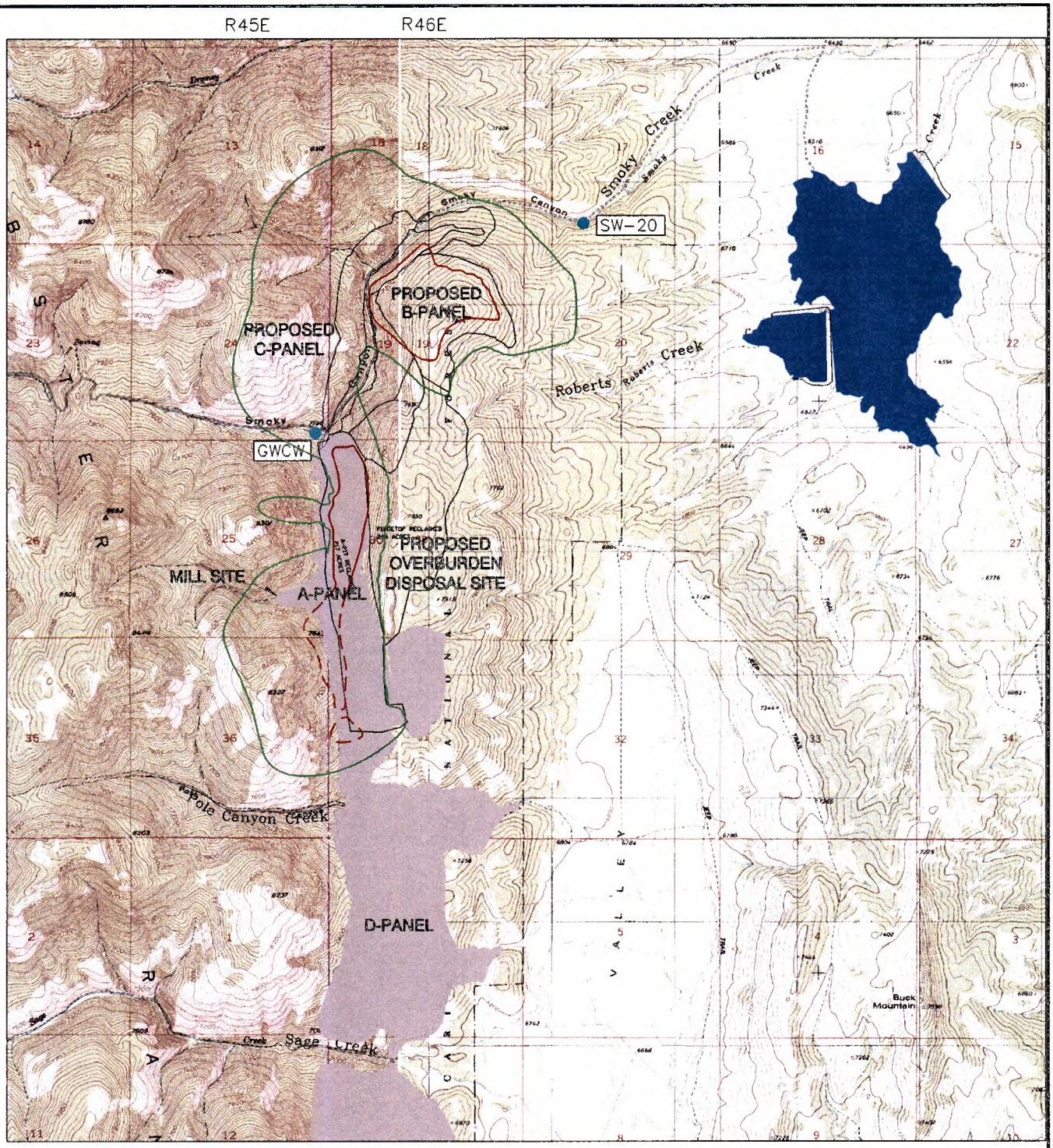

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FIGURE 4.3-9
GROUNDWATER MODEL RESULTS FOR MANGANESE - ALTERNATIVES A AND B
SIMPLOT SMOKY CANYON MINE PANELS B&C
SUPPLEMENTAL EIS

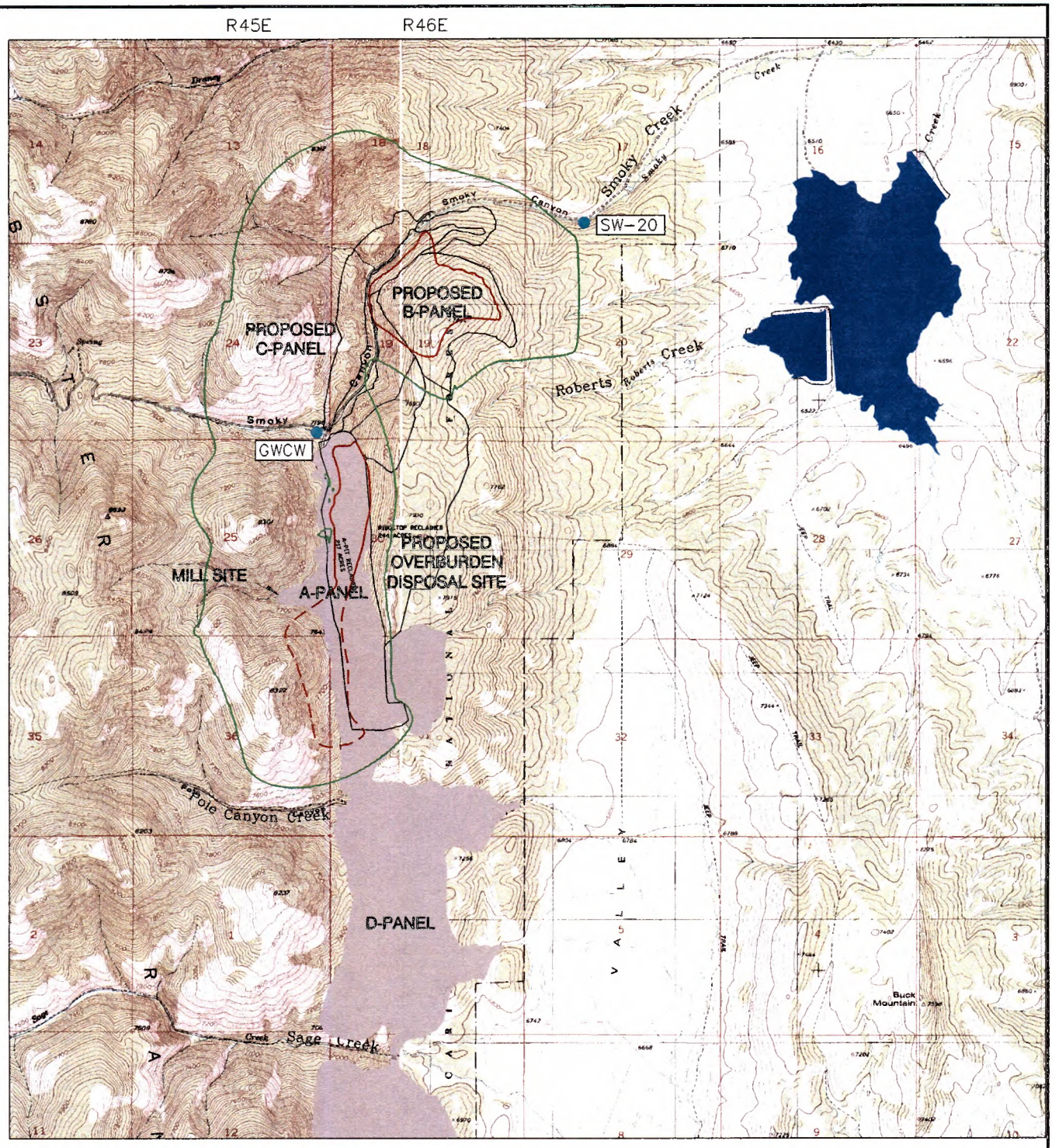

FIGURE 4.3-10
GROUNDWATER MODEL RESULTS FOR SELENIUM - ALTERNATIVES A AND B
SIMPLOT SMOKY CANYON MINE PANELS B&C
SUPPLEMENTAL EIS

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Under the No Action Alternative, impacts to groundwater would not change beyond those actions that are already occurring at the site. Dissolution, mobilization, and migration of trace metals and other contaminants would still occur at current rates unaffected by the proposed mining activities.

4.3.2 Irreversible and Irretrievable Commitment of Resources

Surface Water/Spring Resources

The Proposed Action and Alternatives could involve an irreversible or irretrievable commitment of surface water quality in lower Smoky Creek. This would occur if the water quality of Lower Smoky Spring that supplies water to lower Smoky Creek would be impacted. Existing data indicates that the spring is likely not connected to the Wells Formation aquifer which would receive any seepage from the Proposed Action and Alternatives. However, due to uncertainty, the groundwater impact analysis was conducted with the conservative assumption that Lower Smoky Spring was a discharge point for the Wells Formation aquifer. If the spring was connected to the Wells Formation aquifer, the groundwater modeling indicated the water quality at the spring could be degraded compared to background but it is estimated to still comply with applicable Cold Water Aquatic Life Criterion over a wide range of overburden leachate chemistries. It would also have the potential to impact downstream waters, although to a lesser extent due to the small proportion of water that Smoky Creek contributes to streams such as Tygee Creek, Stump Creek and the Salt River.

Groundwater Resources

The loss of groundwater quantity for culinary and processing use during the proposed mining operations within Panels B and C would practically all be recovered through natural precipitation and infiltration. This would occur from within the recharge areas of the Wells Formation in the project vicinity. Based on the aquifer characteristics of the formations in the area, impacts to groundwater quantity would not be irreversible or irretrievable.

Irretrievable changes in groundwater quality under and downgradient from the area of the Proposed Action and Alternatives would occur. This would occur because of the long-term infiltration of water through the seleniferous overburden material disposed on site. An area of the Wells Formation aquifer extending for a distance of about one half mile down gradient to the west and northwest and a quarter to half mile to the east and northeast of the Proposed Action and Alternatives have been modeled to have detectable water quality impacts from overburden seepage.

Existing use of groundwater in the area of the predicted groundwater impacts is limited to the Simplot water supply wells for the Smoky Canyon Mine. There are no other current groundwater users in the area of impacts and it is extremely unlikely that there will ever be any future utilization of groundwater from the Wells Formation within this area because: 1) the depth to the Wells Formation is approximately 400 feet in the vicinity of the A Panel and increases rapidly westward due to the combined effects of the rock strata dipping downward toward the west while the ground surface elevation climbs up the mountain front; 2) there are usable amounts of groundwater in the Dinwoody Formation which overlies the Meade Peak aquitard; 3) the surface ownership is the USFS and some of the land west of the mine is managed as roadless.

4.3.3 Residual Adverse Impacts

Surface Water Resources

Some increased potential for sediment loading to Smoky and Roberts Creek could still be present after reclamation. This is predicted to approach pre-mining levels after the disturbed area is revegetated successfully.

Groundwater Resources

Resultant adverse effects to groundwater conditions at the site after mining ceases and any mitigation and/or final reclamation has occurred would be mainly from a water quality impact. Since it has been determined that infiltration of precipitation through seleniferous overburden has the potential to affect groundwater quality by releasing selenium and trace metals into the groundwater regime, residual effects would still be likely to remain and be ongoing after proposed reclamation actions have been completed. Over thousands of years, the concentration of contaminants in the infiltrating water may decrease as steady-state geochemical conditions are approached (JBR, 2001a).

4.4 Soils and Watershed

Summary

The Proposed Action and Alternatives would have direct and indirect impacts to the soil resources within the Smoky Canyon Mine area. Soil resources outside the Proposed Action and Alternatives would not be directly affected. The proposed Smoky Canyon Panels B and C would include two open pit mines and a ridge-top overburden facility that would result in approximately 618 acres of new disturbance and 835 acres of total disturbance. Potential direct impacts to soil resources include loss of soil during salvage, sediment loss due to erosion, exposure and mobilization of selenium, and reduced productivity. Indirect impacts related to soil resources include water quality degradation related to erosion or selenium in sediment, and reduced viability of vegetation related to soil fertility factors.

Surface disturbance and removal of soil resources for replacement during reclamation activities would result in direct impacts within the project area. These activities cause physical and chemical changes in the soil resources which affect the behavior and fertility of the material. Soils within the project area would be physically lost during salvage and replacement operations through the excavation, movement from stockpiles, and transport of the resource to the final reclamation site.

Loss of soil fertility within the project area could be reduced by incorporating slash into the salvaged growth medium to increase the organic matter content, implementing appropriate BMP's, mixing soils with few coarse fragments together with soils containing high coarse fragment content to dilute the total coarse fragment percentage, and timing salvage operations to optimize revegetation. Overall, the potential for successful revegetation on reclaimed areas is favorable due in great part to the implementation of soil conservation measures as proposed in the Mine Plan.

Indirect impacts related to the selenium content of plant growth medium within the project area are possible but would be greatly reduced by ensuring that all seleniferous overburden is covered with an 8-foot layer of chert prior to topsoil/growth medium placement.

Erosion could occur in areas of new or increased surface disturbance. Soil limitations indicate that disturbed areas would experience increased erosion potential, either by wind or water. Successful revegetation in the project area would reduce this impact on the watershed over time. Measures would be implemented for sediment and erosion control to reduce soil loss and contain sedimentation which could be caused by sheet and gully erosion from drainage and surface runoff. Concurrent and timely revegetation of disturbed areas would also reduce the potential for soil erosion in the project area by improving ground cover.

Erosion potential for soils within the Smoky Canyon area and the entire Tygee Creek watershed area has been rated as high (Maxim, 2001b; USDA, 1976). Considering the proximity of potential disturbance at Panels B and C to Smoky and Roberts Creeks, increased erosion could cause increased sediment loading to the streams. Erosion and sediment control measures and successful revegetation would reduce this impact within the watershed. Erosion of disturbed and unvegetated areas by wind or water is possible but would be reduced with timely establishment of cover crops, implementation of BMP's, and other proposed reclamation activities identified in the Proposed Action.

Potential impacts to soil and watershed resources would be similar for Alternatives A and B. These impacts include loss of soil during salvage and replacement of soil resources, erosion, exposure and mobilization of selenium, and reduced soil productivity due to disturbance at the site. Although the described activities would be slightly different for the different alternatives, the acres affected and reclaimed would be the same. With implementation of topsoil salvage and reuse practices, soil conservation measures, BMP's, and other proposed operating procedures, the impacts to this resource under the Proposed Action and Alternatives would be minor.

Potential exists in the project area for the presence of selenium and other contaminants in soil, both naturally occurring and in association with reclaimed areas previously disturbed by mining activities. Eroded sediment may introduce selenium in soluble form to surface and groundwater.

The sediment in run-off to Smoky Creek could affect channel stability and the downstream aquatic environment. It should also be recognized that an acceptable erosion rate or loss in terms of soil productivity may not be within water quality standards for sediment (USDA, 1979). Implementation of appropriate BMP's incorporated as design features in the Mine Plan would reduce sediment loading to the stream, minimizing effects to the channel stability and the downstream aquatic environment.

Issue Indicators

Soil resources have been evaluated and topsoil suitability has been determined using the USDA Soil Survey Handbook (USDA, 1999a) and local interim soil suitability guidelines. Modification to soil chemical and physical characteristics, acres of disturbance, potential for selenium and metal mobilization in soils, and potential for erosion are also assessed for comparison of alternatives.

The Tygee Creek watershed has been analyzed in accordance with the Ecosystem Analysis at the Watershed Scale, Federal Guide for Watershed Analysis, Version 2.2 (JBR, 2001a). Existing conditions in the watershed and potential impacts that would result from the Proposed Action and Alternatives are evaluated using this analysis method which includes human use, vegetation, hydrology, erosion control practices, stream channel, water quality, and species and habitat components.

4.4.1 Direct and Indirect Impacts

Impacts to soil resources would occur in a number of ways during mining operations. Physical and chemical changes to the soil would occur by mixing during initial salvage operations and when placed in stockpiles for future reclamation use. Some of the existing soil resource may be lost during salvage. Soil mixing and loss would also occur during final growth medium distribution and completion of reclamation. Erosion of topsoil/growth medium after redistribution on regraded sites during the final stages of reclamation would have a greater potential until the soil is stabilized by successful revegetation. Soils outside the area defined by the Proposed Action and Alternatives would not be affected.

Physical Changes to Soil Resources

The development of soil characteristics is influenced by five factors including time, climate, parent material, topography, and biological factors. Due to mixing and destruction of the soil biological crust during recovery and placement, salvaged topsoil and growth medium material no longer retains the characteristics of the parent soil. Since soil formation is a process that takes place over time, it is not feasible for reclamation to return the land to the previously existing soil conditions, although a viable growth medium base would be placed to create a suitable seedbed for vegetation establishment.

Microorganisms such as bacteria and fungi are important in the decomposition of biological materials and the formation and improvement of soil itself (USDA, 1979). Natural processes, such as dust blowing on the site from other areas, will reinoculate the site with these microorganisms. Root penetration and the development of a rhizosphere environment are also thought to perpetuate the growth of microorganisms (USDA, 1979).

Direct impacts to soil resources include compaction and crushing of the growth medium by equipment during recovery, stockpiling, and subsequent replacement during reclamation. Effects of soil compaction include reduced permeability, decreased available water holding capacity, and loss of soil structure.

Fertility

Production and fertility of the stockpiled growth medium would be affected by mixing of the soils. Incorporation of slash and vegetative materials into the growth medium during stripping would increase the organic matter content of the material and elevate the production potential. Creating air pockets during soil salvage facilitates air exchange, thereby temporarily preserving the microbial functions of the soil matrix by preventing anaerobic conditions throughout the entire stockpile. After placement of stockpiled growth medium to reclaimed areas, normal biological activity would resume and eventually reach pre-salvage levels (USDA, 1979). Direct use and placement of stripped topsoil on areas to be reclaimed would significantly reduce the loss of soil biological activity and preserve the production potential of the material. Mixing soils containing high fragment content with soils containing fewer fragments would dilute the coarse fragment content and maximize fertility.

Productivity is defined as the rate of vegetation production per unit area, usually expressed in terms of weight or energy. Primary factors that influence natural soil productivity include:

- Length of growing season;
- Climate and soil depth; and
- Fertility.

Productivity evaluations are made by correlating documented knowledge of established soil series to the experience gained in the actual performance of those or similar soil materials in the production of crops or native vegetation (USDA, 1979).

Current Smoky Canyon Mine reclamation practices such as roughening the graded slopes, incorporating slash into the growth medium, implementing appropriate BMP's, and timing of soil salvage operations to optimize revegetation success would reduce soil loss and maximize the production potential.

Soil Loss

Potential for water erosion would be increased after soil salvage operations due to the removal of the vegetative cover and the loss of soil structure. Timely establishment of cover crops on growth medium stockpiles, implementation of applicable BMP's, and concurrent reclamation practices would control soil losses due to water erosion.

Wind erosion hazard is expected to be low due to the characteristic soil features, such as the high percentage of coarse fragments throughout the soil profile. The wind erodibility hazard for all soils within the Proposed Action and Alternatives area has been rated as slight (Maxim, 2001b). Concurrent and timely revegetation of disturbed areas would reduce the potential for soil erosion by improving ground cover.

Slope values for reclaimed slopes under the Proposed Action and Alternatives would tend to have fewer steep areas, with a range of 1 to 45 percent slope. The majority of reclaimed areas identified in the Reclamation Plan incorporate a gentle 3h:1v (Horizontal:Vertical) slope surface during regrading and reclamation activities, yielding an average slope value of approximately 33 percent.

Utilizing the Water Erosion Prediction Project (WEPP) soil erosion model (USFS, 2000b) to represent disturbed areas during mining operations and after reclamation, results indicate that the potential for erosion of disturbed land on 33 percent slopes over a five-year period of time is 60 percent, indicating that 3 out of 5 years could have erosion. Worst case scenario for the disturbed area would indicate the potential of up to 100 percent erosion (5 out of 5 years) during the five-year period. The successful establishment of vegetation on the same slopes indicates that erosion could occur approximately 17 percent of the time over a 30 year period, or 5 out of 30 years. Worst case scenario for the disturbed area would indicate the potential of up to 90 percent erosion (27 out of 30 years) during the 30-year period.

Calculated erosion figures as determined from the WEPP model (**Table 4.4-1**) would be reduced by approximately 10 to 43 percent with vegetation establishment and would be further reduced or eliminated with implementation of applicable BMP's.

Selenium Mobilization

Disturbing the natural soil could oxidize selenium minerals in the soil and mobilize them in the surface environment, resulting in an increase in the availability of selenium and other trace elements for uptake in vegetation. Section 3.5.5 identifies the processes which influence the mobilization and availability of the four oxidation states of selenium which may be present in the soil. The presence or absence of soluble forms of selenium would influence the availability of selenium for plant uptake. Elevated amounts of soluble selenium in growth medium could increase the selenium content of vegetation on reclaimed areas. Exposing subsurface soil selenium to the environment during salvage and redistribution activities

has the potential to increase oxidation processes, thereby increasing amounts of soluble selenium. The timeframe and extent of this process of converting insoluble selenium to soluble selenium in the soil is not well understood at this time. Soluble selenium in surficial growth medium is mobile and subject to being accumulated in plants and leached out of the material in surface runoff or infiltration.

Other Affected Resources

Indirect impacts to other resources caused by soil disturbance from the Proposed Action include:

- Water quality changes due to sedimentation from erosion of exposed slopes would be minimized by implementation of applicable BMP's,
- Physical and chemical changes due to soil loss, reduced fertility, and reduced biological functions in the soil could result in decreased vegetative productivity.

Table 4.4-1 Change in Existing Conditions by Alternative

Condition	Proposed Action	Alternative A	Alternative B	No Action
New Disturbance	618 acres	618 acres	618 acres	0 acres
Erosion Rate, prior to vegetation establishment [1]	60 to 100 percent, or a minimum of 3 out of 5 years[2]	60 to 100 percent, or a minimum of 3 out of 5 years[2]	60 to 100 percent, or a minimum of 3 out of 5 years[2]	N/A
Erosion Rate, after vegetation establishment[1]	17 to 90 percent, or a minimum of 5 out of 30 years	17 to 90 percent, or a minimum of 5 out of 30 years	17 to 90 percent, or a minimum of 5 out of 30 years[2]	3 to 70 percent, or a minimum of 1 out of 30 years
Acres of Land Taken out of Production	835	835	835	None
Topsoil Available [3]	1,623.75 acre-feet	1,623.75 acre-feet	1,623.75 acre-feet	N/A

[1] Average factor as calculated using the WEPP model (USFS, 2000b).
[2] WEPP modeling calculations are, at best, accurate to plus or minus 50 percent.
[3] Utilizing both suitable and marginally suitable material and incorporating a 23 percent swell factor for soil re-placement during reclamation.

The soil conservation measures included in the Proposed Action and Alternatives are designed to reduce potential impacts from selenium mobilization.

Mass stability of mine overburden disposal fills is economically critical because differences in slope steepness can mean significant differences in construction costs. It is also critical from an environmental standpoint because mass slope failures can severely damage water resources, as well as threaten human and animal life (Richardson, *no date*).

Soil factors important in a watershed context include site productivity, sedimentation, erosion processes and rates, topsoil/growth medium management, and reclamation potential. Impacts to watershed resources include erosion in areas of intense land uses and the potential for selenium impacts to water and other ecosystem components in the Tygee Creek Basin (JBR, 2001a).

Proposed Action

The Proposed Action would entail 618 acres of new disturbance within the 835 acres of total disturbance. This disturbance includes 274 acres for Panels B and C pits, 244 acres for an overburden disposal site, 85 acres for haul roads, and 15 acres for miscellaneous water management. The ridge top overburden disposal site would occupy the preferred external overburden disposal site of the 1982 Record of Decision. An additional 217 acres of currently disturbed area in Panel A would also be utilized.

Selective handing of mine overburden would be practiced during the operations. Chert overburden would be spread over seleniferous overburden to a thickness of approximately 8 feet at the external overburden disposal facility and the pit backfill areas. A layer of topsoil/growth medium 1 to 3 feet thick would then be applied to the surface. This cover of clean overburden and topsoil would protect the seleniferous overburden from erosion and root penetration (IMA, 2000).

Reclamation of the disturbance would occur concurrently with mining. Reclamation activities would include backfilling pits with overburden, shaping and contouring the overburden, placement of the chert cap material, placement of topsoil/growth medium over the cap surface, seedbed preparation, seeding, and fertilizing.

The construction of haul roads, overburden piles, and drainage ditches could contribute to increased sediment loading from disturbed areas. Erosion could occur in areas of new or increased surface disturbance. Proposed measures common to all action alternatives to reduce impacts on water resources include sediment collection, run-on/runoff control, soil stabilization, slope stabilization, and seeding and revegetation. Runoff would be managed to reduce sedimentation and erosion in accordance with the SWPPP.

Implementation of BMP's would reduce the potential for and control the potential effects of erosion and sedimentation (IMA, 2000; USDA, 1979). BMP's consist of a wide range of practices for addressing contributions of sediment to surface water resources and are commonly used by industries that cause disturbance to the land surface. Soil conservation measures would be implemented for sediment and erosion control.

Limiting land disturbance to the area which is operationally necessary would minimize the area where erosion and sedimentation could occur. Concurrent reclamation would be done wherever practicable. Growth medium stockpiles and reclaimed slopes would be reclaimed as soon as practicable.

Soil salvage would be based on suitability criteria as described in this document, site slope, and configuration. Salvage operations would not be conducted when soil is excessively wet or dry. Direct haul and placement of growth medium to sites ready for immediate reclamation would minimize the need for stockpiling the material and would be done whenever possible. Salvaged topsoil/growth medium would be placed to a minimum depth of 12 inches over regraded areas, finish graded, fertilized and seeded. A summary of calculated topsoil/growth medium volumes is presented in **Table 3.4-4.**

Calculating the amount of suitable and marginally suitable topsoil/growth medium which could be salvaged (**Table 3.4-4**), approximately 2,101,733 cubic yards of suitable recovered soil, would indicate an average layer of growth medium 1.58 feet thick would be placed over the area to be reclaimed.

Approximately 57 acres of soil resources would be permanently lost and unavailable for use as growth medium for reclamation purposes due to limiting factors such as coarse fragments or low organic matter.

An estimated 59 percent of the soils available for reclamation are classified as only marginally suitable (**Figure 4.4-1**). Elimination of these soils from materials recovered during salvage operations would reduce the potential growth medium quantities which would be available for reclamation. Reduction in soil volume available for use as growth medium may impact the topsoiling design and may require modifications to the Reclamation Plan for the Proposed Action and Alternatives.

Simplot has implemented measures in the Mine Plan to mitigate potential impacts from mobilization of selenium and trace elements. These measures are designed to reduce or eliminate the impacts to soil resources. As demonstrated in Section 3.4, native soils in the study area have been evaluated and characterized for topsoil suitability based on a variety of parameters including coarse fragment content, selenium, and low organic matter. Some soils have been identified as questionably suitable based on the results of laboratory analysis for total and extractable selenium concentrations. Map units ECS, JK, CP, and LDR all contain concentrations of selenium in excess of one mg/kg in one or more horizons within one or more tested profiles, rendering them questionable for use during reclamation. Approximately 120 acres (236 acre-feet) of soil resources would be questionably suitable for use during reclamation due to elevated selenium levels. These could be mixed with other salvaged soils to reduce the overall selenium concentration.

Considering the expansion of soils when excavated from their semi-compacted natural state, the Caterpillar Performance Handbook (Caterpillar, 1999) includes an adjusted swell factor calculation for loamy soils which is approximately 23 percent. This factor can be applied to salvaged soils which are uncompacted and aerated during recovery. Recalculating the topsoil volumes based on the 23 percent swell factor would increase the available growth medium resources to approximately 2,585,132 cubic yards, increasing the placement amount to 1.94 feet thick over the reclaimed area. The actual total volume of available growth medium resources would range between 2,101,734 and 2,585,132 cubic yards.

Alternative A - All Seleniferous Overburden to Pit Backfill

This alternative would incorporate all the components of the Proposed Action but would eliminate the disposal of seleniferous material in the external overburden disposal site outside of the open pits. Only non-seleniferous overburden would be placed in the ridge top external overburden disposal site described in the Proposed Action. The total disturbance area would remain 835 acres, the same as the Proposed Action.

drawings\SIMPLOT\FSEIS\Figures FSEIS\Figure 4.4-1.dwg (revised 1/16/02)

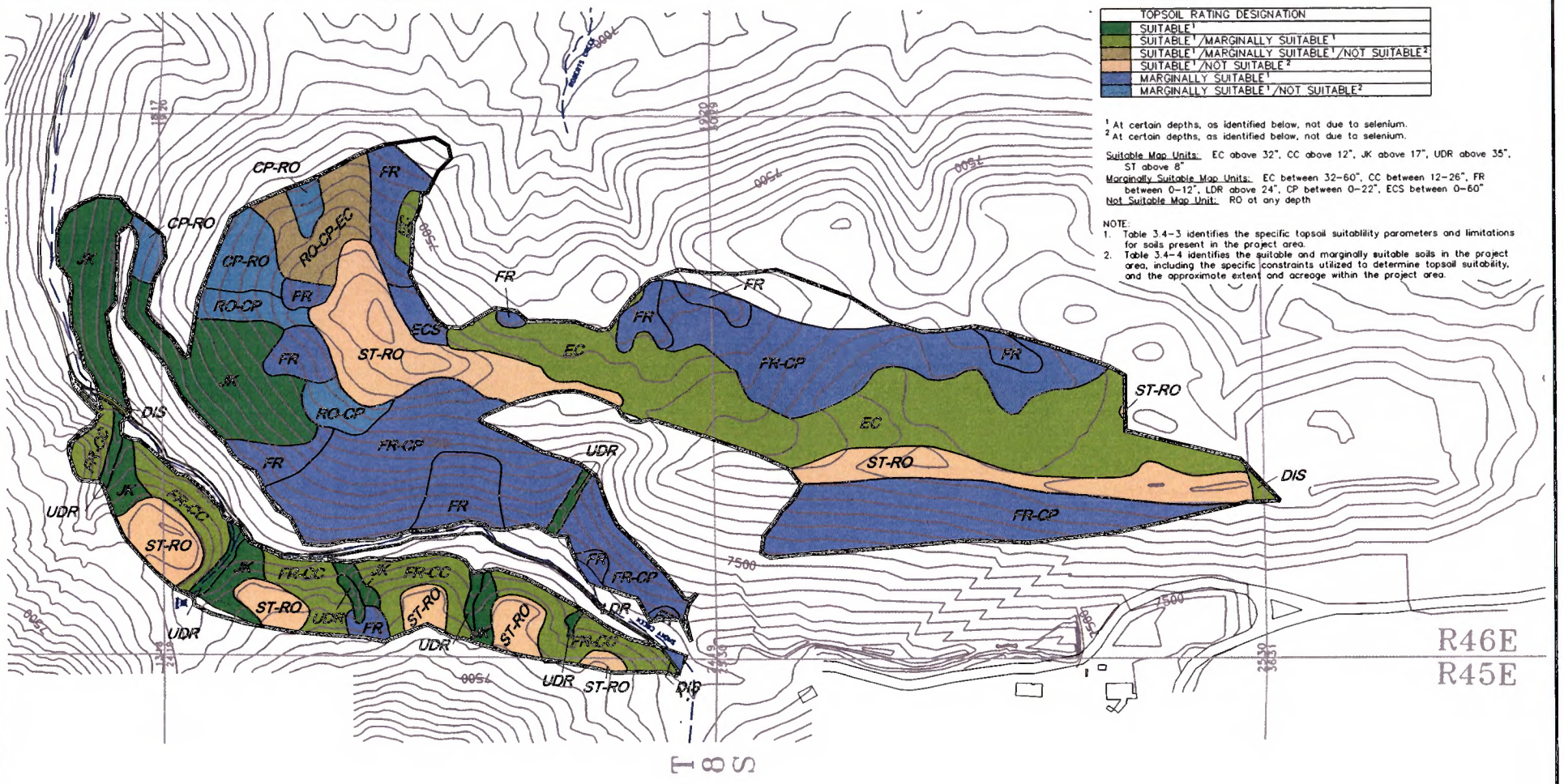

FIGURE 4.4-1
TOPSOIL SUITABILITY RATINGS WITHIN THE PROJECT AREA
SIMPLOT SMOKY CANYON MINE PANELS B&C
SUPPLEMENTAL EIS

Table 4.4-2 shows a comparison of the extent of land disturbance by alternative.

Table 4.4-2 Land Disturbance Comparison by Alternative

Type of Disturbance to Soil Resources	Proposed Action (acres)	Alternative A (acres)	Alternative B (acres)	No Action (acres)
Panels B & C	274	274	274	0
External Overburden	244	244	244	0
Panel A	217	217	217	217
Haul Roads	85	85	85	0
Misc. Water Mngmt.	15	15	15	0
TOTAL ACREAGE	835	835	835	0
New Disturbance	618	618	618	0
Total Reclaimed Area	822	824	830	0
Total Unreclaimed Area	13	11	5	N/A

The chert cap would effectively isolate seleniferous overburden material from the effects of weathering and subsequent migration to the surface environment, therefore, the direct and indirect impacts to the surface environment from Alternative A would be the same as the Proposed Action. Implementation of this alternative would reduce the acreage on which seleniferous overburden is placed by 244 acres. The chert cap would only be used on overburden in Panels A, B and C backfills, 478 acres.

The reclamation completion date would be extended approximately 10 months beyond the reclamation for the Proposed Action. The disturbance area for this alternative would be the same as for the Proposed Action or Alternative B.

Alternative B - No External Overburden Disposal

The total area of disturbance with implementation of Alternative B would be 835 acres, the same as for the proposed action and Alternative A. This alternative would eliminate the need for a permanent external overburden disposal site by ultimately replacing all overburden back into the open pits. The 244-acre temporary overburden storage area would occupy the same area and location as the permanent ridge top overburden disposal site. As a result, the same area would require placement of topsoil/growth medium and reclamation. The topography of the temporary storage area after reclamation would be the same as the pre-mining conditions. The area of chert cap application would be the same as for Alternative A.

Selective handling of mine overburden would be also be practiced under implementation of this alternative. The reclamation completion date would be extended approximately 21 months beyond the reclamation for the Proposed Action.

No Action

Under the No Action Alternative, Simplot's proposed development of mine Panels B and C would be delayed. Simplot would not be able to proceed with mining of the ore in these panels until such time as a mining and reclamation plan is found to be acceptable by the BLM and USFS. The No Action Alternative would temporarily result in no additional impacts to soil resources in the project area.

4.4.2 Irreversible and Irretrievable Commitment of Resources

Irreversible and irretrievable commitment of resources include the new disturbance of 618 acres of soil resources with implementation of any alternative except the No Action Alternative. With man-made disturbance, there would be a loss of soil fertility and microorganisms, resulting in a temporary reduction in vegetative productivity. Suitable topsoil and growth medium material would be stockpiled and utilized during reclamation but the original soil conditions cannot be recreated. The growth medium placed on the reclaimed areas would be expected to develop different characteristics than the parent soil. Soil amendments may be initially required to ensure productivity of the reclaimed sites. With placement of topsoil on reclaimed areas, land use potential could be eventually restored after successful reclamation of the site. If reclamation was not successful, these impacts could have long-term effects.

A total of 13 acres would not be reclaimed under the Proposed Action; 11 acres under Alternative A; 5 acres under Alternative B. These unreclaimed acres consist of highwall areas in the B and C Panels.

4.4.3 Residual Adverse Impacts

Native soil would be lost due to the breakdown of soil structure and interruption of natural soil development as a result of salvage operations. Soils salvaged and utilized in reclamation would initially demonstrate a decrease in infiltration and percolation rates, decrease in available water holding capacity, and loss of organic matter. These effects would be reversed by natural soil development over time. Successful reclamation of disturbed areas would expedite these natural processes and create an environment suitable for long-term vegetation establishment.

It is generally thought that microorganisms will naturally reestablish themselves in salvaged and replaced growth medium. The time required for soil reestablishment depends upon a number of factors: physical and chemical characteristics and water dynamics of the growth medium, the manner in which topsoil salvage and storage was handled during mining, the rate of vegetation establishment, and the rate of natural inoculation of the growth medium (USDA, 1979).

4.5 Vegetation

Summary

The Proposed Action and Alternatives would disturb the same amount of vegetation because the area planned for external overburden disposal under the Proposed Action and Alternative A would have to be used for temporary storage of waste overburden under Alternative B. Direct impacts would result from surface disturbance and removal of existing plant communities. Indirect impacts to vegetation established by reclamation above seleniferous waste overburden are possible. Under the Proposed Action and both Alternatives, this risk would be greatly reduced by ensuring that all seleniferous overburden is covered with an 8 foot thick layer of chert overburden and an additional 1 to 3 feet of

topsoil. Indirect impacts from noxious weed infestation may result from ground disturbance unless prevention and control programs are effective.

Issue Indicators

Issue indicators are the number of acres impacted by the Proposed Action and Alternatives, expected changes in vegetative cover over the short and long-term, the potential for plants to accumulate selenium in excess of allowable levels, and the extent to which vegetation with elevated selenium levels is likely to be used by livestock and wildlife.

4.5.1 Direct and Indirect Impacts

Proposed Action

The new disturbance resulting from the Proposed Action would affect 618 acres of land. The Proposed Action would directly affect 14 acres of aspen, 532 acres of conifer, and 13 acres of mixed aspen/conifer forest which would be harvested prior to the start of mining operations. The harvest of conifer forest would be expected to provide merchantable timber. Also affected would be 30 acres of mixed shrub, and 30 acres of sagebrush.

Table 4.5-1 shows the area of each vegetation community affected by the project. This table is based on vegetation information from the baseline study (Maxim, 2000d) and current project area boundaries.

Table 4.5-1 Acres of Impact on Existing Vegetation Communities

	Aspen	Conifer	Aspen/ Conifer	Mixed Shrub	Sagebrush
Project Impacts	14	532	13	30	30

The topsoil and eight feet of chert overburden capping the seleniferous overburden would essentially prevent selenium uptake in vegetation from the seleniferous overburden. The initially seeded grass and forb species would not have root penetration much below the layer of topsoil or upper part of the chert and would, therefore, not be in contact with seleniferous overburden 9 to 11 feet below the ground surface. Thus, these palatable forage species should not present a risk of selenium bioaccumulation to wildlife or livestock. Nobel (1991) compared the root characteristics of various groups of vegetation and found that winter annuals and perennial grasses generally had maximum root depths of less than one meter.

It is difficult to predict the climax vegetation community that would follow from the initial reclamation seeding. If native plants can successfully compete with, and eventually replace, the initial community, the vegetation mix on reclaimed lands should resemble that which existed before disturbance. However, the path of succession could be altered by variables such as fire frequency, presence of noxious weeds and non-native species, management practices, changes in soil horizons achieved through mining/reclamation, and grazing pressure.

Native trees and shrubs, if reestablished at some future date, either through reclamation or natural colonization, would have greater root penetration than the initial reclamation species. Of the common tree species found in the project area, reports of maximum rooting depth could be found for subalpine fir (*Abies lasiocarpa*), lodgepole pine (*Pinus contorta*), Douglas-fir (*Pseudotsuga menziesii*), and quaking aspen (*Populus tremuloides*) (Stone and Kalisz, 1991). Douglas-fir maximum root depths were reported

from five studies (12.1, >10.5, 4.9, 9.8, and ≈32.8 feet). Subalpine fir maximum root depths were reported from two studies (4.9 and >13 feet). Lodgepole pine maximum root depths were reported from three studies (>3.3, >6.6, and >10.8 feet), and quaking aspen maximum root depths were reported from six studies (4.9, 7.5, >9.8, 4.9, >9.8, and >5.9 feet). In a survey of reported maximum rooting depths of 253 herbaceous and woody plants, Canadell et al. (1996) found that the mean maximum root depths of herbaceous plants, shrubs, and trees were 8.5 feet, 16.7 feet, and 23.0 feet, respectively. The great majority of the root mass of trees and shrubs would be confined to the topsoil and chert cap even if some roots were able to reach the seleniferous overburden. Thus the risk of accumulation of selenium in a future shrub or tree community growing on the reclaimed areas is low.

Potential indirect impacts from the Proposed Action would include an increase in the area susceptible to weed invasion due to ground disturbance. Areas at greatest risk of infestation by noxious weeds will likely have disturbed soil and also be in close proximity to roads. Weed seeds are known to become trapped in and under vehicles and then dispersed to new locations when they are dislodged. Vehicles offer an effective means of transport for weed seeds that are not wind dispersed and the risk of infestation increases with traffic volume. Another potential source of weed infestation is the use of soil for topsoil that already contains weed material. Some noxious weeds can sprout from root or rhizome fragments in the soil as well as from seeds. Weeds may also be introduced by contaminated hay bales used for erosion control or in contaminated mulch used for revegetation. Grazing animals can readily disperse weed seeds attached to their bodies or in their droppings or as they move from infested areas.

Prevention is the most cost efficient strategy to control noxious weeds but it is almost certain that some species will become established in the reclaimed areas of the project. Early detection by monitoring followed by prompt control by chemical or other means is essential to prevent the establishment and spread of noxious weeds. If noxious weeds are neglected, they may quickly reach a point at which they cannot be controlled with current technology. Quickly establishing native or other desirable vegetation on disturbed areas is important because it provides a source of competition for invasive weed species.

The extent of past infestation of noxious weeds in disturbed and reclaimed mine areas is a good indication of the expected magnitude of the problem for lands disturbed under the Proposed Action.

Alternative A - All Seleniferous Overburden to Pit Backfill

Alternative A would disturb 618 acres of generally undisturbed area. The areas of disturbance to vegetative communities would be the same as under the Proposed Action.

The chert cap on seleniferous overburden fill areas would be eight feet thick under Alternative A, the same as the Proposed Action. Thus, direct and indirect impacts to vegetation from Alternative A would be the same as those from the Proposed Action. In the event that the chert caps do not effectively isolate the seleniferous overburden, Alternative A would reduce the acreage subject to selenium accumulation in vegetation by 244 acres because no selenium-bearing overburden would be placed in the external overburden disposal site.

Alternative B - No External Overburden Disposal

Alternative B would directly disturb 618 acres of generally undisturbed land for mine operation. Although no permanent external overburden storage is required under this alternative, temporary external overburden storage would result in the need for disturbance of 244 acres. The area of disturbance is therefore the same as for the Proposed Action and Alternative A. Under Alternative B, all overburden would be placed as backfill in Panels A, B, and C. Selective handling of mine overburden would be

practiced so that the seleniferous pit backfill would be capped with 8 feet of chert overburden and 1 to 3 feet of topsoil.

The 1 to 3 feet of topsoil and 8 foot thick chert cap on seleniferous fill areas would isolate seleniferous overburden from the environment, as effectively as under the Proposed Action or Alternative A.

No Action
The No Action Alternative would result in no additional impacts to vegetation in the project area until mining and reclamation plans are approved.

4.5.2 Irreversible and Irretrievable Commitment of Resources

The loss of timber would be an irreversible commitment of resources. The acreage cleared would include 532 acres of conifer forest, 13 acres of mixed aspen/conifer, and 14 acres of aspen. Reforestation plans will be made in concert with future studies related to selenium uptake in tree species. If trees were planted in reclaimed areas, establishment of forests would be a lengthy process. Conifer forests in particular, probably would not recover to their current stature and complexity for at least 200 years.

4.5.3 Residual Adverse Impacts

A residual adverse impact would result if existing forests were not eventually replaced through reclamation.

4.6 Wetlands

Summary
Under the Proposed Action, direct impacts to jurisdictional wetlands and waters of the U.S. would occur at three culverted road crossings of Smoky Creek. The southern haul road crossing would affect a perennial wetted section of the channel; the two downstream crossings would affect ephemeral to intermittent reaches of the channel. These crossings would impact approximately 0.18 acre of jurisdictional wetlands associated with the Smoky Creek channel. Another 0.07 acre of wetland and 0.07 acre of waters of the U.S. would be impacted by development of the C Panel.

Issue Indicators
The issue indicators for wetlands include the number of acres and the relative functions and values that would be affected by the Proposed Action and Alternatives. Indirect impacts are evaluated by estimating the potential for wetland degradation by changes in water quantity and quality and related impacts to wildlife and aquatic species using the habitat.

4.6.1 Direct and Indirect Impacts

Proposed Action
Under the Proposed Action, an existing road crossing on the upper part of Smoky Creek would be widened to accommodate haul truck traffic, allowing this traffic to access the upper (southern) end of the C Panel Pit. The USFS road would be realigned and would also cross the creek parallel to the haul road. A new haul road crossing would be constructed between the lower (northern) ends of B and C Panels.

The road widening required at the upper crossing (for both the haul road and the USFS road) would impact approximately 100 linear feet of the Smoky Creek channel, in addition to that impacted by the existing road crossing; the lower crossing would impact approximately 300 linear feet of the creek. The USFS road would also be realigned at the lower haul road crossing. A new crossing for the USFS road would require a 100 foot culvert in Smoky Creek just upstream of the lower haul road crossing.

AutoCAD measurements indicate that the 100 foot widening of the existing road would impact a total area of approximately 0.14 acre of riverine-forested wetland habitat (**Table 4.6-1**). This impact would occur near the upper (south) end of the riverine-forested wetland type present in this area (**Figure 3.6-1**). The Aquatic Baseline Report (Maxim, 2000f) and conversation with Maxim personnel indicate this crossing would affect a perennially wetted section of the channel (Personal Communication, Walt Vering, Maxim Technologies, Inc.).

The lower haul road crossing would impact a 300 foot length of the creek. The wetland type in this area is identified as riverine-herbaceous (Maxim, 2000d). AutoCAD measurements of Maxim's wetland mapping indicate that this road crossing would impact just over 0.03 acre of riverine-herbaceous wetland (**Table 4.6-1**).

The realigned USFS road would impact a 100 foot length of the creek. Again based on AutoCAD measurements of Maxim's wetland mapping, this crossing would impact approximately 0.01 acre of riverine-herbaceous wetland habitat (**Table 4.6-1**). Both of these lower road crossings would affect ephemeral reaches of the Smoky Creek channel.

In addition to these impacts, development of the C Panel pit would impact a part of the riverine-shrub wetland community found below the developed spring on the slope above (west of) C Panel (**Figure 3.6-1**). The source of the spring would not be impacted by C Panel development. The riverine-shrub wetland community below this spring is approximately 300 feet in length; half of this community would be impacted by the development of C Panel. When C Panel development impacts the lower 150 feet of this riverine-shrub community, about 0.07 acre of this wetland would be affected. The development of C Panel would impact approximately 0.07 acre of waters of the U.S. in the channel downslope from the spring. According to the original Smoky Canyon Mine EIS (USFS, 1981, p. 5-34), any flow from this spring would be temporarily diverted around the north side of C Panel. A summary of wetland impacts by wetland type is shown in **Table 4.6-2**.

Table 4.6-1 Summary of Impacts in the Smoky Canyon Drainage

Wetland Type	Acreage Impacted by the Proposed Action
Upper Road Crossing	0.138
Lower Road Crossing	0.031
USFS Road Crossing	0.008
C Panel Wetlands Impacts	0.067
Total Wetlands	0.244
C Panel Waters of the U.S. Impacts	0.066
Total Jurisdictional Area	0.310

Direct impacts to jurisdictional wetlands and waters of the U.S. at the Smoky Canyon Mine which would occur under the Revised 1999 Mine Plan are discussed above. These impacts are limited to road crossings and disturbance to an area of wetland and waters of the U.S. located within the footprint of the C Panel. These direct impacts would be the same under Alternatives A (All Seleniferous Overburden to Pit Backfill) and B (No External Overburden Disposal) as they would in the Proposed Action, because the areas of disturbance to jurisdictional sites are the same for the Proposed Action and both alternatives.

Table 4.6-2 Summary of Existing Wetlands and Wetland Impacts in the Smoky Canyon Drainage, by Wetland Type

Wetland Type	Acreage Present in Survey Area	Acreage Impacted by the Proposed Action
Riverine-forested	0.840	0.138
Riverine-shrub	0.939	0.067
Riverine-herbaceous	0.609	0.039 (0.031 + 0.008)
Slope-Shrub	0.012	0
Total Wetlands	2.40	0.244
Waters of the U.S.	0.066	0.066
Total Jurisdictional Area	2.466	0.310

In addition to the direct disturbance of wetland and waters of the U.S., the Proposed Action and Alternatives have the potential to impact wetlands through the mobilization of contaminants from the mine operations. These potential contaminants could include sediment eroded from disturbed areas, fuel and other hydrocarbons from spills, metals and selenium in both mineral and dissolved forms in runoff water.

The proposed Panels B and C mine operations will incorporate Spill Control and Countermeasures as well as Best Management Practices (BMPs) for control of hydrocarbon spills and runoff from the mine disturbances. The BMPs are intended to collect and contain runoff from disturbed areas up to the 100-year, 24-hour precipitation event on top of snow. This would minimize the release to Smoky Creek and other offsite areas of sediment and other contaminants contained in the runoff during the mine's

operational period. These BMPs would also be maintained during the reclamation phase of the operations. A potential additional impact of this runoff management strategy would be to reduce runoff to Smoky Creek. When the reclamation is considered complete, the runoff from the disturbed areas would be restored to natural conditions in Smoky Canyon over the long term, with the exception of runoff collected in the permanent runoff recharge areas.

The potential for selenium entering the wetlands from the Proposed Action during the active mining operations would be minimized by the BMPs described above. Over the long-term, selenium and other contaminants originating from the seleniferous overburden could be mobilized and transported in surface runoff if this material is not adequately capped. The proposed 8 foot thick chert cap and one to three feet of topsoil cover proposed by Simplot over all areas of seleniferous overburden would prevent the mobilization of these contaminants to surface runoff after the cap is completed.

Alternative A - All Seleniferous Overburden to Pit Backfill

As noted above, direct impacts to jurisdictional wetlands in the Smoky Creek drainage would be the same under the Proposed Action and Alternative A. This alternative would eliminate the disposal of material which may contain elevated levels of selenium outside of the open pits. The period of mine activity would be extended by 10 months over the Proposed Action.

This alternative would eliminate the long-term storage of seleniferous overburden outside of the pit limits. The short-term impacts to wetlands of this practice related to releases of runoff and contaminants from the disturbed areas would essentially be the same as the Proposed Action because the BMPs and water management plans applied to the Proposed Action and Alternative A would be the same. The long-term mobilization of selenium and other contaminants from the overburden would also be the same because all such overburden would be covered with the 8 foot cap of chert and 1 to 3 feet of topsoil.

Alternative B - No External Overburden Disposal

Direct impacts to jurisdictional wetlands in the Smoky Creek drainage would be the same under the Proposed Action and Alternative B. This alternative would eliminate the need to develop any new, permanent external overburden disposal area for the proposed mining. The main issue addressed by this alternative is the minimization of potential mobilization of contaminants from the overburden to the environment by replacing all overburden back into the open pits. The period of mine activity would be extended by 21 months over the Proposed Action.

This alternative would eliminate the long-term storage of any overburden outside of the pit limits. The short-term impacts of this practice related to releases of runoff and contaminants from the disturbed areas would essentially be the same as the Proposed Action because the BMPs and water management plans applied to the Proposed Action and Alternative B would be the same. The long-term mobilization of selenium and other contaminants from the overburden would also be the same because all such overburden would be covered with the 8 foot cap of chert and 1 to 3 feet of topsoil.

No Action Alternative

Under the No Action Alternative, development of B and C Panels would be delayed until mining and reclamation plans are approved. During this delay, no additional disturbance to jurisdictional wetlands associated with Smoky Creek would occur and overburden containing elevated concentrations of selenium would not be excavated and potentially mobilized.

4.6.2 Irreversible and Irretrievable Commitment of Resources

Reclamation of the three road crossings and backfilling and reclamation of C Panel, including reclamation of the wetted area below Sheep Spring, would assure that no long term irreversible and irretrievable commitment of wetland resources would occur.

It is also expected that the USCOE will require Simplot to mitigate for the temporary loss of jurisdictional wetlands in the Smoky Creek drainage which would result from construction of the road crossings and C Panel Pit. Such mitigation is generally required as a permit condition for actions involving dredge or fill activities in jurisdictional wetlands. The USCOE generally requires mitigation at a ratio of at least two acres of created wetland for every acre of impacted wetland (i.e., at least a 2:1 ratio). The USCOE also prefers mitigation wetlands to be created in the same area as the impacted wetlands (referred to as on-site mitigation), and prefers the mitigated wetlands to be of the same type as the impacted wetlands (referred to as in-kind mitigation). If wetlands are mitigated off-site or out-of-kind, the USCOE will generally increase the ratio of created to impacted wetlands required for mitigation. As of the date of this writing, Simplot has not yet obtained a permit for the proposed road crossings or impacts to the wetland area and waters of the U.S. affected by the C Panel Pit. Accordingly, details of the mitigation plan are not yet available.

4.6.3 Residual Adverse Impacts

Residual impacts are those that would continue after implementation of mitigation measures and/or final reclamation. The success and location of Simplot's wetland mitigation measures and reclamation following completion of the project would determine the extent of residual impacts in the local area. The combination of mitigation and reclamation has the potential to increase the acreage of wetlands present within or near the Smoky Canyon portion of the project area.

4.7 Wildlife Resources

Summary

Direct impacts to approximately 618 acres of wildlife habitat, more or less previously undisturbed, would occur from implementation of the Proposed Action. The majority of impacted wildlife habitat (86 percent) would occur within the conifer community type. Smaller amounts of habitat would be lost within aspen, aspen/conifer mix, mixed shrub, sagebrush, and wetland/riparian communities. These newly disturbed areas would be of little value to most wildlife species until reclamation and wetland mitigation efforts return the habitat to more natural conditions. Direct mortality and injury impacts would also occur to wildlife species during ground clearing activities. Indirect impacts to wildlife and their habitats adjacent to the project would occur due to characteristics associated with mining (e.g., human disturbance, noise, dust, etc). Forage, cover, and potential breeding sites would be impacted. Displacement of wildlife from these habitats would occur. Displaced animals may be incorporated into adjacent populations. Depending on variables such as species, behavior, density, and habitat quality, adjacent populations may experience increased mortality, decreased reproductive rates, or other compensatory or additive responses.

Long-term impacts to wildlife resources as a result of bioaccumulation or uptake of selenium from seleniferous overburden are not anticipated from implementation of the Proposed Action or Alternatives after reclamation activities are followed (i.e., capping seleniferous material with 8 feet of chert and 1 to 3 feet of topsoil). Short-term impacts from selenium uptake could occur while seleniferous overburden is exposed prior to capping. Runoff from the exposed seleniferous overburden would be captured and directed into sediment retention ponds. Selenium could be dissolved in the water contained in the sediment retention ponds and would potentially be available for uptake either directly or through plants that could eventually grow within or on the edge of the ponds.

Issue Indicators

The issue indicators to address issues related to wildlife include: analyzing changes in habitat quantity and quality, determining the potential for direct exposure of wildlife to selenium contamination, determining the potential for plant uptake of selenium and the potential subsequent wildlife uptake of selenium through forage, and determining the potential for bioaccumulation of selenium to occur and cause effects to wildlife which could affect life cycles or increase the risk of mortality.

4.7.1 Direct and Indirect Impacts

Proposed Action

Under the Proposed Action, seleniferous overburden would be replaced into mine pits and on the ridge top disposal site located near the new mine pits. Chert material would be placed on top of all seleniferous material with approximately 8 feet of cover before topsoil placement. The chert cap would protect the seleniferous overburden from erosion and most root penetration and would thus prevent the surface environment being exposed to elevated levels of selenium during the long term.

The chert and topsoil capping of all seleniferous overburden would eliminate chronic selenium exposure to wildlife from the buried seleniferous overburden in the long term. During the time period before the seleniferous overburden is covered with chert, wildlife could be exposed to selenium through direct ingestion of: the overburden itself, weeds or other temporary vegetation growing on the overburden, and runoff water that may accumulate in sediment/runoff control ponds. This exposure period would be relatively short and during mining operations when wildlife would not be expected to inhabit these active mining areas. However, it is possible that herbivores and predators preying on these species could ingest some quantity of selenium from the seleniferous overburden areas in the short term before they are covered with chert.

Wildlife exposure to selenium in runoff water contained in sediment control ponds prior to the overburden being covered with chert is not likely to be a problem because waterborne selenium is not very toxic to wildlife when water is the only exposure route (Skorupa, 1998). Chronic toxicity to livestock has been observed when drinking water exceeds 2.0 mg/L selenium (NRC 1980 reported in Skorupa, 1998). Surface water sampled from the A-Panel open pit in 1998 by Montgomery Watson had selenium concentrations less than 0.1 mg/L (Montgomery Watson, 1999).

There is little information in the literature for determining risk to terrestrial wildlife due to direct exposure to selenium in soil or sediment. More is known about selenium concentrations in benthic invertebrates and fish exposed to seleniferous sediment in aquatic habitats but these species are not likely to inhabit the mine sediment control ponds during the active mining operations.

Because of brief exposure period and limited use of actively mined areas before they were capped, the impacts to terrestrial wildlife from short-term bioaccumulation of selenium in annual vegetation at the Proposed Action disturbance is expected to be incidental and generally not a threat to wildlife populations. Preliminary research conducted as a part of the Southeast Idaho Selenium Project has, however, found higher selenium concentrations in the eggs of some species of birds which inhabit phosphate mining areas with exposed selenium sources, versus concentrations found on non-mined lands. Additional investigations into this issue are being conducted by State and Federal agencies.

Table 4.7-1 describes the percent of vegetation impacted under the Proposed Action. These data are compared with the percent of vegetation impacted in the Cumulative Effects area.

Table 4.7-1 Current Amount (acres) and Type of Vegetation and the Percent of Which Would be Impacted Under the Proposed Action as Compared to the Greater Project Area and the Cumulative Effects Area

Vegetation Type	Project Area[1]	Baseline Survey Area[2]	Percent Impacted[3]	Cumulative Effects Area[4]	Percent Impacted[5]
Agricultural	0	0	0	2,106	0
Aspen	14	1,384	1.0	4,700	0.3
Aspen/Conifer Mixed	13	1,208	1.1	1,939	0.7
Conifer	532	2,164	24.6	4,592	11.6
Disturbed	217	577	37.6	1,342	16.2
Mixed Shrubs	30	126	23.5	255	11.6
Riparian/Wetland	<1.0	21	4.8	514	0.2
Sagebrush	30	2,119	1.4	10,504	0.3
Water	0	0	0	560	0
Total	835	7,599	11.0	26,512	3.1

[1] Based on vegetation mapping by Maxim (Maxim, 2000d; Figure 7-1). Project Area equals the proposed Panels B and C and Overburden Disposal Site.
[2] Based on vegetation map created by Maxim (Maxim, 2000d; Figure 7-1). Baseline Survey Area includes the Maxim vegetation study boundary.
[3] Percent of Baseline Survey Area impacted by the Proposed Action.
[4] Based on vegetation map created by Idaho GAP (ICFWRU, 2000; Homer 1998)
[5] Percent of Cumulative Effects Area impacted by the Proposed Action.

Mammals

Big Game

All new disturbance would occur over two miles from identified critical deer and elk winter range (**Figure 3.7-1**). Some disturbance would occur within portions of elk calving areas that historically received high use. No disturbance would occur within identified big game migration routes. However, deer and elk do pass through the project area at some level while en route to winter range. The Proposed Action could cause individuals to divert from their preferred route which could have a negative effect on energy reserves. It is well documented in the literature (McCullough and Ullrey, 1983; and others) that the energy demands of winter survival on ungulates can typically not be met by foraging alone and thus winter survival is at least partially dependent upon stored energy reserves. This potential impact would likely be minimal as alternative routes would be relatively similar in length as preferred routes. Moose are highly dependent upon wetland/riparian habitats; less than one acre of wetland/riparian habitat would be disturbed by the Proposed Action.

With the exception of some remaining highwalls, new surface disturbance would be reclaimed upon completion of mining operations. Reclamation would be implemented concurrent with mining operations, but revegetation would require several years. Mortality and injury to big game resulting from collisions with vehicles is also likely to occur. Habitat near mining activities and additional roads could be underused as big game animals would tend to be displaced from these areas. This displacement could alter natural distribution patterns and result in the overuse of other habitat areas. At the same time, some individuals may show a habituation response to mine areas and be seen frequently by mine personnel.

The calculation of an Elk Habitat Effectiveness Index (EHEI) rated the Cumulative Effects Area as being Highly Viable (0.68) elk habitat. The implementation of the proposed project would result in a 0.003 reduction in the EHEI for the Cumulative Effects Area. By nature of the model, the result of an EHEI calculation is strongly tied to the spatial location and size of the analysis area. For this reason, an EHEI was also calculated for an area more tightly encompassing the project area (i.e., the greater project area, **Figure 3.7-1**). The current EHEI for this area was calculated to be 0.65 (Highly Viable). The Proposed Action would reduce this EHEI to 0.63 (still Highly Viable).

Bats

Impacts would occur to suitable foraging areas for bats within riparian habitat. As mentioned, less than one acre of wetland/riparian habitat would be directly impacted by the proposed project. The Cumulative Effects Area contains approximately 514 acres of wetland/riparian habitat. One known high-use area located on the proposed Panel C (bat survey location C, Maxim, 2000e) would be directly impacted by the proposed project. This high-use are is characterized by Sheep Spring and associated wetland. The spring source would not likely be impacted; however, roughly half of the downstream wetland community would be impacted. The impacts of this action on the bats using this area are unknown. However, it is likely that bat use rate would decrease, at least in the short term. In addition, forested areas and escarpments that potentially provide roosting sites for summer resident bats and hibernation sites for year-long residents might be impacted by blasting activities that may be required during construction activities. Noise and vibration associated with blasting activities could also impact bats using the immediate area. The creation of highwalls will provide new post-reclamation habitat that may be used by bats.

Other Mammals

Impacts of the Proposed Action would be negligible for those predators which utilize a variety of habitats and which hunt over large areas (e.g., mountain lion, black bear, bobcat, and coyote). There would be a small reduction in habitat and associated prey species, but density and availability of prey species (e.g., elk, deer, and small mammals) would probably remain at levels adequate to support existing predator populations. On the other hand, badgers are much more tied to smaller specific areas, and, due to their nocturnal and burrowing behavior, badgers within the project area could be killed or would at least be displaced. Following reclamation of mined land, habitat would eventually be restored for use by small mammals, birds, and other prey species. Predators would also return to reclaimed land in response to colonization by prey species.

Birds

Raptors

The Proposed Action would reduce habitat that supports the prey base (mice, voles and ground squirrels) important for hawks, owls and eagles. Habitat suitable for nesting would also be lost due to the Proposed Action. The forested habitats near the project area would become less desirable for nesting forest hawks

and owls and other species sensitive to human activity. To prevent impacts potentially caused during construction activities on nesting raptors, Simplot would consult with the USFS regarding the establishment of buffer zones or implementation of seasonal restrictions or nest monitoring in the area of any active raptor nests found during construction. Abundant foraging opportunities occur adjacent to the proposed project, thus limiting the impacts caused by the proposed new surface disturbance. The presence of a new haul road would likely increase road kill in the area resulting in an additional food source that could increase raptor populations in the area. However, raptors that would feed on the road kills would in turn be more susceptible to collisions with vehicles. To a lesser degree, a relocation of a power line in the Proposed Action may also effect foraging raptors in the area. Raptor proofing power poles would serve to reduce the use of associated road corridors by raptors and would thus decrease the possibility of vehicle-raptor collisions.

Other Birds

Song birds utilize all habitat types within the project area. The Proposed Action would remove approximately 618 acres of song bird habitat. Bird species, including blue and ruffed grouse, associated with coniferous forests, would be most effected. The Proposed Action would remove approximately 532 acres of coniferous forest. This figure represents approximately 25 percent of the forest in the greater project area and 12 percent of the coniferous forest in the Cumulative Effects Area. Following reclamation it would still be many years before the area regained its current forested characteristics. Most birds that currently use the area would be negatively effected either through direct mortality (eggs and young would be most susceptible), forced movement, or stress related to noise and other human activity. In a review of the literature, Hejl et al. (1995) found that in Rocky Mountain forests all resident species were less abundant in recent clear-cuts than in uncut forests. Neighboring individuals would also be impacted due to competition with dispersing birds. No potential sage grouse habitat would be impacted under the Proposed Action.

Approximately 532 acres of forested habitat would be removed by the Proposed Action. Woodpeckers, including the Management Indicator Species hairy woodpecker and the red-napped sapsucker, currently utilizing these areas would be impacted by the direct removal of required habitat. Individuals would be forced to disperse and reoccupy new areas. Dispersing makes animals more susceptible to predation and can deplete energy reserves. In addition, impacts of competition are felt by individuals currently occupying the area being occupied by dispersing animals.

Amphibians and Reptiles

New surface disturbance during construction activities would kill most amphibians and reptiles within the immediate disturbance area. Herptofauna habitat does occur in other areas throughout the Cumulative Effects Area that would not be impacted. Approximately 7,000 linear feet of new roads would be constructed within the project area. After construction, these additional roads and subsequent increased traffic would cause increased mortalities to amphibians, especially after periods of rainfall when amphibians are most active and more likely to occur on roads. In addition, construction of new mine facilities and roads adjacent to riparian habitat would reduce overland movement of amphibians and reptiles and tend to isolate population segments. These relatively immobile species are not capable of dispersing from breeding habitats over non-natural barriers such as road embankments, mine pits and overburden disposal sites. In addition, amphibians are negatively effected by increased sedimentation in aquatic systems as a result of ground disturbing activities. Various mitigation measures, described in the Water Resources Section (Section 4.3), would be implemented to reduce the amount of sediment that reaches aquatic systems.

Alternative A - All Seleniferous Overburden to Pit Backfill

Alternative A would incorporate all the components of the Proposed Action with the exception that no seleniferous material would be permanently placed at the proposed external overburden disposal site. Instead, all seleniferous material would be temporarily stored and then later placed into mine pits. Due to additional rehandling of overburden, this action would extend the completion date of final capping and reclamation by approximately 10 months. Since the amount of habitat to be removed would remain the same as with the Proposed Action, and since all seleniferous overburden would be capped as under the Proposed Action, long-term impacts to wildlife resulting from Alternative A would be the same as the Proposed Action. However, the potential for short-term selenium intake, which could affect life cycles or increase risk of mortality of wildlife using the temporary storage area, could be increased because of the extended time that the surface area of seleniferous overburden would be exposed prior to capping.

Alternative B - No External Overburden Disposal

Alternative B would incorporate all the components of the Proposed Action with the exception that all overburden, regardless of selenium levels, would be placed in mine pits. The proposed external overburden disposal site would still be used as a temporary storage and handling area and thus the amount of habitat removal would remain unchanged from the Proposed Action or Alternative A. However, the additional rehandling of overburden would extend the completion date of final capping and reclamation for this alternative by approximately 21 months. Long-term impacts to wildlife resulting from Alternative B would be the same as for the Proposed Action and Alternative A. To a greater extent than Alternative A, the potential for short-term selenium intake, which could affect life cycles or increase risk of mortality of wildlife using the temporary storage area, could be increased because of the extended time that the surface area of seleniferous overburden would be exposed prior to capping.

No Action

Selection of the No Action Alternative would maintain current status of wildlife and wildlife populations in and around the project area until mining and reclamation plans are approved. Existing mining operations would continue to occupy wildlife habitat. The displacement of wildlife due to existing, ongoing noise and human activity would continue. Wildlife would continue to be at risk for exposure to higher levels of selenium and trace metals if they ingest plants, invertebrates, fish or other potential foods with elevated levels of selenium.

4.7.2 Irreversible and Irretrievable Commitment of Resources

The loss of 559 acres of conifer and aspen forest would have a long-term impact on many species. The complexity and diversity that characterize these stands is a result of various ecological processes that have occurred over many years. Reclamation activities will quickly provide habitat for species adapted to disturbed and early successional areas such as deer mice (*Peromyscus maniculatus*) and other rodents. Reclaimed areas may also quickly be used as foraging/hunting areas for ungulates, some predators, and scavengers. However, it would take many years before forest-dependent species such as Northen goshawks, hairy woodpeckers, red-breasted nuthatches (*Sitta canadensis*), boreal owls (*Aegolius funereus*), and pine martins (*Martes americana*) would utilize the area.

4.7.3 Residual Adverse Impacts

No residual adverse effects beyond those described above are expected.

4.8 Fisheries and Aquatic Resources

Summary

Fisheries and aquatic life have recreational, economical, and ecological values. All game species are protected by state laws. In addition, some species are protected by federal laws and even international treaties. Aquatic populations are dependent upon the quality of habitat, which in turn is related to water quality, water flows, vegetation, climate, and topography. Distribution of aquatic organisms within the available habitats is related to the quality of the habitats, the size of the habitat areas, interspersion of habitats, and presence or absence of disturbing activities.

Issues and indicators used to ascertain the significance of an impact were developed from public and internal agency scoping. Issues that were identified included: a concern for the cumulative buildup of selenium levels and bioaccumulation of selenium in wildlife within the ecosystem from past, present, and future phosphate mining; fish and wildlife habitat in Smoky Creek and Roberts Creek drainages could be altered/lost due to surface disturbances and mobilization of contaminants to the terrestrial and surface aquatic environments; and road fill in Smoky Creek channel would create fish migration barriers for cutthroat trout and other native fish. These issues and indicators were then analyzed to describe the potential impacts to the affected resources.

Issue Indicators

To judge the significance or validity of the identified issues to fisheries and aquatic resources, various indicators were developed. These indicators are based upon regulatory requirements, baseline data, trends, and best management technology. The indicators developed to address the identified issues and determine potential impacts include: analyzing changes in habitat (breeding, cover, and forage) quantity; or quality; determining the potential for direct exposure of wildlife to selenium-contaminated water; determining the potential for wildlife uptake of selenium through forage; and determining the potential for bioaccumulation and/or biomagnification of selenium to occur and cause effects to fisheries and aquatic wildlife which could affect life cycles or increase the risk of death.

4.8.1 Direct and Indirect Impacts

Proposed Action

Under the Proposed Action, an existing road crossing on the upper part of Smoky Creek would be widened to accommodate haul truck traffic, allowing this traffic to access the upper (southern) end of the Panel C Pit. The USFS road would be realigned and would also cross the creek parallel to the haul road. A new haul road crossing would be constructed between the lower (northern) ends of Panels B and C. The road widening required at the upper crossing (for both the haul road and the USFS road) would impact 100 feet of the Smoky Creek Channel, in addition to that impacted by the existing road crossing; the lower crossing would impact approximately 300 feet of the creek. The USFS road would also be realigned at this haul road crossing. A new crossing for the USFS road would require a 100-foot culvert on Smoky Creek. As stated in Section 3.8, Smoky Creek is intermittent at these crossings.

Clearing of vegetation on the Proposed Action area, which is now generally undisturbed, has the potential to contribute increased amounts of siltation by surface runoff into Smoky and Roberts Creeks. There is a large amount of published information on the negative impacts to aquatic habitat from clearing of vegetation near streams and resulting siltation. Long-term impacts to aquatic resources as a result of increased siltation are not expected if Best Management Practices (BMP's), revegetation, and agency

mitigation measures are followed. Runoff from the Proposed Action area would be directed into sediment ponds and not allowed to enter Smoky and Roberts Creeks.

An increase in amounts of suspended sediment in runoff could adversely affect fish and aquatic invertebrates in Smoky Creek and Roberts Creek if discharged to these streams. Simplot has written a Storm Water Pollution Prevention Plan for Panels B and C, and BMP's in place for the mining operations plan call for a containment of a 100-year, 24-hour storm event plus snow melt. Various structures such as dikes, ponds, sediment traps, catch basins, berms, check dams, as well as preservation of existing vegetation, to the extent possible, near natural drainages, and other sediment control measures, currently help to prevent sediment and runoff water flow from discharging from the currently disturbed area into existing streams.

Long-term impacts to aquatic resources as a result of bioaccumulation or uptake of selenium are not anticipated from implementation of the Proposed Action or Alternatives when the proposed reclamation activities are carried out (i.e., capping seleniferous material with 8 feet of chert material and then 1 to 3 feet of topsoil). Runoff from the exposed seleniferous material prior to capping would be captured and directed into settlement ponds designed to contain a 100-year/24-hour runoff event, thus keeping sediment potentially containing elevated levels of selenium from entering Smoky and Roberts Creeks. Covering all areas of seleniferous overburden with 8 feet of chert plus 1 to 3 feet of topsoil would eliminate the long-term exposure of seleniferous material to runoff and erosion. This would prevent runoff and sediment originating on the reclaimed areas from contributing elevated selenium concentrations in stream water or sediment. The reclaimed Proposed Action area should not be a source of selenium for runoff entering Smoky Creek or Roberts Creek and, therefore, Tygee or Stump Creeks. Within the Project Area, sediment created by removal of vegetation and mining activities would be kept within the project boundaries using a variety of sediment containment structures.

Road fills constructed in and along Smoky Creek would be built of chert or limestone material and should not be a source of selenium. Proposed BMP's such as use of silt fences, hay bale sediment traps, and establishment of vegetation on constructed slopes would minimize sediment impacts to Smoky Creek. Smoky Creek has been extensively rechanneled with little native creek bed remaining (Maxim 2000c), and water flow is intermittent in the area of these road impacts; therefore, the effect of sedimentation on aquatic fauna would be minimal. There is the potential that sediment deposited in ephemeral stream segments could be washed downstream to the perennial reaches of Smoky Creek. If the beaver ponds (located approximately one mile downstream of the Proposed Action) remain active during the life of mining operations, they should settle out this sediment as they currently do for sediment that naturally washes down the channel.

During active mining, runoff from the mine pit and overburden areas would be contained and not allowed to discharge to Smoky and Roberts Creeks. This would reduce the intermittent and ephemeral flow in these creeks during the period of active mining and until reclamation is completed. Approximately 14 percent of the overall area of the Smoky Creek watershed would be affected by the containment ponds within the mine site reducing spring runoff into Smoky Creek. Approximately 7.6 percent of the watershed would be permanently diverted to the runoff recharge areas. This should not impact aquatic habitat in the lower perennial reaches of the stream which is maintained by ground water discharge just upstream of the beaver ponds approximately one mile downstream of the mine site.

The placement of culverts in Smoky Creek along the access road would not be expected to have any impact on fisheries due to the intermittent nature of the Creek in the area of the Proposed Action and the Alternatives. There is no spawning habitat in Smoky Creek at this location.

Alternative A - All Seleniferous Overburden to Pit Backfill
Under Alternative A, Simplot would selectively handle and replace seleniferous overburden as backfill in the mine pits. This alternative would eliminate the disposal of material which may contain elevated levels of selenium outside of the open pits, thus reducing the surface area of selenium material. Other overburden material which does not contain elevated concentrations of selenium would be placed in the ridge top overburden disposal site that is included in the Proposed Action. The pit and overburden disposal configuration and sizes would be the same as the Proposed Action. Direct impacts to fisheries and aquatic organisms in the Smoky Creek drainage would be the same as under the Proposed Action. The duration of impacts under this Alternative would be 10 months longer than the Proposed Action.

Alternative B - No External Overburden Disposal
Alternative B would incorporate all the components of the revised Proposed Action but would require Simplot to selectively handle and replace all chert, shale, and mudstone overburden as back fill in the mine pits of Panels A, B, and C. This alternative would eliminate the need to develop a new, permanent external overburden disposal area for the proposed mining. By replacing all seleniferous material back into the mine pits and covering with chert, this alternative would reduce the buried surface area of seleniferous material compared to the Proposed Action. This surface area would be the same as in Alternative A. However, the potential for mobilization of selenium-bearing sediment and runoff would be the same as the Proposed Action and Alternative A because all areas of seleniferous overburden would be covered with 8 feet of chert and 1 to 3 feet of topsoil. Direct impacts to the aquatic habitat in the Smoky Creek drainage would be the same as under the Proposed Action or Alternative A. The duration of impacts under this Alternative would be 21 months longer than the Proposed Action.

No Action
Under the No Action Alternative, development of Panels B and C would be delayed until mining and reclamation plans are approved. During this delay, no additional disturbance to Smoky Creek would occur and overburden containing elevated levels of selenium would not be excavated and potentially mobilized. There would be no potential for impacts to fisheries and aquatic resources from development of Panels B and C during this delay.

4.8.2 Irreversible and Irretrievable Commitment of Resources

The reclamation of the mine pits and overburden disposal areas should permanently stabilize these surfaces to minimize release of sediment to Smoky and Roberts Creeks. The road fills in Smoky Creek would be removed and reclaimed. The road culverts would be removed in this process. There would be no irreversible and irretrievable commitment of aquatic habitat for this project.

4.8.3 Residual Adverse Impacts

No residual adverse effects beyond those described above are expected.

4.8.4 Inland Native Fish Strategy

The Proposed Action and Alternatives have been evaluated for compliance with the 1995 Interim Inland Native Fish Strategy (INFISH) which was made part of the Caribou National Forest Plan in 1995. This strategy is Alternative D as described in the Environmental Assessment for the Inland Native Fish Strategy (June, 1995). Under the strategy, proposed activities that could potentially degrade Riparian Habitat Conservation Areas (RHCA) must be evaluated for compliance with interim Riparian Management Objectives (RMO) identified in the strategy. RHCAs are portions of watersheds where riparian resources receive primary emphasis and management activities are subject to specific standards and guidelines. Smoky Creek in the vicinity of the Proposed Action and Alternatives is an intermittent stream that is considered to be a Category 4 RHCA. The RHCA slope width is 50 feet on either side of the stream measured from the edge of the stream channel.

The project's compliance with the Minerals Management RMOs under the interim strategy are shown in **Table 4.8-1**:

Table 4.8-1 Compliance with INFISH Minerals Management RMOs

RMO	Standard/Guideline	Description of Compliance
MM-1	For operations in a RHCA take all practicable measures to maintain, protect, and rehabilitate fish and wildlife habitat affected by the operations.	The operations will not directly disturb fish habitat (Section 4.8.1). Riparian and wetland habitat will be protected from erosion and sedimentation (Section 4.3.1). All disturbance of the RHCA will be reclaimed at the end of mining operations (Sections 2.2.4, 2.2.5).
MM-2	Locate structures outside RHCAs. If no alternative to roads exists, keep roads to the minimum necessary and close, obliterate and revegetate roads no longer required for minerals operations.	Road disturbance in the RHCA would be three road crossings and two gabion retaining walls. These would be removed and reclaimed at the end of mining operations (Section 2.2.5)
MM-3	If no alternative exists to locating mine waste facilities in RHCAs, prevent releases and instability by: A. Analyzing the waste material to determine chemical and physical stability characteristics. B. Locate and design waste facilities to ensure mass stability and prevent release of acid and toxic materials. C. Monitor waste facilities to confirm predictions of chemical and physical stability and make adjustments as necessary. D. Reclaim and monitor waste facilities to assure chemical and physical stability and revegetation to avoid adverse impacts to inland native fish. E. Require reclamation bonds adequate to ensure long-term chemical and physical stability and successful revegetation.	All overburden disposal will occur outside the boundaries of the Smoky Creek RHCA. Panels A, B, and C must be backfilled with overburden to comply with management practices. A. Overburden has been chemically and physically characterized. (Section 3.1.5). B. Overburden will be located and capped to prevent discharge of COPCs to the RHCA (Section 2.2.3). AMD would not occur. C. Overburden facilities would be monitored to confirm predictions (Section 2.9.1). D. Overburden facilities would be reclaimed and then monitored (Sections 2.2.5, 2.9.1). E. Reclamation bonding would be required as a condition of mine plan approval and will include costs related to capping, reclamation and monitoring of the overburden facilities
MM-4	For leasable minerals, adjust operating plans of existing contracts to eliminate impacts that prevent attainment of RMOs; avoid adverse effects to inland native fish.	The mine plan is reviewed in this SEIS and would not prevent long-term attainment of the RMOs (Sections 4.3, 4.5, 4.6, 4.8). Impacts to native fish would be avoided (Section 4.8.1)

Table 4.8-1, continued.

RMO	Standard/Guideline	Description of Compliance
MM-5	Permit sand and gravel operations in RHCAs only if no alternatives exist and adverse effects to inland native fish can be avoided.	Not Applicable to Proposed Action and Alternatives.
MM-6	Develop inspection, monitoring, and reporting requirements for mineral activities. Evaluate and apply the results of inspections to modify mineral plans as needed to eliminate impacts that prevent attainment of RMOs and avoid adverse impacts on inland native fish.	Existing and required inspections, monitoring and reporting would provide information on compliance with the mine plan, BMPs and the RMOs (Section 2.9.1). Impacts to native fish would be controlled (Section 4.8.1)

4.9 Threatened, Endangered, and Sensitive Species

Summary

Baseline surveys conducted both for the current Proposed Action (Chadwick, 2000; Maxim, 2000d and 2000e; Shive et al., 2000) and for other phases of the Smoky Canyon Mine development (USFS, 1981 & 1982; BLM, 1991 & 1992; Mariah and Associates, 1988a, 1988b, & 1990; TRC Mariah, 1992, 1995a) indicate that the project area supports potential habitat for some listed and sensitive species, but is occupied by only a few of these species. No listed or sensitive plants have been found in the area, though potential Ute ladies'-tresses habitat and marginal habitat for Cache's beardtongue exist in the area.

Though unlikely, wintering bald eagles could begin to forage at the tailings impoundments. Should bald eagles begin to regularly feed on waterfowl which in turn regularly foraged on the tailings ponds, or on fish inhabiting the ponds, the eagles could begin to accumulate elevated levels of selenium or other trace elements.

A Biological Assessment was prepared to evaluate potential effects of the Proposed Action on listed and candidate species (JBR 2001b). A finding of "No Effect" was made for the slick-spot peppergrass, which apparently does not occur in or near the area. A "No Effect" determination is warranted when a project or activity will not have any effect on a listed species or its critical habitat. A finding of "May Affect, Not Likely to Adversely Affect" was made for other listed and candidate species which occur or may occur in the area. A "May Affect - Not Likely to Adversely Affect" determination is warranted when it is found that a project or activity will have effects on a listed species or critical habitat, but those effects are not likely to adversely affect listed species or critical habitat. The rationale for these findings is provided in the accompanying discussion.

Sensitive species recorded in the area during the 2000 baseline surveys were the flammulated owl and the Yellowstone (fine spotted) cutthroat trout. Boreal owls were recorded in the area during survey work conducted in 1999. Removal of mixed conifer, and possibly of aspen/conifer habitat, could impact foraging habitat used by the owls. The Proposed Action includes measures to prevent or minimize impacts on fisheries in the project area.

A Biological Evaluation was prepared to evaluate potential effects of the Proposed Action on sensitive species occurring or potentially occurring in the area (JBR 2001c). A finding of "No Impact" was made for sensitive species which have little or no potential to occur in the area. A "No Impact" determination is made when a project or activity will have no environmental effects on habitat, individuals, a population or a species. A finding of "May Impact Individuals or Habitat, But Will Not Likely Contribute to a Trend Towards Federal Listing or Cause a Loss of Viability to the Population or Species" was made for Cache's beardtongue, Townsend's big-eared bat, wolverine, trumpeter swan, northern goshawk, the three sensitive owl species which occur or may occur in the area, the northern three-toed woodpecker, the spotted frog, and the Yellowstone (fine-spotted) cutthroat trout. This finding is warranted in cases where the effects of activities or actions on a species or its habitat are minor, or are consistent with Conservation Strategies of conservation of the species. The rationale for these determinations is presented in this section.

In total, the Proposed Action would result in disturbance to approximately 559 acres of conifer, aspen, and mixed aspen/conifer habitat. All three of these habitat types could be used by foraging flammulated and boreal owls.

In addition to the loss of potential flammulated and boreal owl foraging and nesting habitat (species known to occur in the project area) the Proposed Action would remove this same 559 acres of habitat from potential use by goshawks and great gray owls, which are known to occur near the project area, and from other sensitive species which may utilize the project area on an irregular or incidental basis. Both goshawks and great gray owls may also forage in the more open mixed brush and sagebrush habitat types. A total of 60 acres of these habitat types would be disturbed by the Proposed Action. Great gray owls would, as described above, be expected to forage more in edge habitats than in dense forest.

Reclamation would restore a majority of disturbed habitats, but a significant time lag would exist between reclamation implementation and establishment of forest habitat types. Approximately eight acres of the proposed Panel B high wall, and five acres of the Panel C high wall, would not be reclaimed. Under the Proposed Action, a total of 822 acres, out of the 835 acres disturbed, would be reclaimed. A total of 13 acres of highwall would be left unreclaimed.

The Proposed Action incorporates measures to limit the mobilization and migration of selenium and other trace elements or contaminants from the project area into nearby streams or surrounding aquatic habitat.

Issue Indicators

The indicators used to assess impacts to threatened, endangered or sensitive species are the levels to which the Proposed Action and Alternatives are likely to affect listed species or critical habitat; likely to jeopardize the continued existence of listed species; or likely to contribute toward Federal listing or to cause a loss of viability to populations of sensitive species, or specific populations of a sensitive species.

4.9.1 Direct and Indirect Impacts

Proposed Action

Existing information and the baseline surveys indicate that several threatened, endangered, or candidate species which have the potential to occur in the area either are unlikely to occur, or habitat for these species does not occur in the project area. Specifically, the baseline surveys found that potentially suitable habitat for the slick-spot peppergrass does not occur in or near the project area. The one

reported occurrence of slick-spot peppergrass on the Caribou-Targhee National Forest is a questionable record, and the Forest Service is considering removing this species from the Caribou-Targhee sensitive species list. The baseline surveys also concluded that while potential habitat for Ute ladies'-tresses, as identified by the USFWS (1992), exists on lower Roberts Creek, near the survey area, no Ute ladies'-tresses were found during the baseline surveys. The Proposed Action may affect potential habitat of this species, but is not expected to adversely affect any known individuals or populations of this species.

Potential habitat for the gray wolf exists in the area, but the proximity of active mining, logging and frequent human visitation would be expected to limit use of the area by this species. The baseline surveys found no evidence of these species in the area. During a January, 2001 track survey in the Manning Creek area, approximately six miles south of the project area, JBR recorded a single set of wolf tracks. These tracks indicated the wolf may have been following a small group of elk through the area. The Proposed Action may affect potential habitat of these species, but is not expected to adversely these species.

Other listed species discussed above have some potential to occur in the project area, and are discussed in more detail below.

Canada Lynx (Lynx canadensis)

Threatened

While evidence suggests lynx may only rarely occur in the project area, Canada lynx may use portions of the area as travel corridors or linkage habitat. The Proposed Action would result in disturbance to approximately 618 acres of undisturbed habitat. This undisturbed area includes conifer habitat dominated by lodgepole pine, Douglas-fir, and subalpine fir. Smaller amounts of Englemann spruce are also present. **Table 4.9-1** presents a breakdown of these impacts, by habitat type, and summarizes the impacts to each habitat type present in the baseline survey area and cumulative effects analysis area.

As described in Section 3.5, the majority of habitats impacted by the Proposed Action would be the conifer type, which includes a mix of lodgepole pine, Douglas-fir, and subalpine fir. Englemann spruce is less common in the area, and is found primarily in the cool, shady portions of Smoky Canyon. As noted in Section 3.9.3, Canada lynx seem to prefer to move through continuous forest, and frequently use ridges, saddles and riparian areas, and may avoid open areas, at least during daily movements within their home range (**Figure 4.9-1**). Impacts would occur near the lower edge of forested habitats in the Webster Range, rather than in the more continuous forest to the west, or in riparian corridors. Impacts on the ridge above Sage Valley would occur in habitats already partially disturbed by mining operations. Accordingly, the Proposed Action is expected to result in minimal impacts on potential lynx habitat connectivity.

While portions of this habitat may be suitable for lynx, particularly in shaded areas of Smoky Canyon, baseline surveys detected no evidence of lynx in the area, and no confirmed lynx sightings have been made in the area for many years. The project may affect potential lynx linkage habitat, but based on available information, would be unlikely to adversely affect Canada lynx.

Table 4.9-1 Current Extent (Acreage) of Identified Vegetation Types Present in the Baseline Survey Area and Cumulative Effects Analysis Area, and Acreage and Percent of each Type that would be Impacted by the Proposed Action

Vegetation Type	Proposed Impacts[1]	Baseline Survey Area[2]	Percent Impacted[3]	Cumulative Effects Area[4]	Percent Impacted[5]
Agricultural	0	0	0	2,106	0
Aspen	14	1,384	1.0	4,700	0.3
Aspen/Conifer Mixed	13	1,208	1.1	1,939	0.7
Conifer	532	2,164	24.6	4,592	11.6
Mined Land	217	577	37.6	1,342	16.2
Mixed Shrubs	30	126	23.5	255	11.6
Riparian/Wetland	<1.0	21	4.8	514	0.2
Sagebrush	30	2,119	1.4	10,504	0.3
Water	0	0	0	560	0
Total	835	7,599	11.0	26,512	3.1

[1] Based on vegetation mapping by Maxim (Maxim, 2000d; Figure 7-1). Project Area equals the proposed Panels B and C and Overburden Disposal Site.
[2] Based on vegetation map created by Maxim (Maxim, 2000d; Figure 7-1). Baseline Survey Area includes the Maxim vegetation study boundary.
[3] Percent of Baseline Survey Area impacted by the Proposed Action.
[4] Based on vegetation map created by Idaho GAP (ICFWRU, 2000; Homer 1998)
[5] Percent of Cumulative Effects Area impacted by the Proposed Action.

Bald Eagle (Haliaeetus leucocephalus)

Threatened

The Proposed Action would not impact any bald eagle nest or roost sites. The principal bald eagle wintering area near the project area appears to be along Crow Creek. This stream would not be impacted by the Proposed Action. While no bald eagles were observed in or near the project area during the 2000 baseline surveys, three sightings were recorded in the area during baseline surveys conducted during the winter of 1978/1979. As Maxim noted, waterfowl utilizing the Smoky Canyon tailings ponds (TP1 and TP2) represent a potential prey base which could attract bald eagles to the area. A recent review of this issue indicates the tailings ponds are partially ice-covered by the time wintering bald eagles arrive on the wintering grounds. (Personal Communication, Betsy Hamann, USFS, November, 2001) Accordingly, the potential for wintering bald eagles to utilize the ponds is considered low. However, should one or more eagles regularly feed on waterfowl which, in turn, forage on the tailings ponds, or should the eagles forage on fish inhabiting the ponds, the eagles could begin to accumulate selenium or other trace elements that may be present in the water. Because eagles have not been recorded foraging at the tailings ponds, it is questionable if the ponds represent a potential source of selenium uptake for eagles. Should bald eagles begin to regularly forage at the tailings ponds, however, the potential to adversely affect individual birds would exist. Should bald eagles begin to utilize the tailings ponds on a regular basis, Simplot would approach the USFWS regarding the use of mitigation techniques.

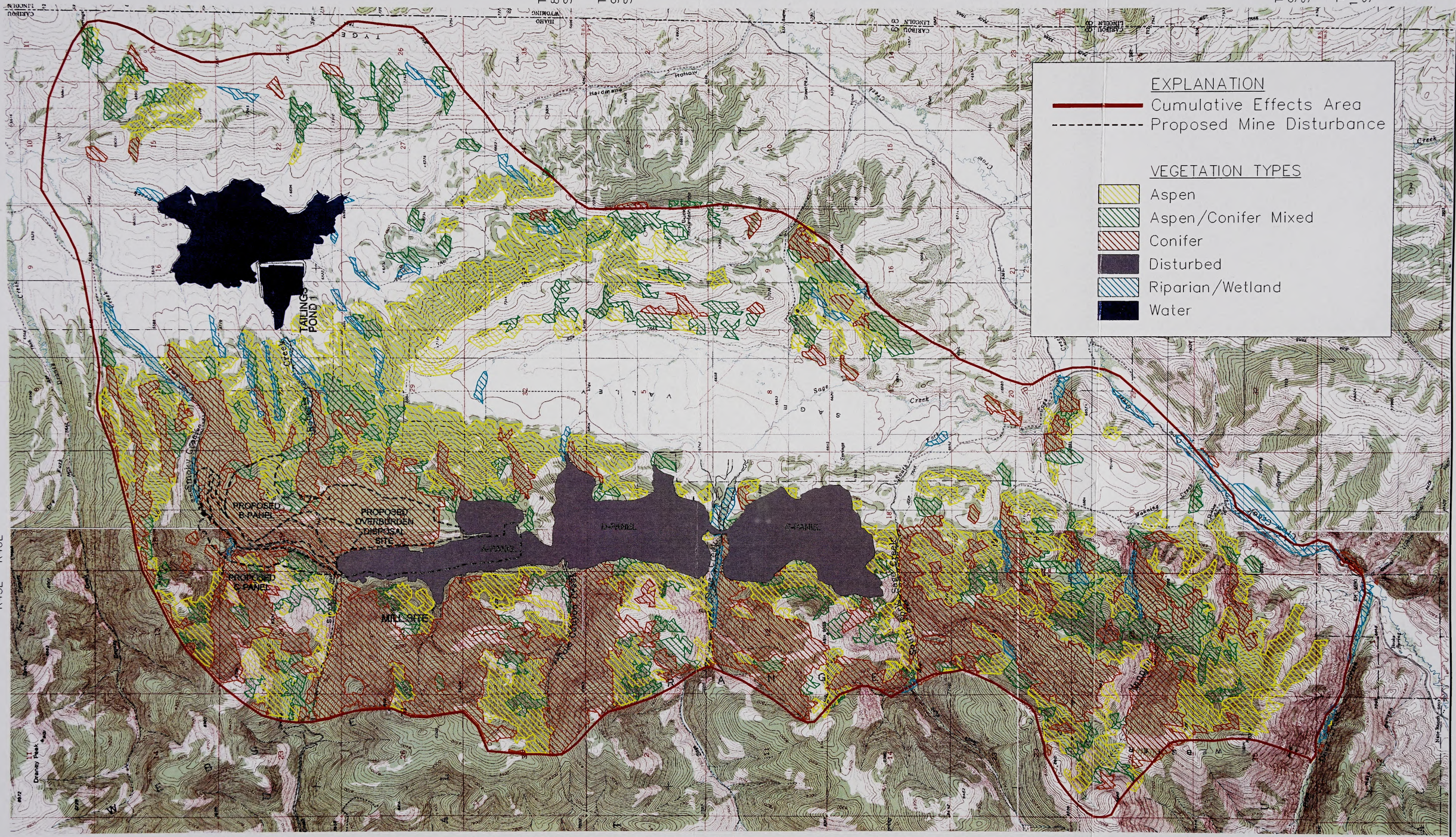

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FIGURE 4.9-1
HABITAT MAP
SIMPLOT SMOKY CANYON MINE PANELS B&C
SUPPLEMENTAL EIS

drawings\SIMPLOT\FSEIS\Figures FSEIS\Figure 4.9-1.dwg (revised 1/16/02)

Whooping Crane (Grus americanus)

Endangered

The Proposed Action would occur in foothill and mountain habitats of the Webster Range, so would not impact potential whooping crane habitat. Should one or more whooping cranes begin to utilize the tailings ponds as a foraging area, the potential for the birds to begin accumulating trace elements would exist. With only a single whooping crane now present in the Grays Lake flock, however, this possibility is extremely remote.

Sensitive Species

The baseline surveys found that potentially suitable habitat for Payson's bladderpod and spotted bats does not occur in or near the project area. Because no outcrops of the Twin Creeks Limestone occur in the area, no potential starveling milkvetch habitat is present in the project area.

Baseline surveys and a review of existing information indicates that Columbian sharp-tailed grouse and Bonneville cutthroat trout do not occur in the project area.

The baseline surveys identified potential Cache's beardtongue habitat along the ridge of Panels B and C and in the ridge top overburden disposal area (Maxim, 2000d). This species, however, generally occurs at elevations above those found in the project area, and no evidence of this species was found in the survey area.

Townsend's Big-eared Bat (Corynorhinus townsendii)

Sensitive

The lack of big-eared bat detections in the area and the limited habitat present suggests that the species either is not present, or is present in only low numbers, in the area. Based on the results of their studies, Maxim (2000e) concluded no big-eared bat maternity colonies are present in the area.

Wolverine (Gulo gulo)

Sensitive

Maxim surveyed the project area for wolverine and other furbearers, using tracking survey methodology described by Zielinski and Kucera (1995). No evidence of wolverine presence was detected during these surveys. However, Ms. Betsy Hamann, Wildlife Biologist on the Caribou-Targhee National Forest, noted that a wolverine sighting was reported near Wood Canyon in the Preuss Range, approximately 27 miles south of the project area, in 1992. Ms. Hamann also stated that wolverines have been recorded in the Bear River Range south of Soda Springs.

Like the lynx and gray wolf, wolverines generally inhabit large tracts of undisturbed forest habitat. Wolverines may pass through the area, but would not be expected to frequent areas which are subject to frequent human activity. The project may affect potential wolverine habitat, but would be unlikely to adversely affect wolverines.

Trumpeter Swan (Cygnus buccinator)

Sensitive

Maxim did not record trumpeter swans in the project area during the baseline studies conducted for the SEIS (Maxim, 2000e). Swans could potentially utilize the tailings ponds as resting or possible foraging or nesting habitat. Extended foraging on the tailings ponds could expose swans to selenium or other trace metals accumulation. Should trumpeter swans begin to utilize the tailings ponds on a regular basis,

Simplot would approach the USFWS regarding the use of mitigation techniques.

Harlequin Duck (Histrionicus histrionicus)

Sensitive

The small streams in and near the Proposed Action area do not represent typical harlequin duck foraging or nesting habitat. Harlequin ducks may stop briefly in the project area or on the tailings ponds, but would not be expected to remain in the area for extended periods.

Northern Goshawk (Accipiter gentilis)

Sensitive

Maxim noted that while much of the project area is considered potential northern goshawk habitat, no goshawks were observed, and no nests or other evidence of goshawks were found in the project area. A goshawk nesting territory is reported to exist approximately one mile west of the project area, however, and goshawks may utilize the project area for foraging. Disturbance associated with development of Panels B and C and the associated overburden disposal area would impact approximately 618 acres of undisturbed land. This area represents potential goshawk foraging habitat. This area represents approximately nine percent of the undisturbed habitat in the baseline survey area and less than three percent of the undisturbed, non-water habitat in the Cumulative Effects Area (excluding agricultural land).

Boreal Owl (Aegolius funereus)

Sensitive

Based upon surveys conducted for this SEIS in 2000, Maxim (2000e) concluded the project area represents only marginal boreal owl habitat. However, during surveys conducted by TRC Mariah in 1999, boreal owls responded to taped calls at three locations, one of which was within the footprint of the proposed B Panel Pit. The extent to which boreal owls utilize the area may vary, but impacts to conifer and possibly to aspen habitats would reduce potential boreal habitat in the area. As described below, impacts to occupied habitats would result in some degree of displacement of any resident birds.

Flammulated Owl (Otus flammeolus)

Sensitive

During baseline studies of the project area conducted in the spring of 2000, flammulated owls responded to calls at three locations during the May survey period (Maxim, 2000e). Flammulated owls also responded to taped calls during surveys of the area conducted by TRC Mariah in May of 1999. Searches conducted following the responses to calls during the Maxim baseline surveys in 2000 did not locate any flammulated owl nests. During the 2000 surveys, one flammulated owl responded to calls from a location just northwest of the proposed Panel C. Two responses to calls were obtained east of the Panel B area. The eastern edge of the Panel B pit would approach within approximately 300 feet of one of these two call locations. In all three cases, flammulated owls called in habitat characterized by large diameter Douglas-fir interspersed with aspen and lodgepole pine. The Proposed Action or alternatives would not impact any known flammulated owl nest sites, but would impact approximately 559 acres of aspen, aspen-conifer and conifer habitat. This 559 acre area represents approximately 12 percent of the aspen, aspen-conifer and conifer habitats currently occurring in the baseline survey area and approximately five percent of these habitats occurring in the cumulative effects analysis area. These areas represent potential flammulated owl foraging habitat. Removal of this habitat would reduce available flammulated owl foraging habitat.

Removal of occupied flammulated owl habitat can be expected to result in some displacement of owls from occupied habitat. The extent of displacement is uncertain, but individual birds may be forced to

forage in other nearby habitat. If this habitat is already occupied, increased competition for forage and other resources would occur. Depending on variables such as species, behavior, density, and habitat quality, adjacent populations may experience increased mortality, decreased reproductive rates, or other compensatory or additive responses.

Great Gray Owl (Strix nebulosa)

Sensitive

While no great gray owls were detected during the baseline studies, the project area was considered to represent potential great gray owl habitat. A great gray owl territory has been reported approximately 2.5 miles southwest of the survey area. This territory is outside of the Cumulative Effects Area. Impacts to forest and forest edge habitats could reduce potential great gray owl foraging habitat, but would not impact any known great gray owl nesting territories.

Three-toed Woodpecker (Picoides tridactylus)

Sensitive

Maxim (2000e) found no three-toed woodpeckers or evidence of the species during their baseline surveys. However, three-toed woodpeckers responded to calls, and a pair of the birds were recorded in the Manning Creek area, approximately six miles south of the project area, during surveys conducted in that area in mid-April of 2001. The project area appears to include potentially suitable three-toed woodpecker habitat, and removal of 532 acres of conifer habitat would impact potential three-toed woodpecker foraging habitat. The lack of either detections or other evidence of the species indicates that neither the Proposed Action nor Alternatives A or B would impact known three-toed woodpecker populations. The removal of 532 acres of conifer habitat represents an impact to nearly 25 percent of the conifer habitat present in the baseline survey area, and to approximately 12 percent of the conifer habitat present in the Cumulative Effects Area.

Amphibians

Spotted Frog (Rana pretiosa)

Sensitive

Amphibian and reptile surveys of the project area were conducted during the summer of 2000. No spotted frogs were found during these surveys. Direct impacts of the proposed action would affect slightly over 0.3 acre of wetland habitat. Amphibian populations could, however, be adversely impacted by such indirect effects as increased selenium concentrations in surface waters in sediment ponds in mine area.

Fish

Yellowstone (Snake River Fine Spotted) Cutthroat Trout (Oncorhynchus clarki bouvieri)

Sensitive

Baseline fisheries studies of streams in and below the Panel B and C project area conducted in 2000 found that Smoky Creek supported brook and cutthroat trout from just above beaver ponds near the mouth of Smoky Canyon to Smoky Creek's confluence with Tygee Creek. Both species were also found at the confluence of Tygee and Smoky Creeks. Sampling below the Tailings Pond No. 2 dam found both these trout species and leatherside and Utah chub.

Because the inhabited reaches of Smoky Creek are over a mile downstream from the Proposed Action area, and because the Proposed Action includes measures to avoid impacts to waters inhabited by trout and other fish, the Proposed Action is expected to have no direct effects on fisheries in Lower Smoky

Creek. Management practices are designed to prevent the migration of selenium and other trace elements or contaminants to these waters. Implementation of these practices as a part of the Proposed Action is expected to prevent impacts to Yellowstone cutthroat trout, including the fine spotted trout.

Alternative A - All Seleniferous Overburden to Pit Backfill

Direct impacts to habitats in the project area would be the same under the Proposed Action and Alternative A. Under Alternative A, Simplot would selectively handle and replace all shale and mudstone overburden as backfill in the mine pits. This alternative would eliminate the disposal of material which may contain elevated levels of selenium outside of the open pits. Other overburden materials that do not contain elevated concentrations of selenium would be placed in the ridge top external overburden disposal site that is included in the Proposed Action. The pit and overburden disposal configuration and areas would be the same as the Proposed Action.

This alternative would eliminated the long-term storage of seleniferous overburden outside of the pit limits. Due to additional rehandling of the overburden, this action would extend the completion date of final capping and reclamation by approximately 10 months. BMP's and water management plans applied to the Proposed Action and Alternative A would be the same. The long-term containment of selenium and other contaminants from the overburden would be essentially the same as the Proposed Action because all seleniferous overburden would be covered with the 8 foot cap of chert and 1 to 3 feet of topsoil.

Alternative B - No External Overburden Disposal

Direct impacts to habitats in the project area would be the same under the Proposed Action and Alternative B. Alternative B would incorporate all the components of the revised mine plan but would require Simplot to selectively handle and replace all chert, shale and mudstone overburden as backfill in the mine pits of Panels A, B, and C. This alternative would eliminate the need to develop any new, permanent external overburden disposal area for the proposed mining. To make this alternative possible, however, Simplot would have to temporarily store overburden in the same 244 acre area as the external overburden disposal site included in the Proposed Action or Alternative A and then relocate all of it back into the final pit of Panel B when mining in that panel is completed. The main issue addressed by this alternative is the minimization of potential mobilization of contaminants from the overburden to the environment by replacing all overburden back into the open pits.

This alternative would eliminated the long-term storage of any overburden outside of the pit limits. The additional rehandling of overburden would extend the completion date of final capping and reclamation for this alternative by approximately 21 months. BMP's and water management plans applied to the Proposed Action and Alternative B would be the same. The long-term containment of selenium and other contaminants from the seleniferous overburden would also be the same because all such overburden would be covered with the 8 foot cap of chert and 1 to 3 feet of topsoil.

No Action

Under the No Action Alternative, development of Panels B and C would be delayed until mining and reclamation plans are approved. During this delay, impacts to 618 acres of currently undisturbed habitat would not occur and overburden containing elevated concentrations of selenium would not be excavated.

4.9.2 Irreversible and Irretrievable Commitment of Resources

The Proposed Action would result in the removal of 618 acres of currently undisturbed habitat. Under the Proposed Action and Alternative A, eight acres of the Panel B highwall and five acres of the Panel C highwall would be left unreclaimed. Under Alternative B, five acres of the Panel C highwall would be left unreclaimed.

4.9.3 Residual Adverse Impacts

Development of a mature forest habitat which may be used by Flammulated and boreal owls, and possibly as foraging habitat by goshawks, great gray owls and three-toed woodpeckers, would occur only after an extended period of time.

4.10 Grazing Management

Summary
The Pole Canyon sheep allotment would be impacted by development of Smoky Canyon Mine Panels B and C and the external overburden disposal site. The Proposed Action and Alternatives would disturb existing vegetation by clearing the areas needed for mine operations. One stock water source would be also be affected and access to the allotment would be further impeded by mine development. A key factor in mine reclamation would be selective handling of overburden to ensure that all seleniferous overburden is buried below an 8 foot thick layer of chert overburden and 1 to 3 feet of topsoil. This would prevent the likelihood of potential impacts from selenium accumulation in forage vegetation which could present a hazard to livestock grazing on reclaimed lands. Disturbed areas would be reclaimed by seeding a mix of grass species and application of fertilizer. Potential exists for the further spread of noxious weed species into the project area which could result in a decline in quality of the grazing allotments.

Issue Indicators
Issue indicators include the number of acres suitable for grazing which will be impacted by the Proposed Action and Alternatives, expected changes in vegetative cover over the short and long-term, potential for noxious weed infestation, potential for plants to accumulate selenium in excess of allowable levels, and the extent to which vegetation with elevated selenium levels is likely to be used by livestock.

4.10.1 Direct and Indirect Impacts

Proposed Action
The Proposed Action would directly affect, by disturbance, 618 acres of generally undisturbed land for operation of mine Panels B and C. The Proposed Action would directly affect 14 acres of aspen, 532 acres of conifer forest, and 13 acres of mixed aspen/conifer forest which would be harvested prior to the start of mining operations. Also affected would be 30 acres of mixed shrub, and 30 acres of sagebrush. The Pole Canyon sheep allotment is 12,658 acres in size and these impacts represent less than five percent of the total land area. Conifer forest is considered poor forage for animals grazing the allotment (Mickelsen, 2000a) and impacts to conifer forest represent 86 percent of the total vegetation impacts.

No reduction in animal months permitted on the allotment is likely to result from the proposed mine disturbance.

The 1 to 3 feet of topsoil and 8 feet of chert overburden capping the seleniferous overburden would essentially prevent selenium accumulation from buried seleniferous overburden in forage vegetation growing on reclaimed areas. The initially seeded grass and forb species are not likely to have root penetration much below the layer of topsoil and would, therefore, have no chance of accumulating selenium from seleniferous overburden eight feet below the topsoil. Thus, using topsoil that is low in soluble selenium, these palatable forage species should not present a risk of selenium accumulation to livestock. Nobel (1991) compared the root characteristics of various groups of vegetation and found that winter annuals and perennial grasses generally had maximum root depths of less than one meter.

It is difficult to predict the climax vegetation community that would follow the initial reclamation seeding. When native plants successfully compete with, and eventually replace, the initial reclamation vegetation community, the vegetation mix on reclaimed lands should resemble that which existed before disturbance. The path of succession could be altered by variables such as fire frequency, presence of noxious weeds and non-native species, management practices, and grazing pressure. The initial reclamation vegetative cover of grasses would have a higher value for grazing than the existing climax community of forest and shrubs.

Potential indirect impacts from the Proposed Action include an increase in the area covered by weed species due to ground disturbance. Prevention is the most cost efficient strategy to control noxious weeds but it is almost certain that some species would become established in the reclaimed areas of the project. If noxious weeds are neglected, they may quickly reach a point at which they cannot be controlled with current technology. Quickly establishing native or other desirable vegetation on disturbed areas is important because it provides a source of competition for invasive weed species which degrade the grazing potential of grasslands.

The Proposed Action would result in the temporary relocation of a water trough at Sheep Spring north of Smoky Creek Road. The trough would be relocated and could be restored to its original location after reclamation of the mine pit, if necessary. No impact to grazing would result if the trough is relocated. The trough may need to be permanently relocated if it is determined that sheep can no longer graze on the reclaimed mine area near the trough.

Development of the Proposed Action would affect access to the Pole Canyon allotment because sheep would not be allowed to cross active mine pits or reclaimed areas until they are reclaimed sufficiently.

Alternative A - All Seleniferous Overburden to Pit Backfill

Alternative A would directly affect 618 acres with new disturbance from mine operations. The areas of disturbance to vegetative communities would be the same as under the Proposed Action. Under this alternative, all seleniferous overburden would be placed as backfill in Panels A, B, and C. Capping the seleniferous pit backfill would be approximately 8 feet of chert overburden and 1 to 3 feet of topsoil. The ridge top external overburden disposal site would contain only chert and limestone overburden and, therefore, no chert cap would be necessary on this area.

The identical cap thickness suggests that Alternative A would be as effective in isolating seleniferous overburden from the surface environment as the Proposed Action. Thus, direct and indirect impacts from

Alternative A would be nearly the same as those from the Proposed Action. This alternative would extend the completion date of the reclamation of the B pit by approximately 10 months which would delay completion of reclamation by the same amount.

Alternative B - No External Overburden Disposal
Alternative B would directly affect 618 acres with new disturbance from mine operations. Although no permanent external overburden storage is required under this alternative, temporary external overburden storage would result in the need for disturbance of the same site as the external overburden disposal area in the Proposed Action and Alternative A. The area of disturbance is therefore the same as for the Proposed Action and Alternative A. Under Alternative B, all overburden would be placed as backfill in Panels A, B, and C. Selective handling of mine overburden would be practiced so that the seleniferous pit backfill would be capped with approximately 8 feet of chert overburden and 1 to 3 feet of topsoil.

The 8 foot thick chert cap and 1 to 3 feet of topsoil on seleniferous fill areas would isolate seleniferous overburden from the environment, as effectively as under the Proposed Action or Alternative A. This alternative would extend the completion date of the reclamation of the B pit by approximately 21 months.

No Action
The No Action Alternative would result in no additional impacts to livestock grazing allotments until mining and reclamation plans for mining Panels B and C are approved.

4.10.2 Irreversible and Irretrievable Commitment of Resources

No natural or depletable forage vegetation resources are likely to be permanently lost as a result of implementation of the Proposed Action or Alternatives when suitable forage plants are successfully established on reclaimed areas. Permanent loss of forage production for livestock would result only if restoration of forage plants in reclaimed areas was not successful.

4.10.3 Residual Adverse Impacts

No residual adverse impacts to grazing are expected as a result of implementation of the Proposed Action or Alternatives when reclamation is successful and the chert caps effectively isolate the seleniferous overburden from the environment. There would be a significant, although unknown, delay before the reclaimed areas are again available for livestock grazing and unhindered access to the Pole Canyon allotment is restored.

4.11 Recreation and Wilderness

Summary
Potential impacts of the Proposed Action and Alternatives on recreation would be predominantly limited to hunting activities in the vicinity of the Proposed Action. Much of the current access is limited due to the presence of private land to the east and minimal road routes through the area. Based on information from the USFS, the impact of the mine would only affect a few hunters who may have traditionally used the Proposed Action area. Potential impacts may include alterations in hunting patterns, due to the potential relocation of wildlife and increasing the use of other areas for hunting. The short-term increase in game density would be followed by the decreased wildlife numbers that normally follow the reduction

of habitat. This would increase the density of hunters in certain areas and may diminish big game yields (USFS, 1981).

This project would have a minimal adverse impact on the dispersed recreational opportunities without an appreciable gain in developed recreational attributes. Surrounding areas could provide and easily support displaced recreational opportunities (BLM and USFS, 1992). There are no federally designated wilderness areas involved in the project area or the Cumulative Effects Area.

Issue Indicators

Issue indicators for recreation and wilderness include: direct impacts on wilderness areas, impacts on wild and scenic rivers, the extent to which the Proposed Action and Alternatives would change or restrict access to public land for recreational and wilderness experiences and change in the ability of the land to support historic recreational activities.

4.11.1 Direct and Indirect Impacts

Proposed Action

Under the Proposed Action, recreationists who have traditionally used the Proposed Action area to either hunt or for other recreational activities would have to use other areas along the Smoky Canyon Road or in the general vicinity for the period required by Simplot to extract the ore and reclaim the proposed disturbance areas. Under the Proposed Action, access and use by the public for recreational use would be restricted on over 835 acres. Land utilized primarily for the development of two open pits and an overburden disposal area would be temporarily removed from recreational use until reclamation is completed and successful including some residual highwalls. Although recreationists would be temporarily displaced from these areas, the surrounding lands can easily support this adjustment. Since no new public roads are proposed to be built with the Proposed Action, increased wildlife harassment, over-harvesting, and poaching are not anticipated to occur.

Although the Smoky Canyon access road is located between Panels B and C, public access along this road would not be restricted. Travelers along the road would be required to travel through two safety guard stations at the new haul road crossings of the public road. Public access from the east to the Diamond Creek Campground, Webster Ridge Trail, or USFS lands would not be restricted as a result of the implementation of the Proposed Action. Access to these areas during the summer months via vehicles would continue to occur. In addition, access to these areas during winter months would continue to occur via snowmobile. Public vehicle parking for snowmobile use along upper Smoky Creek is currently limited. This limitation in vehicle parking for snowmobile use would continue with or without the implementation of the Proposed Action.

Since federally designated Wilderness Areas do not exist within or in the vicinity of the Proposed Action area, impacts to Wilderness Areas will not occur as a result of implementation of the Proposed Action. Since the Proposed Action is located outside and adjacent to federally designated Roadless Areas, no direct impacts to Roadless Areas is anticipated. Upon the completion of the Proposed Action, the Smoky Canyon Road will not be relocated or reclaimed; however, the surrounding mining area (Panels B and C) would be reclaimed. As such, with the implementation of reclamation activities on mined lands, the fact that the Smoky Canyon access road will not be reclaimed, and due to the existing topography of the area, vehicular access to designated roadless areas adjacent to the Proposed Action area is not anticipated to change during or upon the cessation of mining activities.

Due to the intermittent nature of Smoky Canyon Creek in the vicinity of the proposed project area, and the fact that the proposed project is not anticipated to result in major reductions in the perennial flow of lower Smoky Creek, impacts to recreational fishing are not anticipated in the Proposed Action area.

Since Smoky Creek is not currently designated or proposed for study as a Wild and Scenic River, no impacts to the Wild and Scenic Designation would occur from the Proposed Action or Alternatives.

Alternative A - All Seleniferous Overburden to Pit Backfill
Implementation of Alternative A would disturb the same "footprint" as the Proposed Action and would result in the same impacts to recreation and wilderness as the Proposed Action. However, the completion of reclamation efforts would extend for an additional 10 months. Therefore, the public would be restricted from accessing the mined area for at least an additional 10 months beyond the time frame of the Proposed Action.

Implementation of Alternative A would not result in any impacts to federally designated Roadless Areas, Wilderness Areas, or Wild and Scenic Rivers.

Alternative B - No External Overburden Disposal
Implementation of Alternative B would disturb the same footprint as the Proposed Action and result in the same recreation and wilderness impacts as the Proposed Action. Reclamation and hunter displacement would occur for an additional 21 months following cessation of mining beyond the time frame of the Proposed Action. Under Alternative B, all of the overburden material would be placed in the A, B, and C Panel pits eliminating the need to develop any permanent external overburden disposal areas. The placement of additional overburden material within Panel B would also result in elimination of the highwall in that panel and result in a reduction of safety issues to future recreationists in the area. Specifically, since the length of remaining highwall after reclamation would be reduced, future recreationists within the area are less likely to be attracted to it and injured from falling along the highwall.

No impacts to federally designated Wilderness Areas, Roadless Areas, or Wild and Scenic Rivers would occur as a result of implementation of Alternative B.

No Action
Under the No Action Alternative, approximately 618 acres of land would not be mined or disturbed until mining and reclamation plans are approved and this area would continue to be available to recreationists, the majority being hunters. Access through Smoky Canyon by recreationists would continue with no additional direction from the mining company (i.e., manned crossing safety stations and additional signage would not be constructed). Limited parking for vehicles with snowmobiles would continue along Smoky Canyon Road.

4.11.2 Irreversible and Irretrievable Commitment of Resources

There would be no irreversible or irretrievable commitment of recreation resources as a result of this Proposed Action or Alternatives once the area has been reclaimed and this reclamation is deemed successful.

4.11.3 Residual Adverse Impacts

No residual adverse effects to recreation are expected to occur as a result of the implementation of the Proposed Action or Alternatives. Full and successful reclamation of disturbed areas would allow recreational use to return to similar levels as found under pre-mine conditions. Mined area would be reclaimed; however, the restored areas would initially become grasslands with some residual highwalls. The original vegetation community would not initially return to reclaimed areas, but big game and other wildlife are expected to utilize these grasslands for forage. Although it may take a considerable (~200 years) length of time, it is likely that areas previously vegetated with forests and shrub lands would return to their original cover type by natural succession. This process could be accelerated by modifying the reclamation plan to include planting of native shrubs and trees in suitable areas. Adverse residual impacts are not anticipated as a result of the proposed project.

4.12 Visual Resources

Summary

The proposed operations would result in disturbance of natural slopes on either side of Smoky Canyon, as well as visual changes resulting from backfill of currently open pits. Impacts to visual resources would result from vegetation removal, exposure of soil and rock and topographic changes, placement of external overburden, and reclamation. The severity of these impacts is tempered by the reduced level of viewer sensitivity in the area which contains secondary travel routes, and receives limited dispersed use. As seeded vegetation becomes established on reclaimed surfaces, visual scars from mining and backfilling will become less obvious in the landscape, and will comply with the Visual Quality Objectives (VQO's) described in the Draft Revised Forest Plan (USFS, 2001).

Issue Indicators

Issue indicators for visual resources include: evaluation of the current and proposed conditions using the USFS Visual Management System and comparison of the proposed visual modifications with the USFS Visual Quality Objectives for the area.

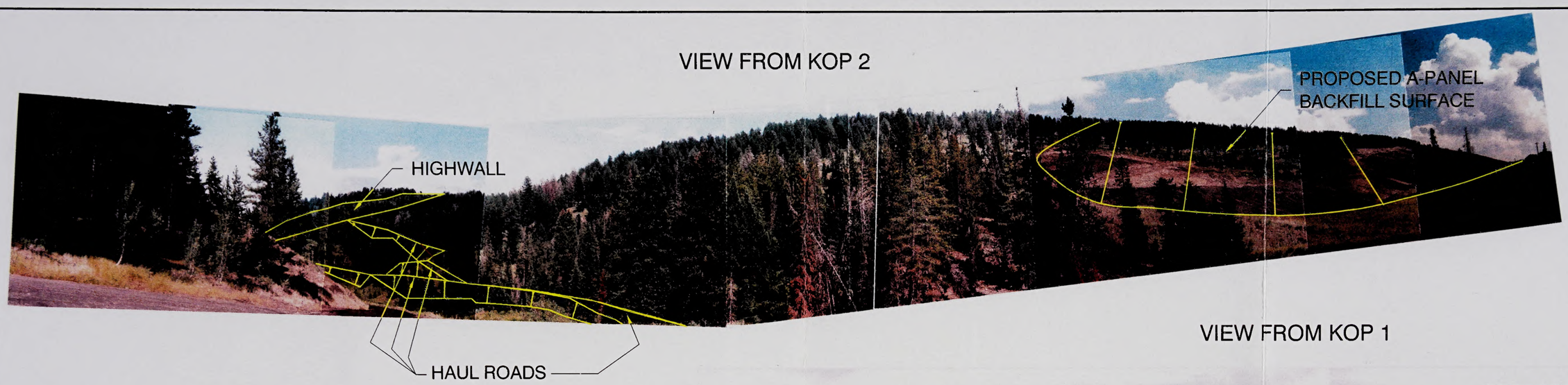
4.12.1 Direct and Indirect Impacts

Proposed Action

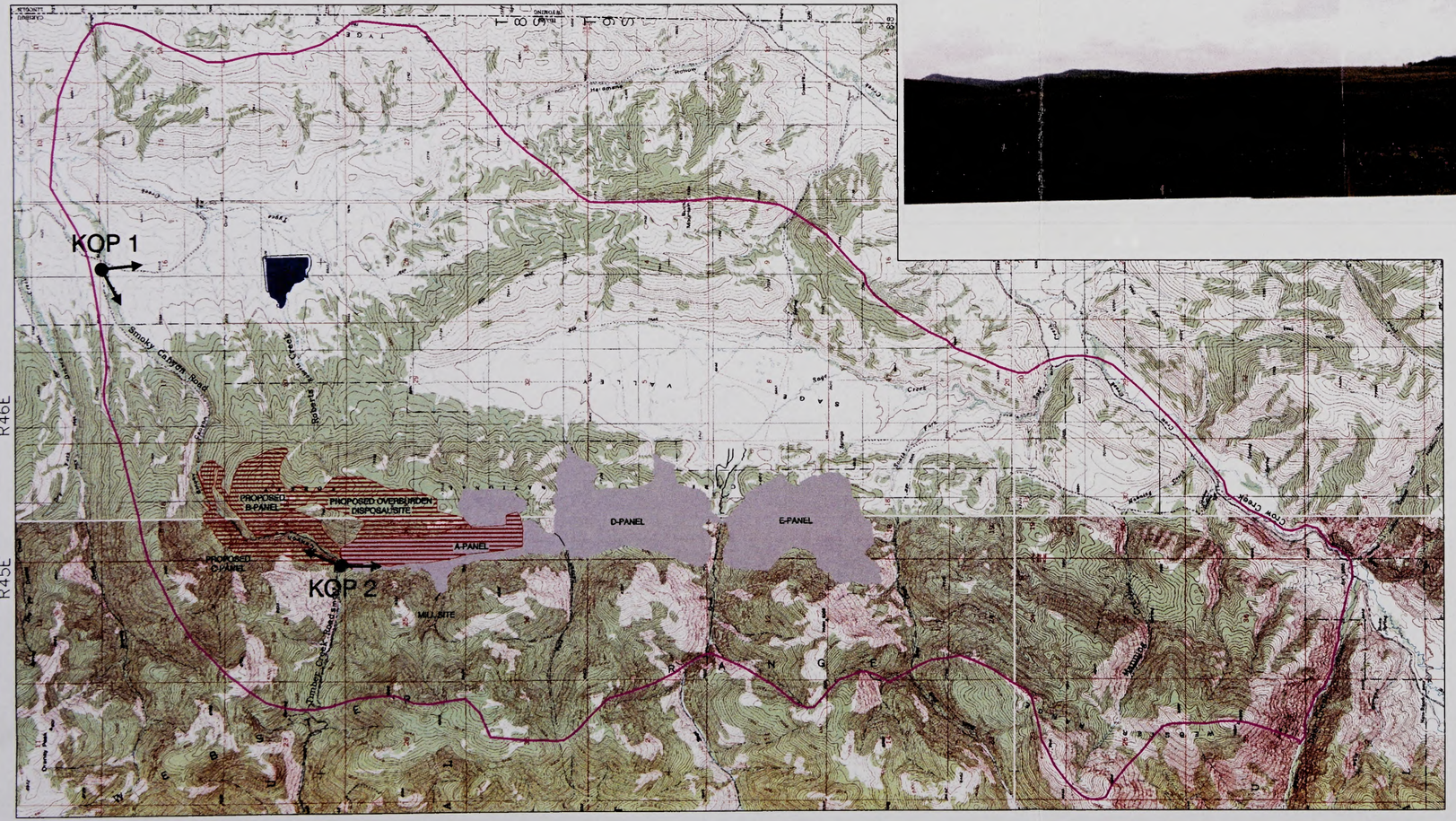
Visual impacts would result initially from the stripping of vegetation, including timber, from the proposed mining panels and the external overburden site (**Figure 4.12-1**). These clear-cuts would effect a fairly drastic change to the color and texture pattern of the existing landscape and would be visible from both KOP #1 and KOP #2. Both B and C pits and haul roads would be evident from the Smoky Canyon Road during mining, but would be buffered by a strip of remaining trees along much of the road. The rock gabion retaining wall would be visible from Smoky Canyon Road. Areas cleared of timber, and other mining activity such as overburden removal and hauling, may be visible to hunters and recreationists at upper elevations in the surrounding area.

As mining progresses, the backfill into Pit A would become obvious from the Smoky Canyon Road. The complete backfill of Panel A would provide a more natural slope than the current open pit (**Figure 4.12-2**). Eventual revegetation of this slope would contrast in color from any remaining dark green conifer cover

VIEW FROM KOP 2



VIEW FROM KOP 1



EXPLANATION
- Cumulative Effects Area Boundary
- Existing Mine Disturbance
- Existing Tailings Ponds
- Proposed Mine Disturbance
- KOP 2 Key Observation Point

N

5000 0 5000 FEET

FIGURE 4.12-1
POST-MINING VIEWS
SIMPLOT SMOKY CANYON MINE PANELS B&C
SUPPLEMENTAL EIS

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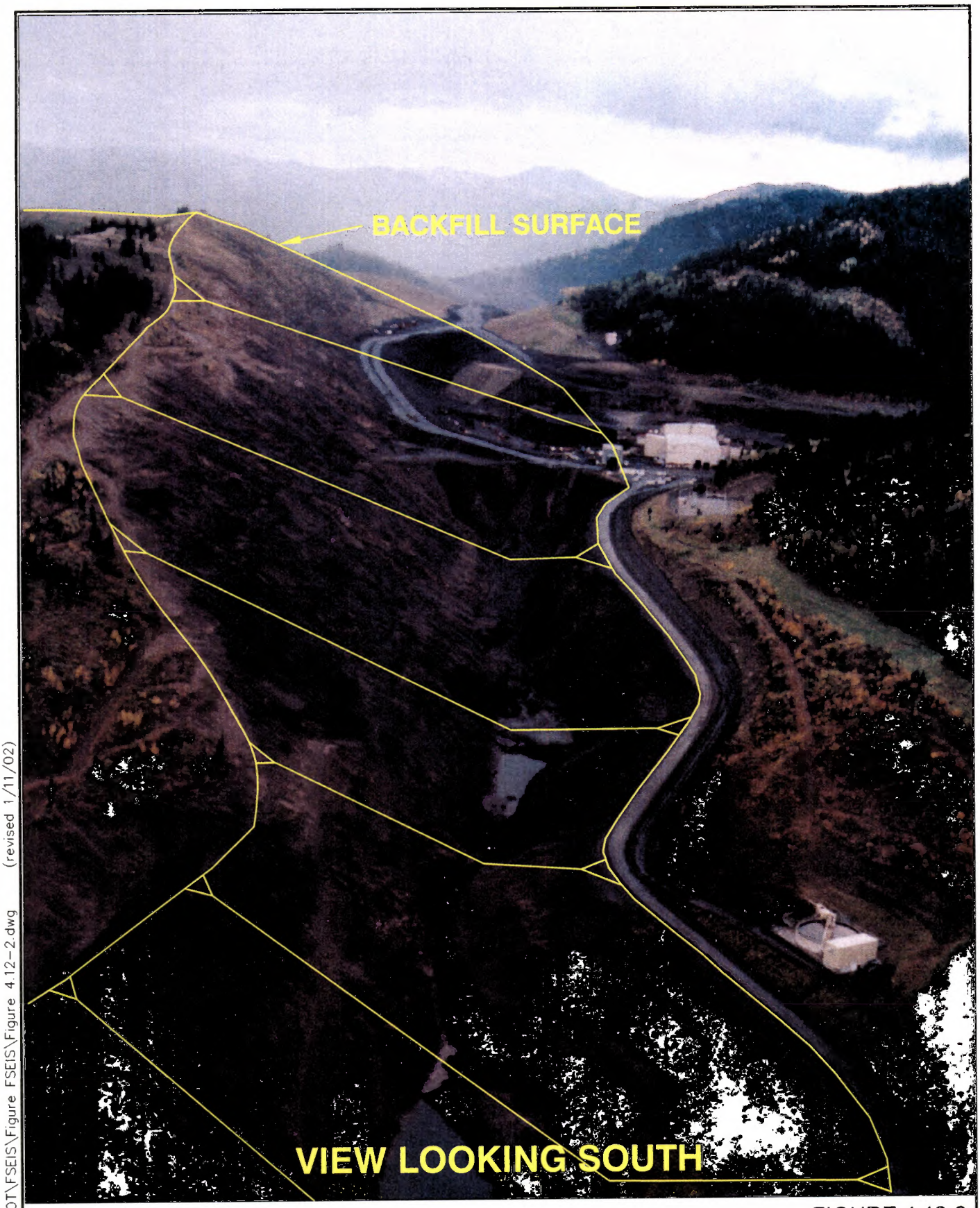

FIGURE 4.12-2
PANEL A AERIAL PHOTO
SIMPLOT SMOKY CANYON MINE PANELS B&C
SUPPLEMENTAL EIS

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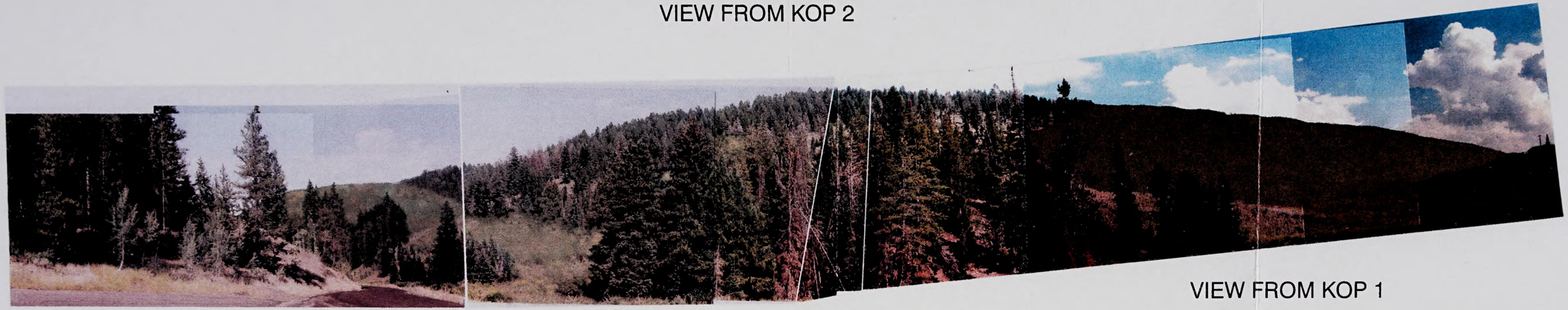
VIEW FROM KOP 2



VIEW FROM KOP 1

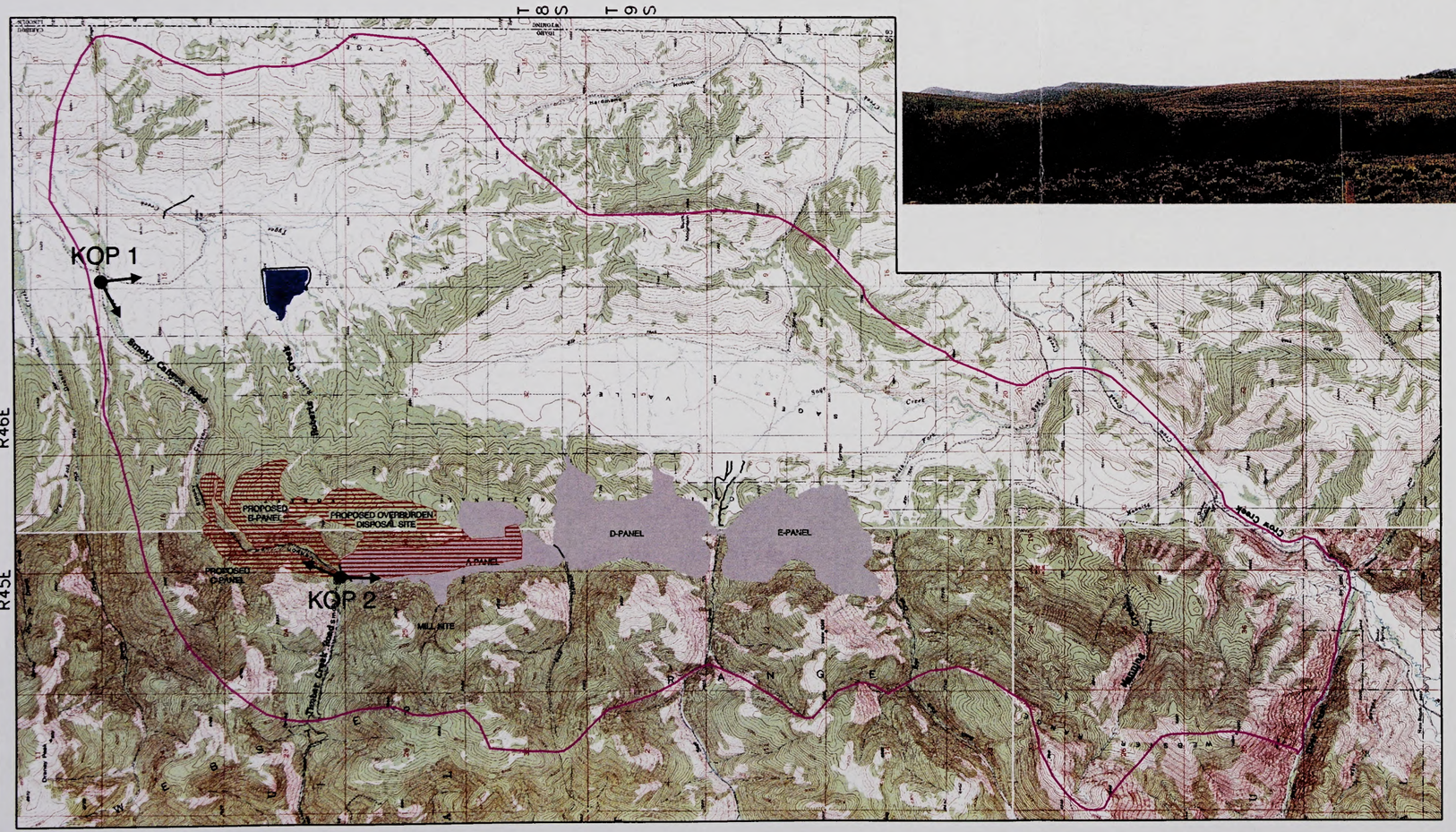


FIGURE 4.12-3
POST-RECLAMATION VIEWS
SIMPLOT SMOKY CANYON MINE PANELS B&C
SUPPLEMENTAL EIS

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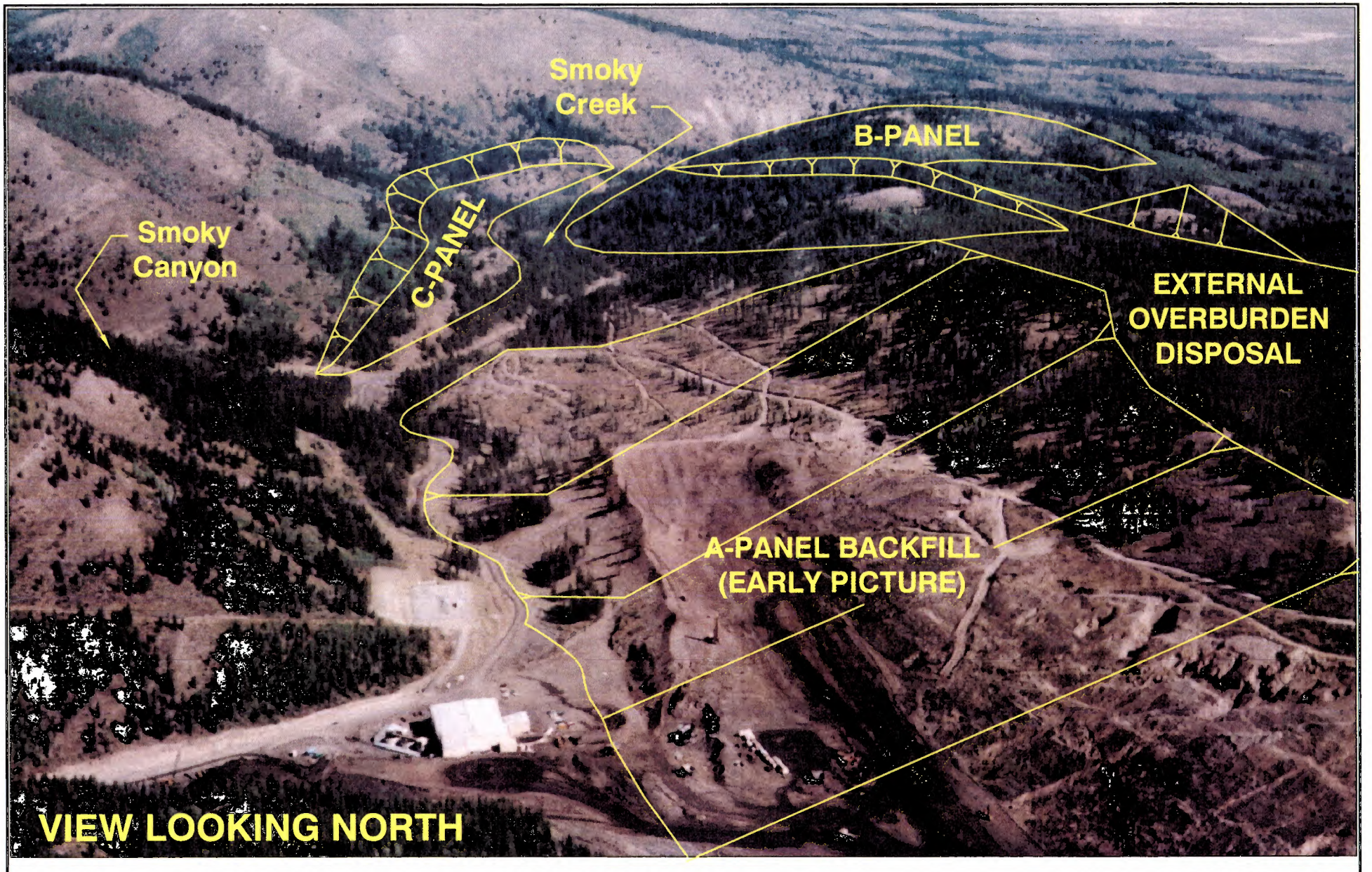

FIGURE 4.12-4
PROPOSED ACTION AERIAL PHOTO
SIMPLOT SMOKY CANYON MINE PANELS B&C
SUPPLEMENTAL EIS

on adjacent slopes. The expected time frame is three to five years for the bright green revegetation community to become established and apparent.

Mining of Panel B would essentially take the top off a large hill slope, dramatically changing the line, form, colors, and texture of the landscape in view from KOP #1. The remaining highwall would not be visible from the Smoky Canyon Road. Pit backfill, recontouring, and revegetation would allow Panel B to blend somewhat with the many ridge lines, drainages, and vegetation of the area, but the rounded hilltop would be evident as a bright patch in the landscape (**Figure 4.12-3**). Unvegetated runoff recharge areas would show from a distance as an uneven line along the base of the external overburden site.

The VQO of Partial Retention would not be met under the Proposed Action or Alternatives in the short term. The Maximum Modification VQO would be met under these actions. The appropriate VQO for this mining area was suggested as Modification or Maximum Modification. The Revised Forest Plan suggests that Modification or Maximum Modification generally occur in "unseen areas" of phosphate mining. The Partial Retention areas are foreground, middleground, and background for primary and secondary travelways (USFS, 2001). Visual impacts of the proposed action in general are moderated to some extent by the curved, irregular shapes of the panels and overburden site, and existing patches of vegetation on various slope surfaces in the area (**Figure 4.12-4**).

Alternative A - All Seleniferous Overburden to Pit Backfill
Visual impacts under this alternative would essentially be the same as that for the revised Proposed Action, however the duration of active mining impact would be extended by 10 months until completed reclamation of the B pit.

Alternative B - No External Overburden Disposal
Under Alternative B, the visual impacts would be similar to those for the Proposed Action, however the final topographic lines in the area of the proposed external overburden site would be nearly the same as they are presently, since that site would be a temporary storage site only. Vegetation would be removed in this area, however, and it would require reclamation. The duration of the mine activities would be extended by 21 months under this alternative.

No Action
Under the No Action Alternative, there would be no additional visual impacts along the Smoky Canyon Road until the mining and reclamation plan for Panels B and C is approved.

4.12.2 Irreversible and Irretrievable Commitment of Resources

The irreversible commitment of resources includes the loss of vegetation, and topographic changes which result from large scale mining excavations and backfills. These original characteristic landscapes cannot be re-created. The harvest of approximately 532 acres of mature lodgepole pine on Panels B and C would have an effect upon the visual landscape which lasts for decades.

4.12.3 Residual Adverse Impacts

Upon completion of reclamation, the visual qualities of the project area would contrast in color, texture, and form from patches of undisturbed landscape. These residual impacts would not necessarily be adverse, depending upon the interpretation of the viewer.

4.13 Cultural Resources and Native American Concerns

Summary
One cultural resource site has been identified by previous cultural resource surveys within the proposed area of disturbance. This site is not considered to be eligible for the National Register of Historic Places (NRHP). Another site, the multi-component historic/prehistoric, is between areas of proposed disturbance. It is not considered eligible. Alternatives A or B would not have any impacts on NRHP-eligible cultural resources. One historic feature, a road, needs to be evaluated for integrity and NRHP eligibility, before a determination of impacts can be determined.

Issue Indicators
The primary issue indicator is the determination if any NRHP-eligible sites would be disturbed under the Proposed Action and Alternatives.

4.13.1 Direct and Indirect Impacts

Proposed Action
The proposed Smoky Canyon Mine disturbance for, Panels B and C would have no impact on eligible cultural resources within the proposed area of disturbance. The one historic site recorded within the proposed area of disturbance (Panel B) is not eligible for the NRHP. Another site, a multi-component prehistoric/historic site, is located near the northwest edge of Panel A and near the proposed disturbance area, but is not eligible for the NRHP.

Although neither the mine pits or overburden disposal would impact the Smoky Canyon Road, the construction of haul roads accessing the pits will realign the historic road in two areas. Therefore, the road, which appears as an historic feature on a GLO map, needs to be recorded and evaluated in the field in order to assess possible impacts and before a final statement of impacts to NRHP-eligible sites can be made.

There would be no impacts to known Native American religious sites, traditional cultural places, or treaty rights.

Alternative A - All Seleniferous Overburden to Pit Backfill
Alternative A would have the same disturbance footprint as the Proposed Action and this alternative would have no direct or indirect impacts on NRHP-eligible cultural resource properties.

Alternative B - No External Overburden Disposal
Since Alternative B would have the same disturbance footprint as the Proposed Action, selection of this alternative would have no direct or indirect impacts on NRHP-eligible cultural resource properties.

No Action
Selection of the No Action Alternative would result in no direct or indirect impacts on NRHP-eligible cultural resource properties.

4.13.2 Irreversible and Irretrievable Commitment of Resources

No irreversible or irretrievable commitment of eligible cultural resources have been identified for the Smoky Canyon Panels B and C.

4.13.3 Residual Adverse Impacts

No residual adverse effects to eligible cultural resource sites would occur under the Proposed Action.

4.14 Social and Economic Resources

Summary
Socioeconomic impacts were evaluated at two different levels. The effect on the Star Valley area of Wyoming was evaluated separately due to it not receiving tax money from the Smoky Canyon Mine, while being the residence of most of the mine's employees. The tri-county area of Bannock and Caribou Counties, Idaho and Lincoln County, Wyoming, which is influenced by both the Smoky Canyon Mine and the Pocatello fertilizer plant was also evaluated.

The Smoky Canyon Mine is a significant employer of residents of the Star Valley and is commonly acknowledged to provide the highest paying jobs in the area. The mine employs 207 persons while the associated fertilizer plant near Pocatello, Idaho employs 500 persons. Indirect and induced employment above the direct employment is an additional 1,113 persons. The proposed action would result in continued employment for these persons, as well as continued royalty and tax payments to governments, payroll, and resultant multiplier effect.

Issue Indicators
Issue indicators for social and economic resources include: the local and regional population caused by the Proposed Action and Alternatives, tax revenues and other public financial measurements related to the operations, needs for local and regional public infrastructure, and mining costs and resource utilization related to the mine plans considered.

4.14.1 Direct and Indirect Impacts

Proposed Action - Star Valley, Wyoming
Significant socioeconomic impacts to an area occur when there is a large migration of population into, or out of, the area. The southeastern Idaho phosphate industry is a mature industry, with little prospect of radical changes in size and capacity. Since there is no anticipated change in employment as a result of the Proposed Action, there is no anticipated change in population or in-migration to Caribou County, Idaho or Lincoln County, Wyoming as a result of the Proposed Action. Therefore, the Proposed Action would not result in impacts to community resources such as schools, housing, police and fire protection, and water and sewage services.

The Proposed Action would result in continued employment for approximately 180 residents of the Star Valley at the Smoky Canyon Mine. Annual payroll for these workers is approximately $4.7 million.

Proposed Action - Tri-County Area

The Proposed Action of continuing to operate the Smoky Canyon Mine would result in continued economic benefits to the economy of southeastern Idaho, southwestern Wyoming, and northern Utah. The primary benefits to local and state governments are royalties paid for mining on federally owned land. The Smoky Canyon Mine pays royalties based on the tonnage and grade of ore mined. One half of the royalty is returned to the Idaho state government, which in turn disburses 10 percent of the funds it receives to Caribou County. The operation also pays property taxes directly to Caribou County and other government entities, such as school districts; these payments would continue under the Proposed Action.

The Smoky Canyon Mine is currently paying about $2 million annually in federal mineral royalties. Under the Proposed Action, royalty payments in this range, as adjusted annually, are expected to continue for at least an additional 10 years. Royalty payments in this range would result in about $1 million annually being distributed to the state of Idaho, which in turn would distribute about $100 thousand annually to Caribou County, Idaho. These amounts represent approximately 0.03 percent of the total revenue for the Idaho state government and 0.5 percent of the revenue for Caribou County. The Smoky Canyon Mine accounts for approximately 35 percent of the federal mineral royalties paid in the State of Idaho. In addition to royalties, property taxes, sales taxes, and other taxes paid by the Smoky Canyon Mine and Pocatello fertilizer plant are significant sources of income for various governmental entities. Under the Proposed Action, these tax revenues would continue.

Under the Proposed Action, employment would continue at the Smoky Canyon Mine and the Pocatello fertilizer plant. Direct employment at the Smoky Canyon Mine is 207 while the Pocatello fertilizer plant employs about 500 individuals.

Rehandling and reclamation costs for the Proposed Action and Alternatives were estimated using Means (2002) labor and equipment rates. The rehandling portion of the cost estimate includes loading, hauling, dozing, and road maintenance. The reclamation cost portion includes slope regrading, seeding, fertilizing, and seedling planting. Under the Proposed Action, the total rehandling and reclamation costs are estimated at $4,799,000.

In addition to the direct employment, there is indirect and induced employment. The majority of the operating inputs for the both the Smoky Canyon Mine and the Pocatello fertilizer plant are purchased in southeastern Idaho. Only about five percent of the Pocatello fertilizer plant's production is marketed in southeastern Idaho. It is the 95 percent of the production that is shipped outside of the area that supplies the operating inputs that brings additional funds into southeastern Idaho and results in indirect and induced employment above the direct employment at the Smoky Canyon Mine and the Pocatello fertilizer plant. Appropriate employment multipliers for the miscellaneous mining, and chemical manufacturing and petroleum refining industries in Idaho are 2.3 and 3.3, respectively (USDC, 1992).

A continuing ore supply to the Pocatello fertilizer plant would continue under the Proposed Action. The plant is one of four phosphate fertilizer plants in the western United States and is a significant supplier of phosphate fertilizer to the agricultural industry in the western half of the United States.

Alternative A - All Seleniferous Overburden to Pit Backfill - Star Valley, Wyoming
Alternative A involves selectively handling all seleniferous overburden as backfill for Panels A, B, and C, and capping it with chert overburden and topsoil. Reclamation of Panel B would be extended by an additional 10 months. Simplot does not anticipate additional employees would be required under Alternative A, but current employees will work additional hours. This results in continued wages paid to residents of the Star Valley for the additional 10 months required to reclaim Panel B.

While the additional wages as a result of Alternative A represent a positive economic impact for the Star Valley, it is an additional cost of doing business for the Smoky Canyon Mine. The total estimated incremental cost associated with rehandling and reclamation under Alternative A is $6,052,000 over the cost of reclamation under the Proposed Action. The primary reason for the increased cost is attributed to rehandling (loading, hauling, placing) approximately 16 percent of all the overburden mined in the project. This reduces the profitability of the Smoky Canyon Mine and the Pocatello fertilizer plant. In order to accommodate these increased costs, Simplot may consider revising the mine plan to reduce stripping ratios which could result in less ore being mined and a smaller utilization of the non-renewable phosphate resource.

Alternative A - All Seleniferous Overburden to Pit Backfill - Tri-County Area
The social and economic benefits of Alternative A in the tri-county area of Bannock and Caribou Counties, Idaho and Lincoln County, Wyoming result from the extended time period required to reclaim Panel B. The selective handling of the seleniferous material and chert capping material would require additional parts and supplies for the heavy equipment used. The amount expended by the Smoky Canyon Mine for heavy equipment parts and supplies would increase over the Proposed Action for the additional 10 months required to reclaim Panel B. This represents an additional positive economic impact in southeastern Idaho.

As with the impact of Alternative A on the Star Valley, while the additional cost associate with Alternative A represents a positive economic impact of suppliers to the Smoky Canyon Mine, the cost of Alternative A is an additional cost of doing business for Simplot and reduces the profitability of the operation. Again, the incremental cost of reclamation under Alternative A is $6,052,000 over the reclamation costs of the Proposed Action.

Alternative B - No External Overburden Disposal - Star Valley, Wyoming
Alternative B involves selectively handling and replacing all overburden as backfill to Panels A, B, and C. Reclamation of Panel B would be extended by an additional 21 months. Simplot does not anticipate additional employees will be required under Alternative B, but current employees will work additional hours. This results in wages paid to residents of the Star Valley for the additional 21 months required to reclaim Panel B.

While the additional wages as a result of Alternative B represent a positive economic impact for the Star Valley, it is an additional cost of doing business for the Smoky Canyon Mine. The total estimated incremental cost associated with rehandling and reclamation under Alternative B is $17,900,000 over the cost of the Proposed Action reclamation. The primary reason for the increased cost is attributed to rehandling approximately 36 percent of all the overburden mined in the project. This reduces the profitability of the Smoky Canyon Mine and the Pocatello fertilizer plant. In order to accommodate these increased costs, Simplot may have to reduce stripping ratios and mine less ore than under the Proposed Action or Alternative A. Of the three alternatives that result in continued operation of the mine and

fertilizer plant (the Proposed Action, Alternative A, and Alternative B), Alternative B is the most costly to implement, and would result in the lowest ore recovery and a smaller utilization of the non-renewable phosphate resource.

Alternative B - No External Overburden Disposal - Tri-County Area

The social and economic benefits of Alternative B in the tri-county area of Bannock and Caribou Counties, Idaho and Lincoln County, Wyoming result from the extended time period required to reclaim Panel B. The selective handling of the seleniferous material and chert capping material would require additional parts and supplies for the heavy equipment used. The amount expended by the Smoky Canyon Mine for heavy equipment parts and supplies would increase over the Proposed Action for the additional 21 months required to reclaim Panel B. This represents an additional positive economic impact in southeastern Idaho.

As with the impact of Alternative B on the Star Valley, while the additional cost associate with Alternative B represents a positive economic impact of suppliers to the Smoky Canyon Mine, the cost of Alternative B is an additional cost of doing business for Simplot and reduces the profitability of the operation. Again, the incremental cost of reclamation under Alternative B is $17,900,000 above the reclamation costs under the Proposed Action. Of the three alternatives that result in continued operation of the mine and fertilizer plant (the Proposed Action, Alternative A, and Alternative B), Alternative B is the most costly to implement.

No Action - Star Valley, Wyoming

Under the No Action Alternative, production at the Smoky Canyon Mine would cease in two years (2003), when the current Panel E is mined out. The mine would remained closed until such time a site specific mine plan under Simplot's rights under the Mineral Leasing Act and prior approvals under the National Environmental Policy Act (NEPA) process is approved. The most direct effect of ceasing production at the Smoky Canyon Mine would be approximately 180 residents of the Star Valley becoming unemployed and the loss of approximately $4.7 million in annual mine payroll. The jobs at the Smoky Canyon Mine are widely acknowledged to be among the highest paying available to residents of the Star Valley, and some of the few that include benefits packages such as health care.

In addition to increased unemployment and reduced wages spent in the local economy, increased use of public assistance programs, and decreased quality of life in the Star Valley would result. The community service providers in the Star Valley, the Wyoming Department of Family Services, and the Lincoln County Health Department, would experience an increased demand for their services under the No Action Alternative. It is anticipated that additional personnel may be temporarily needed by these organizations should the Smoky Canyon Mine cease production.

The Star Valley in recent years has experienced an influx of residents from the Jackson Hole area of Wyoming. The No Action alternative may accelerate this change in social structure of the Star Valley. As employees of the Smoky Canyon mine leave the area for alternative employment opportunities, should they become unemployed as a result of the No Action Alternative, residences and real estate in the Star Valley would be available for purchase. The availability of this real estate will undoubtedly come to the attention of real estate developers and agents. The Star Valley's economy would be altered, with a lesser focus on natural resources extraction and a greater emphasis on tourism and land development.

No Action - Tri-County Area

The No Action Alternative would result in the early closure of the Smoky Canyon Mine in two years (2003), when Panel E is mined out. The mine would remain closed until such time a mine plan under Simplot's rights under the Mineral Leasing Act and prior approvals under the NEPA process is approved. Many of the workforce that would be laid off during the mine closure would likely find other permanent employment and/or move out of the area during the time the mine is closed. Direct employment lost as a result of the No Action Alternative would be 207 employees at the Smoky Canyon Mine and about 500 employees at the fertilizer plant in Pocatello, Idaho. In addition to direct employment at the mine and fertilizer plant, there is additional indirect and induced employment of approximately 1,113 persons above the direct employment. Since the majority of the operating inputs for both the mine and the fertilizer plant are purchased in the tri-county area, the majority of the indirect and induced employment is in the tri-county area. These individuals would also experience decreased employment as a result of the no-action alternative.

Royalty payments would cease upon mine closure under the No Action Alternative. This would result in a reduction of approximately $2,000,000 in federal mineral royalties. This would result in a reduction of about $100,000 in royalties distributed to Caribou County, an approximate $900,000 reduction in royalties distributed to the state of Idaho, and about a $1,000,000 reduction in royalties retained by the federal government. These amounts represent approximately 0.03 percent of the total revenue for the Idaho state government and 0.5 percent of the revenue for Caribou County. The No Action Alternative would also result in reductions in the property tax paid to Caribou County and to other local taxing entities such as school districts. The mining industry, of which the phosphate mines are by far the largest component in Caribou County, pay approximately 18 percent of the property taxes paid in Caribou County. Increased use of public assistance and unemployment compensation funds would result from the No Action Alternative as the Smoky Canyon Mine and the Pocatello fertilizer plant close, and remain closed until a mine plan is approved, upon exhaustion of Panel E.

4.14.2 Irreversible and Irretrievable Commitment of Resources

Under the Proposed Action, there would be no irreversible and irretrievable commitment of socioeconomic resources.

Both Alternative A and Alternative B continue operation of the Smoky Canyon Mine, as does the Proposed Action; therefore, they have the same effect on irreversible and irretrievable commitment of socioeconomic resources as would the Proposed Action.

Implementing one of the alternatives that allow for continued operation of the Smoky Canyon Mine has a greater economic value than closing the mine for a period of time and then recommencing operations.

Under the No Action Alternative, there would be an irreversible and irretrievable loss of economic value of the Smoky Canyon Mine. Closing the mine for a period of time and later reopening will likely occur under the No Action alternative, as the E panel is mined out and the mine closes until a revised mine plan is approved. The prices received for phosphate rock and fertilizer have increased very little in the past 15 years. The Producer Price Index (PPI) for SIC Code 147 - Chemical and Fertilizer Mineral Mining increased from 100.2 in October, 1985 to 107.9 in October, 2000, an average annual increase of 0.49 percent. During the same time period, the PPI for SIC Code 2874 - Manufacturing Phosphatic Fertilizers increased from 105.1 to 121.7, an average annual increase of 0.98 percent (Bureau of Labor Statistics,

2000). This small increase in PPI indicates that prices received for products produced by the Smoky Canyon Mine and the Pocatello fertilizer plant are increasing at less than 1 percent annually.

The rate of inflation, as measured by the Consumer Price Index, averaged 3.2 percent from October, 1985 to October 2000, and is currently approximately 2.0 percent (Bureau of Labor Statistics, 2000). The value of products produced by the Smoky Canyon Mine and the Pocatello fertilizer plant are not increasing as fast as the general rate of inflation, which is a good proxy for the change in operating costs of the mine and fertilizer plant.

Given the past of less than 1 percent annual gains in prices received by the Fertilizer and Chemical Mineral Mining and Phosphatic Fertilizer Manufacturing Industries, while inflation is approximately 2.0 percent, current operation of the Smoky Canyon Mine is economically advantageous to future operation of the mine. Large improvements in operating efficiency are extremely unlikely to occur in the near future for mature industries such as phosphate mining and phosphate fertilizer manufacturing.

Under the No Action Alternative, there is high likelihood of the mine ceasing operation until a revised mine plan is approved. Former employees of the Smoky Canyon Mine will leave the Star Valley as alternative employment opportunities arise, and place their residences and real estate up for sale. In recent years, there has been an influx of individuals into the Star Valley from the Jackson Hole area. Placing more real estate in the Star Valley up for sale would undoubtedly increase this influx of individuals into the Star Valley. This will result in an irreversible change in the social characteristics of the Star Valley. Changes in social characteristics of the Star Valley would include an increase in the number of part-time residents, smaller families, and higher incomes, primarily among the newly arrived residents. Additionally, the economic structure of the Star Valley would be irreversibly altered. Natural resources extraction would play a much smaller role in the area's economy while real estate development and tourism would be more important.

4.14.3 Residual Adverse Impacts

There would be no residual adverse impacts to socioeconomic resources as a result of the Proposed Action or Alternatives A and B. While change in the society of the Star Valley may accelerate under the No Action Alternative, whether or not this change is an adverse impact is a matter of opinion. The agricultural and natural resource extraction interests would resist change in the society of the Star Valley, while real estate developers would welcome the change.

4.15 Transportation

Summary

The proposed mining and related activities would not result in increased traffic on area roads or road maintenance requirements and is not expected to create risks to public safety with the road crossing safety guard stations that would be used. The existing roads serving the area are adequate and maintained regularly.

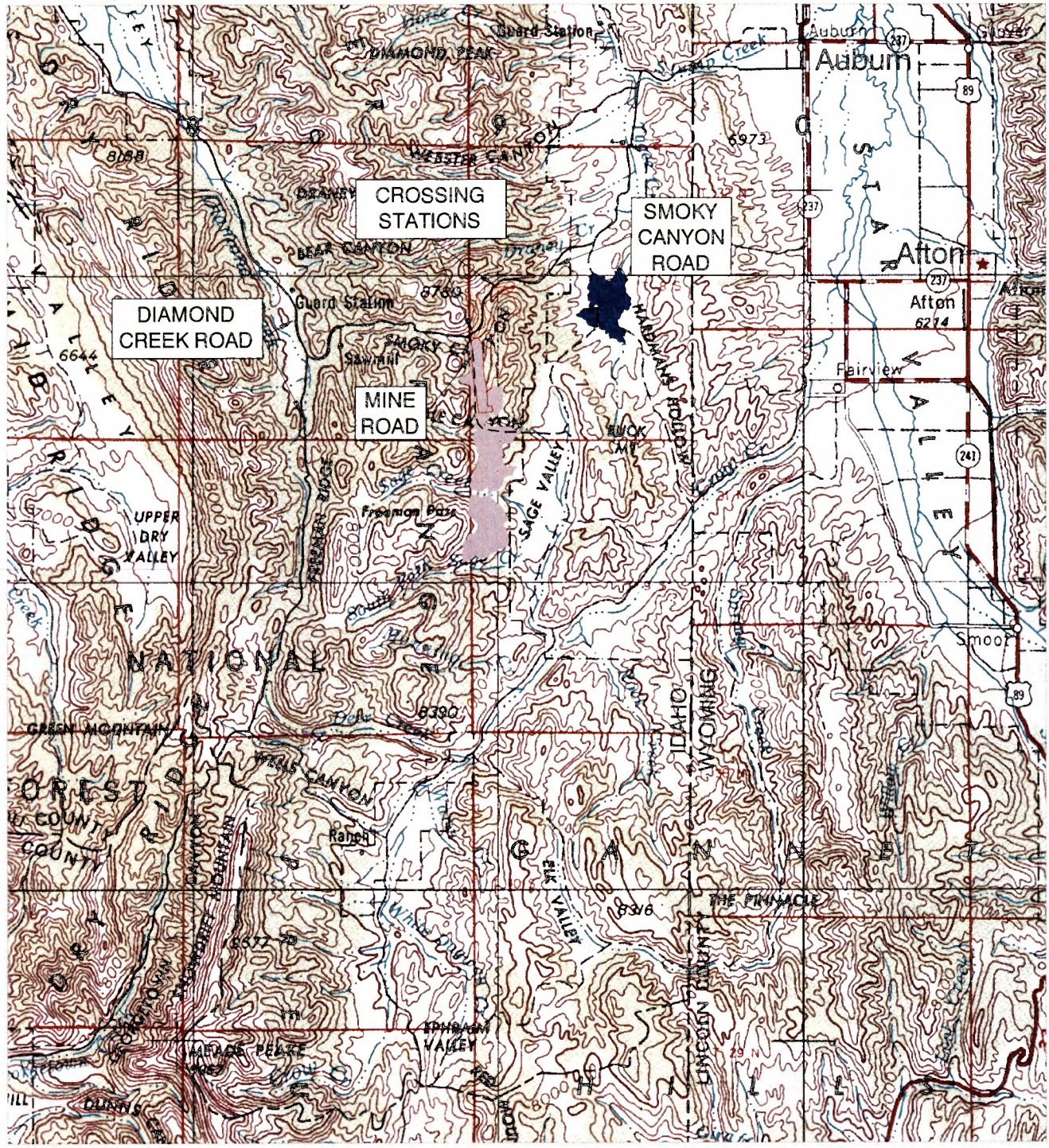

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FIGURE 4.15-1
TRANSPORTATION AND ROADS
SIMPLOT SMOKY CANYON MINE PANELS B&C
SUPPLEMENTAL EIS

Issue Indicators

The primary issue indicator is the degree to which the Proposed Action and Alternatives would affect the use of existing transportation facilities in the general area.

4.15.1 Direct and Indirect Impacts

Proposed Action

The Smoky Canyon Road and Smoky Creek would both be crossed in two locations by haul roads built for the Proposed Action (**Figure 4.15-1**). The lower (northern) road crossing would involve construction of a 45-foot high haul road fill and 300-foot long culvert across the creek. To enable a safe crossing of this road by the existing public access road, a new access road grade would be built up the north side of Smoky Canyon to meet the grade of the new haul road and then be built back down the canyon slope to rejoin the existing access road. This new access road would be built to the same standard as the existing access road.

Construction of this road would temporarily hinder traffic on the Smoky Canyon road but public access would continue during the construction period. The existing Smoky Canyon road would be blocked where it met the new section of access road and it would be preserved in its current condition so it could be restored to its prior condition during removal and reclamation of the haul roads. At that time, the new access road would also be reclaimed by regrading, topsoiling, and revegetation.

The location of the other of the new road fill is at the junction of the Smoky Canyon Road to the mine access road. This stream crossing would be widened to accommodate the 100-foot width of a new haul road exiting the south end of Panel C. Construction of this road crossing would temporarily hinder traffic on the Smoky Canyon road but public access would continue during the construction period.

To provide for public safety, Simplot would build a manned or automatic crossing safety guard station at both locations where the Smoky Canyon Road crossed the two new haul roads. Public traffic would be controlled at these crossings only to the degree required to prevent accidents with mine traffic on the haul roads and to prevent public access up and down the haul roads themselves.

The Proposed Action would not directly result in an increase in employment or required vendor services at the mine so the traffic density on the Smoky Canyon Road from mine-related traffic would not increase. There would be no increase in Transportation impacts in the Cumulative Effects Area from the Proposed Action or Alternatives.

Alternative A - All Seleniferous Overburden to Pit Backfill

The impacts to transportation from Alternative A are essentially the same as the Proposed Action except that the manned guard stations at the road crossings and the temporary realignment of the access road at the lower crossing would be utilized for a period of 10 months more than the Proposed Action.

Alternative B - No External Overburden Disposal

The impacts to transportation from Alternative B are essentially the same as the Proposed Action except that the manned guard stations at the road crossings and the temporary realignment of the access road at the lower crossing would be utilized for a period of 21 months more than the Proposed Action and 11 months more than Alternative A.

No Action
Transportation impacts from the development of Panels B and C would be delayed until site specific mining and reclamation plans are approved.

4.15.2 Irreversible and Irretrievable Commitment of Resources

There would be no irreversible and irretrievable impacts to local transportation resources as a result of the Proposed Action or Alternatives.

4.15.3 Residual Adverse Impacts

There would be no residual adverse impacts to local transportation resources as a result of the Proposed Action or Alternatives.

4.16 Cumulative Effects

The Cumulative Effects Area for the Smoky Canyon SEIS is shown on **Figure 4.16-1**. The geographic Cumulative Effects Area referred to in this section varies according to the resource being discussed, but generally includes the watersheds of upper Tygee Creek (Roberts Creek and Smoky Creek), Sage Creek, Manning Creek, and portions of Deer Creek within the eastern slope of Webster Range. This encompasses an area of approximately 26,500 acres. Major land uses in the area are timber harvesting, livestock grazing, and mining. The area is also used for hunting, fishing, and other outdoor recreation but the effects of these activities are likely to be of lesser magnitude than those of the three major land uses.

Cumulative effects are those impacts on the environment which result when the incremental impacts of the Proposed Action or Alternatives are added to those of other past, present, and reasonably foreseeable future actions in the Cumulative Effects Area. Reasonably foreseeable future extends to 2015. Cumulative effects address direct and indirect impacts to the resources described earlier and include: geology, minerals, and topography, air and noise, water resources, soil and watershed, vegetation, grazing management, wetlands, wildlife resources, fisheries and aquatic environments, TES species, recreation and wilderness, cultural resources, social and economic, hazardous materials, and visual resources. Results of cumulative effects analyses lead to the determination of whether the Proposed Action contributes significantly to impacts associated with other activities in the area.

Vegetation Management
Since the early 1980's, timber sales of approximately 1 million board feet (MMBF) have occurred bordering and within the Cumulative Effects Area. Within the Cumulative Effects Area, approximately 147 acres of timber not associated with mining activities have recently been harvested. Approximately 532 acres of mainly mature lodgepole pine would be harvested as a result of the Proposed Action. This figure represents about 11.6 percent of the timbered land within the Cumulative Effects Area. By 2007, approximately 34 percent (1800 acres) of timbered land within the Cumulative Effects Area will have been harvested as a result of mining activities. These timbered lands are used to some extent by many species including deer, elk, moose, song birds, small mammals, predators, and raptors. Following timber removal, these areas would be reclaimed with grasses and, where practical, efforts would be made to

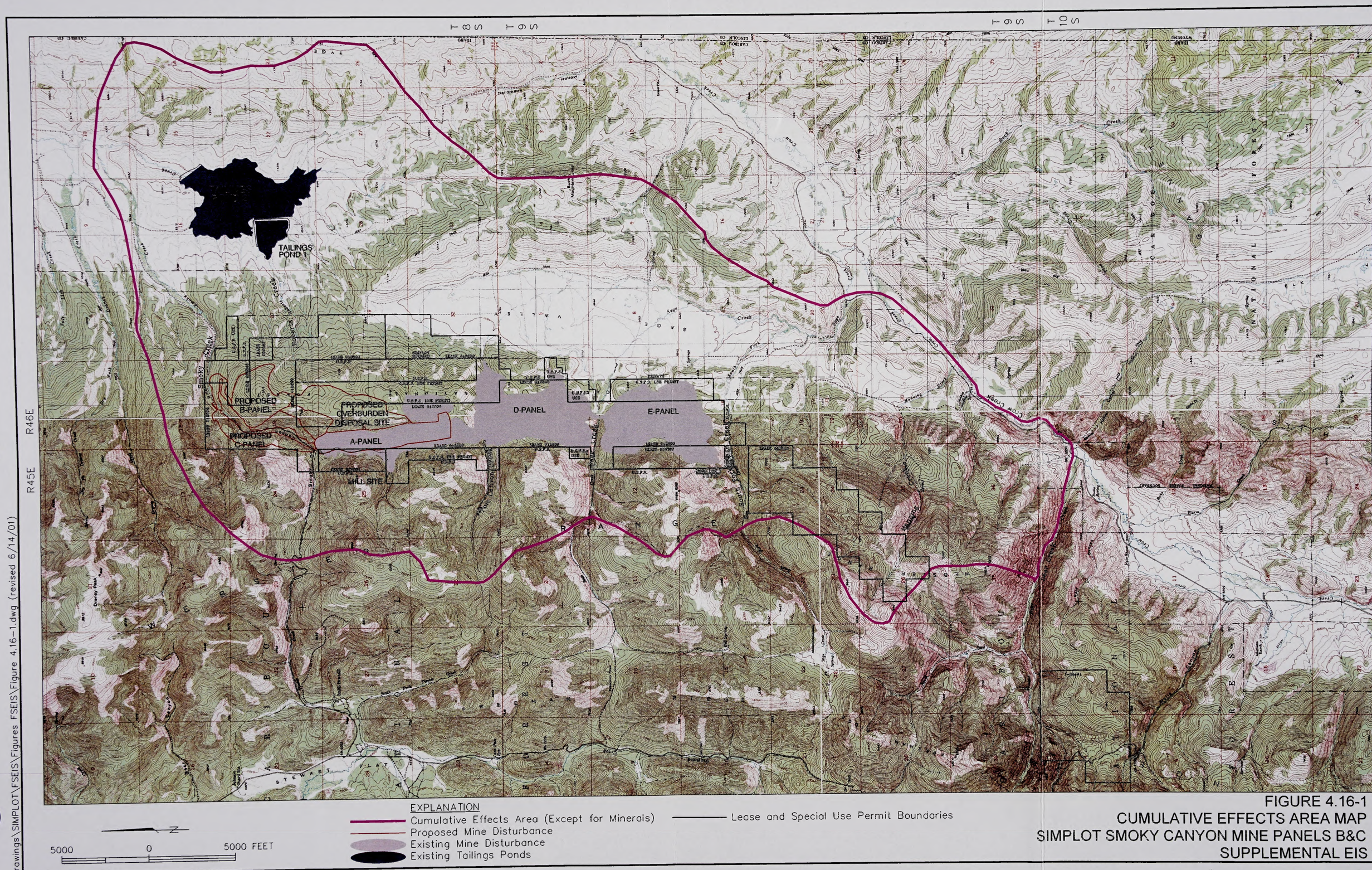

FIGURE 4.16-1
CUMULATIVE EFFECTS AREA MAP
SIMPLOT SMOKY CANYON MINE PANELS B&C
SUPPLEMENTAL EIS

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replace the timber components. These areas would need a USFS silvicultural prescription for revegetation.

Three prescribed burns conducted in the early 1980s affected a total of 477 acres. These three burns were conducted in conifer/aspen habitat on Manning Creek (250 acres, burned in 1981), in aspen habitat on the South Fork of Sage Creek (150 acres, burned in 1981), and in aspen habitat in Sage Valley (77 acres, burned in 1982). Because these areas were burned approximately 20 years ago, natural colonization/recolonization has occurred in areas affected by these burns. Very small areas, totaling less than four acres, have also been affected by wildfire in the area.

The USFS conducts monthly monitoring during the growing season of Smoky Canyon Mine lands for potential weed occurrences. Weeds found are reported to the mine. Simplot retains a contractor to conduct weed control activities on mine lands. Any chemicals used for weed control must be approved by the USFS. The USFS has also been treating weeds in the Smoky Canyon area, and maintains a Weed Atlas of weed occurrences and treatments. The Weed Atlas indicates that the main weeds treated in the area are musk thistle, Canada thistle, dyers woad, yellow toadflax and black henbane. Leafy spurge is known to exist along the road to Smoky Canyon, between USFS lands and the state line (some of these occurrences are outside of the Cumulative Effects Area). A leafy spurge patch was treated in Salt Lick Canyon, and tall white top was treated near Timber Creek, in 2001. Occurrences of Scotch thistle and spotted knapweed have been reported on mine dumps several miles northwest of the Smoky Canyon Mine. The increased awareness of weed issues, and active treatment of weeds, are designed to limit the spread of invasive species, and if possible to eradicate noxious weeds from USFS lands. Colonization from adjoining lands, however, remains a potential problem.

Livestock Grazing

The livestock industry has been an integral part of the Cumulative Effects Area since human settlement of the area. Following years of over grazing, in recent years livestock stocking levels have decreased in order to bring numbers in line with forage production. In 1976, the Crow Creek portion of the Diamond Creek Planning Unit provided 15,223 sheep months of grazing and 2,546 cow months (USFS, 1977b). Currently, a total of 3,020 head of sheep and 99 head of cattle are permitted for grazing for a total of 7,214 animal months (Mickelsen, 2000a and b). In addition, grazing activities currently exist on private lands within the Cumulative Effects Area. Livestock grazing would continue to be a major land use activity within the cumulative area and may be expected to increase above current rates.

Mining

The final Smoky Canyon Mine EIS was completed in 1982 (USFS, 1982a). Operation of the mine began in 1984 and has been continuous since then. Mining is expected to continue as a major activity in the Cumulative Effects Area. When the development of the phosphate resources of the current Panel E is completed in 2003 the total disturbed acreage of federal land for the permitted Smoky Canyon mining operation is estimated to be 1,413 acres. The Proposed Action for mining Panels B and C includes the disturbance of approximately 618 additional acres between 2002 and 2005. The phosphate resource located in the Manning lease (located in the southern portion of the Cumulative Effects Area) is planned for development in approximately 2005 and its disturbance area is estimated to be approximately 850 acres. In addition to the federal land disturbance, the total maximum area of affected private land related to the operation of the tailings pond is estimated to be 553 acres. The tailings ponds are already permitted by the U.S. Corps of Engineers and the State of Idaho.

4.16.1 Geology, Minerals and Topography

A larger Cumulative Effects Area, encompassing the eastern half of Caribou County, Idaho and the northern half of Bear Lake County, Idaho, was used to evaluate cumulative effects to geologic, mineral, and topographic resources. This larger area was selected because the Smoky Canyon Mine lies in the heart of the Western Phosphate Field. Activities that affect geology, minerals, and topographic resources within the Cumulative Effects Area consist primarily of major mining activities of which phosphate ore mining is dominant. Potential effects to the geology, mineral, and topography resources consist of mineral resource depletion, paleontological resource discovery and removal, topographic changes, exposure of selenium-bearing rock, and geotechnical instability. Past and present phosphate mining activities, and projected future phosphate mining for the next 15 years are analyzed in terms of cumulative effects for this resource. **Figure 4.16-2** shows location and control of known phosphate reserves in the Cumulative Effects Area.

Within the Cumulative Effects Area, depletion of mineral resources occurs only from mining activities in the area. In 1999, 5.86 MMT of phosphate rock were produced from Idaho and Utah (USGS, 2000b). Prior to 1946, phosphate mining in southeastern Idaho was limited to only two significant mines (USGS et al., 1975). In 1975, economically recoverable phosphate ore reserves in southeastern Idaho were estimated at one billion tons, comprising about 80 percent of reserves in the Western Phosphate Field (USGS et al., 1975).

Overall worldwide demand for phosphate is forecast to increase from one percent to two percent per year, and production from large mines in Florida is projected to decrease while supply from large deposits in North Africa will increase (USGS, 2000b). Based on this information, phosphate production from the Cumulative Effects Area will likely also increase by one to two percent per year. Over the next 15 years, therefore, between 80 and 100 MMT of total phosphate ore production, or an average annual production of about 6 MMT, is projected from southeast Idaho. With respect to depletion of mineral reserves within the Cumulative Effects Area, the impact of the Proposed Action accounts for less than 15 percent of the total to be mined over the next 15 years. Positive impacts associated with recovery of this resource include making this commodity available to society, economic growth and employment, and increased understanding of the geology of this and similar deposits.

Within the Cumulative Effects Area, impacts on the discovery, destruction, or removal of paleontological resources occur primarily from mining activities. The effects from mining activities can be positive as well as negative. Mining can uncover paleontological resources and information which would otherwise not be uncovered, thereby increasing scientific understanding. Within the Cumulative Effects Area, there is a wide range of sedimentary units representing ages from the Cambrian to the present. To date, the paleontological impacts within the Cumulative Effects Area have occurred at all the phosphate mines, and the Proposed Action and Alternatives would not cause significant additional impacts.

Effects on topography within the Cumulative Effects Area occur primarily from mining activities. These effects also occur on a small scale from land grading and construction of buildings and roads, as well as from natural causes, such as erosion and land slides. Other natural resource activities such as grazing, timber harvesting, rights of way and recreational activities do not significantly affect topography. Viewed on a total acreage basis, the topography of the Cumulative Effects Area has been relatively unaffected by mining. The Proposed Action and Alternatives, and the foreseeable future activities within the Cumulative Effects Area would not have a significant impact on topography except in the immediate vicinity of the mine disturbance.

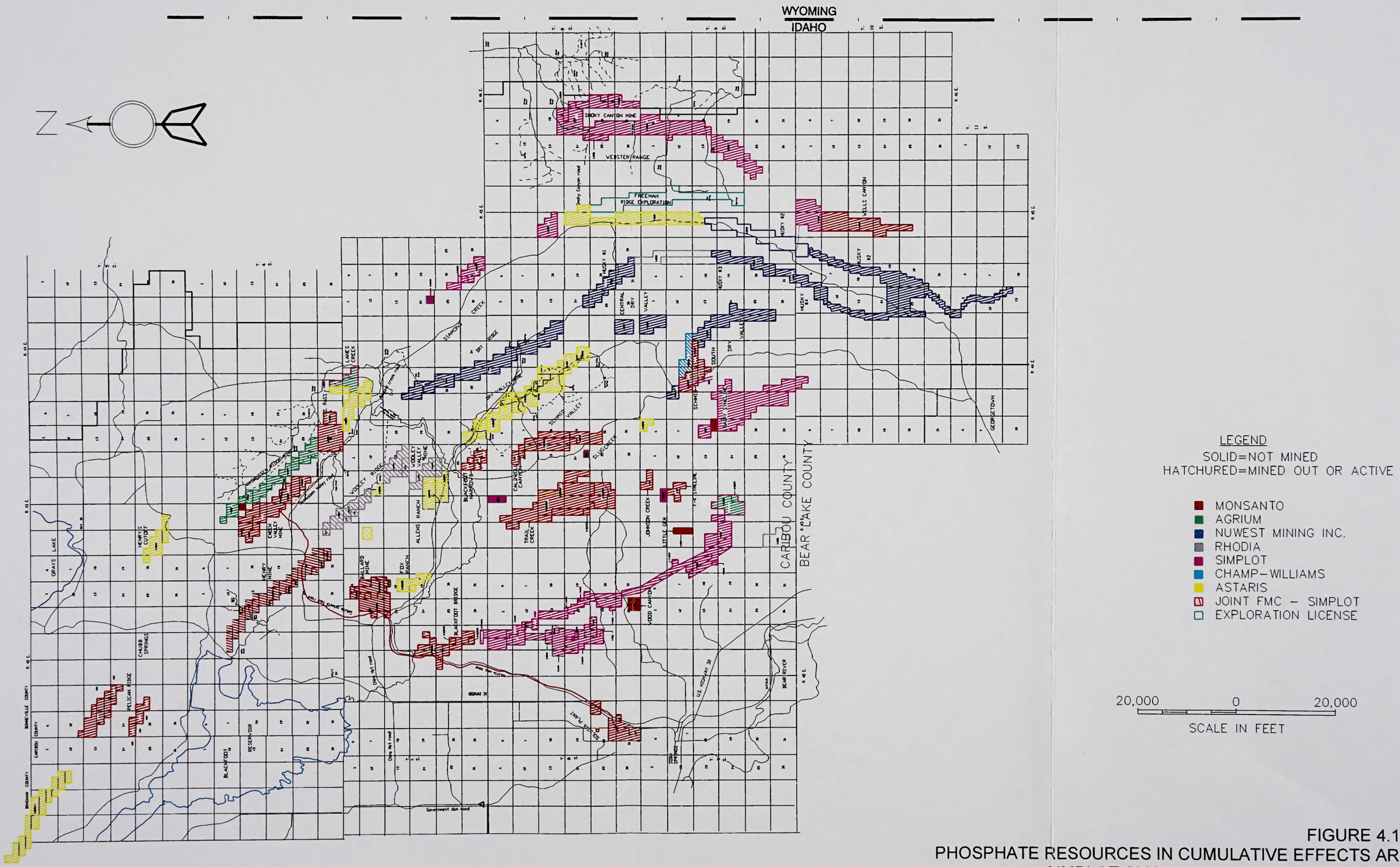

FIGURE 4.16-2
PHOSPHATE RESOURCES IN CUMULATIVE EFFECTS AREA
SIMPLOT SMOKY CANYON MINE PANELS B&C
SUPPLEMENTAL EIS

Modified from: Simplot's southeastern Idaho Phosphate figure, drawn by Ray Petrun 9/1/98.

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Selenium mobilization within the Cumulative Effects Area can be affected by a variety of activities. However, mining activities have the most significant impact due to the disturbance of geologic units with elevated selenium concentration, and the exposure of these materials during mining. When these materials were exposed by Smoky Canyon Mine in the past, there was essentially no understanding of the mechanism of selenium mobilization or the potential environmental impacts. In addition to impacts on geologic, mineral, and topographic resources, environmental analyses should include effects on vegetation, soil, water, and other resources potentially affected by selenium contamination.

Recent research has identified sources, pathways and control measures that will reduce the selenium impact from future phosphate mining. Based on the design and management practices identified in this SEIS, the selenium effects from the Proposed Action and Alternatives would be very minor in scale relative to the entire Cumulative Effects Area. Because mining activities within the foreseeable future are expected to reduce the potential for selenium mobilization, selenium impacts from new mining within the Cumulative Effects Area would also be reduced.

Effects on highwall and overburden fill stability within the Cumulative Effects Area occur primarily from mining activities, but can also occur from other major earth moving activities such as the construction of surface water impoundments, road cuts and fills. However, potential geotechnical instability from these activities usually affects only a relatively small area, in the immediate vicinity of the disturbance. The analysis conducted for the Proposed Action and Alternatives can only assess overall stability. Small failures of highwalls or overburden fills might still occur. It is not possible to account for all factors affecting stability on a small scale. With advances in geotechnical analysis methods and the benefit of previous experience, the potential for future impacts will likely be diminished. The predicted minor potential impacts to geotechnical stability from the Proposed Action, alternatives, and future foreseeable activities should be insignificant with respect to the Cumulative Effects Area.

4.16.2 Air and Noise

Air borne particulate matter is the most common air pollutant emission associated with the major commercial land use activities in the Cumulative Effects area: mining, timber harvesting, and grazing. Grazing and timber harvesting can produce fugitive dust but the quantities are minimal and are expected to remain approximately equal to present conditions. Mining is the major dust producing activity in the area.

All the past, present and reasonably foreseeable mining activities in the Cumulative Effects Area are operated by Simplot and the amount of air pollutants resulting from this activity is largely based on the mining rate and the truck haul distances. The present rate of mining is comparable to the proposed mining rate for the Proposed Action and reasonably foreseeable future mining activities. The location of the mining will change along the Simplot land position but the mining related air emissions will stay approximately constant so the air emissions from the mining over time are not cumulative, rather they are primarily just relocated. Depending on the truck haul distances for each phase of mining, the air emissions from this activity will change over time. The volume of air emissions related to truck hauling will actually decrease when mining is shifted from the E Panel to Panels B and C because of the shorter haul for the ore to the mill.

The closest Class I areas are outside the required maximum distance (i.e. 60 miles) for ambient air impact evaluation. Current, future or alternative operations at Smoky Canyon Mine are not forecasted to impact these Federally designated Class I areas.

The cumulative effects of noise, if the Proposed Action, Alternative A, or Alternative B are selected, will basically be equivalent to existing conditions. Noise impacts from mining operations will shift in a northern direction for the proposed mining operations and will then likely shift further south for the reasonably foreseeable mining operations south of the current E Panel. The noise from these operations will not be cumulative, rather it will be relocated along the phosphate mining trend.

4.16.3 Water

Surface Water

Simplot's mining activities span two watersheds, both of which ultimately are part of the Salt River system. The northernmost watershed is the Tygee Creek basin. For cumulative assessment purposes, the southernmost watershed wherein Simplot activities currently occur (the Sage Creek basin) also becomes relevant. A general description of that drainage and its existing environment follows in order to provide the context for the Cumulative Effects Analysis.

South of the Tygee Creek Basin, past and current mining activities are within tributary drainages that flow eastward to Sage Valley. These tributaries include Pole Canyon Creek, mainstream Sage Creek, and South Fork Sage Creek. After exiting the Webster Range, Sage Creek drains generally to the south through Sage Valley. With a total watershed area of approximately 25 square miles, it joins Crow Creek along the southeastern Cumulative Effects boundary. Crow Creek flows northeast into Wyoming, and enters the Salt River about 8 miles upstream from the confluence of Stump Creek with the Salt River.

As with the Tygee Creek basin streams, groundwater and surface water are interrelated in the Sage Creek watershed area. As surface expressions of groundwater, unnamed springs contribute flow to Pole Canyon Creek, Sage Creek, and South Fork Sage Creek, (USFS, 1981). USGS mapping indicates that Manning Canyon Creek and Deer Creek are fed by springs. A large spring complex known as Hoopes Spring, is located on the flanks of the range just north of South Fork Sage Creek, and contributes flow to its lower reaches. Hoopes Spring is one of the large springs in the area, with flow rates of 2.3 to 3.9 cfs in 2000 (Maxim, 2000c). The large spring in lower South Fork Sage Creek discharged at about 6.3 cfs in 2000 (Maxim, 2000c).

The 1981 Smoky Canyon Mine DEIS (USFS, 1981) provided water rights information in the area of coverage for that document. It included rights to Smoky Creek, Sage Creek, and areas north of Smoky Creek. The Idaho Department of Water Resources provided updated water rights information from their computer database for the Cumulative Effects Area. The types of uses associated with the rights are either irrigation or stock watering, and thus they are seasonal uses, typically spring through fall.

None of the streams within the Cumulative Effects Area are on the current (1998) State of Idaho 303(d) list of impaired waters, nor are they on the list of streams whose quality has been determined to be threatened (IDEQ, 1999). Sage Creek, from its headwaters to Crow Creek, was on the 1996 list as being impaired due to sediment, but was removed after further assessment by the State (IDEQ, 1999). Crow Creek, Deer Creek, Tygee Creek, and Stump Creek were surveyed by the Division of Environmental

Quality in the mid 1990's and were found to be of sufficient quality to support their beneficial uses. Pole Canyon Creek was apparently not included in this survey.

Many of the past and current human activities within the watersheds of the Cumulative Effects Area, including mining, livestock grazing, timber harvesting, and road construction, typically increase sediment loads to streams and often result in channel instability. These types of impacts are not well-documented within the watersheds of interest: no watershed assessments, stream stability ratings, etc. have been done, at least within the portions of the watersheds on national forest land (Lee Leffert, Caribou National Forest, personal communication). Sage Creek and Tygee Creek apparently have low enough sediment loads to meet their stated beneficial uses, according to the DEQ's water body assessments (IDEQ, 1999). It is likely that impacts from some of these activities have occurred in the past to at least some degree. For example, livestock activity has been noted to have affected some of the area streams, as indicated by bank trampling, including lower Smoky Creek (TRC Mariah, 2000a). Best management practices and other controls implemented in recent years serve to reduce sediment impacts from mining and timber production.

On a regional basis, throughout the Snake/Blackfoot River watershed, weighted average annual suspended sediment concentrations are approximately 150 mg/l (USGS, 1977). Water quality data obtained for four quarterly samples taken in 1998/1999 at the USGS gaging station on the Salt River (USGS, 2000b) provided limited parameters for assessment. These data showed that suspended sediment concentrations ranged from 24 mg/l during fall baseline condition to 105 mg/l during spring snow melt conditions. TRC Mariah's data from 1979-1999 showed suspended sediment concentrations in lower Smoky Creek to range from non-detectible to 240 mg/l (Upper Smoky ranged from non-detectable to 1120 mg/l) and in lower Tygee Creek to range from non-detectible to 28 mg/l. Maxim (2000c) reported suspended sediment concentrations of 30 mg/l and 4 mg/l, respectively, at those sites.

Beginning in the Spring of 1987 for lower Pole Canyon Creek below the overburden fill, every sample collected at that site has contained selenium concentrations greater than 0.005 mg/l. None of the samples taken from that site before that time had values greater than 0.005 mg/l, nor have the any of the samples taken from the stream above the overburden fill ever had values greater than 0.005 mg/l. Concentrations of selenium since 1991 in Lower Pole Canyon Creek, below the French drain, have ranged from 0.07 mg/l to 1.0 mg/l (TRC Mariah 2000a). Studies done by University of Idaho showed selenium concentrations in Pole Canyon Creek, above the French drain to be below detection while the concentration at the outlet of the French drain was 0.680 mg/l (Bond, 2000, Munkers et al, 2000).

In both the spring and fall of 1998, the North Fork of Sage Creek (as named by Montgomery Watson, 1999) was sampled as part of the ongoing Idaho Mining Association Selenium Subcommittee studies. Samples were taken at a site above the North Fork's confluence with Pole Canyon Creek and at a site below its confluence. Data from the spring sampling event (Montgomery Watson, 1999) showed that the selenium levels in the North Fork of Sage Creek increased between the upstream and downstream sites: the upstream site had a concentration of 0.00041 mg/l and the downstream site had a concentration of 0.041 mg/l. The latter value is higher than the 0.005 mg/l cold water aquatic life criterion for selenium.

Examination of flow rates in spring of 1998 (Montgomery Watson, 1999), shows that North Fork Sage Creek above the confluence with Pole Canyon Creek had a lower flow (0.23 cfs) than the North Fork Sage Creek site below Pole Canyon Creek (4.0 cfs). Lower Pole Canyon Creek was flowing at 2.9 cfs when measured that same season by TRC Mariah (1999) at the monitoring site below the French

drain/overburden fill. In fall 1998, flows were much lower; 0.06 in North Fork Sage Creek above Pole Canyon Creek and 0.12 in North Fork Sage Creek below Pole Canyon Creek (Montgomery Watson, 1999). Selenium concentrations reported by Montgomery Watson (1999) for the fall of 1998 were non-detect above and 0.0019 mg/l below Pole Canyon Creek. During the fall of 1998 the lower Pole Canyon Creek monitoring site was dry (TRC Mariah, 1999). Similar flow and selenium results for samples taken in May 2000 in North Fork Sage Creek above and below Pole Creek (Montgomery Watson, 2001) and lower Pole Canyon Creek (TRC Mariah, 2001) also indicate that Pole Canyon's French drain/overburden fill may be contributing selenium to downstream waters, but further field studies still need to be undertaken to establish the impacts of Pole Canyon Creek on North Fork Sage Creek and Sage Creek downstream.

Sage Creek, as it flows through Sage Valley, and Crow Creek, in the vicinity of its confluence with Sage Creek, are both used for irrigation and stock watering by various water right holders. In addition, these streams are considered as fisheries. Within these stream reaches, however, water quality information useful to assess current mining related impacts due to selenium is lacking. Instead, as an indicator of whether elevated selenium may be occurring in the lower reaches of Sage Creek and in Crow Creek, data from the Montgomery Watson (1999) investigation, along with data from TRC Mariah's 1998 aquatic studies (TRC Mariah, 1999) can be used. All data used in this analysis are from samples taken in the spring of 1998. A sample taken in Sage Valley in the stream designated by Montgomery Watson as North Fork Sage Creek had a selenium concentration of 0.041 mg/l at a point downstream of where they indicated Pole Canyon Creek flowed into North Fork Sage Creek. In order to assess the possible concentration of selenium at points further downstream of that site, additional stream flow measurements and selenium concentrations from sites tributary to the lower reaches of Sage Creek were compiled. Assuming no other gains or losses to Sage Creek other than the additive values of the measured tributary stream flows, an estimate of the selenium concentration at the mouth of Sage Creek was made. Further, an estimate of the selenium concentration in Crow Creek below Sage Creek can be made by assuming a flow rate in Crow Creek. **Table 4.16-1** provides the results of this effort, and shows that selenium concentration at the mouth of Sage Creek under this scenario would be greater than the 0.005 mg/l cold water aquatic life criterion.

The selenium concentration in Crow Creek downstream from Sage Creek depends on the background selenium concentration in Crow Creek and its flow rate in the Spring of 1998. There is little flow monitoring data on Crow Creek at its confluence with Sage Creek. Flow monitoring data discussed in the 1981 DEIS (USFS, 1981) showed a range of flow in Crow Creek just below Sage Creek in the last 6 months of 1979 of 35 to 68 cfs. Background selenium concentrations for Crow Creek for 1998 are not available but can be assumed to be the typical background concentration in natural streams in the area, <0.001 mg/l (USFS, 1981). Using a flow in Crow Creek below Sage Creek of 60 cfs, and a background selenium concentration in Crow Creek of 0.0005 mg/l (½ detection limit), the selenium concentration in Crow Creek downstream of Sage Creek was calculated to be 0.0036 mg/l which is less than the cold water aquatic life criterion.

Table 4.16-1 Spring 1998 Selenium and Flow Data, and Load Calculations for Sage Creek

Site Name	Site Number	Flow Rate (cfs)	Selenium Conc. (mg/l)	Selenium load (lbs/day)
North Fork Sage Creek	MW ST-187	4.0 (measured)	0.041 (measured)	0.886
Sage Creek	MW ST-183	9.8 (measured)	0.00007 (estimated)	0.0037
Hoopes Spring	TRC - HS	4.6 (measured)	0.004 (measured)	0.0994
South Sage Creek	MW-ST185(flow) TRC-LSS(conc) *	5 (measured)	0.001 (measured)	0.027
Sage Creek at Mouth	N/A	23.4 (sum of above)	0.008 (calculated from load and flow)	1.016 (sum of above)
Crow Ck. below Sage Creek	USFS, 1981 Site 2 Fig.2-14	60 (estimated)	0.0005 mg/l (est. background)	0.1617 (est. background)
Crow Ck. below Sage Creek	USFS, 1981 Site 2 Fig.2-14	60 (estimated)	0.0036 (calculated from load and flow)	1.1777(sum of 2 items above)

* Montgomery Watson did not have a lower South Sage station in the spring of 1998 (their downstream station (ST228) was only sampled in the fall). TRC's lower South Sage station was sampled for selenium (0.001 mg/l) in spring of 1998 but flow was not measured. Therefore, the flow (5 cfs) measured by Montgomery Watson at their upper South Sage station (ST185) was used as a stand-in to represent the flow at the downstream station because there was no flow measurement at the downstream by either MW or TRC.

In order to obtain more direct information, a few samples have been recently collected. In April 2001, the USFS sampled Sage Creek immediately above its confluence with Crow Creek and reported a total selenium value of 0.006 mg/l. In May of 2000, Montgomery Watson (2001) sampled Sage Creek below its confluence with North Sage Creek but above its confluence with South Sage Creek and reported a selenium concentration of 0.0029. In 2001, IDEQ (2001) sampled Sage Creek just above its confluence with Crow Creek during three separate monitoring events; total selenium concentrations ranged from 0.0023 to 0.0052 mg/l.

According to the Idaho 1998 303(d) List (State of Idaho, 1999), Crow Creek, Deer Creek, Stump Creek, and Tygee Creek were all found to support their beneficial uses according to surveys by the Department of Environmental Quality between 1993 and 1996. Sage Creek, while it appeared on the 1996 303(d) List as sediment-impaired, was removed from the 1998 list because it was deemed to support all of its beneficial uses.

The Proposed Action would have no effect on the water quality in Pole Canyon Creek, Sage Creek, or Crow Creek because no activities related to the Proposed Action would occur in those drainages. The potential for the Proposed Action to increase selenium impacts in the northern part of the Cumulative Effects Area (namely Smoky Creek and the Tygee/Stump Creek watersheds) was described previously.

Tailings Ponds - Surface Water

The existing tailings ponds would operate similarly under the Proposed Action as they currently do, and are expected to have similar water quality. The water in the tailings ponds is not directly connected to surface waters and State water quality criteria do not apply to the water in the tailings ponds. The ponds have been designed to contain all contributing runoff and precipitation that occurs as a result of a 100-

year, 24-hour storm event. Water from the toe drain in Tailings Dam No. 2 is discharged to Tygee Creek and monitoring of the creek downstream indicates that water quality complies with Cold Water Aquatic Life Criterion. This drain collects shallow groundwater from under the downstream toe of the tailings dam. The operation of the tailings ponds for the Proposed Action and Alternatives should be essentially the same as the existing operations and current conditions are expected to continue.

In the event of a discharge due to overtopping of the dam, dam failure, or changes in the water chemistry of the toe drain, tailings constituents could be discharged to Tygee Creek. The tailings impoundment capacity is always maintained so as to contain the operating quantity of tailings and more than a 100-year, 24-hour storm event in the tailings pond watershed. The tailing dams themselves have been designed to withstand a 0.15g earthquake event without release of tailings. Guidelines for seismic analyses published by Seed (1979) indicate that a pseudostatic coefficient of 0.15g is appropriate for highly active seismic areas with the potential for large earthquakes (Richter Magnitude 8).

The Abandonment Plan for the tailings ponds (Golder, 1992) includes provisions for dewatering the tailings pond to the extent possible and revegetating the dried surface of the tailings solids. A permanent fresh water pool is expected to be present in the lower part of the reclaimed tailings pond area. Permanent spillways, sized to safely pass the 100-year, 24-hour runoff event, will be cut through the two tailings dams and discharge to Tygee Creek. The Roberts/Tygee Creek diversion channel was built to carry the 100-year, 24-hour runoff event and is proposed to be left in place and fitted with overflow channels leading to the tailings pond which would carry overflows from the channel.

Groundwater

Groundwater conditions in the Cumulative Effects area are similar to those already described for the area of the Proposed Action and Alternatives. On the west side of the Cumulative Effects area, groundwater recharge into the Triassic Thaynes and Dinwoody formations occurs in the high elevation area of Webster Ridge. Where the west-east drainages of Pole Canyon Creek, Sage Creek and, South Fork Sage Creek cross the Triassic units, groundwater discharges to the stream channels in springs. This surface flow typically increases downstream toward the contact of the Dinwoody Formation with the Phosphoria Formation. Across the Phosphoria Formation, the stream flow typically maintains a constant flow indicating the Phosphoria shales do not act as a groundwater discharge or recharge area. The stream flow then typically decreases where the streams flow across the outcrop of the Wells Formation east of the Phosphoria outcrop indicating that the Wells Formation outcrop area is an area of groundwater recharge.

Pole Canyon Creek, and Sage Creek do not gain flow where they cross the trace of the West Sage Valley Branch Fault indicating a lack of groundwater discharge along this fault trace in these locations. South Fork Sage Creek also becomes dry where it flows across the Wells Formation outcrop but large springs near the USFS boundary provide perennial flow conditions for the lower reach of this stream in Sage Valley. These springs originate along the trace of the West Sage Valley Branch Fault at outcrop of the Wells Formation limestone. Other large springs about ½ mile to the north along the same fault trace, called Hoopes Spring, also discharge from Wells Formation along the West Sage Valley Branch Fault.

Water balance calculations for Sage Valley indicate that less water discharges from the valley in Sage Creek than enters it from the streams on its west side and a few very small springs located in the valley itself (Ralston, 1979). This indicates that the stream channels in Sage Valley itself are losing flow into

the alluvial fill of the valley and also to irrigation uses in the valley. The bedrock beneath the alluvial cover of Sage Valley is hydraulically separated from the Wells Formation aquifer by the West Sage Valley Branch Fault and the East Sage Valley Branch Fault.

The Upper Tygee Creek drainage area is located in the northeast portion of the Cumulative Effects Area. Roberts Creek is a named stream in the western portion of this drainage area. The other channels are unnamed. The upper headwaters of Roberts Creek and the channels on the west side of this drainage area are located in Wells Formation outcrop and there are no mapped groundwater discharges in this area. These channels then flow across Dinwoody Formation and Salt Lake Formation outcrop areas. Lower Roberts Creek is perennial due to spring flow in Section 20, T8S, R46E. This spring is located along the trace of the East Sage Valley Branch Fault.

Most of the streams in the upper Tygee Creek watershed are ephemeral but the main stem of Tygee Creek in Sections 27 and 28, T8S, R46E is maintained perennially by a small spring with a flow volume of 0.18 cfs in September 2000 (Maxim, 2000c). Most of the Tygee Creek drainage area is on outcrop of the Salt Lake Formation but there are also extensive outcrop areas of Jurassic rocks in this area.

The stream channels and springs in the Tygee Creek drainage area are hydraulically separated from the groundwater resources of the Proposed Action and Alternatives area by a series of north trending thrust faults which separates the Wells Formation aquifer from the rock units on the east side of these faults (**Figures 3.1-1** and **3.3-4**). In addition, most of the stream channels in this area are located on outcrop of the Tertiary Salt Lake Formation which unconformably overlies the bedrock units involved in the thrust faulting and acts as an aquitard due to its low permeability.

Groundwater use in the Cumulative Effects Area, exclusive of the Simplot water wells, is from water wells for domestic water supplies. All of these wells are in different groundwater regimes than the area of the Proposed Action or Alternatives and should not be impacted by the current or proposed mining activities. The Nolan Draney and Auburn Fish Hatchery wells are located in the Tygee Creek valley on the east side of the East Tygee Branch Fault. These wells are separated hydrogeologically from the area of the Proposed Action and Alternatives by three major thrust faults. The Robert Nate well is located 7 miles south of the area of the Proposed Action and Alternatives along Crow Creek and the well conditions are dominated by the Crow Creek valley hydraulic regime.

Effects from timber harvesting, grazing, rights-of-way and recreational uses on groundwater resources are negligible. Mining activities have the potential to impact the resource by withdrawal for consumptive use or from infiltration from open pits and seepage through overburden disposal fills which have the potential to affect groundwater quality.

The Simplot Culinary and Industrial wells, represent the only groundwater withdrawals within the Cumulative Effects area of any consequence. The total of the existing water rights for the other three domestic wells in the Cumulative Effects area is 0.12 cfs which added to the typical Smoky Canyon Culinary Well pumping rate of 0.22 cfs (100 gpm) equals a total water well discharge of about 0.34 cfs. The Industrial Well (3.48 cfs) is typically not pumped. Existing natural groundwater discharge in springs within the Cumulative Effects area exceeds the typical total water well discharge in the same area by a wide margin. In 2000, the combined fall (low flow) discharge of Hoopes, Lower South Fork Sage Creek, Upper Roberts Creek, and Lower Smoky Creek was 9.83 cfs (Maxim, 2000c). The low flow discharge of these same points as described in the 1981 DEIS was 9.67 cfs (USFS, 1981). Comparing these

similar values indicates no discernable reduction in the spring flow has occurred since the Smoky Canyon Mine was built. There are no dewatering operations in the existing Simplot open pits and dewatering is not anticipated to be required for the proposed pits in B and C panels. Future open pits south of E-Panel are also not anticipated to require dewatering.

Hoopes Spring is located along the trace of the West Sage Valley Branch Fault and is apparently a discharge point for groundwater from the Wells Formation (Ralston, 1979). The selenium concentration of this spring began to increase in the fall of 1997 while other parameters appeared to stay at background concentrations. During the 13-year period from 1984 to 1997 the mean selenium concentration was 0.0024 mg/l, ranging from <0.001 to 0.005 mg/l. In the 4-year period since fall 1997, the mean selenium concentration was 0.0066 mg/l, ranging from 0.004 to 0.010 mg/l. The trend in selenium concentrations since 1997 has been upward to a value of 0.010 mg/l in the spring of 2000. Additional monitoring will determine if concentrations will continue to decrease or increase in the future.

The only changed condition in the area of Hoopes Spring is the construction of the Simplot Panel D and E open pits and overburden disposal areas. The reason for the increased selenium concentrations is unknown at this time. Simplot is fully committed to the processes described in their HMEII Report in concert with the regulatory agencies to investigate this issue. The HMEII Report is included as a separate document in the appendix.

The Proposed Action and Alternatives are not anticipated to impact Hoopes Spring because the groundwater regimes for these two areas are different. Groundwater flow in the Wells Formation in the vicinity of Hoopes Spring is flowing from west to east toward the spring. In the vicinity of the Proposed Action and the Alternatives, groundwater flow is predominantly to the north and west.

The Smoky Canyon culinary well is located west of the existing Panel A pit. It was drilled to a depth of 1,000 feet. It was constructed to allow inflow of groundwater into the well from the Meade Peak Member of the Phosphoria and the upper Wells Formation sandstone. Water quality data has been obtained on an irregular basis from the Culinary Well by Simplot since 1984. The water quality of the Industrial Well was not monitored prior to 2000. The results of these analyses for selenium are shown in **Table 4.16-2**.

These data indicate that the background selenium concentration of the Wells Formation aquifer water in the year that mining at the Smoky Canyon Mine started (1984) was below detection levels. Background concentrations were maintained for approximately 10 to 12 years. Within 12 years after mining began (1996) the selenium concentration in the well water increased to 0.17 mg/l. It has varied between 0.007 mg/l and 0.031 mg/l since then with no obvious trends.

Table 4.16-2 Total Selenium Analysis for the Culinary and Industrial Wells (mg/l)

Date	Culinary Well	Industrial Well
8/84	<0.003	--
5/18/87	<0.005	--
1/89	0.006	--
4/26/94	<0.005	--
12/16/96	0.017	--
12/10/97	0.027	--
8/4/00	0.015	--
8/9/00	0.017	--
8/18/00	0.016	--
8/22/00	0.031 dissolved	--
8/23/00	--	0.016
8/29/00	0.010	0.014
9/12/00	0.013	0.016
9/26/00	0.016	0.015
9/27/00	0.011 dissolved	--
10/10/00	0.009	0.011
11/01/00	0.011	0.014
11/21/00	0.022	0.009
12/05/00	0.007	0.009

--- No data

Selenium water quality data collected from the Culinary Well and the Industrial Well by Simplot during the summer and fall of 2000 indicate that the water in the Industrial Well had similar selenium concentrations to the Culinary Well. Both the wells had selenium concentrations that varied from 0.007 to 0.031 mg/l averaging 0.0136 mg/l for the Industrial Well and 0.013 mg/l for the Culinary Well. The Industrial Well obtains water from a depth of 690 feet to 1320 feet; an interval length of 630 feet. Because of the similarities in the average selenium concentrations in the two wells, it is likely that the selenium in the Culinary Well water is present in the Wells Formation aquifer and is not being contributed in any significant way from the perforations in the Meade Peak member. The selenium in the groundwater at the Culinary and Industrial wells locations is thought to be due to infiltration of surface water collected in the A-Panel open pit which has elevated selenium concentrations due to runoff from the exposed overburden shales on the footwall of the pit. This water infiltrates into the underlying Wells Formation and is thought to enter the water table and migrate laterally to the location of the water supply wells.

The estimated water quality impacts from the Proposed Action and Alternatives to the Culinary Well have already been described and would replace the existing water quality in the water supply wells.

The impacts of the Pole Canyon overburden disposal facility on the surface water quality of lower Pole Canyon Creek have already been described. There are no monitoring wells to determine to what degree this facility is also impacting groundwater quality. Ralston (1979) described the baseline flow in Pole Canyon Creek as being similar to the other streams along the east side of the Webster Range in that upper Pole Canyon Creek was perennial due to spring discharge from the Dinwoody Formation. Stream flow decreased where it flowed over the Wells Formation in lower Pole Canyon. Ralston attributed this decreased stream flow to infiltration of the water into the underlying Wells Formation.

The Pole Canyon overburden disposal facility was built as a canyon fill from approximately the contact of the Phosphoria and Wells Formations downstream to the mouth of the canyon. As a result, almost all of the overburden fill is located on Wells Formation outcrop area. Water with chemistry similar to that discharging from the French drain outlet is likely infiltrating into the Wells Formation under the overburden fill. The quantity and impacts of this infiltration to groundwater are unknown at this time. Simplot plans to complete studies described in the HMEII Report in concert with the applicable regulatory agencies to address the groundwater and surface water impacts of the existing facilities at the Smoky Canyon Mine, including the Pole Canyon overburden disposal facility.

Impacts to groundwater in the vicinity of the Pole Canyon overburden disposal facility have not been identified but are likely to be dominated by the effects of the fill itself on the underlying recharge zone. No additional impacts to groundwater quality in the Pole Canyon area are anticipated from the Proposed Action or Alternatives because groundwater flow in the area of the B and C Panels is flowing away from Pole Canyon.

Tailings Ponds - Groundwater

The Simplot tailings disposal facility is located in the northeast portion of the Cumulative Effects Area. Tailings Pond No.1 and No.2 are both constructed on outcrop of Tertiary Salt Lake Formation. Pre-construction geotechnical investigations conducted for these facilities showed that the Salt Lake Formation clay strata have permeabilities ranging from essentially zero to about 1 ft/day (Forsgren-Perkins, 1983, 1988). This low permeability foundation is expected to control downward percolation of tailings water from the tailings impoundments.

Design of both tailings ponds relied on the Salt Lake Formation to provide vertical seepage control for the impoundments. The dams themselves were designed to be constructed using the Salt Lake Formation clayey materials so the dams have uniformly low permeabilities. To ensure containment of tailings water, both dams were designed and constructed with low permeability (<1 ft/yr) cutoffs in their foundations that penetrated completely through the surficial permeable alluvium/colluvium at the location of the dams and keyed into the underlying Salt Lake Formation.

Drilling was done at the base of Tailings Dam No. 2 in 2000 to test this hypothesis. The nested monitoring wells were installed, GW-12, 13, and 14, to depths of 35, 278, and 335 feet respectively. GW-12 was developed in alluvial deposits along the former Tygee Creek channel. GW-13 was developed in a higher permeability zone within the Salt Lake Formation and GW-14 was developed at the base of the Salt Lake Formation near its contact with the underlying Jurassic rock. The water qualities of these three monitoring wells are compared with water from the Tailings Pond No.2 in **Table 4.16-3**.

Table 4.16-3 Water Quality in Tailings Pond No. 2 Monitoring Sites (mg/l)

Parameter	GW-12	GW-13	GW-14	Tailings SW-9	Toe Drain SW-10	U.Tygee SW-7	L.Tygee SW-5	Aquatic Life*
Aluminum	<0.1	0.2	<0.1	0.2	<0.1	3.53	0.23	NS
Arsenic	<0.001	0.006	0.001	0.005	0.001	0.0017	0.0001	0.190
Barium	0.1	0.3	0.4	<0.1	0.1	0.33	0.13	NS
Cadmium	<0.0001	<0.0001	<0.0002	0.0037	0.0002	0.0002	0.0001	0.0017
Chloride	19	2900	8530	31.5	34.5	8.33	20	NS
Chromium	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.314
Copper	<0.01	0.04	0.06	<0.01	<0.01	<0.01	<0.01	0.021
Fluoride	0.13	0.22	0.27	1.37	0.18	0.167	0.173	NS
Lead	<0.001	0.001	0.006	<0.001	<0.001	0.002	0.001	0.005
Mercury	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	12 E-6
Nickel	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.283
Selenium	<0.001	<0.001	<0.001	0.032	0.0015	<0.001	0.001	0.005
Silver	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	NS
Sodium	18	1879	5980	20	30.5	9	18.6	NS
Sulfate	24	5	144	101.5	67.5	28.7	19	NS
Thallium	<0.001	<0.001	<0.001	<0.002	<0.002	<0.002	<0.002	NS
TDS	311	4740	15,100	363.5	415	298	282	NS
Zinc	<0.02	0.06	1.61	<0.02	<0.02	<0.02	<0.02	0.188

*Note: Cold Water Aquatic Life Criterion for cadmium, chromium, copper, lead, nickel, silver, and zinc are calculated per 40 CFR 131.36 for hardness. A hardness of 200 mg/l was used.
-Values shown for SW-9, 5, 7, and 2 are averages from Maxim water monitoring in Maxim, 2000c.
NS = No regulatory standard has been set.

Comparison of the water quality in GW-13 and 14 with GW-12, or any other groundwater in the Cumulative Effects Area, shows that it is very different water than any of these as demonstrated by the very high TDS, chloride, and sodium. This is an indication that groundwater from the Jurassic rocks under the Salt Lake Formation are a source of sodium-chloride groundwater which is moving upward through the Salt Lake Formation. This was also considered by Ralston to be the source of the salt in the salt springs area that was formerly present in the Tailings Pond No.2 site (Ralston, 1987). There is no indication from the water quality data for GW-13 and -14 that there is any contamination of this water by seepage from the tailings disposal facility. The main tracer elements of the tailings water, fluoride and selenium are in concentrations in GW-13 and 14 that are apparently background.

Stable isotope data show that the GW-13 and -14 water are clearly different than the tailings pond water, or any other water in the study area for that matter. Tritium and carbon-14 isotope data for these samples show them to be 12,500 and 33,500 years old respectively.

Comparison of the GW-12 water quality data with the water quality of the tailings pond and upper Tygee Creek indicates that it is more similar to Tygee Creek water quality and suggests that the shallow alluvium has not been contaminated by tailings pond water. The fluoride and selenium concentrations in this well are at background levels that are more similar to upper Tygee Creek. GW-12 water has sodium and chloride values higher than upper Tygee Creek but this is attributed to this salt being high in the local background of the former saline spring area. GW-12 water quality also complies with applicable Cold Water Aquatic Life Criterion.

The toe drain under Tailings Dam No.2 was added to reduce pore pressures under the downstream toe of the dam. There is no direct connection between the toe drain system and the tailings impoundment upstream of the tailings dam. The toe drain was designed to eliminate accumulation of groundwater under the downstream toe of the dam. The solute chemistry of a sample from the toe drain (SW-10), shows fluoride, selenium and sulfate concentrations that are between tailings pond water and upper Tygee Creek water quality and sodium, chloride and TDS concentrations that are higher than the tailings pond water. Stable isotopic ratios for hydrogen and oxygen show that this water lies between the tailings pond water quality and Salt Lake Formation groundwater or Tygee Creek surface water. The solute and isotopic data suggests that some tailings pond water may be mixed with the water coming from the toe drain. Toe drain water quality meets the applicable Cold Water Aquatic Life Criterion and it is discharged to the Tygee Creek channel below the tailings dam.

Comparison of the upper Tygee Creek water quality (SW-7) with lower Tygee Creek water quality 1/4 mile downstream from Tailings Dam No.2 (SW-5) shows a slight (5.9 percent) increase in fluoride concentration at SW-5, placing the fluoride concentration between the upper Tygee Creek and Tailings Pond No.2 Toe Drain (SW-10) water quality. This suggests water quality at the SW-5 location may be influenced by discharge from the toe drain. This is also shown by the stable isotopic data which shows SW-5 water quality to lie between that of the toe drain and Tygee Creek water. SW-5 water quality generally has concentrations of the other parameters equal to or less that those in the upper Tygee Creek water quality. Other than fluoride, the only solute parameters that are increased downstream at SW-5 are sodium and chloride which is considered to be residual effect of the salt accumulation in Tygee Creek that had been the natural condition of the stream before the tailings facility was built. Ralston (1987) showed that Tygee Creek downstream of where it flowed across the saline spring area had an electrical conductivity of 2,010 umhos/cm compared to an average conductivity during 2000 of 451 umhos/cm. This comparison shows that lower Tygee Creek water quality has improved since the Tailings Dam No.2 was built but there is likely residual salt continuing to leach from the stream channel deposits. Regardless of the effects of the residual salt and the toe drain discharge, water quality at SW-5 meets the applicable cold water aquatic life criterion for Tygee Creek.

4.16.4 Soil and Watershed

The Cumulative Effects Area for soil resources is shown in **Figure 4.16-1** and includes that area affected by previous, current, and future reasonable foreseeable development activities along the east side of the Webster Range from Deer Creek on the south to the ridge line north of Smoky Creek on the north. Mining has disturbed large areas of soil resources in the Cumulative Effects Area in the past, including Smoky Canyon Mine Panels A, D, and E. The proposed development of Smoky Canyon Mine Panels B and C is expected to have a project life of approximately four years. Further mine operation in the Cumulative Effects Area is possible if proposed mining in the Manning Creek lease is conducted. Within the Tygee Creek watershed, approximately 13 acres within the Proposed Action area would remain

unreclaimed as pit highwall. Disturbance occurring south of the area of the Proposed Action, including the existing Smoky Canyon Mine operations at Panels D and E and the proposed Manning Creek project, is within the Sage Creek watershed which flows to Crow Creek.

Past studies by the Selenium Working Group and others have indicated that the concentration of selenium and other metals in surficial growth medium and vegetation at reclaimed mining sites can be influenced by the mining operations. Where shales, particularly middle waste shales, are present in the surficial growth medium, selenium and possibly other metal concentrations may be elevated and vegetation rooted in these materials may have elevated concentrations of these elements. Where vegetation is rooted only in topsoil, the selenium and other metal levels in the soil and the vegetation are likely to be lower than vegetation rooted in overburden. The depth of the major root zone relative to the thickness of the topsoil cover may have a bearing on the selenium and metal content of the vegetation because some of the roots may penetrate the soil into the underlying overburden material and be affected by the combined chemistry of the topsoil and overburden.

During August 2000, soil or overburden shale growth medium and vegetation samples were collected from 29 quadrants in six different reclamation treatment areas within the current disturbance area at the Smoky Canyon Mine (JBR, 2000c). These soil and shale growth medium samples were analyzed to determine the effects of past mining and reclamation practices on the occurrence of selenium and other metals in growth medium and vegetation in the reclaimed areas. Prior to 1995, overburden shale materials were commonly utilized as growth medium at Smoky Canyon and other mines. Four additional quadrants were located in undisturbed neighboring areas to provide background data.

Samples were collected from the reclaimed areas and adjacent undisturbed lands to provide a comparison of selenium concentrations on reclaimed lands to background concentrations of selenium that are naturally occurring. Background soil selenium and metal concentrations have been found to vary with the location of the soil sample relative to the Phosphoria shale outcrop, the soil thickness, and the amount of weathering that has occurred in the soil. Different reclamation treatment areas have been determined to affect the selenium concentration in the surficial materials and vegetation.

Soil, growth medium, and vegetation samples in six reclaimed treatment areas at the Smoky Canyon Mine were collected and analyzed for concentrations of several metals, including selenium (JBR, 2000c). The sample areas were in reclaimed portions of the A, D, and E panels. Sample areas varied in whether topsoil/growth medium was used on top of the overburden, when they were seeded, and the type of overburden. Additional control samples were taken from undisturbed control areas near Panels A, D, and E.

Table 4.16-4 summarizes the results of soil sampling for selenium concentrations conducted on treatment and undisturbed areas at the Smoky Canyon Mine during the August 2000 sampling.

Table 4.16-4 Summary of Selenium Concentrations in Soil for Reclamation Sites and Adjacent Undisturbed Locations at Smoky Canyon Mine

Treatment Number	Site Name	Reclamation Method/ Site Conditions	Date Reclaimed	Total Selenium (Average)	Extractable Selenium 1) (Average)
1	A1 External Dump	Non-topsoiled area, vegetation rooted in unsorted overburden	1985	23.82 mg/kg	0.0276 mg/kg
2	A1 External Dump	Topsoiled area, vegetation rooted in topsoil over overburden	1995	33.36 mg/kg	0.0244 mg/kg
3	South end A Pit Backfill	Vegetation rooted in unsorted overburden	1994	13.93 mg/kg	0.002 mg/kg
4	Pole Canyon Dump	Vegetation rooted in unsorted overburden	1990	36.28 mg/kg	0.082 mg/kg
5	North end D Pit Backfill	Vegetation rooted in topsoil over unsorted overburden	1998	12.72 mg/kg	0.0076 mg/kg
6	North end E Panel External Dump	Vegetation rooted in topsoil over chert	1999	2.52 mg/kg	0.002 mg/kg
7	Background/ Control	Undisturbed lands adjacent to mining activities	N/A	0.6 mg/kg	0.005 mg/kg

Source: JBR, 2000c.
1) Method: ASA Mono 9 Soil Paste with water soluble Hydride Analysis

There does not appear to be a strong correlation in the data between total and extractable selenium levels (correlation coefficient 0.47). The correlation between extractable selenium levels in soil to selenium concentrations in vegetation is high (correlation coefficient 0.92). Interpretation of Pearson's Correlation Coefficients indicates that the closer the absolute value is to 1.0, the stronger the relationship. The inverse is also true, and the closer the value is to 0.0, the weaker the relationship (NMSU, 2000). This indicates that no direct connection has been determined between the total selenium concentration and the extractable selenium concentration of the same material.

The total concentration of selenium in soils does not directly determine the concentration of selenium in the plants growing on those soils (Lakin, 1972 as cited in Bauer, 1997; Fisher, 1991). Palmer and Olson (1991) indicate that the soluble soil selenium should be a reasonable predictor of plant selenium content. Absorption by plants depends on the chemical form and solubility of the selenium, as well as the pH and moisture content of the soil. The actual amount of selenium in a given plant tissue reflects the amount of selenium available to the plant as well as the accumulating proclivity of that plant (Prodgers and Munshower, 1991).

Current BLM and USFS recommendations for maximum selenium concentrations in soil and growth medium used in reclamation are 1.0 mg/kg total selenium and 0.1 mg/kg extractable selenium (BLM and USFS, 2000). Maximum selenium concentration in vegetation of 5.0 mg/kg dry weight is also considered a standard for the protection of grazing animals.

The combined average concentration of total selenium in soil from all of the Smoky Canyon Mine samples analyzed from the treatment areas was 20.7 mg/kg (JBR, 2000c). Average total selenium levels for each of the six treatment areas exceeded 1.0 mg/kg (**Table 4.16-4**). Only the control sites had an average selenium level below the recommended maximum at 0.6 mg/kg. Average extractable selenium from each of the reclamation treatment areas and from the control area were below the 0.1 mg/kg standard.

Previous studies by the Selenium Working Group and others have indicated that the concentration of selenium and other metals in surficial growth medium and vegetation at reclaimed mining sites can be influenced by mining operations. Different reclamation treatment methods affect the selenium concentration in the growth medium materials and vegetation. This study has concluded that middle waste shales present in the surficial growth medium tend to have elevated selenium and other metal concentrations and vegetation rooted in these materials also tends to have elevated concentrations of these elements.

Table 4.16-5 indicates the comparisons of selenium concentrations in on-site soils determined during the August 2000 sampling of Smoky Canyon Mine reclaimed areas to the recently established interim soil suitability levels for reclamation.

Table 4.16-5 Selenium Concentrations in Reclaimed Areas at Smoky Canyon Mine Compared to Recently Developed Interim Suitability Standards for Soils

Laboratory Analysis Results	Number of Quadrants Sampled	Percent of Total Quadrants Sampled	Interim Soil Suitability Determination
Total selenium less than 1 mg/kg and Extractable selenium less than 0.1 mg/kg	2	6.90	Suitable
Total selenium between 1 to 5 mg/kg and Extractable selenium less than 0.1 mg/kg	2	6.90	Questionable
Total selenium more than 5 mg/kg and Extractable selenium less than 0.1 mg/kg	23	79.31	Questionable
Total selenium more than 1 mg/kg and Extractable selenium more than 0.1 mg/kg	2	6.90	Unsuitable

Impacts to soil resources from other uses includes grazing, timber harvesting, and recreation. Removal of trees and vegetation exposes the soil resources to erosional factors and equipment used to remove and haul the timber causes compaction which further increases the erosion potential by increasing runoff and decreasing infiltration. Erosion of seleniferous shales which might outcrop in these disturbed areas could oxidize selenium and subsequently mobilize higher concentrations into the surface soils.

Livestock grazing reduces the quantity of vegetation on the soil surface which has the potential to increase erosional processes. Specific localized damage in riparian areas from compaction and vegetation removal by cattle is common, allowing sediment to enter the waterway and contributing to the destruction of the stream banks.

Typical recreation in the Cumulative Effects Area consists of hunting, fishing, and other outdoor activities. Generally, these activities have a lesser magnitude on the soil resources than other uses due to their

intermittent and seasonal nature. Potential effects are limited and would include compaction from vehicle travel.

The Proposed Action or Alternatives would not incorporate harmful amounts of selenium or trace metals in the soil of the reclaimed area due to the incorporation of management practices into the mine and reclamation plan. The main mitigative feature in these management practices is the selective handling and capping of seleniferous overburden with an 8 foot thick chert cap before applying 1 to 3 feet of topsoil. Similar management practices would likely also apply to future mining at Manning Creek. Thus, selenium content of soil on new reclaimed areas in the Cumulative Effects Area would not increase under the Proposed Action or future mining of phosphate in the area. Existing selenium impacts on old reclaimed areas would be studied and mitigated in the future as described in the HMEII Report.

4.16.5 Vegetation

Mining has disturbed 1,651 acres of vegetation in the Cumulative Effects Area in the past, including Smoky Canyon Mine Panels A, D, and E, and the 553 acres for the permitted tailings pond. The proposed development of Smoky Canyon Mine Panels B and C is expected to have a project life of approximately four years and disturb an additional 618 acres. Further mine operation in the Cumulative Effects Area is possible if proposed mining in the Manning Creek lease is conducted on 850 acres.

Timber sales have taken place in or near the Cumulative Effects Area since the early 1980's. Detailed information is available for two recent timber sales, the Pole Canyon sale and the South Fork sale. The Pole Canyon sale totaled 248 acres of which 32 acres were within the Cumulative Effects Area. The South Fork sale totaled 221 acres of which 115 acres were within the Cumulative Effects Area. Timber on 532 acres of the proposed Smoky Canyon Mine Panels B and C and external overburden storage area would be harvested prior to land clearing. Thinning of over-mature stands of timber in the Cumulative Effects Area will likely take place in the future to prevent beetle infestation and reduce the fire fuel load. Prescribed burns conducted in the early 1980s affected approximately 477 acres of conifer and aspen habitat types within the Cumulative Effects Area.

The listing of vegetation types to be disturbed by the Proposed Action and Alternatives and how they compare with the area mapped during the baseline studies and the Cumulative Effects Area is shown in **Table 4.16-6**.

Table 4.16-6 Vegetation Impacts

Vegetation	Proposed Action	Baseline Studies Area	Percent Impacted	Cumulative Effects Area	Percent Impacted
Agricultural	0	0	0	2,106	0
Aspen	14	1,384	1.0	4,700	0.3
Aspen/Conifer	13	1.208	1.1	1,939	0.7
Conifer	532	2,164	24.6	4,592	11.6
Mined Land	217	577	37.6	1,342	16.2
Mixed Shrub	30	126	23.5	255	11.6
Riparian/Wetland	<1	21	4.8	514	0.2
Sagebrush	30	2,119	1.4	10,504	0.3
Water	0	0	0	560	0
Total	835	7,599	11.0	26,512	3.1

BLM and USFS interim guidelines for maximum selenium concentrations in soil and growth medium considered suitable to be used in reclamation are 1.0 mg/kg total selenium and 0.1 mg/kg extractable selenium (BLM and USFS, 2000b). Soils with selenium concentrations between 1 to 5 mg/kg and extractable selenium less than 0.1 mg/kg would be considered to be questionable. Soils with total selenium concentration levels more than 5 mg/kg and extractable selenium less than 0.1 mg/kg would be questionable for use in reclamation. Unsuitable growth medium material would consist of total selenium concentrations greater than 1 mg/kg in combination with extractable selenium levels greater than 0.1 mg/kg. Implementation of these interim guidelines could reduce the amount of selenium available in vegetation for uptake by grazing animals. These guidelines have been established recognizing the heterogeneity in the growth medium and variability of plant species and individual plants to potentially bioaccumulate selenium.

BLM and USFS interim standards for maximum selenium concentration in 50 percent of the vegetation is 5.0 mg/kg dry weight (BLM and USFS, 2000b). Forty-five percent of the vegetation may contain concentrations of selenium between 5 and 10 mg/kg dry weight. No more than 5 percent of vegetation may contain concentrations of selenium greater than 10 mg/kg dry weight and no more than 0.5 percent of vegetation may exceed 20 mg/kg dry weight selenium concentration. It is anticipated that these interim standards would also apply to the Smoky Canyon Mine Proposed Action and Alternatives.

Table 4.16-7 is a summary of the selenium levels in the soil/growth medium and vegetation growing on the reclaimed areas.

The placement of an 8 foot chert cap over seleniferous overburden is expected to effectively isolate the seleniferous overburden material from the effects of weathering and subsequent migration to the surface environment. Placement of 1 to 3 feet of topsoil on top of the chert cap material would enhance the performance of the overall cap in reducing percolation of surface water into overburden through evapotranspiration. Studies conducted by JBR (2001c), indicate that in reclaimed areas where vegetation is rooted in a layer of low selenium growth medium over chert, the selenium and other metal levels in the

vegetation are lower than vegetation rooted in shale overburden. Reclaimed areas which utilized a layer of topsoil over shale overburden do not show significant differences in selenium concentration compared with areas utilizing only the shale overburden (JBR, 2001c). The depth of the major root zone relative to the thickness of the non-seleniferous growth medium cover has a bearing on the selenium and metal content of the vegetation because some of the roots penetrate the growth medium into the underlying shale overburden material and are affected by the combined chemistry of the growth medium and overburden (JBR, 2001c).

The average dry weight concentration of selenium in all vegetation sampled by JBR from the reclaimed sample areas was 12.11 mg/kg which exceeds the 5.0 mg/kg threshold. The control site vegetation measured 0.25 mg/kg. Individually, reclamation treatment area two in the Panel A external dump and reclamation treatment area six in Panel E were below the desired maximum selenium concentration at 4.84 and 0.36 mg/kg, respectively. These sites placed topsoil over the overburden material prior to revegetation during the reclamation process. In addition, treatment area six utilized a chert cap placed on top of the overburden shales to further protect the vegetative rooting zone from contact with seleniferous material. The highest average selenium concentration in vegetation (31.68 mg/kg) was found in reclamation treatment area four, the Panel D, Pole Canyon dump. The average selenium concentration at this treatment area was significantly different ($\alpha = 0.05$) from the other reclaimed areas and the control area. This area was comprised of unsorted overburden with no topsoil covering.

Table 4.16-7 Soil/Growth Medium and Vegetation Sampling Results (mg/kg)

Area	Soil/Growth Medium						Vegetation		
	Total Selenium			Extractable Selenium			Total Selenium		
	Mean	High	Low	Mean	High	Low	Mean	High	Low
T1	23.82	34.2	13.2	0.0276	0.056	0.002	10.88	15.3	5.1
T2	33.36	56.0	20.7	0.0244	0.048	0.002	4.84	13.0	1.2
T3	13.93	24.3	6.1	0.002	0.002	0.002	5.83	10.6	2.1
T4	36.28	63.6	13.2	0.082	0.23	0.002	31.68	74.0	9.4
T5	12.72	19.8	7.0	0.0076	0.026	0.002	7.1	12.4	2.1
T6	2.52	6.1	0.5	0.002	0.002	0.002	0.36	0.7	<0.2
Control	0.6	1.1	<0.2	0.005	0.008	0.002	0.25	<0.4	<0.2

Selenium concentrations in vegetation reported from a 1998 study at the same sites in the IMA Selenium Committee Regional Investigation Report (IMA, 1999) were higher than those found in 2000. The IMA report found overall selenium concentration in vegetation from reclaimed areas was 16 mg/kg which was approximately 100 times greater than the concentration (0.15 mg/kg) found on background (control) areas on undisturbed land. The IMA (1999) report included data collected on three specific sites at the Smoky Canyon Mine which were again sampled in 2000 by JBR; the selenium concentrations in vegetation were higher in 1998 than 2000 (**Table 4.16-8**).

Table 4.16-8 Comparison of Average Vegetation Selenium Values 1998 and 2000 (mg/kg)

Reclamation Area	1998	2000
A Panel External External Overburden Site	19.7	10.9 and 4.8
A Panel Backfill	10.5	5.8
Pole Canyon External Overburden Site	39.9	31.7

Since methodologies were different, the results in Table 4.16-7 and Table 4.16-8 are not directly comparable.

The correlation of total selenium concentration in vegetation with soil extractable selenium is much higher (correlation coefficient = 0.92) than the correlation with soil total selenium (correlation coefficient = 0.44). Both correlations are significant ($\alpha = 0.05$). The high correlation with selenium concentration in vegetation suggests that soil extractable selenium is an important factor in predicting which areas are likely to show selenium accumulation in vegetation. It is also notable that elevated selenium concentrations in vegetation occurred despite the fact that soil extractable selenium was in all cases below the 0.1 mg/kg threshold.

The soil and vegetation studies performed on the reclaimed areas of the Smoky Canyon Mine (IMA, 1999a; JBR, 2001c) suggest that some vegetation is accumulating selenium in concentrations above the BLM and USFS guidance levels.

The data for the site where topsoil was placed over chert overburden (treatment area six) reveals soil and vegetation selenium levels within the BLM and USFS guidance. This indicates the results of the proposed capping and reclamation plan for the Proposed Action and Alternatives would also comply with the guidance and would not contribute to the existing selenium impacts.

Future mine plans that incorporate similar management practices into their design would not contribute additional reclaimed areas that result in vegetation with high selenium levels. The vegetation with high selenium levels would be confined to existing reclamation where chert was not used to cap the seleniferous materials.

4.16.6 Grazing Management

The area of analysis includes portions of the Pole Canyon, Salt Lick, Timber Creek, and Sage Creek allotments. Vegetation cover types in the Cumulative Effects Area are shown in **Figure 4.16-3**.

At current levels, the four allotments on government land graze a total of 3,020 head of sheep and 99 head of cattle. Grazing takes place during the summer months on a system of rotation and the total number of animal months is 7,214 (Mickelsen, 2000a). Significant changes include possibly reducing the Sage Creek and Timber Creek allotments grazing intensity by half. **Table 4.16-9** is a summary of the allotments in the Cumulative Effects Area. Potential effects of grazing on wildlife are discussed in Section 4-16.8, Wildlife.

Table 4.16-9 Allotments in Cumulative Effects Area

Parameters	Pole Canyon	Sage Creek	Salt Lick	Timber Creek
Percent in Cumulative Area	50%	45%	50%	25%
Acreage	12,658	4,057	1,133	3,672
Season of Use	6/27 - 9/20	7/1 - 8/30	6/6 - 9/1	7/1 - 8/30
Numbers	1,020 sheep	1,000 sheep	99 cattle	1,000 sheep
Animal Months	2,924	2,000	290	2,000

Some restrictions have been placed on the permit holders as a result of past mining and timber sales on the allotment (Mickelsen, 2000a). Currently, no grazing is allowed on mine dumps, trailing is limited across mine dumps, and no watering is allowed in ponds or streams flowing from mine dumps. However, Simplot reports that some short term grazing occurs on mine facilities in spite of the restrictions. No grazing is allowed in new timber plantations. The permit holder is required to use only certified weed-free hay or straw on USFS lands (USFS, 2000b).

Mining has disturbed large areas of vegetation, potentially usable for grazing, in the Cumulative Effects Area in the past, including Smoky Canyon Mine Panels A (391 acres), D (514 acres), and E (511 acres). Panel E was entirely within the Sage Creek allotment. The greater part of Panel D was in the Timber Creek allotment and a portion of Panel D and all of Panel A was in the Pole Canyon allotment. The tailings ponds on Roberts Creek are permitted by the United States Army Corps of Engineers and the State of Idaho for a full capacity of 553 acres, a capacity which is adequate to hold the tailings from Panels B and C. The proposed development of Smoky Canyon Mine Panels B and C is expected to have a project life of approximately four years. Further mine operation in the Cumulative Effects Area is possible if proposed exploratory drilling in the Manning Creek region is successful. The estimated mining disturbance for the Manning lease is 850 acres.

The available forage area has been reduced about 14 percent in the Cumulative Effects Area portion of the allotments based on 3,086 acres disturbed by mining and under reclamation, and 147 acres disturbed and replanted due to logging. Revegetation over time would replace the lost forage. Reclamation vegetation would not be immediately available to sheep permittees. Several years of growth are required to ensure establishment and contaminant control prior to grazing.

Vegetation growing in selenium-enriched soil or growth media can absorb selenium through its roots and concentrate in a process termed bioaccumulation. In the terrestrial ecosystem, bioaccumulation of selenium by plants is the first major step in biomagnification, the increasing concentration of selenium within successively higher trophic levels. Consumption of selenium-enriched plants by livestock can result in selenium poisoning as the element is further concentrated in the organs of the animal.

The average concentration of total vegetation selenium in six different reclamation areas at the Smoky Canyon Mine sampled by JBR ranged from 0.36 mg/kg to 31.7 mg/kg (**Table 4.16-10**) (JBR, 2000c). The sample location in Panel E, which had a topsoil covering over chert fill, was well within the desired vegetation selenium concentration threshold (5 mg/kg) at 0.36 mg/kg. This result suggests that capping seleniferous overburden with chert and topsoil should be effective in controlling selenium uptake in

VEGETATION TYPES
- Agricultural
- Aspen
- Aspen/Conifer Mixed
- Conifer
- Disturbed
- Mixed Shrubs
- Riparian/Wetland
- Sagebrush
- Water

TYGEE RIDGE
WEBSTER RIDGE
PROPOSED B-PANEL
PROPOSED OVERBURDEN DISPOSAL SITE
PROPOSED C-PANEL
A-PANEL (MINED OUT)
D-PANEL (MINED OUT)
E-PANEL (ACTIVE)
Tygee Creek
Smoky Creek
Dry Creek
Pole Canyon Creek
Sage Creek
Crow Creek
Deer Creek
Swanning Creek
South Fork Sage Creek
R46E
R45E
T 8 S
T 9 S
T 10 S

Adapted from Idaho Cooperative Fish and Wildlife Research Unit (ICFWRU), USGS, 2000, Idaho GAP Analysis Project 2, University of Idaho Web Site, Downloaded September 2000. <http://www.wildlife.uidaho.edu/data.htm>

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EXPLANATION
- Cumulative Effects Area
- Proposed Disturbance

drawings\SIMPLOT\FSEIS\Figures DFSEIS\Figure 4.16-3.dwg (revised 4/9/01)

FIGURE 4.16-3
VEGETATION TYPES IN CUMULATIVE EFFECTS AREA
SIMPLOT SMOKY CANYON MINE PANELS B&C
SUPPLEMENTAL EIS

vegetation used for reclamation. The portion of the Panel A external dump area which had a layer of topsoil over unsorted overburden was just below the USFS vegetation standard at 4.84 mg/kg. The highest average selenium concentration in vegetation (31.68 mg/kg) was found in the Panel D Pole Canyon dump. In this reclaimed area, vegetation was growing directly in shale overburden with no topsoil covering.

Table 4.16-10 Selenium Content in Vegetation at Smoky Canyon Reclaimed Areas

Reclamation Treatment Area	Description of Area Sampled	Average Selenium in Vegetation (mg/kg)
T1	A-Panel External Dump: non-topsoiled area, plants rooted in unsorted overburden	10.88
T2	A-Panel External Dump: topsoiled area, plants rooted in topsoil over overburden	4.84
T3	South end A-Pit Backfill: plants rooted in topsoil over unsorted overburden	5.83
T4	Pole Canyon Dump: plants rooted in unsorted overburden	31.68
T5	North end D-Panel Backfill: plants rooted in topsoil over unsorted overburden	7.1
T6	North end E-Panel External Dump: plants rooted in topsoil over chert	0.36
T7	Control area off the reclaimed mine area	0.25

Presently livestock are not permitted to graze on the mined reclaimed areas so there is little direct exposure to forage with elevated levels of selenium. Future reclamation would implement management practices so vegetation is not in contact with seleniferous materials; over time some of the reclaimed mine sites such as T6 in the above table could again by grazed. Some of the other existing reclaimed sites with elevated selenium levels in the vegetation may need to be permanently excluded from the allotments or mitigated to reduce selenium levels in vegetation.

The allotments in the area of cumulative effects analysis have been adversely affected by introduction of noxious weeds resulting from mining-related ground disturbance. Noxious weeds believed to have been introduced in this way are spotted knapweed (*Centaurea maculosa*), diffuse knapweed (*Centaurea diffusa*), musk thistle (*Carduus nutans*), Canada thistle (*Cirisium arvense*), and dyer's woad (*Isatis tinctoria*) (Mickelsen 2000a). Noxious weeds established in the slurry pipeline area of disturbance are spreading into adjacent allotments (Mickelsen, 2000a). The mine related disturbance has the potential for further encroachment by noxious weeds on grazing lands.

4.16.7 Wetlands

The principal impact to wetlands within the Cumulative Effects Area occurred as a result of the construction of the Smoky Canyon Mine Number 2 Tailings Pond (TP2). As mining progressed, Simplot found additional tailings area, beyond that provided by their original tailings pond (TP1) was needed. Because regulated wetlands would be impacted by construction of the additional tailings facility, Simplot applied for a wetlands permit from the U.S. Army Corps of Engineers (USCOE), the USCOE issued a permit for construction of the TP2 facility in 1991. The new tailings facility includes an earthen dam and

a diversion ditch which conveys flow in Tygee Creek around the tailings facility, and also captures flow from Roberts Creek. Additionally, a clay liner was placed over a saline spring which was located within the footprint of the TP2 pond.

Total disturbance from the tailings facility, including roads, dams, and ancillary facilities, is projected to affect approximately 553 acres. Based upon National Wetlands Inventory (NWI) maps of the project area, the completed TP2 facility will disturb a total of 137 acres of wetlands. This total includes 17 acres of saline springs located near the confluence of Tygee and Roberts Creeks. As allowed by permit, these springs were covered with a clay liner and tailings during construction of the Phase I dam for TP2.

As summarized in the Wetland Mitigation Plan prepared on the TP2 facility (TRC Mariah, 1995b), a total of 139 acres of vegetated wetlands were present in the TP2 project area prior to construction of the Phase I Lift. This total included the 137 acres identified on NWI maps of the project area, minus eight acres of unvegetated area present at Salt Springs (located at the confluence of Roberts and Tygee creeks), plus an additional ten acres of vegetated wetlands found to have formed below TP1. Construction of the Phase I Lift and subsequent filling of the Phase I pond resulted in impacts to 104 acres of vegetated wetlands (**Table 4.16-11**). Filling of the pond behind the Phase II Lift, which was completed in 1996, has or will result in impacts to another seven acres of vegetated wetlands. The Phase III lift, when constructed as permitted, would impact another 13 acres of vegetated wetland. Simplot has prepared a mitigation plan which will compensate for the loss to these wetlands. A portion of this mitigation has been (or is being) conducted concurrently with construction of the various TP2 lifts. The remainder will be created upon closure and reclamation of the site. As described in the 1995 Wetland Mitigation Plan (TRC Mariah, 1995b), mitigation includes creation of wetlands on site, in part during reclamation of the tailings facility at the close on mining in the area, protection and enhancement of existing wetlands in the area by fencing, and off-site mitigation on a parcel of land near the Grays Lake National Wildlife Refuge.

Other disturbance to wetlands and waters of the U.S. in the analysis area includes a 6,000 foot long fill over Pole Creek (USFS, 1981, p. 5-34) and an approximately 400 foot wide haul road fill crossing over Sage Creek (TRC Mariah 1997). Based upon an examination of the downstream end of the channel affected by the Pole Creek fill, the affected channel appears to be a waters of the U.S. approximately eight feet in width. This 6,000 foot fill, therefore, appears to have affected approximately 1.1 acres of waters of the U.S. The function of this waters of the U.S. was maintained by installing a French drain beneath the dump, allowing flows in the creek to pass through the dump. While the French drain allows water to pass through the lower portion of the dump and maintains flows in Pole Creek, leaching of the overburden apparently occurs.

The stream in the area of the Sage Creek crossing is described as being 4 to 8 feet wide with relatively abrupt edges and with several forks. Assuming a total average wetland/waters of the U.S. width of 50 feet, this haul road would have impacted approximately 0.46 acre of wetlands/waters of the U.S. **Table 4.16-11** summarizes the disturbance to wetlands and waters of the U.S. which have occurred in the cumulative effects survey area, and shows the disturbance which would occur as a result of the Proposed Action.

In addition to these impacts, and as shown in **Table 4.16-11**, reasonably foreseeable future exploration, mining and other activities in the Cumulative Effects Area is projected to result in impacts similar to those occurring as a result of mining to date in the Smoky Canyon Mine area, or approximately 1.8 acres of

jurisdictional wetland. In total, past, proposed and reasonably foreseeable future disturbance would impact an approximate total of 131 acres of jurisdictional wetlands in the Cumulative Effects Area. As noted above, a majority of these impacts occurred as a result of construction of Tailings Pond 2.

Table 4.16-11 Previous and Proposed Disturbance to Wetlands and Waters of the U.S. in the Smoky Canyon Mine Cumulative Assessment Area

Action Resulting in Disturbance	Acreage of Disturbance		
	Wetland	Waters of the U.S.	Uncertain Status[1]
Tailings Pond 2, Phase I	104	-	-
Tailings Pond 2, Phase II	7	-	-
Tailings Pond 2, Phase III	16	-	-
Pole Creek Dump	-	1.1	-
Sage Creek Haul Road Crossing	-	-	0.46
Subtotal, Existing Disturbance	127	1.1	0.46
Proposed Action	0.306	0.066	0
Total Jurisdictional Area	127.31	1.17	0.46
RFF[2] Impacts	0	0	1.8
Total Existing and RFF	127.31	1.17	2.26

[1] Wetland and/or Waters of the U.S.
[2] Reasonable Foreseeable Future

4.16.8 Wildlife

Coniferous trees, aspen, and sagebrush are the dominant vegetation types within the Cumulative Effects Area. To a lesser extent, riparian and wetland areas are also present and perform important ecological functions. This diversity in habitat types allows for many wildlife species to utilize the area. The foremost impact to wildlife within the area has been habitat loss associated with mining activities, grazing, and timber harvest. Other impacts have included elevated selenium levels, noise disturbance, and direct mortality. The two major effects of mining activities in this area on wildlife are habitat conversion and increased availability of selenium.

The majority of habitat conversion is in the form of forest removal followed by replanting with grass and forb seed mixtures. This habitat conversion will cause forest dependent wildlife to disperse in search of new areas. In general, dispersal decreases survival rate and increases competition. Species such as elk may take advantage of new foraging areas; however, negative impacts associated with forest cover removal may out weigh any advantage related to increased foraging opportunities. Creation of additional edge may benefit various mammalian and avian predators, but at the same time may negatively effect prey species and those species requiring continuous blocks of forested habitat. The creation of mine highwalls would provide additional habitat that may be used by bats and some bird species.

The Cumulative Effects Area contains naturally occurring selenium-bearing rock and soil. Mining activities can expose this material to bioaccumulation thus exposing wildlife in the area to elevated levels of selenium. In general, elevated levels of selenium would potentially be available to wildlife through ingestion of vegetation growing on seleniferous overburden, vegetation growing on or near tailings and/or sediment ponds, drinking of water from tailings and/or sediment ponds, and to the predators that prey on these species.

Site investigations into the selenium content of soil and vegetation in existing reclaimed areas at the Smoky Canyon Mine indicate that total average soil selenium in the six different reclamation treatment areas studied ranged from 2.5 to 36.3 mg/kg. Average selenium in vegetation growing on these same areas ranged from 0.36 to 31.7 mg/kg. The highest soil and vegetation selenium values were found where vegetation was growing directly in shale overburden and the lowest soil and vegetation selenium values were found were vegetation was growing in topsoil that had been placed over chert overburden.

It is possible that herbivores, and predators preying on these species, could ingest elevated amounts of selenium from eating vegetation growing on existing overburden disposal areas. Because of the lack of site-specific data on selenium impacts to wildlife, it is difficult to predict if elevated metals in forage and prey species would adversely affect local wildlife associated with the existing mine disturbances in the Cumulative Effects area. Preliminary research conducted as a part of the Southeast Idaho Selenium Project has found higher selenium concentrations in the eggs of some species of birds which inhabit phosphate mining areas with exposed selenium sources, versus concentrations found in birds on non-mined lands. The authors of this study note that these concentrations are generally within the background range for selenium reported for other regions (Ratti and Garton, 2000), but note their findings suggest further investigations into this issue should be conducted. A larger-scale investigation is being conducted. Results of data gathered during 2000 and 2001 are expected in 2002. Simplot and the USFS are negotiating an Administrative Order on Consent to investigate the threatened mobilization of selenium and other hazardous substances from past mining activities at the Smoky Canyon Mine and on those lands (may have other surface ownership). A work plan is being developed to investigate impacts from the mine and tailings impoundment to waterfowl and other aquatic species at the tailings impoundment. IDEQ will be the agency working with Simplot in the investigation at the tailings impoundment. State authorities are cited in the AOC for the impoundment investigation. USFS CERCLA authorities will be used to address releases on land under the jurisdiction of the USFS.

Two surface water sources, Pole Creek and Hoopes Spring, have selenium levels above aquatic life standard of 0.005 mg/l, which may affect terrestrial wildlife that utilize these water sources. These can also affect downstream aquatic habitat in Sage Creek.

Within the Cumulative Effects Area, Tailings Ponds 1 and 2 will continue to be used for mining activities and can be considered as permanent fixtures on the landscape. Based on one sample event, surface water selenium levels were higher than the aquatic life standard (0.005 mg/L) in Tailings Pond 2 (0.041 mg/L). This standard does not legally apply to the water in the pond.

No site-specific studies are known that assess toxic levels of selenium for amphibians, reptiles, or mammals as related to selenium levels in water or aquatic plants and invertebrates. No studies have been conducted within the Cumulative Effects Area to specifically evaluate the effects of selenium in water, invertebrates, or wetland vegetation on wildlife. However, studies in other areas and with other species indicate that acute and chronic affects can occur to physiology of species that ingest elevated levels of selenium. Site-specific studies of this nature to assess the selenium impacts from past Smoky

Canyon operations would be conducted as discussed in the HMEII Report and directed by the USFS and IDEQ.

The effects of grazing on sagebrush/grassland habitats is well documented. In general, wildlife are negatively affected by livestock grazing due to competition for forage, direct mortality by trampling, and habitat removal/conversion due to overgrazing on both uplands and wetlands. As described in the Canada Lynx Conservation Assessment Strategy (USFS et al., 2000), both domestic livestock and /or wild ungulate grazing may change the structure or composition of native plant communities. In particular, grazing has been a factor in the decline or loss of aspen stands. Aspen habitats provide cover, foraging and nesting opportunities to a variety of both game and nongame species (e.g., mule deer, snowshoe hare, cavity nesting birds). Grazing may reduce understory vegetation in both forest and sagebrush/ mixed shrub habitats. Proper rotation and stocking rates can minimize these negative effects.

Potential impacts of roads have already been discussed in relation to raptors (Section 4.7.1). Recreational use in the general area is discussed in Section 3.11. Human presence tends to disturb many species of wildlife, including sensitive species. Major recreational uses in the area include hunting, fishing, ATV and snowmobile use, camping and picnicking. Diamond Creek Campground is located approximately four miles west of the Proposed Action area; a winter season warming hut is located just north of the campground. Accessible (all-season road) areas receive year-round recreational use. Human disturbance during periods of the year when wildlife are otherwise stressed, due to a lack of forage and/or harsh weather (as occurs during the winter season) can further stress wildlife and may increase mortality. Specifically, wintering big game may be subject to increased harassment by recreationists, particularly if available hiding/escape cover is reduced by other activities. Recreation use in the area can be expected to reflect local population changes and interest in outdoor activities. Losses of forage or changes in habitat structure due to road construction, noxious weed encroachment, or livestock grazing may also impact game and nongame species inhabiting the area. New road construction tends to increase recreational and other use of formerly remote areas, placing further pressure on wildlife.

Since the early 1980's, timber sales of approximately 1 million board feet (MMBF) have occurred bordering and within the Cumulative Effects Area. Within the cumulative effects boundaries, approximately 147 acres of timber not associated with mining activities have recently been harvested. Approximately 532 acres of mainly mature lodgepole pine would be harvested as a result of the Proposed Action. This figure represents about 11.6 percent of the timbered land within the cumulative impact area. By 2007, approximately 34 percent (1,800 acres) of timbered land within the Cumulative Effects Area will have been cleared as a result of mining activities. These timbered lands are used to some extent by many species including deer, elk, moose, song birds, small mammals, predators, and raptors. Following timber removal these areas will be reclaimed primarily with grasses. The effects of this habitat conversion are described earlier within this section.

4.16.9 Fisheries and Aquatic Resources

The effects on aquatic habitat by mining, grazing, timber harvest, and roads in the Cumulative Effects Area include the potential for an increase of sedimentation, which could result in a loss of spawning habitat for fish and a decrease of benthic organisms used by fish for food. Mining presents the potential for introduction of higher levels of selenium into streams by surface and subsurface flow of water in addition to that introduced with sediment. Increased levels of selenium and some trace metals in water

and forage has occurred as a result of past and current mining activities and natural processes, particularly in the Pole Canyon Creek watershed. As discussed in Section 4.3, turbidity, an indicator of increased sediment transport, has increased downstream of existing mining at Smoky Canyon by between 4 and 7 NTU's which is a small increase and still results in low total turbidity values (9 to 20 NTUs) downstream of the mine area. This low turbidity is not considered to be limiting for fish spawning habitat or benthic organisms. Aquatic monitoring conducted downstream of existing mining areas at Smoky Canyon has generally recorded no negative impacts to the benthic populations and communities attributed to changes in water quality or substrate composition with the exception of elevated values in Lower Pole Canyon Creek and Hoopes Spring (TRC Mariah, 2000b). No adverse effects attributable to selenium have been reported by local ranchers. Because of this and the fact that the mine will utilize current BMPs to control runoff and sediment in future developments the potential for a significant impact on spawning habitat and decrease of organisms from new mine developments is likely low.

Tailings Ponds 1 and 2 will continue to be used and can be considered as permanent fixtures on the landscape. Based on one sample event, surface water selenium levels were higher than the aquatic life standard (0.005 mg/L), at two locations: Tailings Pond 2 (0.041 mg/L) and Lower Pole Creek (0.5 mg/l). However, waterborne selenium itself is not very toxic to fish and wildlife (Skorupa, 1998). Yearly aquatic quality monitoring in Smoky, Tygee, Pole, Sage, South Sage Creeks and Hoopes Spring have been conducted by TRC Mariah since 1982. With the exception of Pole Creek and Hoopes Spring, water quality and aquatic habitat has been good in the creeks monitored by TRC Mariah.

Aquatic monitoring of Pole Creek was performed by TRC Mariah in 1999. Aquatic life standards at Lower Pole Creek were exceeded for cadmium, selenium, and zinc at the time of that sampling (spring season). The spring benthic populations at Upper Pole Creek above the Pole Canyon Dump, consisted primarily of Caddisfly (*Neothremma*), a species that inhabits erosional stream habitats. Density and the number of taxa of macroinvertebrates in the spring at Lower Pole Creek, below the Pole Canyon Dump, was low compared to past years. No sampling was conducted in fall 1999 due to an absence of flow. There has been no fish sampling to date in Pole Creek.

TRC Mariah observed lower trout populations than previously noted in Upper Sage Creek, but populations are normally low and fluctuate during drought and high flow years. Trout populations at Lower Sage Creek and Hoopes Spring were intermediate as compared to past sampling. Trout populations at Lower South Sage were higher than past sampling. Though water quality and water supply at Lower South Sage are both very good, optimum fish habitat has been affected by grazing and contains large areas of shallow, slow moving water with little cover. In 1995, TRC Mariah concluded that there is no evidence that trout populations in the Sage Creek drainage have been adversely affected by phosphate mining (TRC Mariah, 1995a). There has been no recent fish sampling to date in Sage Creek.

No studies have been conducted within the Cumulative Effects Area to specifically evaluate the effects of selenium in water, invertebrates, or wetland vegetation on wildlife. Additional studies are still needed before the cumulative effects of selenium exposure in this area on wildlife are fully understood. Simplot intends to implement the processes described in the HMEII Report which will include site investigations related to selenium.

The livestock industry has been an integral part of the Cumulative Effects Area since human settlement of the area. Following years of grazing, livestock stocking levels have been recently decreased in order to bring numbers in line with forage production. Livestock grazing would continue to be a major land use

activity within the Cumulative Effects Area but is not expected to increase above current rates. The effects of grazing near aquatic habitats is well documented. TRC Mariah concluded in the 1994 Sage Creek Fisheries Study that livestock grazing and use of riparian areas had the greatest impact on trout habitat and, therefore, trout populations in the Sage Creek drainage (TRC Mariah, 1995c).

By 2007, approximately 34 percent (1,800 acres) of timbered land within the Cumulative Effects Area will have been cleared as a result of mining activities. These timbered lands naturally control sedimentation of streams by erosion processes. Following timber removal these areas will be reclaimed primarily with grasses which will control sedimentation of streams by erosion processes.

According to the Draft Environmental Impact Statement for the Caribou National Forest Proposed Land and Resource Management Plan (USFS, 1984a), mining activities, timber harvesting, and grazing of livestock on public lands would increase sediment yields. Under most alternatives considered, which includes various levels of land use activities, sediment production would increase, but within the standards established for soil and water quality regulations. It is not possible to quantify total effects of these activities on private land due to individual landowner style or level of management.

4.16.10 Threatened, Endangered, and Sensitive Species

The limited use of the project area by Listed/Candidate species minimizes the impacts of disturbance in the area on these species. Bald eagles have not been recorded foraging at the Simplot tailings ponds, but could be attracted by waterfowl utilizing the ponds. Past, present and reasonably foreseeable future impacts in the Cumulative Effects Area would not be expected to influence bald eagle use of the tailings ponds.

Disturbance associated with logging, mining and right-of-way construction may limit the attractiveness of the Cumulative Effects Area to species such as the gray wolf, which prefer extensive tracts of undeveloped land. Conversely, the presence of livestock may attract this species, and could result in conflicts with human activities. Impacts to mature forest and riparian areas may decrease potential Canada lynx habitat and impact travel corridors.

Grazing of mesic areas could impact potential Ute ladies'-tresses habitat, though baseline surveys have not identified populations of this species in surveyed portions of the project area.

Baseline surveys have documented that the general area of the Smoky Canyon Mine is used by at least three sensitive species, the boreal owl, the flammulated owl and the Yellowstone (fine spotted) cutthroat trout. Habitats which could support occasional use by other sensitive species, including the trumpeter swan, northern goshawk, great gray owl, and three-toed woodpecker also exist. Other sensitive species appear to have more limited potential for occurrence in the project area, though no evidence of these latter species was found during baseline surveys. The limited use of the area by most sensitive species minimizes the impacts of disturbance in the area on these species.

Disturbance associated with logging, mining, and right-of-way construction which includes the removal of mature forest habitat and snags could impact local boreal and flammulated owl populations. While their presence was not documented, impacts to conifer, mixed conifer or shrubland habitats could impact goshawk or great gray owl foraging areas. Impacts to forest edge habitats, in particular, could impact great gray owl foraging areas. All-season roads can increase winter recreational use of an area,

potentially affecting sensitive species, including wolves, lynx and wolverines, during a time of the year when these species are already under stress due to harsh conditions. Approximately 1800 acres of timbered land will have been cleared at the completion of mining activities. Current plans are to reclaim this acreage primarily with grasses. Forest habitats suitable for boreal and flammulated owls, as well as northern goshawks, three-toed woodpeckers, and great gray owls, would not become reestablished in the short term. Another 147 acres within the Cumulative Effects Area have been subject to recent logging. Timber harvest is not expected to be a prevalent use of the Cumulative Effects Area in the future, but thinning of overmature stands and for fire prevention may still occur. The 1,947 acres which have been or will be subject to logging (1,800 associated with mine development and 147 acres of timber harvest outside mining areas) represent approximately 31 percent of the conifer/aspen-mixed conifer habitat present within the 25,558 acre Cumulative Effects Area.

Because no other large bodies of water excepting the mine's tailings ponds exist in the area, impacts to trumpeter swans, other than those discussed above, would not be expected from other activities in the Cumulative Effects Area.

Activities which increase sediment runoff into streams or impact riparian zones, including mining-related activities, grazing and logging, as well as road construction and maintenance near streams, could adversely impact Yellowstone cutthroat trout populations inhabiting area streams. Fuel or hazardous materials spills associated with any of these activities could also impact Yellowstone cutthroat trout.

The potential for mobilization, transport, and uptake of selenium and trace metals at levels greater than environmental standards exist in the area. Natural erosion and leaching processes have mobilized selenium into soil and water. Mining activity has exposed these same materials to similar processes and in doing so, has locally accelerated the rate of natural mobilization. Reclamation practices at mine disturbances in the past have resulted in elevated selenium concentrations in soil and vegetation. On disturbed sites, vegetation uptake and elevated concentrations in surface water and groundwater can make selenium available to terrestrial and aquatic life through forage and drinking water. Under these conditions, accumulation of selenium in water, soil, and biota can occur. Current and future mining practices include mitigation for these impacts.

The influence of these processes in the Blackfoot and Salt River basins are only generally understood at this point, and many factors can determine potential for mobilization, transport, and bio-availability at any one site. Topographic setting, overburden and soil characteristics, surface drainage, and groundwater characteristics are among key physical attributes that can vary from mine site to mine site. Reclamation and management practice's employed by mining operations have mitigated impacts to varying degrees in recent years. In addition to investigations being performed by the Selenium Subcommittee, several other completed and on-going studies address selenium concentrations and their effects. Data collected thus far do not thoroughly address the mechanisms regarding selenium mobilization, uptake, and distribution encountered in the Cumulative Effects Area.

Simplot plans to cooperate with the regulatory agencies as described in the HMEII Report in conducting site investigations related to the existing Smoky Canyon Mine area to determine levels of selenium contamination in the environment and their impacts on biota.

4.16.11 Recreation & Wilderness

The implementation of the Proposed Action and Alternatives would directly impact recreation by the temporary loss of public lands that are used for multiple use recreation. The Proposed Action area does not offer unique recreational opportunities that are not also found elsewhere in the immediate vicinity. While the Proposed Action would prohibit public access to 835 acres of land, it would reopen after the reclamation process is complete. In addition, public access along Smoky Canyon Road would not be prohibited. Therefore, no cumulative effects are anticipated to recreation and wilderness as a result of implementation of the Proposed Action.

When combined with past, present, and reasonably future mining related activities, total area temporarily removed from public recreational use within the Cumulative Effects Area will encompass approximately 3,645 acres. The majority of this acreage (3,545 acres) represents mining activities, with the remaining acreage representing disturbances from timber management activities. Since the dominant recreational use within the Cumulative Effects Area is big game hunting, that recreational use would receive the most impact. During the conductance of mining activities, big game would likely move to other unimpacted areas. However, upon the cessation of reclamation, deer and elk are likely to return to previously mined areas, mostly on the edge of vegetation zones (forest to grass land) to forage. Cumulative impacts to hunters are anticipated to be minimal to none.

4.16.12 Cultural Resources and Native American Concerns

Figure 4.16-4 illustrates the boundaries of most major cultural resource inventories within the Cumulative Effects Area. Inventories for drill holes and timber sales were not delineated on this figure. The area surveyed to date contains ten cultural resources sites of which three are NRHP-eligible. Although these three sites are not within the Proposed Action area, secondary effects could occur. Past and present cumulative impacts include grazing, timber harvesting, utility and road right-of-ways, and recreational activities. Vandalism and collection of cultural resource artifacts has likely occurred due to increased traffic and activity in the area. The mining activities have impacted the view shed surrounding the cultural resources. These impacts are ongoing within the Cumulative Effects Area. The Proposed Action and Alternatives will likely contribute to these secondary impacts. All three of the eligible properties are located south of the Proposed Action area, but north of the active Panel E. There are several possible historic GLO features within the Cumulative Effects Area that need to be visited in the field in order to determine their status. These features may then need to be recorded and evaluated.

There would be no impacts to known Native American religious sites, traditional cultural places, or treaty rights.

4.16.13 Social and Economic Resources

The Cumulative Effects Area includes the tri-county area of Bannock and Caribou counties, Idaho and Lincoln County, Wyoming.

There are no foreseeable changes of significance in timber harvesting, livestock grazing, agricultural activities, or recreation use in the tri-county area. Mining would still be the main economic force in Caribou and Lincoln counties. Since mining is expected to continue at the same level at the Smoky Canyon Mine under the Proposed Action and probably in the future to continue at the Manning Creek

Lease, the economy of Lincoln County would remain stable. The economy of Caribou County, for the same reasons on the scale of the phosphate mining industry in southeast Idaho, would also remain stable.

With no large in- or out-migration to the area anticipated as a result of cumulative impacts from mining, grazing, timber harvest, rights-of-way, and recreational activities, there are little if any anticipated cumulative social and economic impacts to the Star Valley or the tri-county area.

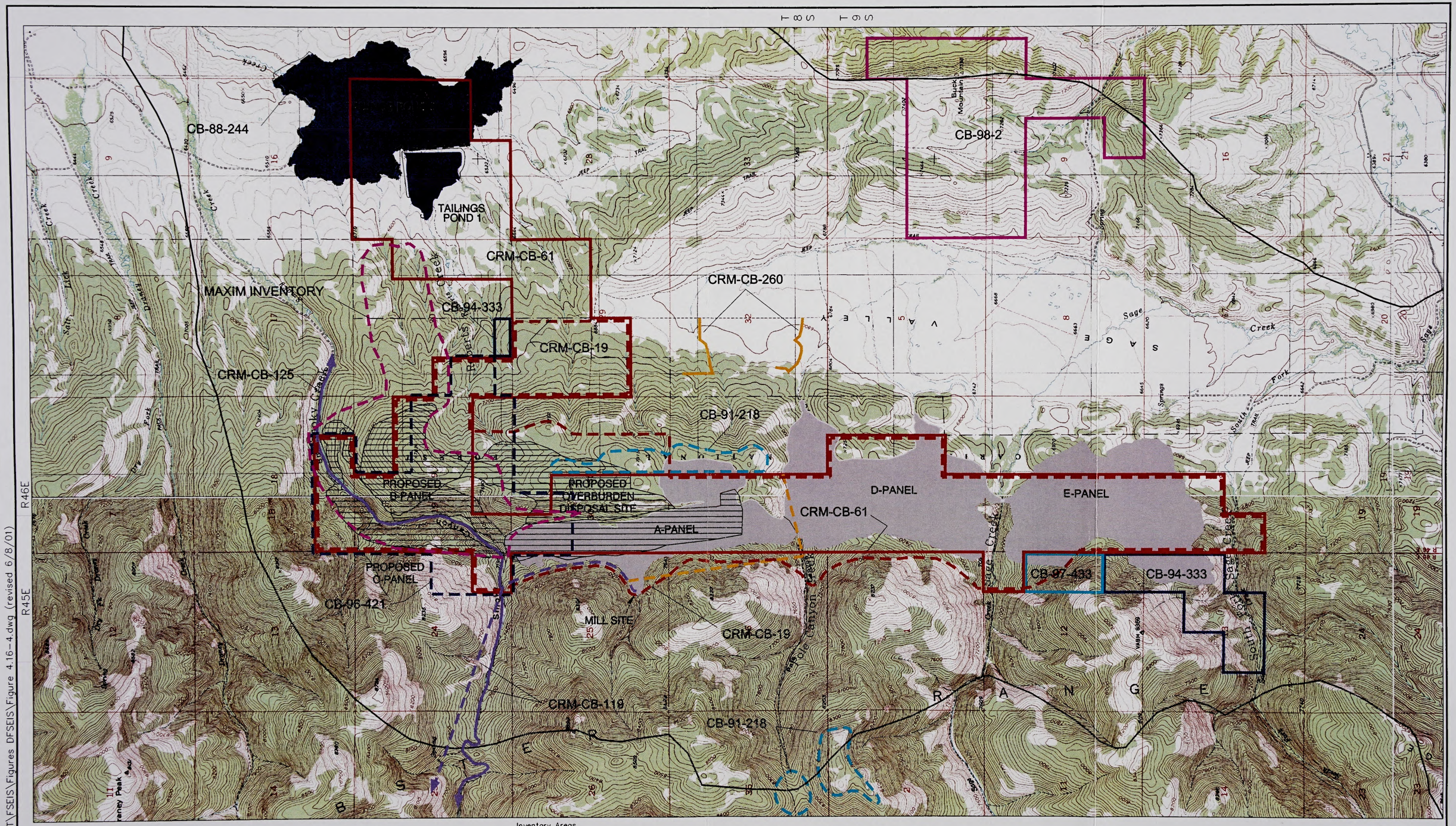
4.16.14 Visual Resources

The Cumulative Effects Area is within a region of generally north to northwest-trending mountain ranges and valleys. The most common land form is the foothills, which are cut at intervals by small creeks and drainages. Although scenic variety exists in the densities, arrangements, and colors of vegetation, no visually distinct landscapes are found in the Cumulative Effects Area. The area is generally undeveloped other than for mining; visual modifications to the area have been in the form of timber cuts, roads, mining operations, range improvements, power lines, and pipelines.

Mining activities are ongoing in Panel E; Panels D and A are mined out. The potential for future additional landscape disturbance, in addition to the Proposed Action and Alternatives, is mainly in the Manning Creek area, currently proposed for exploration. All of these areas south of proposed Panels B & C are designated with a VQO of M, Modification. The proposed mining of Panels B & C would extend the disturbance north of the existing mining disturbances. Mining on the Manning Creek Lease would extend the mine related disturbances south of the present disturbances.

Views of the mining activity in the Cumulative Effects Area are generally blocked from the west by the Webster Range. Portions of the mining disturbance may be visible as a background element from locations along the Crow Creek Road and from trails on Tygee Ridge. The general mine area from Smoky Creek on the north to Deer Creek on the south is a distant view for travelers on Star Valley roads.

The increase in surface area of the tailings ponds (ultimate area 553 acres) will further add to the permanent landscape change. The surface water-pond element was not present in the area prior to the creation of the tailings ponds. The continual expansion will occur visually as a gradual change. There is a low level of sensitivity to this expansion due to lack of public access to the tailings ponds. Views from a distance are possible by recreationists or hunters on Tygee Ridge or Draney Peak.



drawings\SIMPLOT\FSEIS\Figures DFSEIS\Figure 4.16-4.dwg (revised 6/8/01)

FIGURE 4.16-4
CUMULATIVE EFFECTS AREA WITH PREVIOUS INVENTORY AREAS
SIMPLOT SMOKY CANYON MINE PANELS B&C
SUPPLEMENTAL EIS

Final Supplemental EIS

Smoky Canyon Mine
Chapter 5 - Consultation and Coordination

Chapter 5
Consultation And Coordination

5.1 Public Participation Summary

Public participation specific to the Smoky Canyon Mine Panels B and C Supplemental EIS (SEIS) is summarized in this chapter. This chapter describes how the public was involved; identifies persons and organizations that were contacted for feedback; and specifies time frames for accomplishing EIS goals in accordance with 40 CFR 1506.6.

Public involvement in the SEIS process includes the necessary steps to identify and address public concerns and needs. The public involvement process assists the agencies in: (1) broadening the information base for decision making; (2) informing the public about the Proposed Action and the potential long-term impacts that could result from the project; and (3) ensuring that public concerns and needs are understood by the agencies.

Public participation in this SEIS process is required by NEPA at four specific project steps: the scoping period, review of the Draft SEIS, review of the Final SEIS, and receipt of the Record of Decision from the BLM.

The public participation process for the Smoky Canyon Mine Panels B and C SEIS is comprised of five components, as described in the following sections.

5.1.1 Public Scoping Period and Meetings

The public was provided a 30-day scoping period at the beginning of the SEIS process to identify potential issues and concerns associated with the Proposed Action. Publication of a Notice of Intent (NOI) in the Federal Register initiated the public scoping period on March 24, 2000. The NOI summarized the Proposed Action and a determination by the agencies that a Supplemental EIS would be necessary for analysis of Simplot's proposal. Legal notices of the Proposed Action and public scoping period were published in the Afton, Wyoming, Soda Springs, Idaho and Pocatello, Idaho newspapers. A news release was also sent to the three newspapers.

A scoping letter was mailed to 170 agencies, groups, and individuals announcing the scoping period and describing the Proposed Action. Issues that had been identified by the agencies were also included in the mailing.

Formal public scoping meetings were held in Afton, Wyoming and Pocatello, Idaho on April 17 and 18, 2000 respectively. Site maps, photographs, a briefing document, the scoping letter, and public comment forms were made available at these meetings.

The public scoping period ended on April 30, 2000. During that period the agencies received eleven written responses, four comment forms, and one e-mail from individuals and organizations. Two additional letters and one comment form were received after the end of the scoping period and were also

considered as part of the scoping record. Information obtained by the agencies during public scoping was combined with issues identified by the agencies themselves and this formed the scope of the SEIS.

5.1.2 EIS Mailing List

An SEIS mailing list of interested persons was assembled from mailing lists maintained at the BLM Pocatello Resource Area Office and the USFS Caribou-Targhee National Forest Office. This list was supplemented by addresses of scoping participants. All parties and agencies on the mailing list were sent a letter requesting that they complete and return a postage-paid card indicating level of interest in receiving a copy of the Draft and Final SEIS. The mailing list for the Draft and Final SEIS was adjusted accordingly.

5.1.3 Distribution of the Draft SEIS

A 60-day Draft SEIS review period was initiated by publication of the Notice of Availability for the Draft SEIS in the Federal Register. This was extended by 30 days. Public review meetings were held in Afton, Wyoming and Pocatello, Idaho during the public comment period.

The Draft SEIS was distributed as follows:

- A Notice of Availability was published in the Federal Register specifying dates for the comment period and the date, time, and location of the public comment meetings.
- A news release was provided by the agencies at the beginning of the 60-day comment period on the Draft SEIS. The news release was submitted to the same news organizations as for the initial public scoping announcement.
- The Draft SEIS was distributed to interested parties identified in the updated EIS mailing list, as described above.

Public meetings were held in Afton, Wyoming and Pocatello, Idaho to obtain comments on the Draft SEIS and to answer questions that the public had regarding the project or the SEIS process.

5.1.4 Final SEIS Distribution

The Final SEIS distribution was completed after consideration was given to comments received on the Draft SEIS. A 30-day Final SEIS review period was initiated by publication of the Notice of Availability for the Final SEIS in the Federal Register. The Final SEIS was released as follows:

- Notice of Availability was published in the Federal Register.
- Copies of the Final SEIS were sent to addresses on the updated mailing list.
- A news release was issued to the same newspapers used for previous project announcements.

5.1.5 Record of Decision

Subsequent to the 30-day review period for the Final SEIS, the USFS will make recommendations to the BLM and BLM will prepare a Record of Decision. The BLM Record of Decision will be distributed to people and organizations identified on the updated project mailing list. A Notice of Availability will be published in the Federal Register. A news release will be made to the same newspapers used for previous project announcements.

5.2 Methods by Which Public Input Is Evaluated

Letters and oral comments received by the agencies on the Draft SEIS were reviewed and evaluated by the agencies to determine if information provided in the comments would require a formal response or contains new data that may identify deficiencies in the SEIS. Steps were initiated to correct such deficiencies and to incorporate information into the Final SEIS.

5.2.1 Consultation With Others

The following state and federal agencies were consulted during preparation of the SEIS:

Idaho Department of Lands
U.S. Environmental Protection Agency
U.S. Fish and Wildlife Service
U.S. Geological Survey
Idaho Department of Environmental Quality
Idaho Department of Fish and Game
Idaho Department of Water Resources
Idaho Conservation Data Center
Wyoming Department of Environmental Quality
Northern Shoshone-Bannock Tribe, Fort Hall
U.S. Army Corps of Engineers
University of Idaho

5.2.2 Consultation with Idaho Department of Environmental Quality

The BLM and USFS coordinated with the Idaho Department of Environmental Quality during the preparation of the DSEIS and in reviewing the information in the document. These consultations were as follows:

April 2, 2001 - Met at the IDEQ office in Pocatello to review the groundwater hydrology description and modeling results that were intended to be used in the DSEIS.

August 22, 2001 - Met at the Pocatello library to discuss IDEQ's comments on the DSEIS prior to their preparing their comment letter.

September 19, 2001 - Met at the BLM State Office in Boise to discuss IDEQ's and EPA's comments on the DSEIS prior to their preparing their comment letters.

November 14, 2001 - Met at the IDEQ Office in Pocatello to discuss their comment letter on the DSEIS and request additional guidance on how the Smoky Canyon Mine would comply with State regulations.

March 13, 2002 - Met at the IDEQ Pocatello Office to discuss water quality issues and the FSEIS.

In addition to these meetings there were a number of telephone conversations and e-mails between the BLM and the IDEQ related to the Smoky Canyon Mine.

5.3 List of Preparers And Reviewers

Lead Agency - Bureau of Land Management
Joint Lead Agency - U.S. Forest Service

Interdisciplinary Team and Technical Specialists

EIS Project Team Leader: Jeff Cundick, BLM
EIS Project Assistant Leader: Philippe de Hénaut and Jeff Jones, USFS
NEPA Compliance: Cheryl Probert, USFS; Jeff Cundick, BLM
Plan Review: Philippe de Hénaut, USFS; Jeff Cundick, BLM
Geology, Minerals, and Topography: Jeff Cundick, BLM; Philippe de Hénaut, USFS
Reclamation: Jeff Cundick, BLM; Philippe de Hénaut, USFS
Transportation: Randy Tate, USFS
Recreation/Wilderness: Debrah Tiller, USFS; Mel Moe, USFS
Fisheries: Bill Janowsky, USFS; Jim Capurso, USFS
Wildlife Resources: Geoff Hogander, BLM; Betsy Hamann, USFS
Water Resources: Philippe de Hénaut, USFS; Lee Leffert, USFS; Jeff Jones, USFS
Air Quality/Noise: John Lott, USFS
Grazing/Vegetation: Mel Moe, USFS; Victor Bradfield, USFS
Soil and Watershed: John Lott, USFS; Lee Leffert, USFS
Cultural Resources/Native American Religious Concerns: Ali Abusaidi, USFS
Hazardous Materials: Wendell Johnson, BLM
Socioeconomics: Jeff Cundick, BLM; Cheryl Probert, USFS
Wetlands: Lee Leffert, USFS
Threatened and Endangered Species: Rose Lehman, USFS; Betsy Hamann, USFS
Visual Resources: Debrah Tiller, USFS

Simplot Corporation

John Cunningham, Regulatory Affairs Manager
Dennis Facer, Mine Manager
James Louis, Mine Engineer
Larry Raymond, Engineering Director
Bruce Winegar, Senior Environmental Manager

Third Party EIS Contractor - JBR Environmental Consultants, Inc.

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Wildlife/Fisheries	Greg Brown JBR Salt Lake City, UT	BS Natural Resources 11 years experience
Noise/Air Quality	Erin Hallenburg, EIT JBR Salt Lake City, UT	BS Biology BS Civil Engineering 16 years experience

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Soils	Karen Kinsella JBR Elko, NV	BS Resource Management, Soils AS Biology/Computer 6 years experience
Surface Water/ Watershed Analysis	Karla Knoop CPH JBR Price, UT	BS Watershed Science 21 years experience
Geology/Ground Water	Duane Whiting JBR Elko, NV	BS Geology 25 years experience
	Pat Rogers JBR Elko, NV	BS Geology MS Geology 19 years experience
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Ground Water Modeling Geochemistry	Alan Mayo Alan Mayo Assoc. Orem, UT	BS Geology MS Geology PhD Hydrogeology 25 years experience
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Geochemistry	Lisa Kirk Maxim Bozeman, MT	BS Geology 14 years experience
Vegetation	Holly Beck Maxim Boise, ID	BS Ecology MS Botany 8 years experience
Wildlife	Pat Mullen Maxim Helena, MT	BS Biology MA Zoology/Wildlife Biology 16 years experience
Bats	Tom Butts Maxim Helena, MT	BA Zoology MS Wildlife Management 21 years experience
Wetlands/Riparian Aquatics/Amphibians	Walt Vering Maxim Boise, ID	BA Biology MS Natural Resources 8 years experience
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Soils	Duane Noel Grasslands Inc. Helena, MT	BS Biology MS Soil Physics 21 years experience
Cultural Resources	Dale Gray Frontier Historical	BA History MA History 19 years experience

5.4 Updated Mailing List: Smoky Canyon Mine Panels B and C SEIS

Federal Agencies:

(NOTE: Number in parenthesis indicates number of copies sent.)

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U.S. Fish and Wildlife Service (1)
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Final Supplemental EIS

Smoky Canyon Mine
Chapter 6 - References and Glossaries

Chapter 6
References And Glossaries

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List Of Acronyms

AAQS	Ambient Air Quality Standards
ABA	Acid Base Accounting
AFDC	Aid to Families with Dependent Children
Ag	Silver
AGP	Acid-Generating Potential
AIRFA	American Indian Religious Freedom Act
AIRS	Aerometric Information Retrieval System
Al	Aluminum
ALS	Advanced Life Support
AMSL	Above Mean Sea Level
ANFO	Ammonium Nitrate and Fuel Oil
ANP	Acid-Neutralizing Potential
APE	Area of Potential Effect
ARD	Acid Rock Drainage
As	Arsenic
ATV	All-Terrain Vehicle
AWC	Available Water Capacity
AWHC	Available Water Holding Capacity
AUM	Animal Unit Month
Ba	Barium
BA	Biological Assessment
Be	Beryllium
BE	Biological Evaluation
BIA	Bureau of Indian Affairs
BLM	Bureau of Land Management
BMP	Best Management Practices
bp	Before Present
CCEMS	Caribou County Emergency Medical Services
Cd	Cadmium
CEC	Cation Exchange Capacity
CEQ	Council on Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act

CFS	Cubic Feet Per Second
CFR	Code of Federal Regulations
Chadwick	Chadwick Ecological Consultants, Inc.
Cl	Chloride
CO	Carbon Monoxide
COPC	Contaminants of Potential Concern
CPI	Consumer Price Index
Cr	Chromium
CRP	Conservation Reserve Program
CT	Computerized Tomography
Cu	Copper
CWA	Clean Water Act
CY	Cubic Yard
DAP	Diammonium Phosphate
dB	Decibel
dBA	Decibel-A Weighted
°F	Degrees Fahrenheit
DEIS	Draft Environmental Impact Statement
DO	Dissolved Oxygen
DOT	U.S. Department of Transportation
EA	Environmental Assessment
EC	Electrical Conductivity
EHEI	Elk Habitat Effectiveness Indexes
EIS	Environmental Impact Statement
EMT	Emergency Medical Technician
EPA	Environmental Protection Agency
ESA	Endangered Species Act of 1972
F	Fluoride
FCI	Functional Capacity Indices
Fe	Iron
FEIS	Final Environmental Impact Statement
FHWA	Federal Highway Administration
FLPMA	Federal Land Management Practices Act

FY	Fiscal Year
GCL	Geosynthetic Clay Liner
GLO	General Land Office
gpd/ft	Gallons Per Day Per Foot
HAP	Hazardous Air Pollutants
HDPE	High-Density Polyethylene
Hg	Mercury
HGM	Hydrogeomorphic Methodology
HUC	Hydrologic Unit Code
Hz	Hertz
IDEQ	Idaho Department of Environmental Quality
IDFG	Idaho Department of Fish and Game
IDL	Idaho Department of Lands
IMA	Idaho Mining Association
IMASS	Idaho Mining Association Selenium Subcommittee
INFISH	Inland Native Fish Strategy
ISU	Idaho State University
JBR	JBR Environmental Consultants, Inc.
KOP	Key Observation Point
LAU	Lynx Analysis Unit
LDS	Church of Jesus Christ of Latter Day Saints
LIEAP	Low Income Energy Assistance Program
LRMP	Land and Resource Management Plan
Mn	Manganese
MAP	Monoammonium Phosphate
Maxim	Maxim Technologies, Inc.
MBF	Thousand Board Feet
MCE	Maximum Credible Earthquake
MCL	Maximum Contaminant Level
meq/l	Millequivalent Per Liter
mg/l	Milligram Per Liter
MLA	Mineral Leasing Act
mm	Millimeters

MM	Million
MMBF	Million Board Feet
MMBCY	Million Bank Cubic Yards
MMLCY	Million Loose Cubic Yards
mmhos/cm	Millimhos Per Centimeter
MM-1	Minerals Management RMO
MMS	Minerals Management Service
MMT	Million Tons
MPH	Miles Per Hour
MRI	Magnetic Resonance Imaging
MSHA	Mine Safety and Health Administration
MWL	Meteoric Water Line
NAAQS	National Ambient Air Quality Standards
NAGPRA	Native American Graves Protection and Repatriation Act
Ni	Nickel
NNP	Net Neutralization Potential
NEPA	National Environmental Policy Act
NH_3	Ammonia
NHPA	National Historic Preservation Act
NOAA	National Oceanic and Atmospheric Administration
NOI	Notice of Intent
NO_x	Nitrogen Oxide Compounds
NPDES	National Pollutant Discharge Elimination System
NRHP	National Register of Historic Places
NWS	National Weather Service
NTU	Nephelometric Turbidity Units
ORV	Off-Road Vehicle
OSHA	Occupational Safety and Health Administration
Pb	Lead
PLS	Pure Live Seed
PM_{10}	Particulate Matter Smaller than 10 Microns
PMP	Probable Maximum Precipitation
POO	Plan of Operations

PPI	Producer Price Index
ppm	Parts Per Million
PR	Partial Retention
PSD	Prevention of Significant Deterioration Air Quality Program
PTC	Permit to Construct
PVC	Polyvinyl Chloride
RCRA	Resource Conservation and Recovery Act
RHCA	Riparian Habitat Conservation Area
RIMS II	Regional Input-Output Modeling System
RMO	Riparian Management Objective
RMP	Resource Management Plan
ROD	Record of Decision
RUSLE	Revised Universal Soil Loss Equation
SAR	Sodium Adsorption Ratio
SARA	Superfund Amendments and Reauthorization Act
Sb	Antimony
Se	Selenium
SEIS	Supplemental Environmental Impact Statement
SHPO	State Historic Preservation Officer
SIC	Standard Industrial Classification
Simplot	J.R. Simplot Company
SIP	State Implementation Plan
SO_2	Sulfur Dioxide
SO_4	Sulfate
SPCC	Spill Prevention Control and Countermeasure Plan
SPLP	Synthetic Precipitation Leachability Procedure
SSL	Soil Screening Level
SWPPP	Storm Water Pollution Prevention Plan
TAFI	Temporary Assistance for Families in Idaho
TCP	Traditional Cultural Property
TDS	Total Dissolved Solids
TES	Threatened, Endangered, or Sensitive Species
Tl	Thallium

TMDL	Total Maximum Daily Load
TPF	Total Particulate Factor
TPY	Tons Per Year
TRC Mariah	TRC Mariah Associates, Inc.
TSP	Total Suspended Particulate
TSS	Total Suspended Solids
UCL	Upper Confidence Level
USCOE	United States Army Corps of Engineers
USC	United States Code
USDA	United States Department of Agriculture
USDOI	United States Department of the Interior
USDOT	United States Department of Transportation
USFS	United States Forest Service
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
UTB	Upper Tolerance Bound
VI	Value Indices
VMS	Visual Management System
VMT	Vehicle Mile Traveled
VOC	Volatile Organic Compound
VQO	Visual Quality Objective
VRM	Visual Resource Management
WAA	Wetland Assessment Area
WDEQ	Wyoming Department of Environmental Quality
WEG	Wind Erodibility Group
WPPA	Wet Process Phosphoric Acid
Zn	Zinc
ZnS	Sulfide Mineral Sphalerite

Units Of Measure

Bcy	bank cubic yards
C	celsius
cfs	cubic feet per second
cy	cubic yards (same as loose cubic yards)
dB	decibel
dBA	A-weighted decibel sound scale
F	Fahrenheit
ft	feet
g	gravity
gal	gallon
gpm	gallons per minute
in	inch
kV	kilovolt
lb	pound
lcy	loose cubic yards
µg/m^3	micrograms per cubic meter
µmhos/cm	micromhos per centimeter
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
mgpd	million gallons per day
MM	million
mph	miles per hour
ppm	parts per million
%	percent
tpy	tons per year

Acre-feet. The volume required to cover 1 acre to a depth of 1 foot, which is equivalent to 43,560 cubic feet.

Acid Generation Potential (AGP). The concentration of acid generating minerals in a rock or soil material, measured in tons of $CaCO_3$ equivalents per kiloton of rock.

Acid Neutralization Potential (ANP). The concentration of acid neutralizing minerals in a rock or soil material, measured in tons of $CaCO_3$ equivalents per kiloton of rock.

Acute. Severe; having a sudden onset, sharp rise, and short duration.

Acid Rock Drainage (ARD). Water with pH less than 5, elevated TDS, SO_4, and trace metal concentrations that result from the oxidation of acid generating sulfide minerals with subsequent dissolution and transport of the oxidation products.

Alluvial. Pertaining to material or processes associated with transportation or deposition of soil and rock by flowing water (e.g., streams and rivers).

Alluvium. Soil and rock deposited by flowing water (e.g., streams and rivers); consists of unconsolidated deposits of sediment, such as silt, sand, and gravel.

Alteration. A geochemical process involving mineralogic and geochemical changes due to reaction with fluids moving through rock or soil under natural conditions, particularly in association with mineral deposits. Transformation of feldspar minerals to clay through chemical weathering is considered alteration.

Ambient. Surrounding, existing, background conditions.

Anticline. A fold in rock, where the interior of the fold is comprised of rocks that are older in age than the rocks on the exterior of the fold.

Assay. Qualitative or quantitative analysis of a substance (e.g., ore body).

Basic Elements (visual). The four major elements (form, line, color, and texture) which determine how the character of a landscape is perceived.

Best Management Practices (BMPs). Vegetative and structural methods to control erosion and sedimentation.

Biological Assessment. Information prepared by or under the direction of the federal agency concerning listed species that may be present in the action area and the evaluation of potential effects of the action on such species and habitats. The purpose of the biological assessment is to evaluate the potential effects of the action on listed or proposed species or designated or proposed critical habitat, and determine whether any such species and habitats are likely to be adversely affected by the action. Biological Assessments are conducted for major federal construction projects requiring an EIS.

Biological Evaluation. A Forest Service document of activities in sufficient detail to determine how an action or proposed action may affect any threatened, endangered, proposed, or sensitive species.

Capillary Break. A layer of specified material (usually cobble-sized) used to prevent capillary movements of fluids from one material to another.

Cation Exchange Capacity. The number of sites on a solid surface where reversible cation adsorption and desorption can occur.

Chert. A hard, dense microcrystalline or cryptocrystalline sedimentary rock, consisting chiefly of interlocking crystals of quartz less than about 30 μm in diameter; it may contain amorphous silica (opal). It has conchoidal fracture, and may be white or variously colored. Chert occurs principally as nodular or concretionary segregations, or nodules in limestone and dolomite, and less commonly as layered deposits, or beded chert; it may be an organic or inorganic precipitate or a replacement product.

Chronic. Marked by long duration or frequent recurrence.

Column Test. A leaching laboratory test where water or other leaching solution is percolated through a vertical column of earth material and the resulting leachate is collected and analyzed for dissolved parameters.

Contrast (visual). The effect of a striking difference in form, line, color, or texture of the landscape features within the area being viewed.

Critical (Crucial) Habitat. Habitat that is present in minimum amounts and is a determining factor for population maintenance and growth.

dBA. The sound pressure levels in decibels measured with a frequency weighing network corresponding to the A-scale on a standard sound level meter. The A-scale tends to suppress lower frequencies (e.g., below 1,000 Hz).

Decant. To remove or pour off a liquid without disturbing associated sediment or solids.

Decibel (dB). One-tenth of a Bel is a measure on a logarithmic scale which indicates the ratio between two sound powers. A ratio of 2 in power corresponds to a difference of 3 decibels between two sounds. The decibel is the basic unit of sound measure.

Dissolution. The process of dissolving.

Electrical Conductivity (or Specific Conductance). The ability of a water or a soil-water paste to transmit electrical current, used to estimate ion concentration.

Endangered Species. Species in danger of extinction throughout all or a significant portion of its range.

Eolian. Soil and silt deposited by wind, such as loess.

EPA Synthetic Precipitation Leachability Procedure (SPLP) – Method 1312. A weak acid bottle roll extraction conducted to simulate metal release from mined material due to exposure to ambient conditions.

Ephemeral Stream. A stream or portion of a stream which flows briefly in direct response to precipitation in the immediate vicinity, and whose channel is at all times above the water table.

Evapotranspiration (ET). The portion of precipitation returned to the air through evaporation and transpiration by plants.

Fate and Transport. Description of the movement of a contaminant through a groundwater system which may include the effects of dilution, dispersion, attenuation and various chemical reactions.

Floodplain. The low and relatively flat areas adjacent to rivers and streams. A 100-year floodplain is that area subject to a 1 percent or greater chance of flooding in any given year.

Flux. Volume of groundwater per unit time that travels through a solid permeable medium, such as alluvium and bedrock.

Folds. A bend in planar features in rocks - like an extended wrinkle. A fold is usually the product of geologic deformation.

Forage. Vegetation used for food by wildlife, particularly big game wildlife and domestic livestock.

Forbs. Any herbaceous plant other than a grass.

Fry. The young of fish.

Game Species. Animals commonly hunted for food or sport.

HELP3 Model. A computer model written by Paul Schroeder et al at the U.S. Army Corps of Engineers Waterways Experiment Station and distributed by the U.S. Environmental Protection Agency that estimates the water balance (water inputs and outputs) of landfills.

Hertz (Hz). The unit of frequency (i.e., sound) formerly designated as cps - cycles per second.

Host Rock. A rock body or wall rock enclosing mineralization.

Hydraulic Conductivity (K). A coefficient of proportionality describing the rate at which water can move through a permeable medium.

Hydraulic Gradient. For groundwater, the rate of change of total head per unit of distance of flow at a given point and in a given direction.

Hydrograph. A graph that shows some property of groundwater or surface water as a function of time.

Hydrophytic Vegetation. The total of macrophytic plant life that occurs in areas where the frequency and duration of inundation or soil saturation produce permanently or periodically saturated soils of sufficient duration to exert a controlling influence on the plant species present.

Hydrostratigraphic Unit. A formation, part of a formation, or group of formations in which there are similar hydrologic characteristics allowing for grouping into aquifers or confining layers.

Intermittent Stream. Stream that flows only part of the time or during part of the year; some segments of the stream may flow year-round.

Isopleth. A line, on a map or chart, drawn through points of equal size or abundance.

Key Observation Point (KOP). An observer position on a travel route used to determine visible area.

Land Use Plan. The organized direction or management of the use of lands and their resources to best meet human needs over time, according to the land's capabilities.

Limestone. A sedimentary rock consisting chiefly of the mineral calcite (calcium carbonate, CaCO3), with or without magnesium carbonate. Common impurities include chert and clay. Limestone is the most important and widely distributed of the carbonate rock and is the consolidated equivalent of limy mud, calcareous sand, and/or shell fragments. It yields lime on calcination.

Lithic Scatter. A discrete grouping of flakes of stone created as a byproduct in the tool-making process. Often includes flakes used as tools as well as formal stone tools such as projectile points, knives, or scrapers.

LRMP. Land and Resource Management Plan. Document that established direction for future decisions of the use of lands and resources in the planning area to best meet human needs over time, according to the land and resource capabilities.

Maximum Credible Earthquake. The largest conceivable earthquake that could occur in an area.

MCL. Maximum Contaminant Level. The highest level of a contaminant that is allowed in drinking water.

Mesic. Moist habitats associated with springs, seeps, and riparian areas.

Mitigation. Actions to avoid, minimize, reduce, eliminate, replace, or rectify the impact of a management practice.

Overburden. Sub-economic non-ore rock or soil associated with a mineral deposit.

Oxidation. A geochemical process involving chemical and mineralogic changes to rock or soil under chemical weathering conditions. Oxidation is typically associated with exposure of buried materials to atmospheric oxygen and water. The process occurs naturally, but is accelerated by mining activity.

Peak Flow. The greatest flow attained during melting of winter snowpack or during a large precipitation event.

Perennial Stream. A stream that flows throughout the year and from source to mouth.

Permeability. The capacity of porous rock, sediment, or soil to transmit a fluid.

pH. The negative $\log_{10}$ of the hydrogen ion activity in solution; measure of acidity or alkalinity of a solution.

$PM_{2.5}$. Particulate matter less than 2.5 microns in aerodynamic diameter.

PM_{10}. Particulate matter less than 10 microns in aerodynamic diameter.

Probable Maximum Precipitation (PMP). The greatest depth of precipitation for a given duration that is physically possible over a given storm area at a particular location at a certain time of year.

Raptor. A bird of prey (e.g., eagles, hawks, falcons, and owls).

Richter Magnitude. Logarithmic scale of earthquake intensity.

Riparian. Situated on or pertaining to the bank of a river, stream, or other body of water. Riparian is normally used to refer to plants of all types that grow along streams, rivers, or at spring and seep sites.

RMP. Resource Management Plan. Document that establishes direction for the use of resources to best meet the needs of humans over time, according to the resource potential or capability.

Run-of-Mine Overburden. Sub-economic rock mined from the phosphate deposit, which is and placed in surface dumps or as pit backfill.

Salinity. Measure of solute concentration, in grams per kilogram; "saltiness".

Scoping. Procedures by which agencies determine the extent of analysis necessary for a proposed action, (i.e., the range of actions, alternatives, and impacts to be addressed; identification of significant issues related to a proposed action; and the depth of environmental analysis, data, and task assignments needed).

Sediment Load. The amount of sediment (sand, silt, and fine particles) carried by a stream or river.

Seepage Collection System. A system of drains, ponds, and pumps to collect and return tailing impoundment and embankment seepage.

Sensitive Species. Those plant or animal species that are susceptible or vulnerable to activity impacts or habitat alterations.

Shale. A fine grained detrital sedimentary rock, formed by the compaction of clay, silt, or mud. It has a finely laminated structure, which gives it a fissility along which the rock splits readily, especially on weathered surfaces. Shale is well indurated, but not as hard as argillite or slate. It may be red, brown, black, or gray.

Significant. As used in NEPA, requires consideration of both context and intensity. Context means that the significance of an action must be analyzed in several contexts such as society as a whole, and the affected region, interests, and locality. Intensity refers to the severity of impacts (40 CFR 1508.27).

SPLP Test. Synthetic Precipitation Leachability Procedure. A laboratory testing procedure established by the U.S. Environmental Protection Agency where a prescribed amount of solid material is mixed for a set time with a prescribed amount of acidified water. The leachate is then separated from the solid and analyzed for parameters of interest.

Sodium Adsorption Ratio (SAR). Ratio of dissolved sodium to calcium+magnesium in water; provides a prediction of cation exchange reaction potential.

Storage Coefficient (S). Volume of water that an aquifer absorbs or releases from storage per unit surface area of aquifer per unit decline in the component of hydraulic head normal to the surface; S is dimensionless.

Sulfides. That part of a lode or vein not yet oxidized by air or surface water and containing sulfide minerals.

Sulfide Oxidation. Chemical conversion of reduced sulfide compound to an oxidized sulfate compound, with associated release of iron and formation of secondary iron oxide mineralization.

Swell. The increase in volume exhibited by certain soils and rocks on absorption of water; an enlarged place in an orebody; a general, imprecise term for dome or arch.

Syncline. A folded rock sequence where the interior of the fold is younger than the rock on the exterior.

Threatened Species. Any species of plant or animal which is likely to become endangered within the foreseeable future throughout all or a significant portion of its range.

Total Suspended Particulate (TSP). Particulates less than 100 microns in diameter (Stokes equivalent diameter).

Total Dissolved Solids (TDS). Total amount of dissolved material, organic or inorganic, contained in a sample of water.

Total Suspended Solids (TSS). Undissolved particles suspended in liquid.

Transmissivity (T). The rate at which water will flow through a vertical strip of aquifer of one unit width and extending through the full saturated thickness, under a hydraulic gradient of 1.0.

Ungulate. A hoofed mammal.

Visual Quality Objective (VQO). A desired level of excellence based on physical and sociological characteristics of an area. Refers to degree of acceptable alteration of the characteristic landscape.

Watershed. Drainage basin for which surface water flows to a single point.

Wetlands. Areas inundated by surface water or groundwater with a frequency sufficient to support vegetation or aquatic life that requires saturated or seasonally saturated soil conditions for growth and reproduction.

Wetland Functions. Dynamic biological, chemical, and physical processes that characterize wetland ecosystems.

Wetland Values. Based on societal properties by which wetlands are determined to be useful, or impart public good.

Final Supplemental EIS

Smoky Canyon Mine
Chapter 7 - Public Comments and Responses

Chapter 7
Public Comments and Responses

This chapter contains copies of public comments received in response to the Smoky Canyon Mine Draft SEIS. The agencies' responses to substantive comments are provided adjacent to the reproduced comment letters. Eleven public comment letters were received on the DSEIS.

Letter 1	USEPA Region 10
Letter 2	US Geological Survey
Letter 3	National Park Service
Letter 4	Idaho Dept. Of Environmental Quality
Letter 5	Idaho Dept. Of Lands
Letter 6	Simplot
Letter 7	Agrium
Letter 8	Peter Reide
Letter 9	Idaho Rivers United
Letter 10	Greater Yellowstone Coalition
Letter 11	Caribou County Commission
Letter 12	Idaho Dept. Of Lands
Letter 13	Idaho Dept. Of Environmental Quality
Letter 14	Kelly Booth
Letter 15	Eldena Grover

Letter #1

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10
1200 Sixth Avenue
Seattle, Washington 98101

Reply To
Attn Of: ECO-088 01-031-BLM

Jeff S. Steele
BLM Pocatello Field Office
1111 N. 8th Avenue
Pocatello, ID 83201

Re: **Draft SEIS for Smoky Canyon Mine, Panels B and C**

Dear Mr. Steele:

We have reviewed the draft Supplemental Environmental Impact Statement (SEIS) for the proposed *Smoky Canyon Mine, Panels B & C* (CEQ #010246) in accordance with our responsibilities under the National Environmental Policy Act (NEPA) and §309 of the Clean Air Act. The SEIS analyzes the impacts related to development of two additional mine pits (Panels B and C) at the existing J. R. Simplot Smoky Canyon Phosphate Mine in southeast Idaho, and supplements the 1983 Record of Decision that accompanied the original Smoky Canyon Mine EIS. This letter summarizes our concerns and objections with the environmental impact of the project, and the adequacy of information provided in the SEIS, provides EPA's rating of the SEIS, makes specific recommendations for addressing the issues we have identified, and transmits more detailed comments on the SEIS and supporting documentation.

Selenium impacts have been identified as a significant issue at active and inactive phosphate mines in southeast Idaho. To address these impacts, a number of federal and state agencies have worked cooperatively to develop a conceptual approach to mitigate releases using various legal authorities including the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA). EPA participated in developing this conceptual approach and supports its implementation. The agencies are now in the early phases of applying this approach at individual mine sites to mitigate impacts. We expect that site-specific clean-ups will be needed at a dozen or more large mine sites in southeast Idaho (including inactive portions of the Smoky Canyon Mine) and will take many years to complete.

The current proposal involves the Smoky Canyon Mine, a large-scale (approximately 3000 acres) open pit phosphate mine and milling operation. Existing facilities include pits (some of which are backfilled), external waste rock dumps, water diversion structures, milling facilities, and a tailings disposal facility. Concentrated ore from the mine is transported via slurry pipeline to Simplot's plant in Pocatello where fertilizer products are produced.

1-1 The proposed action would add approximately 600 acres to the existing mine operation at Smoky Canyon with the development of two additional mine pits, associated haul roads, and waste rock disposal areas. The mine would continue to use existing support facilities including milling and tailings disposal facilities that were previously permitted. The proposal would extend mine life by approximately 4.6 years. The SEIS examines the no-action alternative and three action alternatives (the Proposed Action, Alternative A, and Alternative B).

1-2 Data collected at the site over the past three years document releases of selenium at levels of concern to various media including ground water, surface water, and vegetation. EPA's interests with regard to permitting this expansion, and other new phosphate mining operations, are to minimize additional contaminant loading to the environment that would cause or contribute to environmental impacts, and to identify and encourage the use of mining practices and mitigation measures to control releases of contaminants or eliminate routes of exposure. This is essential to protecting public health, welfare, and the local environment and also ensuring the future viability of phosphate mining in southeast Idaho.

1-3 We have reviewed the draft SEIS and believe that the alternatives developed make significant improvements over past mining practices used at the mine but still have a number of concerns and objections about the project. We believe that these issues need to be addressed before a well-informed decision on the Smoky Canyon expansion can be made. We are encouraged, however, to see that many of the issues we raised during scoping and at other times have been addressed. The alternatives developed include significant improvements to reduce selenium mobility and exposure compared to previous mining methods used at the Smoky Canyon Mine site, and include various combinations of practices such as backfill of pits, waste rock segregation, and placement of clean cover material over seleniferous waste rock. In addition, the technical analysis of impacts was clearly presented, included use of appropriately conservative assumptions and empirical data where available, and in general appears sound. The following paragraphs summarize our primary issues and suggestions for addressing them.

Ground Water Impacts and Range of Alternatives to Protect Ground Water

1-4 The SEIS predicts adverse impacts to ground water, including the Mine's public drinking water supply well, in the vicinity of the backfilled pit. The modeled analysis suggests that these impacts would exceed the national drinking water standard for selenium, and may violate the State of Idaho Ground Water Quality Rule. While EPA recognizes the limitations associated with use of model results, we believe that the SEIS must evaluate alternatives to mitigate for such potential impacts.

Response 1-1

The Proposed Action would affect approximately 618 acres of generally undisturbed land. It is important to clarify that the Proposed Action is not an addition to the existing mine plan; rather it is a phased implementation of the mine plan that was approved by the BLM in 1983. The disturbances being proposed for the B- and C-Panels conform closely to the boundaries evaluated in the 1981 DEIS.

Response 1-2

All information on selenium mobilization to the environment at the Smoky Canyon Mine that were available at the time the DSEIS was prepared are discussed in Chapters 3 and 4 of the document. Mining practices proposed by Simplot for the B- and C-Panel operations include measures to mitigate future exposure routes of selenium into the surface environment, primarily through the use of management practices. The design of the overburden fills was intended to fully mitigate the surface environment exposure route through the application of a thick cap over all areas of seleniferous overburden. The overburden facilities were also designed to direct any seepage into the subsurface groundwater instead of the surface environment because the routes of human exposure to this seepage would be eliminated by nature of the site hydrogeology.

Response 1-3

Thank you for the comment.

Response 1-4

The BLM and USFS have not interpreted the Idaho Ground Water Quality Rule with regard to whether or not the Proposed Action and Alternatives will result in a violation of that rule. The Idaho Department of Environmental Quality (IDEQ) has indicated in writing (See Letter #4) that it intends to pursue a consent order for the predicted groundwater impacts. This would apparently be accomplished under IDAPA 58.01.11.400.06 "Mineral Extraction". The IDEQ has also indicated in their letter that it would not be "timely to develop an additional SEIS to consider modifications to the actions already proposed for reducing infiltration."

Additional information evaluating the potential for reducing infiltration into the overburden fills has been provided in the "Infiltration Barriers - Review of Feasibility for the Smoky Canyon Mine" included in Appendix 2C of this FEIS. This amends the information on infiltration barriers discussed in Appendix 2B of the DSEIS. Other mitigation from enhanced recharge of clean runoff water has been proposed by Simplot as part of the surface water management previously made part of the Proposed Action and Alternatives. This enhanced recharge is described in Chapter 2 and is evaluated in Chapter 4 of this FSEIS.

The mitigative effect of the runoff recharge areas proposed in this FSEIS is to significantly reduce the areal extent in the aquifer where concentrations are greater than MCLs, compared to the previous design evaluated in the DSEIS. These measures have been added to respond to the comments by EPA and

1-5

EPA strongly recommends that the SEIS evaluate reasonable alternatives or mitigation measures to reduce or minimize adverse impacts to ground water. For example, the SEIS should evaluate a range of cover systems for waste rock dumps that include a low permeability barrier to reduce infiltration into the waste piles. It appears that this concept was prematurely dismissed from detailed consideration due to cost. This issue is especially important because of documented impacts of selenium to springs in the area and the Mine's public drinking water supply well that appear to be related to existing mining disturbances at Smoky Canyon Mine.

1-6

The SEIS should clearly outline the physical design of waste rock dump and cover system alternatives, and address key questions related to water movement and water balance. The SEIS should also evaluate additional techniques or Best Management Practices (BMPs) to reduce loading to ground water, such as use of a lower permeability base using compacted native material and/or clay, and systems to collect seepage that may be released from the waste rock dumps.

others and reduce the groundwater impacts to a point that would be expected to be limited to the mine area.

Response 1-5

The evaluation of low permeability infiltration barriers constructed over the seleniferous overburden fills has been significantly expanded in the " Infiltration Barriers - Review of Feasibility for the Smoky Canyon Mine" included in Appendix 2C of this FSEIS. These mitigative designs have not been included in new alternatives because the cost of constructing these fills would make the proposed mining activities uneconomic which would not comply with the Purpose and Need nor would these be "reasonable" alternatives in light of the IDEQ's acceptance of the ground water impacts. In this respect, requiring adoption of an unreasonable mitigation measure that makes an existing mining operation uneconomic would be equivalent to the results obtained by adoption of the No Action Alternative

If the agencies selected an alternative that required Simplot to incorporate very expensive mitigation measures, which they thought made the mining operation uneconomic, the effect would essentially be the same as adopting the No Action Alternative.

The water quality impacts to the Smoky Canyon Mine water supply wells is described in the DSEIS as indicating potential groundwater contamination of the Wells Formation aquifer from existing mining disturbances. It is important to note however, that the water quality in these wells currently complies with State ground water quality standards.

The DSEIS documents an apparent increase in selenium concentrations at Hoopes Springs but is careful to note that the cause for this increase has not been attributed to the Smoky Canyon Mine activities at this time.

Response 1-6

The interrelationships between overburden fill design, especially cover systems, and infiltration of precipitation into the overburden are discussed in detail in the "Infiltration Barriers - Review of Feasibility for the Smoky Canyon Mine" included in Appendix 2C of this FEIS. The use of lower permeability base treatments under the overburden fills is also discussed in this appendix.

1-7

In evaluating waste dump design and cover system alternatives, the analysis should include an evaluation of methods for determining cover system performance and monitoring of liquid movement within the waste rock dump as it is constructed. There is a range of equipment available that would supply cost effective ways to accomplish this monitoring such as the use of piezometers or monitoring wells placed within the dump. This type of monitoring would provide an early warning system in case the waste rock dump or cover system does not conform to model predictions. It is critical, however, that such monitoring be considered during initial design and be incorporated into the plans before construction.

Response 1-7

A comprehensive environmental monitoring plan has been prepared and is included in Appendix 2E of this FSEIS. Monitoring the performance of mitigation measures is important and the usefulness of these monitoring data should be thought out before designing and implementing the monitoring. In the case of the overburden fills at the Smoky Canyon Mine, mitigation of infiltration into the top of the overburden shales is due to runoff and evapotranspiration related to the soil and chert cap. The effectiveness of these processes is entirely up to natural processes which are expected to vary widely in the short term (few years).

The agencies agree with the EPA that monitoring the performance of the overburden cover system including the rate of liquid movement and water chemistry would be useful to evaluate the effectiveness of the design and to check the estimates made for the groundwater impact analysis. Simplot is developing descriptions of the potential monitoring systems to be employed for review by the BLM, USFS and IDEQ.

Monitoring and Contingency Planning.

1-8

The SEIS should describe a strategy or contingency plan to deal with unforeseen circumstances at the site. The strategy should include clearly defined "trigger levels" (e.g., exceedances of ecological benchmarks for various media) or observations (e.g., statistically significant trends in indicators, failure of covers, permit violations) that would set in motion follow-up action. This type of information is necessary to mitigate for uncertainties and risks associated with predictions of environmental outcomes, and will provide an early warning system of unexpected outcomes. Such plans are necessary to ensure that post-mining land use objectives can be achieved and sustained in the future, and to avoid the types of problems that have occurred in the past at Smoky Canyon Mine.

Response 1-8

The Smoky Canyon Mine Environmental Monitoring Plan has been appended to this FSEIS. It includes a contingency plan.

1-9

The monitoring plan in the SEIS should also include the following general information: clear statements of monitoring objectives, sampling locations, constituents to be monitored, and frequency. This information is needed in order to evaluate whether there is an adequate link between observed changes in environmental conditions and implementation of corrective actions.

Response 1-9

The Smoky Canyon Mine Environmental Monitoring Plan has been appended to this FSEIS, and includes the types of information described by the EPA.

Financial Assurance

1-10 The SEIS should disclose the estimated cost to reclaim and close the site in a manner that achieves reclamation goals and post-mining land use objectives. The SEIS should identify proposed financial assurance mechanisms and demonstrate that these mechanisms would ensure that necessary reclamation work would be completed. The analysis should disclose costs associated with

1-11 implementing the reclamation plan, as well as costs associated with implementing contingency measures to deal with reasonably foreseeable but not specifically predicted outcomes (such as unacceptable ground water contamination associated with pit backfill, elevated levels of selenium in vegetation, or other events). This is necessary to inform the public and decision-makers of the financial risk to the public posed by conditions at the site. These financial assurances should be in a form that protects the public interest in the event that a company is unable to implement contingency measures or perform long-term operation and maintenance, including water treatment if necessary, at a closed mine site.

1-12 EPA believes that it is critical to anticipate environmental impacts that are reasonably foreseeable, yet not specifically predicted, and to have financial assurance mechanisms in place to deal with such contingencies. Our experience with mining projects in the northwest shows that a number of mines that have been permitted have developed significant problems or impacts that were not predicted during the NEPA process. To not expect and plan for such problems is to shift significant financial risk to the public.

Response 1-10

The estimated rehandling and reclamation costs for each alternative have been provided in Section 4.14 of the DSEIS. The rehandling portion of the cost estimate includes loading, hauling, dozing, and road maintenance. The reclamation cost portion includes slope regrading, seeding, fertilizing, and seedling planting. This information has been added to Section 4.14. The agencies intend to use the detailed reclamation cost estimates prepared by the agencies for the Proposed Action and Alternatives in developing a reclamation bond amount that Simplot would need to establish for development of the B and C Panels.

Response 1-11

Financial assurance mechanisms for the completion of reclamation work are in the form of reclamation bonds. According to CFR Title 43 Part 3500, Leasing of Solid Minerals other than coal and oil shale, Subpart 3504, Fees, Rental, Royalty and Bonds, the bond amounts for leasable phosphate operations require the consideration of the cost of complying with all permit and lease terms, including royalty and reclamation requirements, when setting bond amounts. The BLM bonds the mining operation for final physical reclamation, which is the actual predicted cost for BLM to perform reclamation using a contractor. Reclamation bonds are not released until the site is reclaimed to the satisfaction of the BLM, and according to plans approved by the BLM. Currently, no new acres are being released in southeast Idaho due to the nature of the selenium issue.

Contingency bonds, addressing remediation efforts for unpredicted outcomes with a low probability of occurrence, could be provided by the Operator but are not required under current BLM policy. This is a separate issue outside of reclamation bonding.

Response 1-12

Although it is agreed that anticipation of unpredicted environmental outcomes could influence procedures for determining financial assurance mechanisms, the BLM cannot approve a proposed project that is expected to result in violation of any laws. Environmental impacts that are not predicted by the analysis are currently not a part of the policy which sets bonding requirements. However, the operator is liable for any degradation that results from mining, regardless of whether the BLM has released the financial guarantee. The BLM believes that the taxpayer should not have to pay to repair degradation of the public lands caused by an operator.

Scope of Analysis

1-13

Under the proposed project, tailings that are generated from mining in panels B and C would be disposed of in the existing tailings pond. The SEIS fails to fully disclose all of the potential impacts associated with tailings disposal. For example, what are the potential impacts to vegetation, insects, birds, and other receptors during operation and post-closure? The SEIS should evaluate and disclose potential impacts associated with tailings disposal, and if necessary, develop alternatives or mitigation measures to address these impacts...

Response 1-13

The tailings ponds are off-lease and not under BLM or USFS regulatory jurisdiction. Environmental regulatory authority over the ponds is accomplished by the Idaho Department of Lands jurisdiction over reclamation, the Idaho Department of Water Resources jurisdiction over the tailings dam and stream alteration, and the U.S. Corps of Engineers jurisdiction over wetlands and waters of the United States. The existing knowledge of the environmental impacts from the tailings ponds is documented in Section 4.16 of the SEIS.

The potential impacts of the tailings operations were evaluated in the original 1981 EIS and more specifically in a 1990 Environmental Analysis conducted on the tailings ponds by the USCOE. Section 2.4.1 of the DSEIS indicates that the operation of the tailings ponds for the tailings from Panels B and C would be essentially the same as the past tailings pond operations.

The tailings ponds are existing facilities on private land that were fully permitted in the past, including an Environmental Analysis on tailings pond construction and operations conducted by the U.S. Corps of Engineers. The tailings ponds were therefore not analyzed as part of the Panels B and C Proposed Action and Alternatives. Because there was no proposal for the tailings ponds awaiting review and approval by the BLM and USFS, no alternatives or mitigation measures were developed in the DSEIS for the tailings facilities. The detailed reasons supporting this decision are:

1. The tailings ponds are located on private land and have already been fully permitted by the U.S. Corps of Engineers and the State of Idaho to a configuration larger than is necessary to contain the tailings volume projected from Panels B and C. No other permitting by the BLM, USFS or any other federal regulatory agency is required at this time to enable Simplot to impound the tailings from Panels B and C in these tailings ponds.

2. The operation of the tailings ponds for the full development of Panels A, B, C, D, and E was conceptually reviewed in the 1981 DEIS and 1982 FEIS.

3. The U.S. Corps of Engineers completed a site-specific Environmental Assessment for the full development of the tailings ponds in the early 1990s. The approved tailings pond plan is for a total capacity in excess of that required to hold the tailings from Panels B and C.

4. The wetlands impacts identified in the Corps EA for the full development of the tailings ponds have already been mitigated off-site according to an approved mitigation plan.

5. The tailings dams have already been raised to a height sufficient to contain the tailings from the Panels B and C without further construction.

6. Groundwater studies recently completed at the tailings ponds showed there was no apparent groundwater impact from these facilities.

7. Surface water studies recently completed at the tailings ponds showed there may be a slight effect of the tailings ponds on surface water quality but all water quality samples were in compliance with state and federal water quality criteria for the receiving streams.

8. The environmental impacts of the tailings ponds, and any required remediation of these impacts will be the subject of site-specific studies to be conducted in the future under a site-specific AOC. Simplot's commitment to this future process is described in the Historic Mining Environmental Impact Investigation Report (HMEII), formerly known as the SMAP, which was distributed to the public along with the DSEIS.

Based on the foregoing, the BLM and USFS analyzed the potential connection between the Proposed Action and the tailings ponds and concluded that these were not connected actions because:

9. The Proposed Action is not justified by any future action to be taken with regard to the tailings ponds.

10. The Proposed Action does not "federalize" the continued operation of the tailings ponds.

11. It is not irrational or unwise to implement the Proposed Action without taking some future action related to the tailings ponds. On the contrary, the tailings ponds are already legally and structurally "ready" for the Proposed Action

12. The Proposed Action does not trigger any major future action at the tailings ponds like permitting or construction.

13. The Proposed Action does not preclude any future actions at the tailings ponds.

14. The Proposed Action does not create a commitment for new actions at the tailings ponds.

15. The Proposed Action can proceed without other major new actions at the tailings ponds.

16. The Proposed Action and the tailings ponds are not interdependent to the point where one cannot exist without the other. The tailings ponds currently exist in support of other mining at Smoky Canyon. If for some reason the Proposed Action was not approved, the tailings ponds would be able to serve other future mine panels at the Smoky Canyon Mine that are currently under lease.

Because the tailings ponds are part of the existing baseline condition and contribute to the cumulative effects, the environmental impacts from the tailings ponds were disclosed in various sections of the DSEIS. Known and potential future impacts to surface water resources from the tailings ponds are described in Sections 3.3.1 and 4.3.1 of the DSEIS. Groundwater impacts from the tailings ponds are described in Section 4.16.3. Vegetation impacts from the tailings ponds

are described in Section 4.16.5. Impacts of the tailings ponds on grazing activities are described in Section 4.16.6. The impacts to riparian and wetlands habitats from the tailings ponds are described in Section 4.16.7. Section 4.16.8 of the DSEIS discusses that, at the time the document was written, there were no results of site-specific studies at the Smoky Canyon Mine available to determine the impacts of selenium on wildlife species impacted by the operations. The section also presents the available water quality data on the tailings ponds and shows that the selenium content of the tailings water was greater than the aquatic life standard. Section 4.16.9 of the DSEIS also discussed that selenium levels in tailings water were above the aquatic life standard and that site-specific studies related to selenium impacts on fish, invertebrates or wetland vegetation had not yet been conducted. Section 4.16.10 of the DSEIS discloses that bald eagles have not been recorded foraging at the tailings ponds but could be attracted by waterfowl utilizing the ponds. The impacts of the tailings ponds on the visual resources of the area are discussed in Section 4.16.14.

Section 2.8 of the DSEIS indicates that the existing impacts from current mining and milling operations (these include the tailings ponds) will be evaluated in the manner described in the HMEII Report .

1-14

... EPA specifically recommends that alternatives or mitigation measures be developed to address deficiencies with the existing reclamation plan.

In summary, our review has identified a number of significant issues with both the potential environmental impact of the proposed action, and with the adequacy of information in the SEIS. EPA believes that it will be necessary to develop significant new information on techniques to protect ground water, monitoring and contingency planning, financial assurance, and tailings pond reclamation planning to address the issues we have raised. We believe this information can be developed quickly and will result in improvements to the project and important benefits to the public. We recommend that no decision on this project be made until addition information on the primary issues we have identified has been developed. The changes in the alternatives or level of information needed may be substantial enough to require issuing another draft SEIS to ensure that the public has adequate opportunity to review and comment on the proposed action.

Response 1-14

The BLM and USFS have no review and approval jurisdiction over the existing operation of the tailings ponds on private land. Because of their lack of regulatory oversight on the tailings ponds, the BLM and USFS did not review the tailings pond reclamation as part of the DSEIS activities and have not determined that there are deficiencies with the existing tailings pond reclamation plan that would need to be addressed with alternatives and mitigation measures, as raised by the EPA. The BLM and USFS believe that the regulatory process described in the HMEII Report is the more appropriate process to follow in reviewing the environmental impacts of the tailings ponds and development of appropriate mitigation. The Idaho Department of Lands has indicated in their public comment letter (See Letter #5) that analysis of effects and alternatives to the tailings pond impacts is "beyond the scope of this document and will duplicate other pending studies. The site specific AOC will include this analysis." A subsequent letter from the Idaho Department of Lands (Letter #12) indicates that they have regulatory authority over the final reclamation of the tailings ponds and will cooperate with the USFS in the site-specific AOC to ensure that appropriate changes, as necessary, are made to the existing reclamation plan. The BLM and USFS agree with the approach proposed by the Idaho Department of Lands.

USFS and IDEQ are negotiating an Administrative Order on Consent with Simplot to conduct a "Site Investigation" under authorities provided by Federal and State statutes to address the release of hazardous substances. IDEQ will represent the State of Idaho interests in the investigation, and will provide recommendations to the Idaho Department of Lands to update the existing reclamation plan required for the closure of the tailings impoundment.

1-15

Based on our review of the SEIS, and the concerns and objections noted above, we have rated the document, EO-2 (Environmental Objections - Insufficient Information). This rating and a summary of our comments will be published in the Federal Register. A copy of the rating system used and our detailed comments are enclosed for your reference.

1-16

We appreciate the opportunity to review this SEIS and are interested in working with BLM and the Forest Service to resolve the issues we have raised. Please call Chris Gebhardt, lead NEPA reviewer, at (206) 553-0253 or Dave Tomten, geologist, at (208) 378-5763 to discuss our comments and how they might best be addressed.

Sincerely,

Elbert Moore, Director
Office of Ecosystems and Communities

Enclosures

cc:
BLM Pocatello Field Office (Jeff Cundick)
U.S. Forest Service Caribou National Forest (Philippe de Henaut)
IDEQ Pocatello (Mark Dietrich)
COE Idaho Falls (Rob Brochu)
USFWS Idaho Falls
IDL Boise (Scott Nichols)
Shoshone-Bannock Tribes (Lisa Safford, Susan Hanson, and Chad Colter)

EPA Comments on Smoky Canyon Mine, Panels B & C Supplemental Environmental Impact Statement (SEIS)

Ground Water Impacts

Draft SEIS Predicts Significant Ground Water Impacts

The Environmental Protection Agency (EPA) has environmental objections to all action alternatives as they are presently proposed because of localized impacts to ground water. Ground water in the Wells Formation Aquifer has been impacted by historic mining and analysis in the SEIS suggests that it would additionally be impacted by mining Panels B and C. The SEIS characterizes the result of selenium-laden water seeping through the proposed overburden facilities as an irreversible and irretrievable commitment of the ground water resource. The document also predicts that with implementation of proposed action alternatives, ground water below proposed Pits B and C would contain selenium levels that would exceed the drinking water standard at 0.05 mg/L. The SEIS shows the exceedance area extending beyond the mining lease boundary.

Response 1-15

The BLM and USFS have added significantly more information to this FSEIS on mitigation measures to protect ground water and environmental monitoring including contingency planning (See the Appendix of this FSEIS for the " Infiltration Barriers - Review of Feasibility for the Smoky Canyon Mine" and the "Smoky Canyon Mine Environmental Monitoring Plan"). Simplot and the agencies have identified and assessed additional mitigation measures to reduce the anticipated impacts to better comply with State regulatory requirements. The ground water modeling has also been significantly improved in its ability to predict the future impacts more accurately (See Section 4.3.1).

Response 1-16

The BLM and USFS have decided that the information presented in this FSEIS is reasonably within the range of the Proposed Action and Alternatives discussed in the DSEIS and is appropriately released in this FSEIS instead of in a supplemental draft.

Compliance with Idaho Ground Water Quality Rule and NEPA

1-17

Permitting this project with the associated impacts to ground water could potentially violate the State of Idaho's Ground Water Quality Rule. The Rule states that the policy of the state of Idaho is to maintain and protect existing and projected future beneficial uses of ground water and to not allow degradation from both regulated and unregulated sources that would impair existing and projected beneficial uses of ground water and interconnected surface water (IDAPA 58.01.11). The Mineral Extraction provision of the Rule allows mining above and in ground water for an *active* [italics added for emphasis] mineral extraction area. Impacts to groundwater from the proposed mine designs, however, would occur long after active mineral extraction ceased.

In light of the anti-degradation language contained in the Ground Water Quality Rule and NEPA regulations at 40 CFR 1500.2(c), the SEIS should contain reasonable mine designs that avoid or minimize adverse impacts to ground water. These designs should minimize impacts to groundwater to the maximum extent practicable considering economic factors. At a minimum, mine designs should not result in selenium levels that exceed the national drinking water standard.

Response 1-17

In compliance with 40 CFR 1500.2(c), the BLM and USFS have coordinated closely with the IDEQ regarding the predicted impacts to groundwater described in the DSEIS. This coordination began before the DSEIS was written to determine if the predicted groundwater impacts would comply with State law and regulations. The coordination has included numerous phone calls, a number of meetings, and a written comment from the IDEQ (See Letter #4). The IDEQ has consistently indicated that, under the Ground Water Quality Rule, they would enter into a consent order with Simplot in response to the predicted impacts. At no time has the IDEQ indicated that the predicted impacts would not be allowed by the State. The BLM and USFS do not have regulatory authority over the groundwater resources and so have encouraged direct coordination between Simplot and the IDEQ in this matter. Those parties are already discussing the content of the consent order and the required mitigation. Mitigation designs for groundwater were not evaluated in the DSEIS because: 1) the BLM and USFS do not regulate groundwater quality which is reserved in the State to the IDEQ; 2) the IDEQ has not indicated that the predicted impacts will not be allowed under State regulations, and; 3) the construction of an infiltration barrier was determined to not be reasonable economically.

In response to public comments, the potential inclusion of infiltration barriers into the cap design are evaluated in Appendix 2C of this FSEIS and are summarized in Section 2.7. In addition, Simplot has clarified that the proposed overburden fill management practices proposed in the DSEIS will serve as long-term, clean water runoff recharge areas (see Section 2.2 of this FSEIS). The mitigative effects of these runoff recharge areas on the groundwater quality impacts are evaluated in Section 4.3.1 of this FSEIS.

Wellhead Protection

1-18

We have serious reservations about the adequacy of contaminant source control measures in the wellhead protection area for the Culinary Well at Smoky Canyon Mine (SCM). Our objections are based on (1) predictions in the SEIS that ground water located below pits in proposed Panels B and C would exceed the drinking water standard for selenium and (2) current knowledge that past mining practices (especially construction of the French drain) facilitated selenium contamination of ground water in the Wells Formation aquifer. The SEIS should describe the wellhead protection area for the Culinary Well, a well that the State of Idaho has identified as a source for a public water system. The lead agencies, as federal entities, must comply with all requirements of the State's wellhead protection program for drinking water wells in the area (see the Safe Drinking Water Act Section 1428(h)). In addition, all action alternatives should include a program to (1) monitor selenium levels upgradient of all drinking water supplies and (2) notify the public about any likely exceedances of drinking water standards. The SEIS should also fully discuss the risk of contaminated ground water affecting wells serving dairies located several miles from SCM.

Response 1-18

The groundwater model was modified to better incorporate the column test information and to account for mitigation measures proposed by Simplot in their comments on the DSEIS. The results of the modified model are discussed in Section 4.3.1 of this FSEIS and show that the water quality in the Culinary Well is estimated to continue to comply with drinking water standards for selenium. The water quality in this well will be monitored according to State requirements for public drinking water sources and notifications of any exceedances of drinking water standards will be distributed to the Smoky Canyon Mine workers and visitors. If monitoring shows that concentrations in drinking water exceed any drinking water standard, this situation would be addressed by the IDEQ with appropriate action.

A new paragraph has been added to the discussion of the groundwater modeling results in Section 4.3.1 of this FSEIS indicating there should be no groundwater impacts to the groundwater along Tygee Creek east of the mine (where the dairy is located).

Consultation with IDEQ

1-19

Lead agencies should continue to consult with Idaho Division of Environmental Quality (IDEQ) concerning impacts to ground water (see 40 CFR 1502.25) and conclude consultations with IDEQ prior to issuing revisions of the SEIS. Future versions of the SEIS should describe consultations between the lead agencies and IDEQ, determinations made by IDEQ concerning compliance with applicable ground and surface water standards and policies, and next steps if IDEQ determines that alternatives fail to meet these standards and policies.

Low-Permeability Cap Design Insufficiently Examined in Draft SEIS

1-20

The alternatives section of the SEIS does not include an alternative that employs a low permeability cap that would reduce infiltration into the waste piles, and thus reduce loading and the extent of the area affected by contaminated ground water. Discussion of this cap design was described only in the section entitled *Best Management Practices for Dissolved Selenium at the Smoky Canyon Mine Panels B and C* in Appendix 2B of the draft SEIS. There, an extremely brief analysis concluded that it would be very expensive to construct such a barrier. Superficially addressing an idea that has the strong potential to limit impacts to ground water and then relegating that discussion to an Appendix rather than include it in the alternatives analysis or Section 2.7, *Alternatives Considered but Eliminated from Detailed Analysis*, is inconsistent with NEPA (see 40 CFR 1502.14). The SEIS should either include an alternative that proposes using a low permeability cap design, or provide compelling reasons why such an alternative was not included and the potential litigative risk that might result. A cost/benefit analysis would be a useful tool to compare alternatives such as this one.

1-21

EPA carefully reviewed a recently prepared preliminary cost estimate of a low permeability cap design, and identified a number of factors that appeared to inflate the cost estimate. Our own preliminary cost analysis suggested that a similar cap design could be implemented at significantly less cost (perhaps as much as 50% less). EPA determined that there are standard practices that would provide for substantial savings that were not considered, including internalizing costs, and maximizing use of native materials. These differences suggest considerable uncertainty in the cost estimates for implementation of a low-permeability cover system, and underscore the need for better information on this topic on which a final agency decision can be made. EPA is committed to working with all the parties to continue this dialog.

Response 1-19

The BLM and USFS have conducted additional discussions with the IDEQ, beyond that agency's public comment letter (See Letter #4). Descriptions of these additional consultations are included in Chapter 5 of this FSEIS.

Response 1-20

A detailed discussion of the applicability of infiltration barriers to reduce seepage from the overburden fills is found in the " Infiltration Barriers - Review of Feasibility for the Smoky Canyon Mine" within Appendix 2C of this FSEIS. This evaluation concluded that construction of an infiltration barrier that could eliminate or significantly reduce the predicted ground water impacts was not financially feasible. Additional costs placed on a mining operation can be offset, within reason, by reducing the other costs. This is typically done by removing less overburden which, in turn, leaves more ore in the ground instead of removing it. The agencies can accept this if it is shown to be necessary. To absorb the increased cost of building the infiltration barrier, Simplot calculated the adjusted overburden stripping ratio of the open pits. The result of this was that Simplot indicated there was no longer enough ore left to produce a reasonable return on the mining activity and the mining of Panels B and C was no longer economically feasible. This was also not in compliance with the Purpose and Need which called for the phased development of the phosphate ore in Panels B and C. Because of the lack of economic feasibility and the non-compliance with the Purpose and Need, and according to 40 CFR 1502.14(a) a summary of the applicability of infiltration barriers was placed in Section 2.7 of this FSEIS. This same issue is addressed in a more cost efficient manner with the use of the runoff recharge areas.

Response 1-21

The BLM and USFS have conducted additional coordination with the EPA in developing potential concepts for a wider range infiltration barrier designs, some of which can potentially be built with on-site overburden materials instead of materials imported to the mine site. Using these on-site materials has the potential of considerable cost savings, if the construction materials can meet the design objectives for reduction in the rate of infiltration. These cost savings can result from internalizing the costs to the mining operations by using mining practices and labor for much of the work related to building the infiltration barrier. The use of on-site overburden material to construct the infiltration barrier can potentially save considerable money, if the material can deliver the required performance. However, operating experience at the mine indicates use of overburden material to build an infiltration barrier would be prohibitively expensive. These issues and the resulting range of costs are described in the " Infiltration Barriers - Review of Feasibility for the Smoky Canyon Mine" found in Appendix 2C of this FSEIS.

Geochemical and Hydrogeological Discussion

1-22

Several sections in the draft SEIS indicate that geochemical and hydrogeologic concerns that EPA raised for the Dry Valley Expansion EIS were taken into account when preparing this document. In particular,

- a geochemical conceptual model has been developed and incorporated into the SEIS;
- BMPs to reduce the mobility and exposure of selenium to receptors have been developed based on this conceptual model combined with what has been learned from existing phosphate mines in Southeast Idaho;
- the BMPs are clearly articulated and integrated into the mine expansion plan;
- plans for the expansion include monitoring of overburden cap effectiveness and other BMPs as well as monitoring of the surface water quality conditions and surface water-ground water relationships;
- geochemical analyses were based on an adequate number of samples from a representative set of locations and rock types;
- surface water-ground water relationships are specifically acknowledged and addressed;
- adequate hydrostratigraphic information is presented to allow evaluation of potential impacts; and
- ground water modeling uses appropriately conservative assumptions and considers regional empirical data when selecting input parameters.

Restricted Scope of the SEIS

Including the Tailings Pond

1-23

The SEIS focuses on environmental consequences of developing proposed mine panels B and C. However, the draft SEIS fails to disclose the potential impacts from the disposal of tailings, a waste that is inevitably produced when processing the ore from those panels. The SEIS should evaluate and disclose impacts associated with tailings disposal to comply with 40 CFR 1508.25, and if necessary, develop alternatives or mitigation measures to address these impacts (see 40 CFR 1502.14(f) and 1502.16(h)). For example, the current reclamation plan calls for seeding the tailings surface and allowing surface run-off to form a pond on a portion of the tailings surface. Our experience suggests that such practices would likely result in adverse impacts during the post-closure period. We believe the most appropriate tools for planning mines and for addressing potential future impacts of proposed mining operations are the mine planning and oversight processes of the land management agency (in this case, the Forest Service) and the BLM and the National Environmental Policy Act (NEPA)...

Response 1-22

The BLM and USFS incorporated previous input from the EPA and USGS on the Dry Valley Expansion EIS when conducting the environmental analysis for the Smoky Canyon Mine.

Response 1-23

As described in Response 1-13, the agencies have determined, under 40 CFR 1508.25 that the tailings ponds are not a connected action but rather are part of the existing, cumulative actions of the entire Smoky Canyon Mine. The cumulative impacts were evaluated in Section 4.16 of the DSEIS. The agencies did not ignore the potential impacts from the tailings ponds but recognized that the majority of the impacts from the disposal of the tailings in these facilities had *already* been evaluated in the original 1981 DEIS for the Smoky Canyon Mine and the 1990 USCOE EA done specifically for the tailings pond facility that would receive all the tailings produced by the Panels B and C operations as well as other operations at the mine. These NEPA documents were prepared prior to the recognition of the selenium problem in the phosphate mining industry in Idaho so the BLM and USFS agree with the EPA that additional environmental analysis of the selenium issues surrounding the tailings facility need to be examined in a timely manner. Given that the tailings ponds are not clearly connected actions under 40 CFR 1508.25, the BLM and USFS have chosen to not extend their regulatory authority over the tailings ponds; this rests with the USCOE, the IDEQ and the Idaho Department of Lands. This decision is reasonable and justified in part by the fact that these agencies, and others, have signed a Memorandum of Understanding (MOU) concerning contamination from phosphate mining operations in southeast Idaho and an area-wide Administrative Order on Consent (AOC) to investigate and mitigate impacts from selenium contamination due to phosphate mining. The MOU specifically states that one objective of the agencies signing the document (including the EPA) is to reduce duplication of effort. As indicated in the HMEII Report, Simplot has agreed to include the tailings ponds within any site-specific AOC so the environmental impacts of the tailings ponds and mitigation of those impacts (including reclamation) will be examined under that process. Because of the lack of clear NEPA authority over the tailings ponds, and the fact that a rigorous, enforceable environmental analysis process (MOU and AOC) had already, the BLM and USFS determined to not evaluate alternatives and mitigation for the tailings ponds in the DSEIS.

...Use of these processes should produce a fully integrated and up-to-date mine plan that effectively addresses all environmental issues at a site. We recognize that Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) enforcement actions can help address environmental problems when making and implementing clean-up decisions, but strongly believe that it is an inappropriate tool for mine planning at proposed or active mining operations.

1-24

Relationship to the Cleanup Process

The draft SEIS describes selenium problems at SCM and describes a general approach for addressing selenium contamination from past, current, and future mining activities. That approach would use the authorities that BLM and the Forest Service possess to administer the mine and use NEPA to address impacts related specifically to development of Panels B and C. The approach described would also rely on use of various state and federal enforcement authorities to address past, current, and some future impacts at the site. EPA participated in developing this framework for addressing selenium releases in southeast Idaho and supports its implementation. The draft SEIS should, however, disclose several important points related to the approach, including:

1-25

- Details of the approach are still being worked out. It is not clear, at this point, whether and the extent to which the approach would be applied to active mining operations (such as active pits, dumps, tailings facilities).
- At this point there is no firm schedule or binding commitment on the part of SCM or the government to address selenium releases according to the framework developed.
- Although the approach appears to enjoy broad support at this stage of negotiations, it has not been implemented at the site-specific level.
- The "Selenium Mitigation Action Plan" prepared by SCM is not binding on any party. It may reflect good intentions on the part of SCM, but does not commit SCM to any specific action.

Response 1-24

Various regulatory approaches exist to deal the selenium impacts from current and past mining operations. The agencies agree with EPA that CERCLA is not an appropriate tool for new mine planning. NEPA is a more appropriate approach and this SEIS is evidence of that. However, many Federal and State agencies, including EPA, have signed a memorandum of understanding (MOU) specifically designed for the selenium issue and agreed to address selenium investigation and cleanup issues at current and past phosphate mining sites in southeast Idaho using, in part, CERCLA authority. The MOU indicates that the signatory agencies will strive to avoid duplication of effort within their regulatory activities regarding selenium impact investigations and remediation. As parties to the MOU, the BLM and USFS have interpreted their duty to avoid duplication of effort with regard to the Smoky Canyon B and C Panel SEIS as limiting the scope of the SEIS only to future impacts of the B and C Panel mining operations and to leave the evaluation of current and historic selenium impacts at the Smoky Canyon Mine to the site-specific AOC process and the CERCLA authority behind it.

Response 1-25

The whole issue of investigating the selenium issue in southeast Idaho is a fast moving target to plan around and much has happened since the EPA drafted its comments. Details of the site-specific approach (site-specific AOC) to implementing the MOU and area-wide AOC to the Smoky Canyon Mine have already been drafted by the USFS and reviewed by Simplot. This effort has clarified the scope of the investigations at Smoky Canyon will include any facility, including pits, overburden fills and tailings facilities, that may contribute to the selenium issue. The USFS and Simplot plan to execute this enforceable AOC by the Spring of 2002. The HMEII Report, while not itself enforceable, provides the public with the necessary information regarding the history, regulatory authorities, technical findings to date, and plans for impending CERCLA investigations that have already begun related to the selenium issues at the Smoky Canyon Mine. The signed site-specific AOC will be an enforceable document that will cover the required actions at the property.

Using Non-Seleniferous Overburden for Reclamation

The SEIS should also consider an alternative that would allow use of non-seleniferous material to accomplish reclamation objectives at other portions of the mine site. For example, an alternative could be developed that would allow SCM to use non-seleniferous waste rock as a cover material or growth medium on existing dumps, or back-filled pits. Such an option could eliminate the need for an external overburden dump (as proposed in Alternative A), reduce the footprint of the mining disturbed area, reduce or eliminate the need for double handling of waste rock, and accomplish important reclamation objectives at other portions of the mine site. Such an alternative would also start to integrate current and planned mining activities with mitigation at existing mine facilities, and introduce flexibility and potential cost savings into the process.

1-26

Monitoring and Contingency Planning

The document should provide general information on monitoring and contingency planning, including clear statements of monitoring objectives. This type of information is necessary to mitigate for uncertainties and risks associated with predictions of environmental outcomes, and would provide an early warning system of unexpected outcomes.

1-27

The monitoring of future ground water impacts needs to be described. It will be important to monitor the actual impacts from the mine expansion and see how those compare to the predicted impacts. Some type of early warning system is needed in case modeling results underestimate either the concentrations of metals in ground water, or the extent of ground water contamination. Monitoring does not need to be described in extreme detail at this stage of analysis, but the overall objectives, constituents, and frequency should be included.

1-28

Ground water impacts from the current mine operation have not been well characterized. Existing wells provide useful information, however, these wells are not optimally placed or constructed to describe ground water quality affected by backfill material. Future monitoring should be designed to avoid this problem. In addition, a number of questions should continue to be evaluated such as the origin of the water emanating from Lower Smoky Spring, water balance within the Pole Canyon dump, and effects to ground water.

1-29

Response 1-26

As indicated in Response 1-13 and 1-23, the BLM and USFS have decided to not include the existing mining facilities and tailings ponds within the scope of detailed analysis and alternatives for the SEIS. This was done, in part, to avoid duplication of effort and comply with the spirit and intent of the MOU and area-wide AOC. It is certainly attractive to try to solve all the *perceived* problems with the existing mining operations as part of the Panels B and C SEIS deliberations. However, the timing of the SEIS and the studies under the AOC are not synchronized; thus the investigation of the causal factors and appropriate mitigation for the selenium issues related to the existing mining operations is not currently available. It would therefore be premature for mitigation measures and alternatives for remediating the existing mining operations to be included in the mine plans for the Panels B and C and the SEIS. Simplot has proposed to store both chert and seleniferous overburden in the external overburden disposal site. Alternative A still includes the disposal of chert overburden in this external facility. In either case, the design of the external overburden disposal facility could include plans for potential re-mining of chert overburden to potentially be used for remediation of the existing mine areas. Although not part of the design necessary for Panels B and C, the agencies have indicated to Simplot that future re-mining of chert from this facility may be a possibility and to plan accordingly. It would be inappropriate to proceed with the application of any remedies for the existing impacts at this time until these have been studied and shown to be effective through the site-specific CERCLA studies.

Response 1-27

A more detailed monitoring plan, including a contingency plan, has been included in the appendix to this FSEIS. This replaces the more general monitoring recommendations included in Section 2.9.1 of the DSEIS.

Response 1-28

A more detailed monitoring plan, including required ground water monitoring, has been included in the appendix to this FSEIS.

Response 1-29

The groundwater monitoring program proposed in the appendix to this FSEIS addresses the EPA's concern related to positioning additional groundwater monitoring wells and evaluation of the source of water from Lower Smoky Spring. The study plans developed under the site-specific AOC will address existing groundwater impacts including any groundwater impacts from the Pole Canyon Dump.

1-30

Environmental Risk

The SEIS should disclose estimated costs for reclaiming the site in the event of financial instability, temporary or premature shutdown, or failure to meet reclamation objectives. This information is necessary for the public to fully understand the risks posed by the project and develop informed comments on the project and its alternatives.

Response 1-30

See Section 4.14 for a discussion of reclamation costs per alternative as compared to the Proposed Action. See responses to comments 1-10, 1-11, and 1-12.

Storm Water

1-31

There are several references to the EPA Storm Water program in the document which do not accurately describe how the program is implemented. References in the Executive Summary conclude that discharges would be in compliance with the EPA Storm Water Pollution Prevention Plan. These conclusions are generally not supported by any data or analysis, and should rather be stated as goals. In addition, there is no "EPA Storm Water Pollution Prevention Plan." By way of background, facilities that wish to discharge storm water to "waters of the U.S." may seek permit coverage under either an individual permit or the storm water Multi-Sector General Permit (MSGP). Those seeking coverage under the MSGP must comply with several terms and conditions to receive and maintain their authorization to discharge. This coverage requires that a facility develop a site-specific Pollution Prevention Plan (PPP). The PPP should include provisions for monitoring Best Management Practice (BMP) effectiveness and implementing changes as necessary (i.e., the "BMP feedback loop"). Discharges that cause or contribute to violations of water quality standards are not authorized by the MSGP, regardless of content of a facilities PPP.

Response 1-31

The suggested clarifications regarding implementation of the stormwater program have been incorporated into the SEIS.

Specific Comments

1-32

When discussing Maximum Contaminant Levels (MCLs), it would be helpful if the text indicated if the MCL is a primary (based on human health) or secondary (based on aesthetics) MCL. This is done inconsistently and the basis for the difference is not explained. The MCL for manganese, for example, is a secondary MCL. When assessing risk to humans from consumption of manganese in drinking water, EPA uses a risk-based concentration of 840 ug/l, based on a Hazard Index of 1.0 for non-cancer effects. Often, risk-based concentration benchmarks are less than MCLs, but in the case of manganese, the MCL is the lower of the two. Although secondary MCLs may provide a useful benchmark for comparison, it is our understanding that they are not enforceable in Idaho. It might be helpful to the public if the distinction between the two types of MCLs were explained. (EPA can provide a reference for the risk-based concentration, if this information is incorporated. Although the risk-based concentration is not enforceable, it may provide a useful benchmark for readers interested in potential human health effects.)

Response 1-32

The tables in Section 4.3.1 of this FSEIS have been annotated to indicate which of the groundwater standards are primary health based standards and which are secondary aesthetics based standards.

1-33

Similarly, the description of the boundaries of "detectable" concentrations might benefit from some additional explanation in the text. Concentrations are detectable based on the analytical methodology and sampling protocols that are used and are not necessarily based on either human health or ecological impacts. EPA does not object to the inclusion of this comparison, but it could be explained more clearly.

Response 1-33

The recommended explanation on the meaning of the detection limit contours has been added to the text describing Figure 4.3-4 in this FSEIS.

1-34 When discussing results of the Synthetic Precipitation Leaching Process (SPLP) testing, it is important to note the pH of the solution used to leach the overburden in this test and describe the effects this would be expected to have on the mobility of the contaminants of concern (i.e., under-prediction or over-prediction).

1-35 S-x, paragraph 1 and page 2-5, paragraph 6: The SEIS should explain why there was a change in the mining sequence of the five panels.

1-36 S-xi, paragraph 4 and page 2-24, paragraph 4: The SEIS states here and at other locations that all new culverts would be designed to pass peak flow from a 100-year storm. The proponent and lead agencies should know what the peak flow from a 100-year storm is and should extrapolate and explicitly state the size of culverts that are proposed to be installed.

1-37 S-xiv, paragraph 2: EPA is pleased that the SEIS contains ground water modeling of the potential impacts from seepage that is appropriately conservative (i.e., does not assume physical or chemical attenuation of the seepage).

1-38 S-xv, paragraph 2: The SEIS should state that the Culinary Well is a source for a public drinking water system.

1-39 S-xv, paragraph 4: The SEIS should state how weeds would be controlled prior to vegetation establishing itself.

Response 1-34

The recommended explanation of the effects of the SPLP test protocol on the predicted values has been added to the text discussing the SPLP results following Table 4.1-2 in this FSEIS.

Response 1-35

The recommended text has been added in this FSEIS. The reasoning for this was that the limited geologic information that Simplot had at the time indicated that Panel B showed thinner ore and in increase in the thickness of overlying chert that had to be removed to recover the ore. The information also suggested that the ore in Panel B was poorly altered. Simplot felt that the reserves in Panel D were more cost effective to recover at that time and requested to delay mining in Panels B and C to the end of the mine life. Also, Simplot was uncertain if Panel C could be economically mined since the plunging ore beds compounded with the large increase in topographic relief from the overlying Webster Range resulted in a large stripping ratio and very small pit. BLM prepared an environmental assessment and decided to allow the sequencing change. However, BLM made no decision on dropping Panel C from the approved mining plan. Geologic information obtained from intensive exploration drilling conducted subsequent to the sequencing modification has shown more favorable ore zones and stripping conditions. Both Panels B and C are considered minable at this point.

Response 1-36

Culvert diameter is shown on Figure 4.3-1 in the DSEIS. The paragraph has been revised to include the size of the culverts (minimum 30 inches) that would be installed in Smoky Creek.

Response 1-37

The Column Leaching Test Data portion of Section 4.1.1 and the Predicted Infiltration Chemistry portion of Section 4.3.1 in this FSEIS have been modified to describe how the concentrations of the seepage chemistry are expected to decrease over time and how this was accommodated in the groundwater impact modeling. Attenuation of the seepage impacts chemically is still not part of the modeling.

Response 1-38

A sentence has been added to the Summary indicating that the Culinary Well is a source for a public drinking water system.

Response 1-39

Additional information about Simplot's weed control program has been added to Section 3.5.

1-40 S-xvii, paragraph 5: The SEIS states that "changes would exceed guidelines for the Caribou-Targhee National Forest Partial Modification category." The SEIS should state whether proposed actions would require amending the visual quality objectives of the Forest Plan and if so, whether such an amendment would be considered significant or non-significant.

1-41 S-xviii, paragraph 5: The draft SEIS predicts that resulting selenium levels in the Culinary Well from adopting Alternative A would exceed the drinking water standard. The SEIS should explain if predicted selenium levels in the public water source for SCM poses health risks for the workers using the water. In addition, the SEIS should state whether the lead agencies and J. R. Simplot are consulting with IDEQ and EPA about potentially exceeding drinking water standards, whether it is likely that a variance of the drinking water standards will be issued, and the process for granting a variance. Also, please note that simply supplying bottled water to mine employees is not considered adequate in the long-term for protecting workers, nor is it adequate for maintaining compliance with drinking water regulations.

1-42 S-xxii: A paragraph or table summarizing the differences in the level of impacts from adopting Alternatives A or B would aid the reader.

1-43 Page 1-6: The status column for the EPA issued NPDES permit for stormwater discharge should state that the permit was recently reissued by EPA and will expire in 2005.

1-44 Page 1-7, Section 1-4: The SEIS quotes direction provided by the Caribou Forest Plan concerning mineral development. "Mineral Resources of the Forest that can be produced at a profit, after consideration of the costs of mitigating measures necessary to protect surface resource values will be produced to meet demands." The SEIS should clarify whether the referenced costs of mitigating measures to protect resource values is limited to those implemented during the operation of the mine, or whether it also includes post-closure reclamation and mitigation costs.

Response 1-40

The appropriate VQO for this mining area was suggested as Modification or Maximum Modification. The Revised Forest Plan suggests that Modification or Maximum Modification generally occur in "unseen areas" of phosphate mining. The Partial Retention areas are foreground, middleground, and background for primary and secondary travelways. (USFS, 2001).

There would be no need to amend the Forest plan to accommodate the Proposed Action or Alternatives. This detail has been added to the SEIS Visual Resources section and to the Summary of this FSEIS.

Response 1-41

The DSEIS groundwater impact analysis predicted that the water quality in the Culinary Well would be greater than the 0.05 mg/l drinking water standard. The new model runs, incorporating mitigation measures to reduce the groundwater impacts from the proposed B and C Panel operations predict that the water quality at the Culinary Well would be maintained within drinking water standards (see Section 4.3.1 of this FSEIS). Simplot will continue to monitor the water quality in the Culinary Well, in accordance with State drinking water regulations, and would take corrective measures, as approved by the State, if any of the monitored parameters were shown to exceed drinking water standards.

Response 1-42

A reference to the comparison of alternatives in Table 2.6-1 has been added to the impacts description in the Summary section of this FSEIS.

Response 1-43

The suggested change has been made in Table 1.3-1.

Response 1-44

The reference to the costs of mitigating measures applies to those implemented during the mine operation as well as to those implemented post-mining. The clarification has been added to Section 1-4.

1-45 Page 1-7, Section 1-4: The SEIS states that the revised Forest Plan utilizes an adaptive approach to reclamation measures, and the proposed project is in compliance with the revised Forest Plan. This statement appears premature. Six of the seven alternatives presented in the revised Forest Plan utilize an adaptive approach with the exception being alternative six which utilizes a prescriptive approach.

1-46 Page 1-9, paragraph 1: We recommend using language which more explicitly recognizes the federal trust responsibility for tribes. For example, the first sentence could be expanded on to read, "Federal agencies also have a trust responsibility to federally recognized tribes. This trust responsibility is reflected in language contained in BLM Manual Section 8160 which directs BLM to 'assure that tribal governments, Native American communities, and individuals whose interests might be affected have a sufficient opportunity for productive participation in BLM planning and resource management decision making.'"

1-47 Page 1-17, footnote: EPA believes that defining geologic and other technical terminology in footnotes aids reviewers of the SEIS who lack this technical expertise.

1-48 Page 2-4, paragraph 8: The SEIS describes the production well and culinary well when describing the facilities at SCM. The description should state that the Culinary Well is a recognized public drinking water source.

1-49 Page 2-5, paragraph 5: The map opposite page 2-5 should use themes to show the sub-panels referenced in paragraph 5 on page 2-5.

1-50 Page 2-7, paragraph 1: The SEIS should describe the successes and failures of past reclamation activities at the end of paragraph 1.

1-51 Page 2-10, paragraph 2: The SEIS should clarify what is meant by the term "control of seepage." Does this term mean no-seepage or low-seepage? How much seepage occurs?

Response 1-45

The statement was made by a Forest planning representative during the preparation process for the revised Forest Plan, in anticipation of then suggested planning approaches. Alternative 7, which used an adaptive approach to phosphate mining and reclamation, is the Agency Preferred Alternative in the Draft Revised Forest Plan (USFS, 2001). Detail has been added to this FSEIS text to reflect the actual language in the Draft Revised Forest Plan.

Response 1-46

The suggested language has been added to Section 1.5 of this FSEIS.

Response 1-47

Thank you for this comment.

Response 1-48

The recommended additional explanation has been added to Section 2.1.3 of this FSEIS.

Response 1-49

The recommended modification has been made to the figure.

Response 1-50

The recommended information has been added in Section 2.1.4 of this FSEIS.

Response 1-51

The tailings ponds were located over low permeability clayey materials that limit seepage from the tailings ponds by nature of the low permeability and thickness of these materials. A seepage analysis out the bottoms of the tailings ponds was not conducted during the design of these facilities. Testing of these materials indicated a permeability of 1 foot per year or less. However, the seepage rate from the tailings ponds would also be influenced by the permeability of the tailings solids, the amount of hydraulic head exerted at the point of interest, and the time period over which the hydraulic head is present. Groundwater impact testing with three new monitoring wells installed at the base of the Tailings Dam No.2 have shown that groundwater has not been impacted by the tailings pond operations and is unlikely to be impacted because the natural groundwater quality under the tailings facility is generally worse than the tailings water (see Section 4.16.3). The seepage rate from the tailings facility has not been calculated because of the lack of data on the permeability of the tailings solids and the evidence that seepage from the tailings pond is unlikely to have a deleterious impact on groundwater quality.

1-52 Page 2-12, table 2.1-2: The table should indicate whether species are native or non-native.

1-53 Page 2-12, paragraph 1: The SEIS should describe the monitoring proposed in the post-closure plans for the tailings ponds.

1-54 Page 2-24, paragraph 1: The word "blocked" should be replaced with word "block".

1-55 Page 3-52, Section 3.3.5: It is not always clear what horizon is being monitored by the wells. Table 3.3-12 summarizes data "from alluvial and bedrock wells," but does not distinguish them. This makes it difficult to compare current site data with water quality projections. (Well construction details can be found in Table 3.3-13, but without referring to it, this section in the SEIS cannot be interpreted.)

1-56 Page 2-53, paragraph 4: The SEIS should specify how it proposes to control weed infestations.

1-57 Page 3-98, paragraph 1: The SEIS should identify predators that have the greatest risk of selenium bioaccumulation due to their diets.

1-58 Ground Water Modeling, Chapter 4: The source of input parameters is clearly stated, which is important. Include some summary discussion of which parameters are believed to be the most uncertain and what effect this would be expected to have on the results and conclusions. Since the amount of area expected to be affected by ground water contamination is an important aspect of the project, it would be helpful if more explanation were brought forward from that report. Maps showing contours of specific concentrations inevitably imply more certainty than is generally appropriate, so some additional discussion would help provide context to the public. (As an example, the discussion of the effect of the uncertainties in the input concentrations found in the DEIS is helpful and informative.)

Response 1-52

The recommended information has been included in Table 2.1-2 of this FSEIS.

Response 1-53

Simplot intends to update the tailings pond closure plan in the future. The post-closure monitoring plans for the facility will be determined at that time. The Idaho Department of Lands (IDL) has regulatory authority over the future closure and reclamation of the tailings ponds. They have indicated that the tailings ponds should be reviewed in the site-specific AOC and any revisions to the closure plan be submitted to the IDL for their review and approval (see Letter #12). The post-closure monitoring would be part of the information submitted to the State under their authority.

Response 1-54

The requested change has been made.

Response 1-55

The correlation of the monitoring well chemistry and the geology of the monitored interval is found in the last half of Solute Chemistry in Section 3.3.5 of the DSEIS.

Response 1-56

See Response 1-39.

Response 1-57

The document states that "No studies have been completed within the area concerning the uptake of selenium by predators as a result of feeding on prey species that were exposed to elevated levels of selenium in vegetation." This applies not only to the Simplot Mine and Southeastern Idaho, but to research into the effects of selenium in general. The USDI's National Irrigation Water Quality Program Information Report No. 3 (USDI, 1998) notes that "three studies of flesh-eating birds have found that less selenium was transferred from the hen's diet to the egg than is typical of plant- and invertebrate-eating species of birds." Heinz (1996), however, notes that "bird species differ substantially in embryo sensitivity to selenium exposure." Heinz goes on to note that even closely related species of birds differ significantly in their reactions to selenium exposure. At the present time, insufficient information exists to fully respond to this comment.

Response 1-58

The discussion of the uncertainty in some of the input parameters on page 4-54 of the DSEIS has been expanded in this FSEIS to bring forward some of the discussion on this matter from the modeling report.

1-59 The model distributes the contaminants evenly throughout the 500 ft aquifer thickness. This would result in underestimating concentrations if the aquifer were significantly less homogeneous than this assumption. How does this assumption fit with Ralston's (1981) conclusion cited in section 3.3.4, which describes high permeability beds separated by low permeability beds?

1-60 There are very few wells suitable to use for hydraulic heads either as input to the model or to calibrate the model. How much is this expected to affect the results?

Response 1-59

The predicted concentrations in the Wells Formation would be higher if the aquifer thickness was reduced. Ralston described the Wells Formation aquifer as being layered with a number of "semi-separated" aquifer systems but he considered the entire formation to be a potential aquifer. Drill logs of the Wells Formation section in the Industrial and Culinary wells do not show evidence of any lithologies such as shales that could be considered aquitards that could decrease the thickness of the aquifer. In addition, the structural setting of the area of interest (anticline) is a likely location for extensive fracture develop which would increase the secondary permeability of the beds. The physical hydraulic evidence for the vertical continuity of the Wells Formation aquifer is Ralston's observation that, while drilling the water wells, depth to water increased with well depth indicating downward gradients to the depths of the water wells.

Response 1-60

The quantity of flow through any portion of the aquifer is proportional to hydraulic head and the permeability. In the modeled system at the B and C Panels, the quantity of water available to move through the system is controlled by the recharge at the local recharge area so one cannot simply change hydraulic head while keeping permeability constant because the modeled flow quantity would no longer equal the amount of water physically available in the recharge. Assuming the recharge rate is fixed, the quantity available to move through the local aquifer is also fixed. This means that changes in hydraulic head must also be accompanied by changes in the permeability of the aquifer to keep the same amount of water moving through the aquifer, equal to the recharge rate. The permeability is a measured characteristic from pump tests at the site so we do not feel comfortable changing that parameter value. The hydraulic head used in the model was that which was calculated to result in aquifer flow equivalent to recharge in the model.

If one ignored the relationships described above and kept aquifer permeability constant and allowed the water flow quantity to change in response to changes in gradient, increases in the hydraulic gradient would cause increases in the quantity of aquifer flow under the site. This would cause lower contaminant concentrations in the aquifer because there would be more dilution of the contaminants. It would also cause the contaminated water to flow further downgradient within any selected time frame. A reduction in hydraulic gradient, with constant permeability and changing water flow quantity would result in less flow through the aquifer giving higher contaminant concentrations and smaller downgradient flow distances within any specified time frame.

1-61

Using the selenium concentration from the field data as well as from the column test data as input to the model was a good way to look at the variability from this source. It provides what should be an upper-end estimate of impacts since those concentrations originate from overburden dumps designed without the proposed BMPs designed to reduce metal mobility.

1-62

Are there site data or regional data that would allow comparison of these model predictions with measurements collected from similar locations? (This refers to ground water beneath pits and overburden piles as opposed to that from seeps and French drains).

Response 1-61

A different analysis of the seepage chemistry has been done for this FSEIS compared to the DSEIS. The groundwater impact analysis in this FSEIS has been modified using a more realistic interpretation of the column test data which better simulates the effects of leaching the overburden with infiltration and takes into account the decrease in concentrations expected over time. As a result, the groundwater modeling results directly incorporate projected column test results as high as about 0.33 mg/l down to about 0.1 mg/l. This more realistic seepage chemistry analysis somewhat negates the value of the field data from the regional database of selenium analyses because the groundwater impact analysis remains conservative and uses a range of values but these values are better related to the laboratory testing on actual samples from the B- and C-Panels of Smoky Canyon Mine. The results of the modeling with the projected column test results are still compared in the FSEIS against the field data obtained from the Smoky Canyon Mine and the regional data base. The BLM and USFS believe that a balanced approach to impact analysis should incorporate both laboratory and applicable field observations, if available. The groundwater impact analysis was also run using a starting value of 0.72 mg/l which was determined from field data at the Smoky Canyon Mine.

Response 1-62

The only other phosphate mine in southeast Idaho that has predicted groundwater concentrations from seepage through seleniferous overburden in pit backfills is the Astaris Dry Valley Mine South Extension Project. The groundwater impact analysis in the FEIS for that proposal indicated that concentrations of cadmium and nickel would be greater than the MCLs in the bedrock aquifer under the backfilled pits. The Dry Valley Mine project development and monitoring has not yet progressed to the point that any impacts would be expected to be detected yet in the monitoring. The Astaris site is not considered to be directly comparable to the Smoky Canyon Mine because of the differences in: hydrogeology, climate, net infiltration into the overburden fills, predicted concentrations of potential contaminants in the overburden seepage, and the effects of chemical attenuation.

The existing information from the Area Wide Studies indicates that each mine site has different conditions that control the release and pathways for contaminants. Data collected from one mine site can only generally be extrapolated to other mine sites in the vicinity. Climatic, geologic, hydrologic and geographic conditions vary across the southeast Idaho phosphate area leading to different release characteristics at each mine site.

1-63 Page 4-23, paragraph 4: This paragraph references an EPA document issued in 2001. This reference should be listed in Chapter 6.

1-64 Table 4.3-6: It is important to note that in this table "baseline" does not refer to unimpacted water quality in the Culinary Well (CW). If this is an average of CW measurements, as stated in the text, then it already includes concentrations that are elevated as the result of past mining. If concentrations at the CW continue to rise as the result of the past mining, then that "baseline" will be a minimum, thus the "modeled plus baseline" concentration would also be higher.

1-65 Page 4-79. Mitigation to offset any unavoidable losses to wetlands should be identified in this document. The consequences of the potential wetland impacts can not be adequately determined until an appropriate wetland mitigation plan is developed. Relying on a Clean Water Act Section 404 permit at some point in the future to determine mitigation needs does not allow for the appropriate disclosure of information about the ability of the applicant to replace wetland functions and values for the proposed action. Wetland mitigation efforts were not completed for many years under a previous Section 404 permit issued to this applicant because anticipated mitigation methods were not practicable, feasible, or available. Decisions about wetland impacts should not be made until an acceptable wetland mitigation plan is developed.

1-66 Page 4-133, table 4.16-3: The table needs a footnote describing the definition of "extractable" selenium in the context of this summary. Alternatively, this information could be added to the body of the text. As there is much discussion regarding correlations between concentrations in vegetation with "soil extractable" selenium, this needs to be specified.

Editorial comments / questions:

1-67 Table 3.3-12: It would be helpful if wells with concentrations above standards were highlighted by bold type.

1-68 Table 3.3.7 and others: "NS" (no standard?) needs to be in the footnotes.

1-69 Is the extent of the Pole Canyon disposal area actually delineated on any of the maps?

Response 1-63

The reference has been added to Chapter 6.

Response 1-64

Tables 4.3-7, -8, -12 and -13 have been modified to replace reference to "baseline" with "2000" to clarify the date of the water quality data shown.

Response 1-65

A Corps of Engineers (USCOE) nationwide permit, authorizing dredge and fill activities in wetlands, must be obtained prior to initiating any such activities. The USCOE would not be expected to issue Simplot a 404 permit until a satisfactory wetlands mitigation plan has been accepted. The USCOE has conducted two site visits in connection with the project, and the Forest Service, the Idaho Departments of Water Resources (IDWR), Environmental Quality (DEQ), and Fish and Game (F&G) visited the site in November, 2001.

Response 1-66

An explanation has been added to the bottom of Table 4.16-4 (formerly 4.16-3) describing the method as ASA Monograph 9, Soil Paste with Water Soluble Hydride Analysis.

Response 1-67

Table 3.3-12 in this FSEIS has been modified to show boldface for the data and the well identifications for any parameters that were measured above the applicable ground water quality standards.

Response 1-68

The explanation "NS = No regulatory standard has been set." has been added beneath all tables containing this acronym.

Response 1-69

Figure 2.1-2 in this FSEIS shows the location of the Pole Canyon External Overburden Disposal Site. This figure has been modified from that in the DSEIS to show the south boundary of that facility

1-70 Specify the location of the climate data used as input to the HELP model.

1-71 Describe the current and historical water quality data for the Culinary Well. Are any trends in concentrations apparent?

1-72 What is the plan for supplying potable water to the mine workers in the future since the Culinary Well is predicted to be above MCLs? Will the water be treated or will a new well be drilled? How often is the water tested?

Response 1-70

The geographic location information of all the climatic data used in the HELP modeling is described on Page 2 of the Smoky Canyon Mine Supplemental EIS Overburden Fills Infiltration Modeling report in Appendix 4C of the DSEIS.

Response 1-71

The water quality of the Culinary Well has been monitored irregularly by Simplot since 1984, with most samples taken during 2000. Water quality data is not available for the Industrial Well prior to 2000. A table of the selenium data and discussion of same has been added to the Groundwater portion of Section 4.16.3. It shows that selenium concentrations in the Culinary Well were below detection levels until 10 to 12 years after mining started at Smoky Canyon and have remained within a range of 0.007 to 0.031 mg/l since then.

Response 1-72

Employees and visitors at the Smoky Canyon Mine have used bottled water for drinking purposes for a number of years although there are some drinking fountains connected to the Culinary Well. This is expected to continue into the future. The most recent groundwater modeling reviewed in this FSEIS shows that the groundwater quality impact mitigation proposed by Simplot would maintain water quality in the vicinity of the Culinary Well within State drinking water standards. Water quality monitoring of the Culinary Well is conducted in accordance with State drinking water regulations and the results are provided to the State. If future monitoring indicated that any parameters exceeded State drinking water standards, Simplot would report this to the State and comply with State regulations to provide a permanent safe drinking water source within the time determined by the IDEQ.

Letter #2

In Reply Refer To:
Mail Stop 423

MEMORANDUM

August 31, 2001

To: Jeff Steele, Field Office Manager BLM
Pocatello, Idaho

From: James F. Devine (signed)
Senior Advisor for Science Applications

Subject: Review of Draft Supplemental Environmental Impact Statement for the Smoky Canyon Mine, Panels B & C at the existing J.R. Simplot Smoky Canyon Phosphate Mine, Caribou County, Idaho

The U.S. Geological Survey (USGS) has reviewed the subject Draft Supplemental Environmental Impact Statement (EIS) and offers the following comments.

SPECIFIC COMMENTS:

Page 3-11, Trace Metals and Sources; Assay Data on Selenium, first paragraph:

2-1 For clarity, the sentence beginning with "They showed selenium occurs in the Phosphoria Formation primarily..." should be changed to "They showed selenium occurs in the Meade Peak Phosphatic Shale Member of the Phosphoria Formation primarily..."

Page 3-11, Assay Data on Selenium, third paragraph:

2-2 The sentence beginning with "Most of the selenium..." should be rewritten as "Munkers et al. (2000) noted that most of the selenium..." in order to avoid any unintended association of this conclusion with the USGS research of Desborough, 1999.

Page 3-12, Geochemical Conceptual Model, fourth paragraph:

2-3 The reference citation, Herring et al. 1999a, for the statement "In alkaline environments like those found in overburden stockpiles in southeastern Idaho, selenide is oxidized to selenite..." should be removed. This was not stated in the cited reference. The reference citation, Herring et al., 1999a, for the statement "Selenide also oxidizes readily to elemental selenium; however, elemental selenium is resistant to oxidation..." should be removed. This was not stated in the cited reference.

Response 2-1

The recommended change has been made in this FSEIS.

Response 2-2

Page 3-11 of the DSEIS, third paragraph: In the context of this paragraph there was the possibility of unintended association between Munkers, 2000 and Desborough et al., 1999 so the sentence beginning with "Most of the selenium..." has been rewritten in this FSEIS.

Response 2-3

Recommended change has been made in this FSEIS.

2-4 For accuracy, the sentence "Since most of the selenium in undisturbed Phosphoria Formation overburden apparently occurs as selenide in pyrite (Desborough, 1977, Desborough et al. 1999, Munckers, et al., 2000), it is probable that ..." needs to be changed to say "Since much of the selenium in the undisturbed Phosphoria Formation may occur as selenide in pyrite (Desborough, 1977, Desborough et al. 1999, Munckers, et al., 2000), it is possible that..."

Response 2-4

The recommended change has been made in this FSEIS.

Page 3-12, Geochemical Conceptual Model, fifth paragraph:

2-5 The two references to Herring et al., 1999a should be removed from this paragraph. None of this material, including the quote, "...relatively stable complexes and compounds with iron and aluminum sesquioxides..." was stated in the cited reference.

Response 2-5

Recommended change has been made in this FSEIS.

Page 3-12, Geochemical Conceptual Model, last paragraph; Page 3-13, first paragraph:

2-6 The reference citation, Herring et al., 1999a, for the entire paragraph should be removed. The stated material is not in the cited reference.

Response 2-6

Recommended change has been made in this FSEIS.

Page 3-16, fourth paragraph:

2-7 The reference citation, Herring et al., 2000, should be removed from the second sentence in this paragraph. The sentence that begins with "Some variability has been correlated..." is questionable because there was no statement of correlation between weathering and oxidation variability in the cited reference. The statement "Herring et al., (2000) found..." should be "Herring et al., (2000b) found..." The reference in the sentence, "In addition, variability in selenium concentrations has...strata (Herring et al, 1999; Desborough et al., 1999; Herring et al., 2000)," should be changed to (Herring et al., 1999; Desborough et al., 1999; Herring et al., 2000b).

Response 2-7

Recommended changes have been made in this FSEIS.

Page 6-10, Chapter 6 References and Glossaries:

2-8 The reference "**Herring, J.R., R.I. Grauch, G.A. Desborough, R.G. Tysdal, and L.L. Stillings. 2000c.** Trace Elements in Phosphatic Shale, Phosphoria Formation, Southeastern Idaho, USA." does not include the name, volume, and/or pages of the publication of this article and is not referenced in either Section 3.1 or 4.1 Geology, Minerals, and Topography. It should be removed from the Reference section.

Response 2-8

Recommended change has been made in this FSEIS.

Thank you for the opportunity to review and comment on this Draft Supplemental EIS.

Copy to: Office of Environmental Policy and Compliance

Letter #3

September 7, 2001

Mr. Jeffrey Cundick
SEIS Project Manager
BLM Pocatello Field Office
1111 North 8th Avenue
Pocatello, Idaho 83201

Dear Mr. Cundick:

Re: DES-01/0022

The National Park Service has reviewed the Draft Supplemental EIS for Smoky Canyon Phosphate Mine, Panels B & C, located on BLM and USFS (Caribou-Targhee National Forest) Lands.

There are three National Park Service areas in close proximity to the Smoky Canyon Mine. They are: Yellowstone National Park, Grand Teton National Park and Craters of the Moon National Monument. Each of these parks include areas classified as mandatory Class I air quality areas under the Clear Air Act.

The Act give federal land managers the responsibility for protecting air quality and its related values. Federal Land Managers are charged with preventing significant deterioration of air-quality-related values in Class I areas, regardless of the pollution source.

3-1

The Affected Environment Section of the DSEIS mentions these Class I areas. There is a table showing distances of the Class I areas from the project on page 3-22. On both the table and in the text above it, Grand Teton National Park is incorrectly listed as Grand Teton National Monument.

We are uncertain from the language in the Environmental Consequences section of the document whether air dispersion modeling studies used for the DSEIS included an analysis of the impacts on the three National Park Service Class I areas. On page 4-16, the DSEIS mentions that an air dispersion model was "run to predict if Class I Areas (i.e. Bridger Wilderness Area) and local communities would be affected by the Proposed Action." Did your analysis demonstrate the consequences, if any, of the proposed action and other alternatives on the Class I areas in Grand Teton National Park, Yellowstone National Park and Craters on the Moon National Monument? This analysis needs to be conducted and the resulting consequences clearly stated.

3-2

Response 3-1

The correction has been made in this FSEIS.

Response 3-2

The Class I Impacts are required for major sources or major modifications of air pollution based on EPA New Source Review guidance. The air dispersion model was run using a polar grid that extended out 70 miles (Grand Teton National Park and Bridger Wilderness Area) and 100 miles (Yellowstone National Park and Craters of the Moon National Monument) from the area of study. With particulate matter being the largest emission and a contributor to regional haze, this air dispersion model was conducted to determine Class I Impacts. The PSD guidelines for Class I impacts were not exceeded for the closest Class I area and were less at Class I areas that are located at greater distances. Using the polar grid system, 360 degrees were evaluated, using total estimated stationary, fugitive and mobile sources. Class I impacts only require stationary sources to be modeled for Class I within 100 kilometers (61 miles). Thus, with the polar grid system and all site-sources included, this approach was very conservative.

Other criteria pollutants were also modeled. There total emissions were significantly less than particulate. The dispersion model predicted negligible Class I impacts.

Information has been added to Section 4.2 of this FSEIS to further explain the predictions from the air dispersion modeling effort.

3-3

We are concerned that none of the National Park Service areas be exposed to unacceptable particulate air pollution levels under Federal or State law, and that there be no air quality degradation in the Class I airsheds.

Other than this concern for air quality, it appears that this project is unlikely to affect National Park Service areas or programs.

If you have any questions concerning this response, please contact Don Codding (303) 969-2076, Nancy Stromsem (206) 220-4015 or Laurie Domler (303) 969-2036.

Sincerely,

Keith Dunbar
Team Leader
Planning and Partnerships

cc:
Dale Morlock, WASO
Laurie Domler, IMRO
Don Codding, IMRO
Nancy Stromsem
John Apel, CRMO
Bob Rossman, GRTE

Response 3-3

This comment is addressed in the response to Comment 3-2. No violation in the National Ambient Air Standards (NAAQS) was predicted by the air dispersion model. JBR's approach estimated fugitive, mobile, and stationary sources in the study area. NAAQS does not require mobile and specific fugitive sources when conducting this analyses, thus the emissions estimates were conservative and the air quality impacts were negligible.

Letter #4

STATE OF IDAHO
DEPARTMENT OF ENVIRONMENTAL QUALITY

224 South Arthur * Pocatello, Idaho 83204-3202 . (208) 236-6160

October 11, 2001

Mr. Jeffrey Cundick
SEIS Project Manager
BLM Pocatello Field Office
1111 N. 8th Avenue
Pocatello, ID 83201

Re: Comments on draft supplemental environmental impact statement J.R. Simplot Company's Smoky Canyon Mine, Panels B & C, Caribou County, Idaho.

Dear Mr. Cundick:

The Idaho Department of Environmental Quality has reviewed the draft SEIS for the development of panels B and C at the Smoky Canyon Mine, located in Caribou County, Idaho. Our review has focused on potential impacts to surface and groundwaters of the State. Based on that review we offer the following general comments:

Surface Water

4-1

Impacts to surface waters of the State particularly from sediment loading into Smoky Creek Pole Creek and Sage Creek have been shown to be significant since the onset of mining at Smoky Canyon (Table 4.3 -1 and 4.3-2, DSEIS). DEQ is concerned that impacts to Smoky Creek from the proposed action are likely to continue. The DSEIS points out that runoff events occurring in the past have contributed large, but unquantified, amounts of sediment into surface water. DEQ encourages installation and maintenance of BMP's to minimize these episodes. As part of these BMP's, DEQ recommends installation of continuous water quality monitoring instrumentation to record events that previously have not been captured because timing of sampling has not coincided with the real-time event. Being able to track water quality in real-time will allow the applicant to monitor the effectiveness of their BMP's and respond in a timely fashion should maintenance be required. It also allows DEQ and other agencies the ability to quantify impacts to the aquatic resource that have previously been unknown.

4-2

In addition, DEQ remains concerned that surface water resources may continue to be affected by release of metals from ongoing and future mining operations. DEQ encourages the applicant to develop a surface water monitoring plan in cooperation with DEQ, USFS and other interested parties. This plan would outline parameters, frequency, quality assurance/quality control, analytical methods, etc., and is needed to evaluate effectiveness of mining practices in reducing or eliminating release of contaminants to the environment.

Response 4-1

Neither Tables 4.3-1 and 4.3-2, nor the related text, in the DSEIS describe "significant" impacts to surface waters occurring since the onset of mining, as implied by the reviewer. While page 4-26 and 4-27 in the DSEIS describe short term and isolated increases in sedimentation as a result of discharges from sediment ponds during runoff events, it does not describe those quantities as "large", as stated by the reviewer.

The various other types of existing monitoring being required could determine impacts to surface waters from sedimentation. These are described in The Smoky Canyon Mine Environmental Monitoring Plan, which has been appended to this FSEIS, and include: quarterly water chemistry monitoring, which tracks seasonal and average flow conditions; sampling from sediment ponds required by the General Stormwater Permit, which tracks BMP effectiveness during isolated runoff events; and two other types of ongoing monitoring (substrate embeddedness and stream macroinvertebrates), which provide assessment of the integrated effects of both typical and unusual flow events. Embeddedness, as described on page 4-24 in the DSEIS, represents a physical measurement of the continuous effects of sedimentation. Stream macroinvertebrates, as discussed on page 3-101 of the DSEIS, are excellent indicators of stream sediment loads and incorporate the results of the runoff events the reviewer is concerned with, as well as baseline conditions. However, continuous monitors as suggested by IDEQ would provide measurements of short-term sediment discharges from mine facilities that would potentially pass unobserved by the above-described stream monitoring. The continuous monitoring would also indicate potential sediment discharges earlier than could be determined by monitoring overall stream health as described above and thus could disclose the need for short-term or interim response actions prior to the occurrence of any significant stream degradation. The BLM and USFS will work with the IDEQ and Simplot to determine any appropriate changes to the existing monitoring plans which may include installation of continuous monitors.

Response 4-2

The Smoky Canyon Mine Environmental Monitoring Plan has been appended to this FSEIS, and includes a description of surface water monitoring.

Ground Water

The DSEIS predicts impacts to groundwater from selenium and manganese which are above the groundwater standards laid out in the Ground Water Quality Rule (IDAPA 58.01.11). These impacts are predicted to degrade groundwater underneath the active mineral extraction area and migrate beyond the surface boundaries of the mineral leasing area. Model runs, calculated out to 100 years, predict standards to be exceeded outside the area of active mineral extraction.

4-3 The magnitude of contamination based on modeling used in the DEIS or other models using various input variables would no doubt present different or varied outcomes. DEQ is of the opinion, however, that impacts to groundwater are likely.

4-3 Based on potential groundwater contamination as presented in the DEIS, DEQ intends pursuant to Idaho Code §39-101 et seq (Idaho Environmental Protection and Health Act) to negotiate a consent order with J.R. Simplot Company. This agreement will bind both parties to actions that will be taken to ensure compliance with the Ground Water Quality Rule" (IDAPA 58. 01.11).

4-3 Principal components of this consent order will include 1) the identification of the active mineral extraction area for purposes of the Ground Water Quality Rule, 2) the identification of approved best management practices, best available technologies and best practical methods to reduce the risk of a release of contaminants, 3) a comprehensive groundwater monitoring network and 4) the requirement that Simplot respond to any ground water degradation as provided in the Ground Water Quality Rule.

4-4 DEQ understands that reducing infiltration through mine backfill is an important component of reducing the risk to contaminating groundwater. DEQ will continue to encourage Simplot and the phosphate mining industry to continue to evaluate and incorporate techniques to reduce infiltration through mine backfill and overburden dumps. However, DEQ feels it is not timely to develop an additional SEIS to consider modifications to the actions already proposed for reducing infiltration.

4-5 DEQ appreciates the opportunity to comment on this DSEIS and looks forward to working with you in the future. Should you have any questions or need clarification on any of the information presented here please feel free to contact me at 236-6160.

Sincerely,

Mark Dietrich
Regional Administrator

Cc: Steve Allred, DEQ Director, Boise
Alan Prouty, JR Simplot Company, Boise
Doug Conde, DEQ Deputy Attorney General, Boise
Phil de Henaut, USFS, Soda Springs
Dave Tompten, EPA Idaho Ops, Boise

Response 4-3

The IDEQ correctly notes that the predicted magnitude of the ground water impacts described in the DSEIS, using different models or input variables, would be different. The BLM and USFS also agree with the IDEQ that any reasonable evaluation of the Proposed Action would indicate that groundwater quality impacts are likely. The main consideration of the Federal agencies on this matter is whether or not these impacts are legally allowable under the Idaho Ground Water Quality Rule because ground water resource utilization and impact analysis issues are not under the jurisdiction of the BLM or USFS.

The IDEQ indicates in their comment that they intend to pursue a consent order with Simplot that will include: identification of the active mineral extraction area, identification of approved best management practices, best available practices and best practical methods to reduce the release of contaminants, a comprehensive groundwater monitoring network, and the requirement that Simplot respond to groundwater degradation. It appears from the description of the consent order that the IDEQ is invoking the Mineral Extraction rule, IDAPA 58.01.11.400.06, which states that naturally occurring constituents found in ground water within a specified area surrounding an active mineral extraction area will not be considered contaminants if all applicable best management practices, best available methods or best practical methods as approved by the IDEQ are applied.

The BLM has inquired further with the IDEQ to clarify its intent regarding the legal status of the predicted groundwater impacts in the DSEIS. This additional information was provided in a November 29, 2001 letter from the IDEQ to the BLM (Letter #13).

Response 4-4

The BLM and USFS agree with the IDEQ that reducing infiltration through mine backfill and overburden fills is an important component of reducing the risk to contaminating groundwater. BLM and USFS believe that this should be evaluated on a site-specific basis to determine the causal effects of local overburden chemistry, climate, and hydrogeology. The costs and benefits for reducing infiltration through overburden fills should be balanced as appropriate for individual mining operations. A discussion of this has been appended to this FSEIS.

Response 4-5

The BLM and USFS agree with the IDEQ that evaluation of modifications to mitigative actions already proposed in the DSEIS should not necessarily require publication of a supplemental DSEIS.

Letter #5

IDAHO DEPARTMENT OF LANDS

October 10, 2001

Jeff Cundick
]Bureau of L"d Management
1111 North 8th Street
Pocatello, Idaho 83201

SUBJECT: Comments on Srnoky Canyon Draft- SEIS (RP-744)

The Idaho Department of Lands has completed reviewing the draft SEIS for Simplot's Smoky Canyon Mine, Panels B and C. The department respectfully submits the following comments on the SEIS.

5-1 1. Alternative A appears to be the best option. Eliminating external waste dumps is important for controlling the release of selenium.

5-2 2. Groundwater impacts do exist under Alternative A. Appropriate monitoring and institutional controls of these impacts should be included in the SEIS.

5-3 3. Monitoring of the groundwater should include the north and cast sides of the project, to check the accuracy of the aquifer model.

5-4 4. The effects of the tailings pond should be disclosed as is done in the draft. An analysis of effects and alternatives, however, is beyond the scope of this document and will duplicate other pending studies. The site specific AOC will include this analysis. Perhaps the AOC should be referenced in the SEIS.

5-5 5. The orange arrows in Figure 2.4-1 are not included in the map legend, and their meaning is unclear.

5-6 6. How many inches of rain are in the 100-year, 24-hour storm event mentioned on page 2-9?

5-7 7. The average rainfall should be mentioned on page 3-19 or 3-20, under climate and meteorology. It is mentioned later on page 3-25, under water resources, but this is not an intuitive place to find it,

Thank you for the opportunity to comment. Boyd Cook, from our Eastern Idaho office, has informed me that he does not have any additional comments. If you have any questions, please call me at 334-0232.

Sincerely,

ERIC WILSON, Mined Land Reclamationist

Response 5-1

The agencies note that this is a site-specific issue and external overburden fills can be allowed with adequate mitigation.

Response 5-2

The proposed groundwater monitoring is part of the overall monitoring plan in the appendix of this FSEIS.

Response 5-3

Groundwater monitoring will be done to the northeast and northwest of Panel B as described in the monitoring plan in the appendix of this FSEIS.

Response 5-4

The BLM and USFS agree with the Idaho Department of Lands that the environmental impacts analyses of the tailings ponds are correctly analyzed in the Cumulative Effects section of the DSEIS. We further agree that analyses of additional alternatives related to the tailings ponds are beyond the scope of the DSEIS (See Response 1-13) and may duplicate investigations under a site-specific AOC. The site-specific AOC is described in the HMEII Report which is included in the appendix to this FSEIS.

Response 5-5

The map legend has been modified to include the orange arrow.

Response 5-6

The 100-year, 24-hour storm event consists of 3.0 inches of precipitation. Further, the ponds would also contain runoff from 2.5 inches of snow melt. The Water Management section in this FSEIS has been revised to include this information.

Response 5-7

The Climate and Meteorology Section in the FSEIS has been revised to include the average annual rainfall amount of 30-35 inches.

Letter #6

Chapter	Description
1.0	**Table of Contents**
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3.0	**Previous Regulatory Actions, Decisions and Technical Work**
3.1	Smoky Canyon Phosphate Mine FEIS
3.2	Tailings Ponds
3.3	Storm Water Permit
3.4	Selenium – Area Wide Investigation and Administrative Order of Consent
3.5	Selenium Mitigation/Treatment Research
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4.0	**Proposed Action**
4.1	Surface Water Resources
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6.1	Methods to Minimize Groundwater Resource Impacts
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7.0	**Summary – Proposed Final Action**
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8.1	Key Documents Cited
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8.3	Stormwater Pollution Prevention Plan
8.4	Memorandum of Understanding Concerning Contamination from Phosphate Mining Operations in Southeastern Idaho
8.5	Consent Order/Administrative Order on Consent
8.6	Administrative Consent Order for Work Related to Area-Wide Investigation
8.7	Groundwater Infiltration Calculations and Modeling Results
8.8	Final Column Test Report
8.9	Groundwater Infiltration Barrier Cost Estimates

Chapter 2 Introduction

The J.R. Simplot Company (Simplot) submits these comments on the Smoky Canyon Mine, Panels B&C Draft Supplemental Environmental Impact Statement (DSEIS).

The comments first focus on prior agency actions regarding the Smoky Canyon Mine and concurrent technical work regarding selenium (Se) issues. This discussion is crucial as an extensive environmental review of the Smoky Canyon Mine project (all five panels, A-E) has already occurred. Also, as the Se issue has arisen, the J.R. Simplot Company has actively sought to change existing mining practices to address this matter, has worked extensively with regulatory agencies to address this matter as required by environmental laws and rules, and has funded substantial research into treatment technologies and impacts on the environment. Finally a number of permits and plans already govern the mining at Smoky Canyon.

Next, substantial information is given on the major issues associated with the Proposed Action and the Alternatives. Topics covered include groundwater , surface water quality, air quality, mineral resources and social/economic impacts. This information includes factual corrections needed in the DSEIS and new information that needs to be considered by the agencies.

Finally, additional information is provided on several specific topics related to this project: the regulatory status of the tailings ponds, methods to minimize groundwater impacts, and selenium concentrations in the soils/vegetation.

This document concludes with a summary of key points that we believe are pertinent in the decision as to the Final Approved Action.
Related key documents and information are included in the Appendices.

Chapter 3 Previous Regulatory Actions, Decisions, and Technical Work

These comments respond to a Draft Supplemental Environmental Impact Statement (DSEIS). The supplemental nature of the analyses presented in the DSEIS is important to recognize, because those analyses expand upon the environmental review conducted at the time the Smoky Canyon Mine project was originally proposed. To view the current DSEIS in context, a brief discussion of the analyses then undertaken is useful.

3.1 Smoky Canyon Phosphate Mine FEIS

In the late 1970's, the J.R. Simplot Company proposed to mine and process phosphate rock at its Smoky Canyon Phosphate Lease in Caribou County, Idaho. The location of the proposed phosphate mining/processing project was identified as 25 miles east of Soda Springs, Idaho and 10 miles west of Afton, Wyoming. The proposal delineated that the lease area was 2,520 acres in size, and that surface mining would disturb about 1,300 acres over a 30-year period. The proposal also expected an additional surface disturbance of about 500 acres for power transmission lines, tailings ponds, tailings pipeline, millsite, slurry pipeline, and access road.

The proposal forecast mining about 2 million tons of phosphate rock per year (at five different panels, A-E) at maximum production. Overburden from the mine would initially be placed in surface dumps. As areas were mined to completion, overburden from subsequent mining areas would backfill the mined-out pits. The ore would be beneficiated (physically washed) onsite with the tailings disposal on private land about one mile east of the mine. The beneficiated ore would be transported about 25 miles in a buried slurry pipeline to the then existing J.R. Simplot Mine in Conda, Idaho. The proposal required about 800 acre-feet of water in the slurry process each year, to be supplied from an industrial well in the vicinity of the mine.

The United States Forest Service (USFS) and the United States Geological Survey (USGS) jointly prepared a Draft Environmental Impact Statement (DEIS) for the Smoky Canyon project in accordance with the National Environmental Policy Act of 1969 (NEPA) and the Council on Environmental Quality regulations under NEPA.[1] The DEIS looked at a number of alternatives for different aspects of the project:

- location of the millsite
- location of the tailings ponds
- the route of the tailings pipeline
- the route of the transmission line
- the access road to the mine, mill and tailings pond
- mined ore and waste transport systems

The DEIS thoroughly reviewed the environmental impacts of the proposed project, including:

- effects on the water quality of nearby streams and creeks.
- effects on the related surface- and groundwater supplies.
- effects on fisheries.
- effects from the primary access routes to the mine.
- effects of a potential failure of the slurry pipeline and tailings dam.
- effects on the future productivity and use of the land.
- effects on surface erosion and slope stability
- effects on habitat for game and nongame species, particularly elk, moose, deer, and endangered/threatened species.

The USFS and USGS issued the final Environmental Impact Statement (FEIS) in 1982,[2] after making corrections to the DEIS and modifying the agency preferred alternative. The agency preferred alternative specifically identified the mine panel sequence, the location of waste disposal site (Pole Canyon) and the slurry pipeline route.

The Bureau of Land Management approved the Smoky Canyon Mine Project on January 6, 1983. The Bureau imposed substantial requirements upon project approval:

- clearance for both endangered and threatened plants and animals had to be obtained prior to any surface disturbing activity.
- degradation of fish habitat could not occur.
- minimization of fugitive dust emissions by the use of some type of dust suppression method was required.

- implementation of an overall reclamation program designed to reclaim all project features (the mine, waste dumps, tailings disposal areas, haul roads, millsites, and slurry pipeline and mine site transmission line corridors) in accordance with State and Federal laws and regulations was necessary.
- reclamation of disturbed areas to standards under the Idaho Surface Mining Act and as required by the USFS was specified. Site-specific reclamation and revegetation requirements were to be developed.
- shaping of waste dumps to blend with surrounding topography, and planting with species blending with surrounding vegetation was required.
- an Environmental Monitoring Program would be implemented.

The Environmental Monitoring Program required by the FEIS contained extensive sampling and testing requirements. Samples were taken regularly from nine (9) different surface water locations and from seven (7) groundwater sites. Twenty-eight (28) different parameters were to be tested for at these sampling locations. Also, aquatic biology monitoring was conducted along several stream segments for select time periods. The monitoring program was designed to ensure that impacts from the approved project could be measured, and to provide early warnings of impacts exceeding expectations. The results of this monitoring program underlie the current analysis of water resources under the DSEIS.

3.2 Tailings Pond

Some components of the original project proposed by Simplot required other regulatory approvals. These approvals were obtained, and the Smoky Canyon Mine has operated in accordance with them for almost twenty years. The tailings ponds exemplify this type of facility.

3.2.1 Regulatory Process for Reviewing and Approving the Tailings Ponds

3.2.1.1 NEPA Process

The tailings ponds were permitted as an essential component of the original Smoky Canyon Mine project. In September 1981, the Smoky Canyon Phosphate Mine Draft EIS (DEIS) evaluated the proposed action and alternatives to it, and specifically considered the tailings ponds and alternatives to them.

First, the DEIS considered alternative means of managing the tailings, and noted "tailings may be disposed of by discharge into natural depressions, mined-out pits, or into tailings ponds behind manmade dams." The DEIS also considered dewatering and thickening the tailings and then using them as backfill. The options of using natural depressions or mined-out pits were rejected because suitable natural depressions or mined-out pits were not available. The backfill option was rejected because it would have complicated the mining approach, reduced the capacity of the pits for mine wastes, and required larger surface waste dumps." Because of these factors, the DEIS concluded that tailings ponds behind manmade dams would be used for intermediate to long-range needs.

Second, the DEIS considered the physical location of the tailings ponds

and discussed two potential locations – North Sage Valley and Roberts Creek. Both locations were deemed acceptable, but only Roberts Creek was then available. The DEIS characterized the Roberts Creek site as "an ideal location for one or more dams." Finally, the DEIS discussed, in detail, the environmental impacts of the tailings ponds, associated tailings lines, and associated activities.

In March 1982, the Smoky Canyon Phosphate Mine FEIS considered comments on the Draft EIS and modified the discussion of the project alternatives and impacts, again with specific reference to the tailings ponds. The Record of Decision for the Smoky Canyon Phosphate Mine approved two tailings ponds located east of the mine for disposal of mill tailings, (i.e., the Roberts Creek site,) and required reclamation of the facilities upon completion of operations.

3.2.1.2 Section 404 and Other Regulatory Reviews/Approvals

Simplot constructed Tailings Pond No. 1 in 1984. In 1989, work began on Tailings Pond No. 2. Simplot applied for a Clean Water Act Section 404 permit for placement of fill into waters of the United States. The Corps issued the Section 404 permit on February 7, 1991, subject to a number of general and special conditions to eliminate, reduce, and mitigate impacts on aquatic areas. EPA and other agencies commented on the draft Section 404 permit and on the associated EA. The Section 404 Permit was modified on May 23, 1997, and on February 25, 1999, again with terms and conditions to protect the aquatic environment. The tailings ponds also were designed and constructed to comply with the Idaho Department of Water Resources' Mine Tailings Impoundment Structures Rules and Stream Channel Alteration statutory and regulatory requirements and the Idaho Department of Lands' Rules Governing Exploration and Surface Mining in Idaho.

Tailings Pond No. 2 dam currently is designed and permitted for a dam height at elevation 6483 feet and a water height at elevation 6480 feet. Simplot anticipates that addition of tailings as a result of mining and milling ore from ongoing Panel E operations and from the proposed Panels B and C will fill less than half of the permitted height and acreage capacity of the tailings ponds. No additional approvals or permits are required for continued operation of the tailings ponds.

3.2.2 Closure and Reclamation Requirements for the Tailings Ponds

The tailings ponds will be closed and reclaimed pursuant to federal and state requirements, including the Corps of Engineers' Section 404 Permit and associated plan requirements, the Idaho Department of Water Resources' Mine Tailings Impoundment Structures Rules and the Idaho Department of Lands' Rules Governing Exploration and Surface Mining in Idaho.

A plan currently exists for "abandonment" of Tailings Pond No. 2, which was requested by the Idaho Department of Water Resources ("IDWR"). This DSEIS describes this plan at 2-12. A site-wide reclamation bond also covers the tailings ponds. Simplot anticipates that the abandonment plan will be updated and revised

as additional reclamation requirements are negotiated with the Corps of Engineers and with the Idaho Department of Lands. In addition, Simplot anticipates that the abandonment plan will be revised to reflect information and strategies developed pursuant to the MOU and AOC on area-wide selenium impacts, as described in the Selenium Mitigation Action Plan (SMAP).
Additionally, under Idaho's tailings impoundment reclamation regulations, Simplot will take steps to ensure that the tailings ponds are reclaimed by:

> (1) dewatering to the extent necessary to provide an adequate foundation for the approved post-mining use;
>
> (2) controlling surface water movement by either channeling it around the reservoir and impoundment structure or through the reservoir and breached structure while providing for erosion-free passage of waters and adequate energy dissipation prior to entry into the natural drainage below the impounding structure;.
>
> (3) detoxifying of any residues within the tailings pond or covering with an adequate thickness of non-toxic material, to the extent necessary to achieve water quality standards in adjacent surface waters; and
>
> (4) reclaiming the area following the required dewatering, detoxification, and surface drainage control measure operations, by retopping the reservoir and impounding structure with stockpiled topsoils or other soils conducive to plant growth.

Simplot anticipates that its effort to meet or exceed regulatory requirements when the time arrives for decommissioning the tailings ponds, along with the continuing oversight of the regulatory agencies, will allow the area to return to an environmental neutral state.

3.3 Stormwater Permit

The Smoky Canyon Mine has had an EPA Stormwater Permit and associated Storm Water Pollution Prevention Plan (SWP3) for over a decade. The purpose of the Permit and Plan is to implement Best Management Practices that control stormwater runoff to prevent degradation to surface water. The Plan was recently updated to include both multi-sector and construction permit requirements. Permit coverage for EPA's NPDES Storm Water Construction Permit is active as of 5/23/2001, and EPA's NPDES Storm Water Multi-Sector Permit was renewed as of 4/12/2001. The following chart details the Best Management Practices at the Smoky Canyon Mine.

Table 1
Applicable Best Management Practices

TYPE OF DISTURBED SURFACE	DISCHARGE DIVERSION	CONVEYANCE SYSTEMS	RUNOFF DISPERSION	SEDIMENT CONTROL & COLLECTION	VEGETATION
Haul Roads and Access Roads	Dikes, Curbs, Berms	Channels, Gutters, Culverts, Rolling Dips, Road Sloping, Berm Slots	Check Dams, Rock Outlet Protection, Level Spreaders, Drop Structures	Gabions, Riprap, Native Rock, Retaining Walls, Straw Bale Barriers, Sediment Traps/Catch Basins, Vegetated Buffer Strips	Seeding
Mining Pits	Dikes, Curbs, Berms	Channels, Gutters	Benched Slopes, Contouring	Sediment Settling Ponds, Straw Bale Barriers, Siltation Berms	Seeding
Overburden, Waste Rock and Raw Material Piles	Dikes, Curbs, Berms	Channels, Gutters	Benched Slopes, Contouring	Plastic Matting, Plastic Netting, Erosion Control Blankets, Mulch-straw Compaction, Sediment/Settling Ponds, Silt Fences, Siltation Berms	Top-soiling, Seedbed Preparation, Seeding
Reclamation	Dikes, Curbs, Berms	Channels, Gutters	Check Dams, Rock Outlet Protection, Level Spreaders, Benched Slopes, Contouring, Contour Ripping, Drain Fields, Drop Structures	Gabions, Riprap, Native Rock, Retaining Walls, Straw Bale Barriers, Sediment Traps/Catch Basins, Vegetative Buffer Strips, Silt Fences, Siltation Berms, Brush Sediment Barriers	Top-soiling Seedbed Preparation, Seeding, Tree Planting, Fertilization.

In targeted areas of the mine, redundant BMP structures are in place to ensure that extreme storm events do not cause sediment discharge to surface waters. Also, the mine has a preventative maintenance program to ensure that stormwater control facilities are clean and operating effectively:

- monthly inspections (except during snow/winter conditions) of BMP structures.
- quarterly visual examination of stormwater quality.
- analytical monitoring of storm event conditions.
- annual comprehensive site compliance evaluation.
- inspection of construction activities.
- recordkeeping of inspections and corrective actions taken to address inadequacies.
- employee training.

The Storm Water Pollution Prevention Plan will be updated to include Panels B and C as mining plans for these panels are developed.

3.4 Selenium Area Wide Investigation and Administrative Order of Consent

6-1

Section 2.8 of the DSEIS references the "SCM Selenium Mitigation Action Plan" (SMAP), which has been distributed with the DSEIS. The SMAP describes the legal framework and mechanisms already in place for addressing selenium issues from past mining practices. Simplot emphasizes that these agreements, entered into under the authority of the Comprehensive Response, Compensation and Liability Act (CERCLA), namely, the Memo of Understanding (MOU) between the State of Idaho, Shoshone-Bannock Tribe and the Federal Agencies, the Area-Wide Consent Order and Administrative Order on Consent (CO/AOC), and the Administrative Consent Order for Work Related to the Area-Wide Investigation,) will require Simplot to enter into site- specific work orders to address contamination resulting from past mining practices. Simplot therefore supports the decisions of the contributing agencies, as stated in section 2.8 of the DSEIS, that the DSEIS need not consider problems associated with past mining practices as part of this SEIS.

Section G6 of the MOU clearly states that the agreement provides the agencies a framework to negotiate agreements or contracts consistent with requirements of the CERCLA. Under these agreements the companies (including Simplot) will undertake appropriate investigation and response actions in connection with selenium and other contamination within the Mining Area. Section X of the CO/AOC states that various site-specific investigations, risk assessments, and remedial actions are intended to follow the Area Wide Investigation. The Area Wide Investigation is intended to minimize duplication and provide consistency for this site- specific work; however, Section X of the CO/AOC states that the "IDEQ, the Federal Agencies, and the Tribe do not waive or limit any of their authorities with respect to determining the scope of or schedule for either the Area-Wide investigation or any site-specific work."

6-2

Under the direction of IDEQ, the Area-Wide investigation is moving forward according to the timeline established by IDEQ. Discussions between Simplot and the USFS on the subject of a site-specific investigation have begun, and Simplot anticipates signing a final agreement within the next several months. Simplot expects that these agreements will allow a complete investigation of the effects of past and present mining on selenium release, and will illuminate the best possible solutions for mitigating the effects of these practices. Because the work under the CO/AOC has been specifically designed to address the effects of phosphate mining on selenium, inclusion of these investigations as part of the B&C Panel SEIS would be ill-advised, as it could only result in delays for the company and the agencies, poorly informed decision making, and ultimately, less effective protection for the environment. Simplot fully supports the agencies' decisions not to include these past and present mining effects as part of the SEIS, but rather to allow the CO/AOC process to fulfill its promise.

3.5 Selenium Mitigation/Treatment Research

Part of the promise of the CO/AOC process is the ability to contribute research results on the selenium mitigation/treatment issue. Several years ago, the observation of selenium toxicosis in livestock and higher than normal levels of selenium in some of the water and forage near Southeastern Idaho phosphate

Response 6-1

The BLM and USFS are interested in the environmental impacts from the existing mining operations at the Smoky Canyon Mine and have determined that these are part of the cumulative effects of the operations. These impacts have been evaluated in Section 4.16 of this FSEIS using existing information. The agencies have encouraged Simplot to proceed with the site-specific studies on the existing mining impacts that are envisioned in the Area-Wide Consent Order as soon as possible and believe these investigations will lead to reasonable measures that can be applied to the existing mining disturbances.

Response 6-2

Once the site-specific AOC is signed, the BLM and USFS expect investigations at Smoky Canyon to proceed in a timely manner and lead to mitigation of existing impacts as soon as reasonably possible.

mining operations led to concern about the potential for environmental impact. To gain a better understanding of ecosystem selenium behavior and potential approaches for control, a University of Idaho laboratory and field research project was initiated in 1997 with funding from the J. R. Simplot Company.
The objectives of the research are:

- Chemical and microbial characterization of the Se reaction pathway, including mineralogical origin and mechanism of release.
- Laboratory studies of "green chemistry" approaches to Se control, such as scrap or waste material amendment, to accelerate stabilization of Se in the waste rock.
- Field studies to examine Se cycling and the performance of waste material amendments under field conditions.
- Passive barrier and sub-surface wetland development for Se removal from low flow water.
- Novel water treatment approaches for high flow, low concentration Se removal.
- Chemical, microbial and biochemical studies to examine the biogeochemical cycling of selenium in this environment and the fate of excessive exposure in terrestrial and aquatic animals.

Current knowledge indicates that Se mimics sulfur in pyrite (iron sulfide) and in sulfur-hydrocarbons present in the middle waste shales of a phosphate deposit. The ancient ocean that deposited the phosphate sediments also deposited a small amount of Se. In past reclamation activities at the phosphate mine site, the action of air and water mixing with waste rock changed the selenium to a salt that rapidly dissolves in water. This allows uptake of the selenium by plants or runoff from rain and snowmelt into creeks. The current selenium situation was unwittingly worsened by the selective use of fertile middle waste shales for top dressing in reclaimed mine sites.

The research has found that the form of selenium released may be controlled by the addition of materials such as scrap iron metal and organic waste amendments such as cheese whey. Both approaches aid the chemical and microbial reactions that can control Se. These amendments are used to try to stimulate and accelerate natural processes to return the released selenium back to a form that will not be mobile in the environment. However, the best management strategy is not allowing the selenium to be released in the first place, and calculated waste rock management, such as isolation of middle waste shales, already is in practice at the Smoky Canyon Mine.

Continuing laboratory and field experiments are focused on gaining an understanding of the complex natural processes that are responsible for both the release and the control of Se in the ecosystem. These experiments are helping to define the molecular and microbial basis for Se cycling in the environment.

At the Simplot Smoky Canyon Mine, University of Idaho field investigations are examining the sub-surface chemical dynamics of waste rock pile and the potential control processes of iron metal and organic waste barriers to limit Se mobilization. Four, 40-ft X 40-ft experimental cells have been constructed to a depth of 15-ft in the waste rock soil. These cells contain an array of water collection devices called lysimeters to assist in collecting water from these sandy, waste rock soils. Using

standard ceramic and experimental pan lysimeters connected to a 65 gal collection system, the ability exists to survey subsurface water dynamics and chemistry. With 16 monitoring systems, over 600 plumbing connections and 56 subsurface water monitoring points connected to a central sampling station, this research has generated a large quantity of data to increase the understanding of complex sub-surface processes.

In Pole Creek, which runs under the Pole Canyon waste rock pile for almost a mile, the water has been dosed with tons of scrap iron to compare the favorable chemistry observed in the laboratory with a field application. Using these so-called permeable barriers, the hypothesis will be tested that addition of sacrificial iron metal to the creek water column will remove dissolved Se from this iron-poor system. In addition, waste cheese whey from Star Valley Cheese is being infiltrated into the side of the Pole Canyon waste rock dump. Normally applied to agricultural fields in this area as a fertilizer, cheese whey increases favorable chemical and microbial reactions to limit the amount of dissolved selenium that can enter Pole Creek.

Figure 1 Cheese Whey Infiltration Gallery ..... (Photograph removed for this chapter)

To study whether plant uptake of Se can be modified by land application of waste cheese whey or scrap iron "fertilizer", field plots have been constructed that will be amended prior to re-seeding. These amendment plots have been plumbed with monitoring lysimeters in the shallow sub-surface of the soil.

Although Se supplements are routinely used in livestock production, control of Se in forage for pasture- confined animals is desirable. Idaho is considered a selenium deficient area for livestock production and most producers supplement animal feeds with 0.3 ppm selenium. Selenium impacted areas near mine sites can contain higher forage levels of selenium than desired for animal nutrition. Simplot is examining some of the biochemical mechanisms of selenium metabolism to better understand the pathways of ingested selenium, thereby increasing knowledge available for managing livestock and wildlife exposure and for addressing potential risks in this ecosystem.

Ordinary septic tanks are being used to construct a subsurface "wetland" and bioreactor to mineralize and remove selenium from low flow, high selenium dump seeps. These bioreactors have good potential to be used in the management of high selenium hot spots using a green chemistry approach that accelerates the natural processes of selenium mineralization. The process is fed using the addition of waste materials found in the local areas. This subsurface wetland approach is especially interesting because it can provide for selenium removal in a passive, out of sight fashion.

Figure 2 Seep Subsurface Bioreactor Assembly.... (figure removed for this chapter)

Some water treatments may require a more active approach. To address this challenge, the University of Idaho has recently signed a cooperative research agreement with a water treatment reactor manufacturer to test a novel approach

to removing Se from high flow, low concentration discharges. This process is currently scalable to 3 M-gal/day. This process will be field tested in a 30,000 gal/day reactor mounted on a portable trailer this year. The initial phase of this reactor development was supported by research grants from the US Environmental Protection Agency.

Figure 3 Moving bed reactor and mobile lab in a recent water test ... (figure removed for this chapter)

The rapid deployment of laboratory results into field pilot demonstration programs by the University of Idaho and the J. R. Simplot Company at the Smoky Canyon Mine has been used by the US Department of Energy as a case study example for the clean-up of the USDOE National Laboratory nuclear weapons sites. Accelerating natural processes to remove contaminants using waste materials such as cheese whey works with the local environment to minimize the potential for ecosystem impacts.

3.6 Selenium Mitigation Action Plan

6-3

Simplot supports the decision of the lead agencies to review the effects of past and current mining operations (e.g., Panels A, D, and E and associated milling and other activities) in the cumulative effects analysis in DSEIS Section 4.16. Simplot also supports the decision of the lead agencies not to divert attention from the Proposed Action and Alternatives A and B by attempting to conduct detailed review in the DSEIS of the effects of selenium and other contaminants from past and current mining and milling operations. As the DSEIS relates (see, e.g., DSEIS 2-49), those effects are being addressed pursuant to the MOU and CO/AOC as also described in Chapter 1.3.4 of these comments above.

On a site-specific basis, Simplot, at the request of BLM, has developed the Smoky Canyon Mine Panels B & C Selenium Mitigation Action Plan ("SMAP" to assist the public in reviewing current information about selenium and in understanding Simplot's ongoing efforts to work with government agencies to mitigate identified impacts from previous mining practices. As such, the SMAP addresses activities and actions not covered by the DSEIS, as well as facilities geographically and operationally separate from the facilities discussed in the DSEIS, and, most profoundly, issues and responses well beyond the scope and statutory authority of the DSEIS.

The scope of actions, properties, schedules, timeframes, legal authorities, and other significant aspects contemplated by the MOU, CO/AOC, and SMAP are dramatically different from those contemplated and discussed by the DSEIS. For example, the MOU, CO/AOC, and SMAP were developed under or describe the activities to be pursued under a statutory authorities very different from NEPA. Some of these authorities, such as the Comprehensive Environmental Response, Compensation and Liability Act ("CERCLA"), obviate the need for NEPA review prior to taking action.

Response 6-3

Comment noted.

6-4

Simplot concurs with the discussion in the DSEIS at 2-49 concerning the SMAP, and notes in particular that: (1) many of the actions contemplated by the SMAP are prospective and not yet subject to review in the SMAP or in the DSEIS; (2) responsibility for many of the SMAP implementing actions will be subject to the lead of IDEQ, a state agency not participating in the DSEIS; (3) studies or actions evolving out of the SMAP are subject to CERCLA, which EPA, a signatory to the MOU and AOC, contends is not subject to NEPA; (4) future actions potentially to be taken under the SMAP are not presently ripe for NEPA review (even if it were allowed) since no "proposal" for a "major federal action" now exists; and (5) the range of studies or actions contemplated by the SMAP is significantly different from the range of actions and impacts discussed in the DSEIS.

6-4

In contrast, the DSEIS properly focuses on the Proposed Action, Alternative A, and Alternative B and leaves to other agencies and legal authorities the past and existing mining activities in Panels A, D, and E. However, since the DSEIS mentions the SMAP in a number of places, Simplot wants to ensure that the DSEIS and the SMAP achieve the objective of informing the public about the wide variety of actions and commitments currently underway to address the selenium impacts of past and current mining activities. Simplot reiterates that past mining activities at Smoky Canyon and elsewhere in Southeastern Idaho have caused selenium impacts. Simplot has worked hard, and funded the efforts of many others, including the University of Idaho, to more clearly understand why phosphate mining and associated materials handling and waste management practices have caused elevated levels of selenium within affected watersheds.

6-4

Even the most basic early efforts have led to knowledge about the causes of selenium impacts. This knowledge already is being used to develop revised practices that substantially reduce the potential for and extent of elevated selenium levels as a result of phosphate mining. One noteworthy example of this increased knowledge and associated practical recommendations appears in the Best Management Practices Guidance Manual for Active and Future Phosphate Mines (Revision 1.0 November 2000). The manual was developed by Montgomery Watson with input and support of governmental agencies and mining companies, including Simplot. Simplot had adopted the BMPs at certain locations of past mining activities in Panels A, D, and E, and has adopted and proposed them for Panels B and C as discussed in the DSEIS.

6-4

Phosphate mining in Southeastern Idaho has been occurring for over 80 years. Simplot has been mining phosphate in Idaho since 1945 and been mining and milling phosphate ore at Smoky Canyon since 1984. NEPA review of phosphate mining commenced in 1977 when the BLM, Forest Service, and the Geological Survey completed a programmatic EIS covering regional phosphate mining and associated activities. Prior to Simplot's mining at Smoky Canyon, a site-specific EIS was prepared in 1982 to address the proposed mining of Panels A, B, C, D, and E. Environmental Assessments covering Panels A, D, and E were completed in 1991, 1992, and 1997 respectively. In the programmatic and the site-specific EISs and in the EAs, selenium was recognized as a potential issue, but then current analytical limitations and incomplete understanding of selenium impacts did not lead the EISs or EAs to address selenium's potential impacts in detail. Simplot, like other phosphate mining companies, and in concert with the involved regulatory agencies, mined and milled phosphate ore and managed associated materials

Response 6-4

The BLM and USFS generally agree with the points raised by Simplot in its comment. The work conducted under site-specific agreements, as described in the HMEII Report, should involve public comment and input. All parties to these agreements should recognize that, even if NEPA does not apply, the findings and major decisions of the site-specific work are of interest to various members of the public and their opinions should be sought out.

The agencies do not agree with Simplot's statement that selenium was recognized as a potential issue in environmental analyses conducted prior to 1997 at the Smoky Canyon Mine. Selenium was known to be present in the Phosphoria Formation materials but these previous environmental analyses did not identify the potential for selenium contamination of the environment to the degree current studies have indicated. The previous NEPA analysis for the B and C Panels, the 1981 DEIS, evaluated potential leachate impacts from overburden on page 5-38. It identified that leachate from overburden, "has the potential of containing the trace elements arsenic, cadmium, chromium, copper, lead, molybdenum, selenium, vanadium, and zinc, and the radioactive elements uranium and radium." The analysis of potential surface water quality impacts in that document concluded that, "None of the proposed project components are expected to have a significant impact on other existing water quality parameters". The analysis of potential groundwater quality impacts on page 5-41 of that document states, "Ground water quality changes, although possible, are deemed very unlikely and of minor significance. Studies conducted over the last several years in the southeastern Idaho phosphate region do not reveal any significant problems associated with nutrients, radioactive elements, or trace elements to either ground- or surface-water quality from sediment ponds."

On pages 5-26 and 5-28 of the 1981 DEIS concentrations in the tailings water of chromium, mercury, selenium, and zinc were reported to be above guidelines for fresh water aquatic life which were characterized as being "slightly toxic" to aquatic life depending on how much tailings water was discharged to surface streams in the event of an unexpected release of tailings to surface streams.

The environmental analysis in the 1981 DEIS for terrestrial wildlife, grazing, and vegetation is basically mute with regard to potential bioaccumulation of selenium or any other geochemical impacts on these resources.

Taken together, the above-described environmental analyses do not show that the land management agencies recognized selenium as the potential issue it now is when the B and C Panel development was last reviewed under NEPA.

without knowing as much as we now know about selenium or other trace metals.

Subsequent developments, such as instances of selenosis in horses and sheep, have significantly raised the awareness of Simplot, other mining companies, the regulatory agencies, and the general public about the adverse effects of mishandled seleniferous materials. This heightened awareness led the lead agencies to require a supplemental EIS when Simplot requested permission from BLM and the Forest Service to mine Panels B and C at the Smoky Canyon Mine. Similarly, EISs at other recent mine expansions have addressed the potential for elevated selenium in great detail; however, past or even ongoing mining activities present dramatically different challenges for remediating elevated selenium levels. For example, while government agencies and private companies, including Simplot, now recognize that placement of seleniferous materials in cross-valley fills is inappropriate, remediating the effects of the Pole Canyon External Overburden dump is a challenge much different than resolving not to construct such a facility with materials from Panels B or C. In any case, Simplot is not asking BLM or the Forest Service for permission to conduct past or current operations – all the requisite federal approvals have been obtained and there is no "proposal" requiring a "major federal action" potentially subject to NEPA analysis for those past or current operations.

6-5

The SMAP addresses current mining and related activities in Panel E and past mining and related activities in Panels A and D. The SMAP also discusses area-wide and site-specific investigations that are being taken or may be taken pursuant to the MOU and CO/AOC. Simplot invites comments and suggestions from agency or public reviewers of the SMAP, which has been distributed by the lead agencies with the DSEIS.

Chapter 4 Proposed Action

This chapter of the Comments provides further explanation regarding the impacts of the Proposed Action on the following resources: (1) surface water; (2) groundwater; (3) the mineral resource; and (4) wildlife, fisheries and aquatic resources. Supplemental information related to these topics also appears in Chapter 6.

4.1 Surface Water Resource

4.1.1 Sediment Control

As described in Chapter 1.3.3, the Stormwater Pollution Prevention Plan (SWP3) will be updated to include Panels B&C as mining plans for those panels are developed. Under this plan, the goal of the Smoky Canyon Mine is to prevent discharges to surface waters that may present negative environmental impacts. Simplot asks that the final agency action recognizes and reference the requirements and responsibilities set by the SWP3. By doing so, the confusion of overlapping regulatory requirements can be avoided.

Table 1 in Chapter 1.3.3 enumerates many of the BMPs that will be used to control potential sediment run-off due to storm events. Synchronistically, a number of the BMPs designed to control potential selenium migration into the environment also

Response 6-5

The HMEII Report, previously called the Selenium Mitigation Action Plan (SMAP), was prepared by Simplot and distributed to the public along with the DSEIS. The BLM and USFS asked Simplot to review the public comments received on the HMEII Report and to produce a modified version incorporating information that responds to the comments. This modified HMEII Report is included in the appendix to this FSEIS.

will control sediment. These BMPs are listed below. Section 2.4.3 of the DEIS discusses a number of proposed management practices to be incorporated in the mining of the B&C panel at SCM. The BMPs identified to mitigate sediment impacts related to selenium include:

- Installing chert and topsoil caps over seleniferous materials
- Controlling sources of water contacting mined areas
- Avoiding placement of snow removal areas on overburden areas
- Avoiding perennial and ephemeral drainages
- Maximizing soil salvage
- Containing sediment from run-off of disturbed areas
- Constructing fills for roads and facilities using chert
- Stabilizing soil
- Advancing the seeding and reclamation process
- Reclaiming Concurrently
- Managing range with deference allowing reclamation to take hold
- Using of Riprap, Gabions, and Culverts to protect chert cover

4.1.2 Selenium

Section 2.4.3 of the DSEIS discusses a number of new management practices proposed for incorporation in the mining of the B&C panels at SCM. It is noted in Appendix 2B, that although a number of metals and other contaminants potentially can be released from mine overburden (including cadmium, zinc, arsenic, lead and others), as Appendix 2B notes, the primary contaminant of concern is selenium. Control of the release of selenium also would result in the control of the other potential contaminants. The applicable BMPs listed in the DSEIS, have been recommended to mitigate the dissolved selenium-related impacts of phosphate mining at the B and C panels of the Smoky Canyon Mine. Other BMPs related to control of erosion and sediment transport from mining activities complement the listed BMPs by assisting to a lesser extent in controlling selenium.

The BMPs identified to mitigate dissolved selenium include:

- Characterization and selective handling of seleniferous materials
- Use of drainage channels on overburden to minimize infiltration
- Control of runon to overburden areas
- Avoiding perennial and significant drainages
- Design of sediment controls off overburden fills
- Overburden grading to maximize runoff
- Overburden pile aspect to maximize southern or western exposures and minimize Infiltration
- Diversion of haul road runoff to avoid overburden areas
- Avoiding placement of snow removal areas on overburden
- Installation of chert and topsoil caps over seleniferous materials
- Minimization of surface area of disposal sites containing seleniferous material
- Avoidance of sensitive groundwater sources
- Reclamation and revegetation to enhance evportranspiration
- Leachate formation and transport control through material consolidation practices
- Basal layer control such as limiting bench height

- Minimization of mining oxidation by immediately covering sensitive materials.
- Modification or elimination of low permeability foundation material to prevent seep formation

6-6 Appendix 2B of the DSEIS more fully defines the BMP's listed above. Simplot believes increased understanding of the full scope and technical issues associated with these BMPs will allow a full appreciation of the resulting beneficial effects.

6-7 One design feature of the reclaimed pits not included in Appendix 2B of the DSEIS is the addition of enhanced infiltration pits on the floors of B&C Panels. Under the mine plan, and as currently practiced in the D panel, runoff collection basins will be constructed on the pit floors in Panels B & C as part of final reclamation. These basins will be composed of coarse rock (Rex Chert) over the Grandeur Limestone, which will be scraped clean of shale and scarified to enhance percolation. The design intent of these basins is to collect clean surface runoff from the final reclaimed surface for infiltration into the Wells Formation. The estimated drainage areas to these basins are approximately 72 acres in the Panel B area (4 of the 72 acres are occupied by the collection basin) and about 4 acres in the Panel C area (1/2 acre of the 4 acres are occupied by the collection basin).

6-8 Based on the proposed mine plan for the Proposed Action, final reclamation essentially will be complete approximately 6 years after mining commences (4.6 years of active mining, 1.5 years to complete final reclamation). The addition of this large volume of clean water recharge to the Well Formation will have a substantial positive effect on post-mining groundwater quality in the vicinity of Panels B and C. These recharge basins are not possible under Alternatives A & B since additional seleniferous material must be returned to the pits. This fact contributes to the superiority of the proposed action over Alternatives A and B.

Many of these BMP's are in large part innovations in phosphate mining. Some of the benefits are yet to be quantified at phosphate mines in Southeastern Idaho. These mining innovations are intended to greatly enhance the protection of the environment with respect to contamination from selenium and other metals, but in some instances may contradict past practices and BMPs such as sloping methods designed to minimize erosion on reclaimed mine areas.

6-9 The cost of implementing the BMPs and innovative management practices puts Simplot at a cost disadvantage to other companies not employing these practices. Simplot agrees with the cooperating agencies that the cost of implementing unreasonable practices (such as total infiltration barriers), would force reductions in the amount of phosphate recovered. We do not believe such an action is consistent with the Mineral Leasing Act, or fair to Simplot and other mining interests. See Chapter 6 for further discussion of infiltration barriers.

Response 6-6

Comment noted.

Response 6-7

The use of previously proposed management practices for overburden fills as permanent infiltration areas is an innovative addition by Simplot to the Proposed Action and Alternatives. The benefit of these features is to introduce large quantities of clean water from the reclaimed surfaces into the ground which will enhance local groundwater recharge. Descriptions of these features has been added to Section 2.2 of this FSEIS. The mitigative effects of these features on the groundwater impacts is discussed in Section 4.3.1 of this FSEIS.

Response 6-8

The enhanced recharge of clean water into the Wells Formation aquifer would occur simultaneously with the seepage through the seleniferous overburden. As described in Section 4.3.1 of this FSEIS, the increased local recharge offsets part of the contaminant loading from the seleniferous overburden, resulting in lower groundwater concentrations of the contaminants. The enhance recharge is also possible with Alternative A and B but reduces the amount of chert available for capping the rest of the seleniferous overburden (see Section 2.2).

Response 6-9

The agencies are sensitive to the cost of implementing management practices and alternatives for the B and C Panel operations and recognition of these costs has been made in the SEIS. The agencies do not believe they are requiring any technically or economically unreasonable mitigation practices. Requiring mitigation of environmental impacts, even those that result in increased operating costs, is within the agencies' authority and is consistent with the concept of ultimate maximum recovery and the general obligations in the regulations implementing the Mineral Leasing Act. Mitigation measures must be applied as needed to ensure that the effects from the Proposed Action are not expected to violate law or cause unnecessary or undue environmental degradation. All companies mining Federal phosphate leases are required to comply with these regulations and the agencies attempt to be consistent in the interpretation and enforcement of these requirements for all mining interests. However, this does not tie the agencies' hands in responding to changing conditions, new information, or advances in the state-of-the-art when it comes to requiring certain mitigation practices for environmental issues.

4.1.3 Miscellaneous Corrections and Comments

6-10 Table 1.3-1: The final SEIS should update the status of Storm Water Pollution Prevention Plan (SWP3) required by the Environmental Protection Agency. The Smoky Canyon Mine has updated its SWP3 to include both multi-sector and construction permit requirements. Permit coverage for EPA's NPDES Storm Water Construction Permit is active as of 5/23/2001, and for EPA's NPDES Storm Water Multi-Sector Permit was renewed as of 4/12/2001.

6-11 Page 3-30, 3rd paragraph: This paragraph identifies a spring discharging into Smoky Creek. This spring is actually in bottom of the creek bed. Due to this fact, it would be difficult at times to identify this spring as a viable monitoring point, especially in normal or wet years.

6-12 Section 4.3.1, Sediment and Channel Related Impacts (General): This section includes a discussion of potential sedimentation impacts based upon existing upstream-downstream comparisons. Although the existing impacts are described as being minor, no discussion has been included regarding the potential that these impacts may also be due to grazing. Grazing typically occurs on the downstream side of the mine area. The mine haul roads and facilities act as a deterrent to upstream grazing. Even more important, some monitoring stations such as SC-SW2 (lower Smoky Creek), SC-SW16 (lower Pole Creek), SC-SW14, SC-SW17 (Hoopes Spring), and SC-SW12 (lower South Sage) are located in the immediate vicinity of active grazing areas.

6-13 Furthermore, in the discussion of sediment impacts to lower Smoky Creek, the discussion omits the fact that this creek is adjacent to the public Forest Service road. Sedimentation also can be attributed to public travel for recreation, to routine road maintenance, to road runoff and to periodic cattle and sheep grazing.

6-14 Page 4-28, 2nd paragraph: The document describes gabions being built out of chert. Consideration also should be given to allowing limestone in addition to chert as gabion construction material.

4.2 Groundwater Resources

6-15 The DSEIS's analysis of impacts to groundwater resources has raised concerns regarding the potential for selenium transport to groundwater, even though selenium contamination of groundwater has not been an issue or concern at this mine or other nearby phosphate mines throughout their history of operations. The basis for the concerns raised by the DSEIS is the output from a relatively simplistic and highly conservative groundwater transport model, which does not incorporate all of the numerous chemical and physical processes controlling selenium fate and transport, but which predicts significant impacts to groundwater in the vicinity of overburden disposal areas. The reality is that such impacts have not been observed to date and are not likely to occur in the future. This fundamental point is lost in presentation of results from the modeling effort.

Response 6-10

The updated permit information has been added to Table1.3-1.

Response 6-11

Information provided by Simplot and others, which was used in the development of the DSEIS, indicates that Smoky Creek is not perennial immediately above Lower Smoky Spring. Therefore, monitoring that spring, even though it discharges from the channel bottom, should be viable during most years and most seasons. At times when stream flow causes the spring discharge point to be submerged, and thus not possible to measure, the monitoring report would simply indicate those conditions. This would be similar to occasions at other sites where, due to heavy winter snow conditions, a given monitoring point might be reported as inaccessible, frozen, etc. Alternatively, a piezometer could be installed in the spring to intercept spring flow in the subsurface for water quality monitoring regardless of surface flow conditions.

Response 6-12

Water quality impacts do occur to surface waters from grazing livestock and have been acknowledged in this FSEIS as part of the existing land use in the vicinity of the mine operations. Please see the modification to the Sediment and Channel Related Impacts portion of Section 4.3.1 of this FSEIS for the additional discussion on road and grazing impacts to surface water.

Response 6-13

See Response 6-12.

Response 6-14

The discussion of the gabion has been revised to allow limestone rock as gabion construction material.

Response 6-15

The modeling approach used in this FSEIS has incorporated improvements to eliminate some of the more simplistic constraints contained in the model which was used for the DSEIS. The results of the modified modeling are described in the Groundwater Impacts portion of Section 4.3.1 of this FSEIS. The agencies do not agree with Simplot that groundwater quality impacts have not been observed to date at phosphate mining facilities and are not likely to occur in the future. As described in Chapter 4 of the DSEIS and this FSEIS, groundwater quality in the vicinity of the Culinary Well has already been impacted by past mining operations at the Smoky Canyon Mine. The selenium concentration at Hoopes Spring has increased in recent years and site investigations will be performed under the site-specific AOC to determine if these increases are attributable to mining. The information contained in the regional data base presented in Appendix 4B of the DSEIS shows a number of seeps and springs throughout southeast Idaho that have elevated selenium concentrations. Some of these discharges are

6-16

Mining operations have been active at Smoky Canyon for nearly 20 years, and even though the BMPs that Simplot is proposing for Panels B and C were not generally used in the past, the impacts to groundwater quality to date have been minimal. Selenium concentrations do not exceed the drinking water standard (0.05 mg/L) in Wells Formation groundwater at either of Simplot's water supply wells, the Culinary Well and Industrial Well, both of which are located within several hundred feet of the inactive Panel A pit. Further, the impacts to surface water quality that have been observed (e.g., Pole Canyon Creek) result from operations dramatically different from the overburden disposal operations associated with the Proposed Action at Panels B and C, in that they do not include many of the best management practices that limit seepage from overburden ("Best Practical Methods" *IDAPA 58.01.11.400.06*).

6-17

Section 4.3.1 of the DSEIS for the proposed expansion at Panels B and C has identified potential groundwater impacts based on the results obtained from "reasonable worst-case" modeling scenarios. The model used in the DSEIS predicts localized impacts to groundwater quality, which are represented by predicted exceedances of the drinking water standards for manganese and selenium in groundwater within the Wells Formation. The exceedances predicted by a "reasonable worst-case" model run occur primarily within the active mineral extraction area (as defined by the lease boundaries) with very limited extent outside that area. Even so, the predicted impacts presented in the DSEIS are significantly greater than any impacts to groundwater quality observed to date, even in the immediate vicinity of the older or active mining operations.

overburden seeps and others are natural groundwater discharges. Thus, there are both regional and site-specific data that indicate potential impacts to groundwater quality can and do occur from phosphate mining in Idaho.

Response 6-16

It is recognized by the agencies that exceedances of MCLs have not been seen to date in the Culinary Well or Industrial Well. This does not necessarily mean that groundwater quality impacts are not present on site, or that they cannot occur in the future. As described in the groundwater flow discussion in Sections 3.3.4 and 4.3.1 of the DSEIS and this FSEIS, groundwater flow in the vicinity of the wells in question is largely east to west. The predicted spread of groundwater impacts from the B and C Panels in the vicinity of these wells is also primarily east to west. If this is the case, any groundwater quality impacts from the backfilled portion of the A Panel and overburden fills south of the A-Panel are not expected to be exhibited in the subject water wells. The open pit of the A-Panel is directly east of the water wells and a few samples taken after 1998 from the ponded surface water in this pit show selenium concentrations of 0.064 and 0.097 mg/l. This water is thought to percolate into the Wells Formation under this pit and could be the source of the average 0.013 mg/l selenium concentrations in the water wells immediately west. If this is the case, it would tend to support the thesis presented in the DSEIS that contamination seeping out the bottoms of backfilled pits can percolate to the Wells Formation aquifer and migrate downgradient with concentrations at any selected location being dependent on the contaminant loading at the source, intervening aquifer conditions, and dispersion and dilution.

In light of the current understanding of the selenium issue, the BLM and USFS agree with Simplot that the proposed overburden disposal practices at the Smoky Canyon Mine, as described in the DSEIS for Panels B and C are a significant improvement over past disposal practices at the mine. This is recognized in Section 4.3.1 of the DSEIS. It was also noted that surface water contamination similar to that observed in Pole Canyon Creek from the overburden disposed of directly in that drainage is not expected to occur from overburden facilities for Panels B and C.

Response 6-17

Concentrations of selenium and manganese greater than the groundwater quality standards are predicted to occur directly beneath and downgradient of the southern portion of the A Panel. The maximum extent of these impacts in a downgradient direction is described in Section 4.3.1 of this FSEIS. The "active mineral extraction area" is a term from the State Ground Water Quality Rule [IDAPA 58.01.11.400.06]. This groundwater would be present at great depth within rugged mountainous topography managed by the USFS as roadless area. There are no discharges of this impacted groundwater to the surface environment. The only groundwater use that would likely be affected in the future is Simplot. The Idaho Department of Environmental Quality (IDEQ) has determined that the proposed operations would be allowed by them through a Consent Order under the State Ground Water Quality Rule. However, the IDEQ will determine the applicability of the "active mineral extraction area" under the State rules and they

6-18

Although the underlying geologic and hydrogeologic characterizations presented in the Draft SEIS are reasonable, the characterization of impacts to groundwater is based on a highly conservative approach that, among other things, does not fully consider the effects of BMPs associated with the Proposed Action and only presents the worst-case condition. For this reason, the models predict impacts to groundwater quality that are considerably more extensive than any impacts observed at the site. Overall, the impact analysis presented in the DSEIS can be made more representative by (1) correcting the reasonable worst case to more accurately reflect the proposed BMPs and (2) incorporating representative values, along with values reflective of the worst case, to describe the chemistry of overburden leachate.

6-19

The model analyses developed to evaluate a reasonable worst case is currently not representative of proposed actions but can be improved by more complete incorporation of the planned BMPs, especially those that will reduce infiltration of water into seleniferous overburden. Simplot has included a number of BMPs in the Proposed Action that will eliminate surface seeps, reduce the amount of water that infiltrates through the overburden and limit selenium transport to groundwater, but some of these BMPs were not incorporated into the modeled scenarios and do not appear to have not been considered in the BLM's stated preference for Alternative A. These inaccuracies need to be corrected in the reasonable worst-case model to reflect the expected physical conditions associated with the Proposed Action. At a minimum, the groundwater modeling results should be presented in light of differences between the modeled leaching and transport scenarios and the planned BMPs so that consideration can be given to the benefits of those practices when evaluating the Proposed Action and Alternatives.

6-20

Setting aside the need for incorporation of BMP effects into the model, the groundwater impacts identified through alternative model runs considering long-term leaching potential are needed to balance those presented in the Draft SEIS for the reasonable, worst-case scenario. The refinements of the model structure and inputs recommended here consider the variability of conditions within the overburden area and realistic changes in leaching conditions with time, and thereby provide predictions that are more likely to be representative of actual future conditions. Use of more representative model inputs is expected to indicate that the extent of impacts to future groundwater quality would be confined within the active mineral extraction area and that resultant selenium concentrations would not exceed the drinking water standard.

will determine the appropriate regulatory response to the predicted impacts through a consent order (see Letter #4 and #13).

Response 6-18

The modeling described in Section 4.3.1 of this FSEIS has been modified from that presented in the DSEIS to include more representative input chemistry values and to incorporate the effects of proposed mitigation measures that had not been previously proposed.

Response 6-19

The modeling presented in Section 4.3.1 of this FSEIS has been modified to include the effects of the mitigation measures proposed since the DSEIS was released. It should also be noted that the agencies' proposed Preferred Alternative in the DSEIS did not reflect a decision to finally select that alternative.

Response 6-20

The previous model runs were based on constant concentrations of COPCs for a 100-year period based on the weighted average for Pore Volume one (see Table 4.1.3 in the DSEIS). The modeling also simulated the effects of a constant 0.75 mg/l concentration in the overburden seepage for 100 years. Both of these assumed input concentrations were conservative and the model results from these conservative inputs showed that there would be no impacts to public health or ecosystems. In response to the public comments on the DSEIS, and information on the column testing that was submitted by Simplot during the public comment period, the agencies have modified the model input chemistry to better reflect the anticipated changes in seepage chemistry over time, as exhibited by the column testing of the overburden samples. The range of seepage chemistry concentrations used as input to the modeling described in this FSEIS are now based on the best fit curve to all the column test data (which were received after the DSEIS was prepared) and the input concentrations in the model were modified to change over time. In addition, Simplot has proposed revisions to the Proposed Action and Alternatives that will mitigate the groundwater impacts. These are described in Sections 2.2 and 2.3 of this FSEIS. The influences of these changes were also incorporated in the modified groundwater impact modeling as described in Section 4.3.1 of this FSEIS.

The revised modeling results are described in Section 4.3.1 of this FSEIS and show that concentrations greater than ground water quality standards would be limited to a smaller area than previously predicted, limited roughly to directly under the combined B and C Panel mining area.

6-21

In summary, the analysis of potential impacts to groundwater resources presented in the DSEIS can be improved by:

- Providing additional explanation of the model set up and the conservative nature of the model assumptions, methods and selected input values.
- Correcting the model to include BMPs that will have a significant effect on infiltration through seleniferous overburden.
- Including results from model runs that use more representative input values for comparison.
- Considering the results from the corrected and additional model runs, along with the results from the most conservative model runs, when the potential extent and magnitude of groundwater impacts are described for use by decision makers in the NEPA process.

In light of these general issues, these comments are organized according to four main themes, with identification of related areas of discussion within the DSEIS, as follows:

1. Use of empirical evidence to describe groundwater impacts at the Smoky Canyon Mine.

2. Explanation of model development and conservatism of modeling approach.

3. Consideration of BMPs in developing the HELP model to provide more accurate predictions of groundwater impacts.

4. Use of more representative input values for critical model parameters, such as the selenium concentration in seepage from overburden, to model more probable future conditions.

5. Summary of recommendations for preparation of the Final SEIS.

Response 6-21

Additional information on the model characteristics and the conservative (protective) nature of the model inputs has been added to Section 4.3.1 of this FSEIS. The model has been modified to incorporate the effects of the proposed mitigation measures and management practices. It has also been modified to include more assumptions on seepage chemistry using all the information from the column tests.

6-22

6-22

6-22

6-22

4.2.1 Empirical Data Describing Current Site Conditions

Simplot has data from the Culinary Well and Industrial Well that can be used to evaluate changes in groundwater quality over the time period when mining has been active at this site. We are providing these data so that they can be considered as part of the groundwater impact analysis and used for comparison to output from the groundwater transport models included in the SEIS.

In Table 3.3-12 of the DSEIS, selenium data for groundwater samples collected in June and September of 2000 for the Culinary Well (GW-CW) are presented, but there are no data presented for the Industrial Well (GW-IW).

The new data provided here are the total selenium data available from GW-CW for 1984 through 2000 and from GW-IW for 2000. These data show that selenium concentrations in Wells Formation groundwater have been variable over time. The source of this variability is not known, but could be related to non-mining influences such as changes in recharge resulting from variable precipitation rates from year to year. There is no increase in selenium concentrations from 1984 through 1994, but concentrations do show an increase in 1996; thereafter, selenium remains stable through 2000. These data provide little evidence for ongoing migration of selenium from disturbed overburden materials into the Wells Formation. Instead, they suggest a change in conditions associated with the cessation of active mining in 1995. The increase in selenium concentration thereafter may be associated with declining annual precipitation amounts in conjunction with migration of water ponded at the base of Panel A pit rather than ongoing transport from an overburden disposal area.

Table 2
Water Quality Data from Simplot's Culinary and Industrial Wells

Date	GW-CW Total Se (ppm)	GW-IW Total Se (ppm)
8/84	<0.003	--
5/18/87	<0.005	--
1/89	0.006	--
4/26/94	<0.005	--
12/16/96	0.017	--
12/10/97	0.027	--
8/4/00	0.015	--
8/9/00	0.017	--
8/18/00	0.016	--
8/22/00	0.031 dissolved	--
8/23/00	--	0.016
8/29/00	0.010	0.014
9/12/00	0.013	0.016
9/26/00	0.016	0.015
9/27/00	0.011 dissolved	--
10/10/00	0.009	0.011
11/01/00	0.011	0.014
11/21/00	0.022	0.009
12/05/00	0.007	0.009

Response 6-22

The information provided in Simplot's comments related to the historical water quality data for the Culinary Well has been incorporated into Section 4.16.3 of this FSEIS. The BLM and USFS agree that the data provided indicate that selenium contamination in the Culinary Well was first exhibited somewhere between 10 and 12 years after mining operations began and that these concentrations have varied within a narrow range since then. We agree that these data are not consistent with increasing concentrations expected if they were caused by seepage through seleniferous overburden. However the agencies' understanding of groundwater conditions at the water supply wells is that groundwater movement in this area is largely east to west so the influences from existing overburden fills would not be expected at the water supply wells. We agree that the selenium concentrations in the water supply wells are more likely due to conditions in the northern portion of the A-Panel pit from infiltration of ponded water in the bottom of the pit. Runoff collected in the A-Panel pit includes runoff from the general area of the mine shop/mill/office area, access road, and the entire Panel A area. Past sampling of this water has indicated that it has selenium concentrations which we think are likely contributed by runoff washing the seleniferous shale left on the pit footwall. It is hard for us to see how recent, short-term declines in precipitation can be the cause of the selenium concentrations observed in the water supply wells, especially since these concentrations first appeared between1994 and 1996. According to data included in the TRC Mariah annual aquatic monitoring reports prepared for Simplot, the precipitation at the Slug Creek Divide from 1993 through 1998 was above average with the exception of 1994 which was below average.

6-23

At page 4-129, in the 3rd paragraph, the DSEIS asserts that the similar selenium values for samples collected from the Culinary Well and the Industrial Well in the summer and fall of 2000, along with the completion of the Industrial Well to obtain water from a depth of 690 to 1320 feet, "*indicates that the selenium in groundwater has penetrated over 690 feet of Wells Formation rock to enter the aquifer section tapped by the Industrial Well. Because of the similarities in the average selenium concentrations in the two wells, it is likely that the selenium in the Culinary Well water is present in the Wells Formation aquifer and is not being contributed in any significant way from the* (Culinary Well) *perforations in the Meade Peak member.*" There are several points necessary to clarify and qualify this interpretation.

6-23

- According to the geologic log, the top of the Wells Formation at the Industrial well is at a depth of approximately 500 feet. Therefore, the Wells Formation thickness between the base of the Meade Peak member and the top of the perforated interval is only 190 feet rather than the stated 690 feet. Secondly, the depth to water in the Industrial Well is only 475 feet, indicating that the water level elevation is above the base of the Meade Peak member. Thus, the potential vertical migration distance for selenium-bearing groundwater from the Meade Peak to the perforated interval of the Industrial Well or to groundwater is much less than 690 feet. Furthermore, the depth to water at the Culinary Well is only 297 feet versus an estimated base elevation of the Mead Peake member at 610 feet, suggesting a high level of saturation in the Meade Peake.

6-23

- The northern part of the Panel A pit is at the base of the mined interval (base of Meade Peak member) and has not been backfilled with overburden spoil. This pit receives stormwater runoff from the mined portion of A pit and the external overburden disposal area. Ponding at the base of the pit is reportedly a common occurrence.
- Mining of Panel A was initiated in 1984 and completed in 1995.

6-23

- The Industrial Well is approximately 750 feet west of the northern end of the Panel A pit. The Culinary Well is approximately 220 feet west of the Industrial Well. The Culinary Well has perforated (open) intervals at depths of 330-390 feet (Meade Peak member of the Phosphoria Formation), 570-770 feet (lower Meade Peake and upper part of Wells Formation), and 710-940 feet (upper part of Wells Formation).

6-23

- The above information strongly suggests that the observed selenium concentrations in groundwater samples from the Culinary Well particularly, as well as the Industrial Well, are a result of several processes: 1) seepage from the Panel A pit downdip (and downgradient) within the Meade Peak member to perforations in the Culinary Well and downward in that well to the Wells Formation in response to strong vertical gradients; and 2) seepage from the Panel A pit ponded area into the Wells Formation and downward along fractures in response to the strong vertical gradients; and 3) downgradient movement of groundwater in the Wells Formation

Response 6-23

Simplot is correct on the first point; the reference to 690 feet in the quoted sentence in the DSEIS is a typo and should be 190 feet. This sentence is not really required and has been removed from this FSEIS. The agencies disagree that the water levels in the Industrial and Culinary wells indicate that this water originates in the Meade Peak member of the Phosphoria Formation. As described in Section 3.3.4 of the DSEIS, the Meade Peak member is widely understood to be an aquitard that does not yield useful quantities of water to wells. If this unit was an aquifer locally, Simplot would observe significant quantities of water flowing from the Mead Peak shales in the open pits at the Smoky Canyon Mine and this has not been observed by agency inspectors. We agree that water in the bottom of the open pit of Panel A is likely contributing to the observed selenium concentrations in the water supply wells but it is very unlikely that this water migrates to the water wells through the low permeability Mead Peak shales. We agree with Simplot that the water from the A-Panel pit percolates out the bottom of the open pit into the Grandeur Limestone and migrates vertically to the water table in the Wells Formation after which it flows laterally in the Wells Formation to the location of the water supply wells. Even if there was lateral migration of this pit water through the Meade Peak shales to the Culinary Well, the amount of water yielded from this unit to that well would be much less than the amount of water yielded from the underlying Grandeur Limestone and Wells Formation, which makes up more than 370 feet of the total perforated zone in this well (570' to 940') v. about 45 feet within the Meade Peak (330' to 375'). Based on relative permeability and length of perforations, the water chemistry of the Wells Formation would be expected to dominate in the water removed from the Culinary Well.

There are no perforations in the Meade Peak section of the Industrial Well that could potentially contribute selenium contamination to the water in that well and it exhibits average selenium concentrations essentially the same as the Culinary Well. Thus it would appear that any contribution of selenium to the Culinary Well from water yielded from the Meade Peak is not necessary for that well to exhibit the selenium concentration that it does; i.e. it is more likely that all the selenium in that well is contributed from the Wells Formation water.

from the area of the Panel A pit to the area of the Industrial Well and the Culinary Well.

6-24 In summary, the selenium concentrations measured in groundwater at the CW and IW are not appropriate as indicators of the expected conditions under the Proposed Action at Panels B & C.

6-25 Under the Proposed Action, the ponding conditions at the north end of the Panel A pit will be rectified by placement and grading of overburden fill in this pit area (with at least ten feet of chert, one to three feet of topsoil and a resultant slope of the final reclaimed surface to inhibit surface infiltration). In addition, the Proposed Action has BMPs that will enhance infiltration of clean water (see discussion in Section 4.2.3 below). Thus, implementation of the Proposed Action will ultimately result in improvement in groundwater quality downgradient of Panel A.

Section 4.3.2, Irreversible and Irretrievable Commitment of Resources, Groundwater Resources

6-26 A final statement regarding the predicted impact to groundwater quality is included here that describes the area where exceedances of drinking water standards are thought likely to occur. Existing use of groundwater is limited to the water supply wells installed by Simplot (Culinary and Industrial Wells). There are no other users of groundwater from the Wells Formation in the downgradient direction and within the area of predicted impact. Future use of Wells Formation as a drinking water supply is extremely unlikely in this area due to (1) the depth to Wells Formation, which increases in the downgradient direction, and high costs related to installation of water supply wells at those depths and (2) the presence of another aquifer, the Dinwoody Formation, located above the Wells Formation in the downgradient direction, that provides a source of potable water with lower costs for well installation.

4.2.2 Modeling Selenium Transport from Overburden

6-27 A better explanation of the selenium transport model and the factors that critically control the model output would be helpful to understanding the results presented in the DSEIS and the realistic potential for impacts to groundwater resulting from the Proposed Action and Alternatives. We recommend that a more detailed explanation of the model, including the clarifications and explanation provided below, be presented in the final SEIS to provide for technically valid and informed decision-making based on the model output.

The chemical transport model used to predict groundwater impacts is simple in design, and the model predictions are strongly controlled by a few key input values, as follows:

- rate of infiltration through overburden,
- area that overburden materials will cover at the ground surface (i.e., overburden footprint).
- selenium (or manganese) concentration in the leachate and duration of leaching at this concentration,

Response 6-24

The BLM and USFS have not asserted in the DSEIS that the existing selenium concentrations in the water supply wells are indicative of the expected concentrations from the development of the B and C Panels. Rather, we have described the selenium concentrations in the water supply wells as being due to the existing mining operations at the Smoky Canyon Mine and that these concentrations would likely be modified by the effects of the proposed overburden disposal practices from the B and C Panels. As stated in the DSEIS and in Response 6-23 above, the selenium concentrations in the water supply wells indicate that there is an active pathway for potential contaminant flow from the existing mining operations to the Wells Formation aquifer. This pathway is also expected to provide the means for contaminant migration from the overburden disposal proposed as part of the B and C Panel development.

Response 6-25

Assuming that the water ponded in the open pit of Panel A typically exhibits a selenium concentration between 0.06 and 0.09 mg/l (existing measurements), this would be the approximate concentration of the contamination loading to the groundwater under Panel A. In the Proposed Action and Alternatives described in the DSEIS, this pit would be backfilled with seleniferous overburden. As described in Section 4.3.1 of the DSEIS the seepage from this overburden was anticipated to have a selenium concentration of approximately 0.181 mg/l. This would be a two to three times increase in selenium concentration over that in the water that has historically ponded in the pit. The groundwater modeling presented in the DSEIS shows that introducing this increased selenium concentration into the groundwater under the Panel A pit results in estimated increases in the selenium concentrations in the water supply wells, downgradient of Panel A.

Simplot has proposed certain revisions to their designs for the Proposed Action and Alternatives, as described in Chapter 2 of this FSEIS, which would mitigate much of the previous downgradient migration of groundwater contamination. The result of these changes is that the impacts to the water quality in the location of the Culinary Well would be reduced compared to those presented in the DSEIS.

Response 6-26

The BLM and USFS agree with the comment and have added similar wording to a new paragraph in Section 4.3.2 in this FSEIS.

Response 6-27

The recommended text additions were added to the Groundwater Impacts part of Section 4.3.1 in this FSEIS.

- rate of leachate migration, and selenium transport, to groundwater in the Wells Formation, and
- flux of groundwater passing through the underlying aquifer.

6-28 The apparent overprediction of groundwater impacts, given the existing conditions at the site, suggests that the modeling inputs or methods, or both, are overly conservative representations of the actual current and expected future conditions.

6-28 Development and presentation of additional model runs that use more representative model inputs is warranted to put the reasonable, worst-case scenario in perspective. These model runs would provide a more accurate reasonable worst case as well as representative results for the range of conditions expected under less conservative but more probable leaching and subsurface transport scenarios.

To put these recommendations into context, the following provides a review of the current DSEIS modeling approach:

4.2.2.1 Infiltration of water through overburden:

The amount of water infiltrating through overburden was evaluated using the USEPA's HELP3 model. The HELP model was originally developed to conservatively estimate infiltration through multiple layers of distinct materials and is typically used to evaluate the effectiveness of various types of caps and covers in reducing infiltration.

The results from the current HELP model indicate that from the 34 inches of precipitation received at the site each year, 4 inches infiltrate to the subsurface, 13 inches runoff and are lost as surface water and the remaining 17 inches are lost by evapotranspiration. In other words, the current transport model only considers water originating from the 4 inches of infiltration that result from the total annual precipitation amount of 34 inches.

4.2.2.2 Leaching of selenium from overburden

The potential for release of selenium, and other constituents, from overburden via leaching by infiltrating water was evaluated through extensive site-specific testing of those materials and also a review of data from other phosphate mines in the region. Although Synthetic Precipitation Leaching Procedure (SPLP) tests were also performed, these test data reflected lower predicted selenium concentrations and were not used to develop model inputs because they were not considered representative when compared to the empirical data set. Two different model runs were conducted — one using a selenium concentration from the column tests (first pore volume weighted average Se = 0.181 mg/L) and one using a selenium concentration derived from a regional dataset (Se = 0.75 mg/L) — to represent the selenium content in leachate generated within overburden disposal areas with all other model parameters held constant.

Response 6-28

The prediction of groundwater impacts from the proposed B and C Panel operations are based on the available information and conservative, professional judgements as described in Section 4.3.1 of this FSEIS. These predicted impacts cannot be directly compared against the existing groundwater quality impacts in the water supply wells because none of the existing mine disturbances are upgradient of the water supply wells like the proposed B and C Panel operations. Thus the current conditions in the water supply wells cannot indicate if the model results are overly conservative.

The model has been modified as described in Section 4.3.1 to incorporate a more detailed grid spacing and annual time steps which accommodates decreasing concentrations of COPCs in the overburden seepage over time. These model runs have replaced the previous model runs based on constant seepage chemistry at the Pore Volume One concentrations as well as the 0.75 mg/l selenium concentration. It is thought that the modified model design and seepage chemistry inputs discussed in this FSEIS provide a more accurate prediction of groundwater quality impacts than was presented in the DSEIS. This was checked by also running the model with a starting selenium concentration of 0.72 mg/l, based on field information from Smoky Canyon Mine.

6-29

In both cases, conservative selenium concentration values were selected to represent the leachate characteristics across all of the overburden disposal areas. The first pore volumes recovered from the column tests, which have significantly higher concentrations than any of the subsequent 9 pore volumes, were used for the model. For the regional data, a wide range of selenium concentrations (from non-detectable concentrations to more than 1 mg/L) was identified in waters impacted by placement of similar overburden materials at this and other mine sites, but approximately the 90th percentile value from that data set (80th percentile value after all non-detect values were removed) was ultimately selected for input to the transport model.

In both model runs, the selenium concentration in leachate was assumed uniform across the entire overburden disposal area. In other words, the same source term was applied for all infiltration over the entire disposal area. It is also important to note that the same concentration value, or source term, was applied throughout the entire duration (>100 years) of each model run.

4.2.2.3 Migration of leachate

Transport of overburden leachate to the Wells Formation aquifer was considered to be 100 percent efficient (i.e., all water infiltrating from overburden instantaneously migrates to the aquifer) regardless of the thickness or hydrologic characteristics of the unsaturated zone above the aquifer. This simplifying assumption was necessary given the complexity of the Wells Formation hydrologic flow system (i.e., fracture-flow system) and lack of detailed information to describe mechanisms and rates of groundwater recharge to that unit.

4.2.2.4 Transport of selenium

Selenium transport from the overburden disposal areas to the Wells Formation groundwater and within the Wells Formation was also considered 100 percent efficient in that no attenuation of selenium transport was considered. This point is made in the modeling report, which explains that this assumption was adopted for the purposes of this model because no information was available to describe actual selenium attenuation behavior at this site. Attenuation of selenium transport varies as a function of the geochemical conditions in the subsurface.

6-30

The model resulting from this combination of approaches is simple in concept: leachate generated by infiltrating water is simply mixed with groundwater present in the Wells Formation aquifer at proportions determined from (1) the HELP model estimate of the infiltration rate through overburden and (2) calculated flow rate through the aquifer. The selenium concentration of this mixture is the selenium concentration of groundwater that is predicted by the model. For example, at the 100-year time mark, the modeled selenium concentrations under the Panel B area (refer to Tables 4.3-6 and 4.3-11 of DSEIS) result from an approximately 1:1 mixture of infiltrating leachate and other Wells Formation groundwater. The result is that at the 100-year time point of the model, the predicted concentration beneath Panel B is simply the concentration resulting from a mixture of approximately 50

Response 6-29

The BLM and USFS agree with the comment that the selenium input chemistry values chosen for the modeling discussed in the DSEIS were conservative which was considered appropriate for the uncertainties in these inputs (see page 4-54 of the DSEIS). A modified, yet conservative approach has been used for the modeling presented in Section 4.3.1 of this FSEIS which better conforms the modeling to the expected changes in seepage chemistry over time (see last paragraph on page 4-54 of the DSEIS)

Response 6-30

The groundwater modeling may be considered simplified in the DSEIS. However, the model has been modified in response to public comments and now incorporates changing input chemistry over time and variable recharge rates with location to accommodate mitigation measures (overburden margin infiltration areas). Section 4.3.1 of this FSEIS presents this more complex modeling approach and the results.

percent overburden leachate and 50 percent clean groundwater from the Wells Formation.

In summary, the selenium concentrations in groundwater that are predicted by the selenium transport model depend on the following critical parameters:

- infiltration rate through seleniferous overburden,
- cross-sectional area of seleniferous overburden,
- selenium concentration in leachate,
- groundwater flux through the aquifer under the disposal areas.

The modeling results must be considered in light of the types of simplifying assumptions necessarily adopted to perform modeling and the uncertainty and conservatism associated with the point estimates ultimately selected for these parameters in the DSEIS modeling effort. Any misrepresentations of these critical inputs, for example due to inadvertent exclusion of planned BMPs or use of unrealistic leachate-chemistry estimates, for input values will result in highly inaccurate predictions for impacts to groundwater quality. Specific examples of such inaccuracies and recommendations that will make the model more representative are provided in Chapters 4.2.3 and 4.2.4.

4.2.3 Full Consideration of Best Management Practices (BMPs)

For the last two years of its operations at the Smoky Canyon Mine Panel E area, Simplot has been voluntarily implementing a program of BMPs. Procedures are in place, both as part of the mine development planning process and through mine operations, to identify locations where specific BMPs are needed, and to implement them in a timely manner. Monthly mine inspections by the U.S. Forest Service and BLM provide the opportunity for close coordination as decisions are made regarding where, when and how to implement specific BMPs. The primary objectives of the BMP program are to: eliminate the formation of surface seeps at the toe of overburden disposal piles, minimize infiltration through seleniferous overburden and minimize the generation of selenium-bearing leachate that can migrate to groundwater.

The following descriptions of the BMPs employed at Smoky Canyon Mine include the specific implementation methods planned for these BMPs during mining of Panels B & C as well as the actual experience over the past two years with these BMPs in mining Panel E, where applicable. These and other BMPs are presented and described in some detail in Appendix 2B of the DSEIS. The information provided below can be used to improve the BMP descriptions in the Final SEIS and to assist in developing model inputs that consider the effects of these BMPs on overburden leaching characteristics.

4.2.3.1 Best Management Practices

a. Design of Sediment and Runoff Controls

Sediment control basins (e.g., ponds and traps) will be located on native ground and thus will not contribute to infiltration through the seleniferous overburden. Under the mine plan for Panels B & C however, runoff collection basins will be constructed on the pit floors in Panels B & C as part of final reclamation. These basins will be composed of coarse rock

6-31A

Response 6-31.A

The infiltration areas (called runoff recharge areas) have been added to Chapter 2 of this FSEIS and their impacts have been evaluated in Section 4.3.1.

(Rex Chert) over the Grandeur Limestone, which will be scraped clean of shale if necessary. The design intent of these basins is to collect clean, surface runoff from the final reclaimed surface for infiltration into the Wells Formation. This runoff would otherwise be lost as surface water flow and would not be considered as infiltration by the current transport model. The effect of including runoff collected by these basins in the modeled infiltration to the Wells Formation is described in greater detail below (supporting calculations are provided in Appendix 8.7).

Based on the proposed mine plan for the Proposed Action, final reclamation will be essentially complete approximately 6 years after mining commences (4.6 years active mining, 1.5 years to complete final reclamation). The addition of this large volume of clean recharge to the Wells Formation will have a substantial positive effect on post-mining groundwater quality in the vicinity of Panels B and C. This benefit is associated with the Proposed Action BMPs, but not identified in the DSEIS.

Under Alternative A, the runoff collection basin in Panel B would be constructed differently. All of the seleniferous overburden that would have gone to the external overburden disposal site would be returned to the Panel B pit as backfill. The thickness of seleniferous overburden under the site of the proposed collection basin would be 100 to 150 feet. Under Alternative B, which does not include an external overburden disposal site, the thickness of seleniferous overburden beneath the site of the proposed collection basin would be 200 to 250 feet. The substantial benefits of the B pit runoff collection basin (to groundwater quality) would only be afforded with the Proposed Action.

6-31B

b. Avoiding Perennial and Ephemeral Drainages

Surveys of the proposed mine areas and external overburden disposal site were conducted in preparation of the DSEIS to identify springs, seeps and other drainage features. Only two features were identified: Sheep Spring and Smoky Spring. The mine plan for Panels B & C locates overburden disposal areas so as to avoid placement within perennial or ephemeral drainages. In particular, the external overburden disposal site is located along the ridge top above the heads of surface drainage features. At Panel C, mining will remove existing drainages entirely. The Sheep Spring channel will be restored over the C Panel overburden backfill, as discussed below. Smoky Spring and the wetland area above it are both off the mine area over the Dinwoody Formation, which is the source of water.

Avoiding placement of seleniferous overburden over these drainage features eliminates the potential introduction of large volumes of water into the overburden, and consequently reduces the amount of water available for infiltration into the underlying Wells Formation.

Response 6-31.B

This additional information has been added to Appendix 2B in Chapter 2 of this FSEIS as applicable.

6-31C

c. Control of Run-on

There will be no run-on to the Panel B backfill and the external overburden disposal site, both of which are along topographic highs. Diversion ditches are planned to route surface water run-on around the south part of the Panel C backfill. The construction would be similar to that used at Panel E currently. At Panel E, Simplot has captured the flow of a spring above the highwall and routed the flow around the active mine area. The flow is conveyed in a 10-foot-wide, 2-foot-deep channel with 1.5H:1V slopes and an overall grade of 4% to minimize erosion. On greater slopes, riprap, grass cover and/or protective mats would be used for additional erosion control.

Eliminating run-on of surface water from upslope areas will remove the potential for a portion of the run-on water to infiltrate the overburden.

Response 6-31.C

See Response 6-31B

6-31D

d. Drainage Channels on Overburden

The Sheep Spring discharge will be re-routed through a channel north of Panel C during the mining operation. Subsequent to mining, the spring discharge will be directed back to its approximate original course in a clay-lined channel over the backfill. The channel will be approximately 10 feet wide and 2 feet deep, with a 2-foot-thick clay liner. The backfill down to the base of the mined interval will be composed of the Rex Chert overburden to a distance of 50 feet from both sides of the new channel. Further, the pit floor will be scraped of shale to directly expose the permeable Grandeur Limestone. This construction will ensure that any water that escapes this channel will infiltrate vertically through permeable, non-seleniferous material to the Wells Formation.

Response 6-31.D

See Response 6-31B.

6-31E

e. Overburden Grading

Final grading is accomplished as soon as practicable after overburden disposal. Approximately 3H:1V slopes are attained on overburden disposal areas with a minimum 2% grade on roads and the crowns of disposal areas. These grading measures will eliminate ponding and reduce the potential for incident precipitation and snowmelt to infiltrate the overburden.

Response 6-31.E

See Response 6-31B.

6-31F

f. Overburden Pile Aspect

The mine plan for Panels B & C incorporates design features that maximize southern and western exposures of the overburden disposal pile and pit backfill slopes. The greater solar exposure on these slopes, relative to east- and north-facing slopes, will enhance evaporation and locally reduce infiltration into seleniferous overburden.

Response 6-31.F

See Response 6-31B.

6-31G

g. Surface Area

Under the mine plan for Panels B & C, the footprint of the external overburden disposal area has been reduced to the maximum extent practicable. Minimizing the footprint of seleniferous overburden will reduce the amount of infiltration contacting seleniferous materials, and thereby reduce the percentage of recharge to the Wells Formation containing selenium.

Response 6-31.G

See Response 6-31B.

4.2.3.2 Incorporation of BMPs in Infiltration/HELP Model

One of the critical model inputs identified above is the rate of infiltration through seleniferous overburden. Certain BMPs will act to limit infiltration through seleniferous overburden; if these BMPs are not incorporated into the model design, then the model likely will overestimate infiltration and leachate generation.

The total volume of leachate originating from the seleniferous overburden materials over time (i.e., leachate flux or leaching rate) is a function of the amount of precipitation, the proportion that infiltrates below the surface, its infiltration rate through overburden and the area of infiltration through seleniferous overburden. The inputs used for the HELP model are based on regional climate data and data from geotechnical tests performed on samples of overburden materials to determine their physical characteristics. This is a valid and widely used approach for approximating the infiltration of incident precipitation through solid materials. An infiltration estimate of 4 inches of water (per unit area) per year was obtained using the HELP model. This represents approximately 12 percent of the total incident precipitation on overburden.

This is a conservative estimate (i.e., likely an overestimation) of the infiltration through overburden materials because a number of simplifying assumptions are built into the HELP model that make it conservative for this assessment. For example, the model computes the rate of flow from the base of the disposed materials assuming continuous saturated conditions, even though these materials are not often likely to be saturated in the overburden disposal setting proposed for Panels B and C. As a result, the leachate flux determined for saturated conditions is higher than would actually occur in unsaturated conditions. In addition, the HELP model was not set up to consider the effects of long-term maturation of the vegetative cover (e.g., over 50+ years) on future infiltration rates through overburden.

6-32

Response 6-32

The BLM and USFS are not sure why Simplot believes the HELP modeling assumes saturated conditions "from the base of the disposed materials". The model assumes initial saturated conditions only for soil liners while the other soil layers are initially assumed to be a field capacity moisture conditions. Subsequent moisture conditions for each layer in the model are calculated depending on the detailed water balance calculations inherent in the model technique. It is true that the HELP model instructions show most landfill geometries having a liner at the base of the model layers, but this is not the case for the modeling conducted for Smoky Canyon where the bottom layer was uncompacted shale.

The vegetation cover assumed for the HELP modeling was a fair stand of grass which has a leaf area index of 2. A dense stand of trees and shrubs would have a leaf area index of 5, which would result in more evapotranspiration in the model and reduce the infiltration somewhat. The instructions to the HELP model for this factor recommend the user assumes a poor to fair stand of grass for most applications. The maps of default input values in the HELP engineering documentation recommend using a leaf area index of about 2 for the Smoky Canyon location.

6-33

The predicted volume of leachate generated per unit time that was used for the transport model was determined from (1) the infiltration estimate from the HELP model and (2) the area for overburden disposal. For the purposes of the model, all areas of overburden disposal were assumed to have the same infiltration rate. As a result, the predicted leachate flux is highly sensitive to the overburden disposal area that is used in the model. This is demonstrated in the results from comparable model runs performed for the various alternatives. The output for the two different model runs – Proposed Action and Alternatives A and B – show differences in the projected extent of impact because that extent is essentially determined by the area of overburden disposal (i.e., the overburden footprint) used in the model run.

6-33

This was an assumption made for simplicity, but it is clearly inaccurate and highly conservative when the BMPs that will be used to manage surface water run-on and run-off as part of the Proposed Action are considered. As discussed above, Simplot plans to construct runoff collection basins that will collect rainfall and snowmelt runoff from soil-covered and re-vegetated overburden slopes and then allow the water to infiltrate through clean coarse rock into the Grandeur Limestone (i.e., the Wells Formation) without contacting seleniferous overburden. Simplot estimates that approximately one quarter of the area within the B pit and one tenth of the area within the C pit will be drained to these infiltration basins and supply clean water from the overburden disposal area for groundwater recharge. These BMPs are expected to increase the amount of clean water available for recharge to the Wells Formation.

6-33

Failure to include these BMP components in the HELP model for the Proposed Action has several implications relevant to the model results, as follows:

1. Surface runoff from 72 acres in the B pit and 4 acres in the C pit will be captured in these basins instead of leaving the area as surface flow.

2. This clean, surface runoff water will infiltrate through relatively inert materials and provide clean recharge directly to the Wells Formation. Increasing the amount of clean recharge to the Wells Formation within the disposal areas lowers the proportion of selenium-bearing leachate mixing with clean groundwater in the Wells Formation, and thereby lowers the predicted selenium concentrations in groundwater under the disposal areas.

6-33

The amount of clean recharge water predicted to infiltrate from these basins annually (13 inches a year over 76 acres) is equivalent to infiltration at a rate of 4 inches per year over an area of more than 245 acres (see Appendix 8.7 for supporting calculations), which if considered would significantly change the mixing proportions of leachate and clean groundwater within the Wells Formation that determine the magnitude of groundwater impacts. Increasing the clean recharge to the Wells Formation results in lower predicted selenium concentrations in groundwater under the B and C pit areas (as much as 45 percent less). The predicted area where groundwater with selenium above its standard will be less

Response 6-33

The mitigative effects of the proposed overburden margin infiltration areas have been incorporated into the modified groundwater modeling as described in Section 4.3.1 of this FSEIS. These modeling results demonstrate the effectiveness of this mitigation which confines the area of groundwater concentrations greater than MCLs to roughly beneath the footprint of the proposed mine area. The BLM and USFS do not agree with the comment that the infiltration areas can only be placed directly onto the underlying bedrock. These can be sited over permeable overburden fill as long as the infiltration only comes in contact with chert or limestone and not with seleniferous shale overburden.

than shown in the DSEIS and may be confined to within the mineral extraction area. Note that the runoff collection basins can only be placed directly onto the bedrock under the Proposed Action; for Alternatives A and B those basins would be placed over seleniferous overburden. Therefore, only the Proposed Action would provide the benefits of the runoff collection basins for controlling impacts to groundwater quality.

6-33

The model runs developed to estimate infiltration from overburden disposal areas associated with the Proposed Action must account for the effects of these runoff collection basins in order to provide accurate predictions of the potential groundwater impacts.

4.2.4 Representative Input Values for Selenium Transport Model

In addition to the amount of overburden leachate predicted from the infiltration rate and overburden footprint areas, selenium concentrations in groundwater predicted by the selenium transport model are strongly controlled by a few other parameters:

- selenium concentration in leachate and duration of leaching at this concentration; and
- amount of clean groundwater passing through Wells Formation under the overburden area, as defined by the hydraulic conductivity times the hydraulic gradient times cross-sectional area of Wells Fm, per unit time (i.e., groundwater flux through aquifer under disposal areas).

The model inputs selected for each of these parameters in the DSEIS model effort are conservative. Alternative model runs that incorporate input values to better represent the overburden disposal settings would provide distinctly different results from those presented in the DSEIS and therefore also need to be presented and evaluated as part of the groundwater impact analysis.

The alternative input values that are more representative of actual existing and expected future conditions at this site and that are recommended for use in additional model runs are presented below with discussion of how the recommended input values will change the modeling results.

4.2.4.1 Selenium Concentration in Overburden Leachate

The selenium concentrations used to represent concentrations in leachate from overburden were selected from both experimental and empirical data to conservatively represent potential leaching effects. The various data evaluated for use in the model are described below.

First, EPA's standard Synthetic Precipitation Leaching Potential (SPLP) test was performed on a variety of overburden materials to evaluate their relative leaching characteristics. Second, a column-test study was conducted to provide quantitative estimates of the concentrations of overburden constituents in leachate generated under conditions that

simulate those expected in the overburden disposal setting at this site. Finally, data describing seeps emanating from overburden disposal areas at this site and other similar sites in southeastern Idaho were compiled to evaluate the range of constituent concentrations observed in seepage, or leachate, generated from seleniferous and other overburden materials in field-scale settings. Although the data from the SPLP tests were not used to develop model inputs, they were considered when designing the column tests and selecting samples of overburden for those tests.

The resultant data available from these sources was then used to identify values for each leachate constituent of interest for input to the transport model, as follows:

6-34

- The concentrations from the first pore volumes passed through columns of distinct lithologies and the estimated proportions of each lithology to be disposed were both used to compute the weighted average concentration in leachate that is considered "*...representative of the initial rinsing and leaching of the overburden in the field by meteoric water*" (Draft SEIS, p. 4-6, last paragraph) The weighted average selenium concentration in the first pore volumes is 0.181 mg/L.

6-34

- A value was selected from the empirical data set to represent "...a *reasonable upper bound of selenium concentration for seepage from the proposed overburden fills*" (Draft SEIS, p. 4-7, last paragraph). A selenium concentration of 0.75 mg/L was that upper bound. As noted in the Draft SEIS (p. 4-39, fifth full paragraph), "*...over 80% of the overburden seeps [with selenium concentrations greater than 0.005 mg/L] had selenium concentrations less than 0.75 mg/L.*"

6-34

These approaches provide highly conservative input values for the model, especially considering that these input values are applied across the entire area of overburden and for the entire duration of the model runs, as explained further in the following two sections.

4.2.4.2 Use of Column Test Data

Numerous factors control leachate chemistry and changes in leachate chemistry over time, including: the rate and total amount of infiltration; the mineralogic and physical characteristics of overburden materials; and the ambient chemical conditions, such as pH and oxidation potential, within disposed overburden.

Response 6-34

The approach to the application of column leach data to the selenium transport model has been changed in the FSEIS. Refer to section 4.3.1, Direct and Indirect Impacts Proposed Action - Ground Water Impacts, Predicted Infiltration Chemistry. The revised approach to modeling uses annualized discharges from overburden piles to the aquifer beneath the mine site that are estimated from a curve fitted to the weighted average concentrations of selenium and other COPCs in leachate from the 10 pore volumes. This provides for a transient modeling approach based on a range of concentrations estimated to vary from 0.33 mg/l to about 0.1mg/l over the time frame of the groundwater impact analysis (100 years). The best fit curve predicts that the selenium concentrations in the overburden leachate would continue to decrease over time until reaching a nearly continuous long-term level of approximately 0.047 mg/l As a result, the weighted average concentration of selenium in the first pore volume (0.181 mg/l) is no longer being used as constant model input. The model was also run with a 0.72 mg/l selenium starting concentration to include field data from the Smoky Canyon Mine (D Panel Seep).

The value of 0.75 mg/l used to model the impact of overburden seepage on ground water quality in the DSEIS was selected to provide an upper value for a range of concentrations to be used to model the selenium impacts to groundwater. This value was selected to include all the field data for average selenium concentrations in the D Panel Seep at the Smoky Canyon Mine. Simplot has indicated that this is not a representative value of potential future conditions in the B and C Panel operations because the waste management conditions when building the D Panel overburden fill did not include the management practices proposed for construction of the B and C Panel overburden fills. In addition, the source of the D Panel Seep is reportedly located at a former slope failure location on the D Panel external overburden fill that was potentially caused by incorporation of excessive snow in the overburden fill during construction. Such a large amount of water incorporated with the overburden during construction of the fill is expected to result in more leaching of the overburden than if this moisture was not incorporated. This causal factor would also be prevented by following the proposed management practices for the B and C Panel operations.

Commentors (Letters 6 and 7) on the DSEIS have indicated that use of the geometric mean of the revised overburden seep and spring data is the most appropriate value for the groundwater impact analysis for the B and C Panel operations. The agencies did not previous use any statistical values from the Appendix 4B of the DSEIS in the impact analysis and agree with the Commentors that the distribution of the data indicates the geometric mean is more appropriate than the average of the overburden seep and spring data. The geometric mean of the revised overburden seep and spring data in Appendix 4B of this FSEIS is 0.088 mg/l. The agencies do not think this statistic should be used for impact modeling for the reasons related to data quality stated in Appendix 4B of the DSEIS. However, it is a useful comparison to the values that are being used for the groundwater impact analysis for the B and C Panels. All the values being used in the B and C Panel groundwater analysis in this FSEIS are higher than the geometric mean of the revised overburden seep and spring data from southeast Idaho.

The upper value of 0.33 mg/l used in the groundwater impact analysis for the B and C Panel operations is higher than 20 of the 23 overburden seeps and springs in the revised overburden seep and spring data set for southeast Idaho (Appendix 4B). This means this value is higher than about 87 percent of all the overburden seeps in southeast Idaho which the agencies believe demonstrates the conservative nature of the upper end of the range of values used in the groundwater impact analysis for the B and C Panels.

When the geometric mean of the combined D Panel Seep and E Dump Seep data in Appendix 4B of this FSEIS (0.39 mg/l) is compared with the highest selenium concentration currently being used in the revised groundwater analysis in this FSEIS (0.33 mg/l) the two values can be seen to compare within about 10 percent of each other. The model results were also checked by using a 0.72 mg/l selenium starting value which is equal to the average of the D Panel Seep data.

6-35

Maxim Technologies, Inc. was the firm contracted to perform column tests in support of the Smoky Canyon SEIS. The column tests were designed to represent probable leaching conditions in unsaturated overburden disposal areas, identify the leachable constituents of overburden materials, and provide a range of concentration data for those constituents in leachate generated within the overburden disposal area through consideration of data from 10 sequential pore volumes collected off the columns. The tests were not designed to predict the change in chemistry over time for this disposal setting, nor do they provide this data, because the rate of infiltration was not controlled to correspond to the rate of infiltration through overburden in the disposal setting. Therefore, the term "pore volume," as used in the Column Test Report prepared by Maxim and DSEIS, describes only the actual volume of water necessary to fill pore spaces and not the time period necessary for flow through of that volume of water. In other words, the time required for a "pore volume" to flow through a unit thickness of unsaturated overburden has not been established through the column test, although the pore-volume sequence can be used to evaluate changes over time.

Response 6-35

The agencies agree that the pore volumes used to divide the overall column leach test were not intended to represent any particular time frame of the proposed B and C Panel operations. A pore volume is the amount of water required to saturate a column of porous material. The pore volume concept can be directly transferred from the laboratory framework to the field. The overburden in the proposed fills at the B and C Panels will have a porosity and thickness which can be used calculate a "pore volume" of water for any column of material in the fills. This does not mean that the overburden fills will ever become saturated or contain this amount of water at any one time. However a single pore volume in the field can be directly correlated with pore volume in the laboratory column tests. The cap design proposed for the B and C Panel operations will limit the infiltration of meteoric water into the underlying overburden to about 4 inches per year. For a typical overburden fill with a 100 foot thickness, it would take approximately 91 years at 4 inches of water per year to introduce one pore volume of water in the overburden. We are also not saying that it will take 91 years for water to move from the surface of the overburden to the base. This can actually happen much faster than this based on the infiltration of water through preferential flow paths in the overburden (see the discussion on infiltration and infiltration barriers in the appendix to this FSEIS.)

6-36

The data presented in the Column Test Report prepared by Maxim, 2001a demonstrate that leached constituents have their highest concentrations in the first pore volume collected from each column, regardless of the lithology (mineral types and composition) of materials tested (see attached Figure for plot of selenium concentration vs. leach volume). The leached constituents have decreasing concentrations in subsequent pore volumes and eventually those concentrations stabilize to relatively constant levels that are much lower than in the first pore volume. Other chemical data collected during the column tests indicates that a number of geochemical processes likely contribute to this reduction in selenium release, including weathering of overburden to reduce permeability and infiltration rates and the reduction in oxidizing potential which reduces the rate of selenium release from its solid forms. This leaching behavior is typical and expected because the first water to pass through the materials picks up the most mobile forms of leachable constituents, including selenium in the residual pore water (Allen et al., 1995). After some volume of water is passed through the materials less mobile forms dominate and concentrations in leachate decline. The change in constituent concentrations per unit volume of leaching varies for the different lithologies tested.

6-37

The column test results clearly indicate that the assumptions adopted for the model (that leachate chemistry (1) is uniform across the entire overburden area and (2) remains constant for the first 100 years) are not accurate representations of the expected leaching characteristics of these materials over time. These points are made in the DSEIS but they are not considered later in the evaluation of model results based on those assumptions. The DSEIS (p. 4-54 to 4-55) states that "...*assuming the shale would leach the same way in the overburden disposal facility as in the columns, the long-term seepage from the proposed overburden fills would be 2 to 5 times less concentrated in selenium as the initial seepage concentration which was used for the groundwater impact analysis.*" This means that the selenium concentrations predicted for groundwater as a result of overburden leaching will be one-half to one-fifth of the concentrations predicted by using the first pore-volume column test result.

Response 6-36

The model is as good as the data inputs that are available and limitations to the model that would tend to skew the concentrations of selenium in pore volumes both upward and downward exist. It is correct that the effects of changes in permeability due to weathering effects and the potential for decline in mobile forms of selenium remaining in the overburden following the initial application of water are not assessed in the column test protocol and/or the model. In the absence of quantitative data describing the effects of these processes, they cannot be modeled. This factor may skew the selenium concentration in some pore volumes upward.

Similarly the effects of oxidation that will result from the wetting and drying cycle within the waste rock dumps over time are not completely assessed by the protocol. The application of air for 24 hours between pore volumes, did not, as evidenced by the declining Eh (oxidation-reduction potential) over the successive pore volumes, appear to have enhanced oxidation of less mobile forms of selenium.

The revised modeling approach described in section 4.3.1, Direct and Indirect Impacts Proposed Action - Ground Water Impacts, Predicted Infiltration Chemistry addresses, to the extent possible with the column test data, the temporal effects of overburden leaching on water quality.

Response 6-37

The variability in leachate chemistry across the site could only be addressed by more extensive testing, which was not the objective of the testing protocol and therefore could not be addressed in the model which used the test results as inputs. As discussed in Response 6-35 and described in section 4.3.1, Direct and Indirect Impacts Proposed Action - Ground Water Impacts, Predicted Infiltration Chemistry, the model inputs have been revised to address the variability of leachate concentration over time.

6-38

The DSEIS does not include any discussion of the expected decrease in selenium release over time or the effects of those changes on the flux of selenium released from overburden over time. Given the uncertainty regarding the average selenium concentration in leachate at various points in time, Maxim recommended the following approach: use a weighted average from the first three pore-volume concentrations to represent the selenium content in leachate migrating from the overburden during the first 100 years and use an average of the first ten pore volumes to represent long-term (>100 year time frame) leaching and transport conditions...

Response 6-38

Section 4.3.1, has been revised in this FSEIS to address the expected decrease in selenium concentration over time. The use of the average concentration of selenium over the first three pore volumes is not a valid statistic in this application because the different pore volumes do not represent the same sample population and cannot be analyzed together statistically. It should also be noted that the Maxim report discussed in the comment was not delivered to the agencies until after the DSEIS was released to the public.

Each of the analytical results for a pore volume from any one column represents a significantly different physical and chemical condition in the column than any other pore volume. For example, the pore volume 3 analyses for any column represents the leachate conditions in the column of rock after three complete pore volumes of water have been passed through the column and two aeration events have occurred. This is quite different than the pore volume 1 conditions which represent only one pore volume of water passing through the column and no aeration events. The differences between the column conditions for early pore volumes and pore volumes beyond number 3 are even more dramatic. These intended differences between the pore volume test conditions indicate that all the pore volumes from any one column are not of the same test population. It is therefore statistically inappropriate to average the results of the first three pore volumes of any one test column and it is even more inappropriate to average the results of all 10 pore volumes.

It needs to be noted that the JBR statistics described in the comment for the first three pore volumes were calculated by JBR at the request of Simplot for their use after the DSEIS was released to the public. Producing this statistic does not indicate JBR's or the agencies' endorsement of the use of this value in the impact analysis.

Aside from our concerns about the inappropriate use of statistics on the column test data, the agencies do not agree with the recommendation that the average of the first three pore volumes should be used to represent the first 100 years of overburden leachate and the average of all 10 pore volumes should be used for the time frame over 100 years. Maxim made these statements but did not offer any plausible reason why they made these recommendations based on the laboratory data or field conditions. As indicated in Response 6-35, the field conditions anticipated to exist at the B and C Panel operations are such that it would take a long time, estimated to be around 91 years, for a single pore volume to infiltrate through the overburden on average. Given the uncertainties in this calculation the agencies have assumed it would take approximately 100 years for a single pore volume to percolate through the overburden in the field.

The raw column test data and the weighted averages calculated from these data clearly indicate that the concentrations of overburden leachate are expected to start out at a high value in the beginning of time and decrease to a nearly continuous value of about 0.047 mg/l. To obtain estimated concentrations between the single pore volume results, a best fit curve has been calculated from the weighted average data as described in Section 4.1.1 of this FSEIS. Concentration data for any point in time can be calculated from this curve. The estimated range

of values from this curve for the first pore volume can be assumed to represent the time period it takes for one pore volume to percolate through the overburden in the field, 100 years. The range of concentrations for the second pore volume can be assumed to be representative of the leachate chemistry from the overburden for the second 100 years and so on. This approach is based on concentrations derived from a best fit curve objectively projected onto the actual column test data without the need for questionable statistical evaluations as proposed in the comment. This approach also conforms to the estimated field conditions related to the amount of time expected to needed to infiltrate the required amounts of water through the overburden fills whereas the comment offers no reason why the proposed averages should represent any period of time.

Using the approach described above, it can be seen that the overburden selenium leachate concentrations during the first 100 years would vary from 0.33 mg/l to about 0.1 mg/l. They would vary from 0.1 mg/l to about 0.05 mg/l during the second 100 years and would approximate about 0.047 during the third 100 years and thereafter. The long-term concentration (over 200 years) estimated in this approach is actually lower than that recommended in the comment based on the average of the 10 pore volumes (0.064 mg/l).

Response 6-39

See Response 6-38.

6-39 ...A weighted average was computed by JBR using the column test results from materials of differing lithologies weighted in accordance with their planned relative proportions within the disposal areas. The weighted average selenium concentration from the first three pore volumes that was computed by JBR is 0.097 mg/L.

6-39 The data used to determine this concentration are provided in the table immediately below. The selenium concentration in the weighted average third pore volume is less than the drinking water standard (0.05 mg/L) as are the selenium concentrations in pore volumes four through ten (see Figures 4 and 5).

Table 3
Smoky Canyon Column Test Results for Selenium

6-39

Pore Volume Collected	Weighted Average Selenium Concentration (mg/L)
1st	0.181[1]
2nd	0.064[1]
3rd	0.047[1]
1st 3 pore volumes	0.097[1] (0.081[2])
1st 10 pore volumes	---- (0.064[2])

Notes:
[1] Weighted average values computed by JBR from: (1) column test results reported by Maxim (2001) and (2) estimated proportions of different overburden lithologies provided by Simplot.
[2] Weighted average value reported by Maxim (2001), Tables 3.1 and 3.2
Use of arithmetic mean is conservative.
Selenium MCL = 0.05 mg/L

6-40

Even without making the model corrections for BMPs, use of the second or third pore volume concentrations as the selenium concentration in leachate results is expected to result in modeling predictions that show no exceedances of the drinking water standard for selenium at any location within the model domain. Use of the average of the first three pore volumes as the model input value in the current model would show a very limited area, immediately below the disposal areas, where exceedances of the drinking water standard are predicted (see Appendix 8.7). This area would be further reduced with inclusion of the planned BMPs associated with the Proposed Action.

6-40

It is useful to consider these alternative model runs as representations of probable conditions at various points in time following the initial rinsing of overburden in the disposal setting. The exact time frame for each of the modeled conditions remains unknown. However, these additional model runs demonstrate that

6-40

- initial leaching and transport from overburden results in the greatest transport of selenium to groundwater and
- selenium transport from overburden materials to groundwater decreases over time.

Changes in selenium concentration as a function of cumulative leaching volume (or time) for each of the sample lithologies tested. Maxim Technologies, Inc., 2001, Simplot Smoky Canyon Expansion EIS, Final Column Test Report, September 2001a, Figure 3-4, p. 19.

Figures 4 & 5 Se Concentration during Leaching (figures removed for this chapter)

6-40

Therefore, the model runs presented in the DSEIS using the first pore volume selenium concentration represent a reasonable, worst-case scenario, in terms of leachate chemistry, for impacts to groundwater, whereas the additional model runs using the later pore volumes demonstrate that reductions in selenium transport to groundwater and improvement in groundwater quality will take place over time. Consideration of these additional model runs along with the reasonable worst-case scenario provides a more realistic prediction of potential impacts to groundwater quality and provides a more representative range of expected conditions.

Response 6-40

The groundwater modeling has been modified to include different seepage chemistry inputs. The previous continuous concentrations at 0.181 mg/l and 0.75 mg/l have been modified to a variable concentration based on the best fit curve to the column test data through pore volume 3. After pore volume 3, the concentrations of the COPCs appear to be asymptotic. The result of this modification is that the initial overburden leaching has the greatest concentration of selenium and this decreases over time. To be conservative, initial selenium concentrations of 0.33 mg/l and 0.72 mg/l were both used in the impact modeling. The agencies believe this modification better conforms the modeling to projected conditions in the field and better conform to the column testing information. The modified groundwater modeling inputs and results are described in Section 4.3.1 of this FSEIS.

6-41

4.2.4.3 Use of Empirical Data

On the basis of the column test results, Maxim 2001a made the following comment in their final report: "*Given the variability of selenium release potential within specific units at Smoky Canyon, it will be prudent to compare these results with considerably more field data as they become available and to attempt to collect lithologic data to better characterize seep locations. The observed variability suggests that a deterministic approach to develop mass load estimates may be overly simplistic in such a complex geochemical setting...*" In other words, field data are not likely to be useful predictors of leachate chemistry unless the disposal setting and lithology of materials disposed at other locations is comparable to the lithology in the planned mixture of overburden materials from the Panel B and C areas. In addition, the practices used to handle and dispose of overburden (e.g., BMPs) need to be comparable to those planned for the Panel B and C areas in order to demonstrate that field data from other locations are representative for the Panel B and C Proposed Action (and Alternatives).

Response 6-41

The comment seems to indicate that field data collected at Smoky Canyon or in southeast Idaho should not be used in conducting environmental impact analyses for the B and C Panels, or in general. The BLM and USFS disagree with this approach because the alternative source of data for impact analyses, laboratory testing, is based on a narrow range of carefully controlled conditions which cannot be claimed to fully represent all the field variables that control geochemistry in the actual field settings. We also need to note that the quote from the Maxim column test report was contained in a report that was not completed or delivered to the agencies until after the DSEIS was released to the public.

The agencies agree that use of field data should be conducted with reasonable judgement as to its applicability to the specific impact analysis being conducted. The wording in the memo accompanying the southeast Idaho data in Appendix 4B of the DSEIS clearly indicates that these regional data can be used "to get a feel" for the range of selenium concentrations that might be expected in different generalized situations such as overburden seeps, French drains, and ponds. The memo also states in the conclusions that: *"It should be recognized that these data are non-homogeneous with regard to: sampling protocols, months and year of sampling, laboratories, analytical methods, and likely other factors. Thus contributions in the variability of the data values to these factors cannot be determined. This influences the significance of the statistics derived from the data."* The intent of these statements in the data base description was to warn the reader that, although statistics can be determined for the regional data and this helps to understand the information, the significance of these statistics is suspect.

The agencies recognize that the existing overburden fills at the Smoky Canyon Mine were not constructed to comply with all the management practices proposed for use in the B and C Panel development and have stated this understanding in the DSEIS. However, the selenium data on the seeps discharging from the existing D and E Dump seeps are useful to compare with the values used in the groundwater impact analysis (see Response 6-34) to make sure that the values used in the impact analyses are reasonable approximations of the current field conditions. We recognize that flow conditions and concentrations of contaminants from existing overburden seeps at the Smoky Canyon Mine are expected to be worse than the proposed B and C Panel operations and have accounted for that in our impact analyses in this FSEIS (Response 6-34). We also agree there could be lithologic and geochemical differences between the overburden in the existing overburden fills at the mine and the proposed B and C Panel operations but we think the differences between overburden fills at the Smoky Canyon Mine should be less than between the Smoky Canyon Mine and other locations in southeast Idaho. Our revised approach to the groundwater impact analysis as described in this FSEIS still uses values based on field data from the existing D Panel Seep. We believe it is still reasonable to compare field data for existing overburden seeps at the Smoky Canyon Mine with the data being used in the groundwater impact analysis for the B and C Panels. This comparison indicates that the values being used in the impact analysis are reasonable compared to existing overburden seeps at the mine.

6-42

As indicated by discussions in Section 4.3.1 of the DSEIS (refer to pages 4-38 to 4-42), water quality data for actual seeps originating from similar overburden materials were collected and evaluated to address the issue of uncertainty associated with the SPLP and column-test results for Smoky Canyon samples. The regional field data were considered together as representative of leachate potentially generated in the proposed overburden disposal areas. However, lithologic descriptions of overburden at the seep areas and details describing the disposal setting for disposed seleniferous overburden including moisture content and source of infiltrating water were either not available or were not evaluated to confirm that the data were in fact representative of expected field conditions at the proposed overburden disposal sites. In fact, the D SEIS identifies ways in which these seeps may not be comparable to leachate generated in the overburden disposal areas in the Proposed Action or Alternatives A and B. For example, " *Many of these existing overburden seeps are located in overburden disposal areas that are not constructed like the overburden fills for the Proposed Action and Alternatives, i.e., they incorporate more water from sources other than precipitation infiltration. In this respect, they represent hydrologic conditions worse than are expected to occur in the proposed overburden fill* " (page 4-7). There may be other significant differences between the settings where seep samples were collected and the settings for the Proposed Action and Alternatives, such as localized differences in lithology or physical setting that result in preferential flow paths, horizontal drainage paths or water storage, that would call into question the comparability of seep water to the average infiltration water present across a large overburden disposal site. These unanswered questions make use of this dataset inappropriate for evaluating impacts associated with the Panel B and C actions.

6-43

The Panel D and E disposal areas at the Smoky Canyon Mine are arguably the most comparable in lithology (i.e., mineral types and relative abundances) and setting to the external overburden disposal site included in the Proposed Action, but even these areas are not truly comparable because the best management practices that will be included in overburden management for Panels B and C generally were not instituted at Panels D and E (note that BMP implementation was initiated at Panel E only two years ago). Even so, the selenium concentrations in those seeps (0.28 and 0.24 mg/L) are much lower than the value used from the regional data set (0.75 mg/L) and provide evidence that even under a worst-case scenario for the external disposal site, selenium concentrations would not be expected to exceed those observed at the Panel D and E seeps. Again, it is important to recognize the differences in the physical settings that result in discrete seepage points versus bottom seepage generated by infiltration across a large-scale disposal area; those differences have effects on seepage chemistry, and its variation over time, in the two different settings.

Response 6-42

See Response 6-41.

Response 6-43

The selenium concentrations referenced in this comment are those reported in Table 4.3-4 of the DSEIS and represent single samples collected from the Panel D and E seeps by JBR in December, 2000. The table presents these data because, at the time of writing the DSEIS, these were the only complete chemistry information available for these seeps. Appendix 4B contains all of the data compiled for the DSEIS from southeastern Idaho. The average concentrations of selenium from the Panel D and E samples shown in this data set are 0.716 and 0.31 mg/l, respectively. This was also disclosed in the narrative of the DSEIS on the page across from Table 4.3-4 in the paragraph which refers to the table. The value of 0.75 mg/l that was used in the DSEIS groundwater analysis was selected to be just higher than the average value for the D Panel Seep and is relatively close to that value. The comment is incorrect comparing the 0.75 mg/l to the 0.28 mg/l value for one grab sample of the D Panel Seep and stating that the selenium concentrations in the seep are much lower than the 0.75 mg/l value.

The agencies recognize that differences in chemistry can and likely do occur in different discrete flow paths within large volumes of overburden. However, many of these discrete flow paths can be assumed to occur through an overburden fill to the extent where modeling the entire fill as a homogeneous mass makes sense on the large scale. This has been the assumption in the groundwater impact analysis done in this FSEIS. The concern raised in the comment about directly using the D Panel Seep data for the groundwater impact analysis has been addressed in the revised modeling approach described in this FSEIS which uses a calculated upper concentration for the input to the groundwater modeling that is based on the column test results.

The upper selenium value used in the revised groundwater impact modeling (0.33 mg/l) is approximately the same as the average selenium value for the E Dump seep (0.31 mg/l) but is lower than the average of the D Panel Seep (0.716 mg/l). The 0.33 mg/l value is higher than 20 out of 23 revised data values (87 percent) in the regional southeast Idaho database (Appendix 4B). The model results were checked using the D Panel Seep average value for the starting concentration (0.72 mg/l) on the best fit curve.

6-44

Lower Pole Canyon Creek Spring, with an average selenium concentration of 0.36 mg/L, is clearly not comparable in setting or mode of leachate generation to the overburden disposal sites proposed. As described in the DSEIS, the overburden disposed in Pole Canyon is frequently flooded with water that later flows freely through saturated portions of the dump. In addition, the average lithology of materials disposed in the Pole Canyon dump is not well known and may not be comparable to the lithology of materials planned for disposal through the Proposed Action or Alternatives. The DSEIS acknowledges these differences on page 4-42, by stating: "*...the data for the lower Pole Canyon Creek are not considered to be representative of potential seepage from the proposed new overburden facilities.*" Even so, the selenium concentration in Pole Canyon Creek Spring (0.36 mg/L) is much lower than the value selected for the model from the regional data set (0.75 mg/L).

6-45

It is not known whether seeps present at other locations in southeastern Idaho originate from overburden disposal areas that are physically or chemically comparable to the disposal sites included in the Proposed Action and Alternatives. Given the uncertainties regarding comparability and representativeness of field data from other overburden disposal sites, including those at Smoky Canyon, it does not appear reasonable to adopt a model input derived entirely from these data for use in evaluating impacts to groundwater at Panels B and C. The empirical data used are all from discrete seepage points, excluding those with the lowest concentration values, and therefore cannot represent the average conditions for seepage generated across the entire disposal area. For this reason, we conclude that the output generated from model runs using the 0.75 mg/L selenium input value do not provide realistic predictions of groundwater impacts and instead represent unreasonable worst-case scenarios in terms of potential future impacts to groundwater quality.

4.2.4.4 Groundwater Flux and Selenium Transport in the Wells Formation

6-46

The final key input parameter that controls the selenium (and manganese) concentrations predicted by the model for Wells Formation groundwater is the amount of clean groundwater that flows through the Wells Formation in the area directly underlying the overburden footprint. According to the model approach used in the DSEIS, at any given point in time the amount of leachate predicted using the methods described above is mixed with the volume of water predicted to flow through the Wells Formation and the relative proportions of that mixture determine the resultant selenium concentration in groundwater. The input values used to compute the groundwater flux through the Wells Formation are uncertain but the methods used to estimate the flux are reasonable given the types of data available from the site. Therefore, we do not recommend any modification of the model input values used to describe flow through the Wells Formation unless new data become available that can improve this estimate.

Response 6-44

The Pole Canyon overburden fill was designed to transmit surface water through a basal French drain which is known not to function as designed and is understood to have resulted in flow through overburden material. The selenium concentrations from samples in Lower Pole Canyon Spring are recognized by the agencies as not being representative of overburden disposal practices described in the Proposed Action or in Alternatives A and B and are likely higher than what would be expected to occur from the base of the B and C Panel overburden fills. The average selenium value for the TRC-Mariah data (0.36 mg/l) is comparable to the concentration currently being used as the upper end of the range for the groundwater impact analysis (0.33 mg/l). However, it should also be noted that other water sample data collected on lower Pole Canyon Creek by the U of Idaho in 2000 and the USFS in 2001, when added to the TRC Mariah data (See Appendix 4B) revise the running average for all the data to 0.67 mg/l. This higher concentration is not considered problematic compared to the upper range of the values used in the revised groundwater impact analysis because the Pole Canyon Dump is considered to be a worse case condition than the proposed B and C Panel overburden fills.

Response 6-45

See Responses 6-34 and 6-41. The continuous 0.75 mg/l value is no longer being used in the groundwater impact analyses in this FSEIS because a more objective method has been used to derive a conservative range of initial input values (0.33 to 0.72 mg/l) and then allow these to decrease along a best fit curve based on the site-specific column test results. The values used in the revised impact analyses still compare favorably with field data obtained from Smoky Canyon and southeastern Idaho.

Response 6-46

The inputs for the flux of water through the waste rock dumps and then through the Wells Formation have been modified for the model used in the FSEIS to reflect the management practices that have been added to the Proposed Action and Alternatives since the DSEIS was prepared. These modified management practices consist primarily of the construction of rock drains and infiltration galleries that will collect surface runoff water that flows to the margins of the waste rock fills and allow it to infiltrate directly into the underlying Wells Formation rocks. This will result in an increase in the flux of ground water through the Wells Formation which would control the contaminant concentrations in the groundwater.

6-47

Once the mixing of leachate and clean groundwater takes place within the Wells Formation, selenium may be transported downgradient via groundwater flow (i.e., advection and dispersion). It is worth noting here that a conservative assumption was also adopted to model selenium transport. The model does not consider attenuation of selenium (and manganese) transport by chemical processes within the Wells Formation, so that the modeled rate of selenium transport is the same as the groundwater flow velocity (see p. 4-54). This is probably not accurate for the aquifer where at least some minimal chemical attenuation is expected, even when conditions that tend to maintain selenium mobility (e.g., oxidizing conditions, near neutral pH, high sulfate concentrations, etc.) exist. Similarly, the model does not consider attenuation of selenium transport during leachate migration from overburden downward through unsaturated portions of the Wells Formation (p. 4-54). Because attenuation is not considered, the model can only overestimate the actual selenium transport rates to and within the Wells Formation. This point is made in the DSEIS (see p. 5-54), but it also needs to be considered when evaluating the output provided by any of the model runs discussed herein, including the reasonable, worst-case model.

Response 6-47

The attenuation of selenium in both the unsaturated part of the Wells Formation and in the saturated part of the aquifer may occur but is expected to be minimal, as Simplot has suggested. Because sufficient data are not available to allow the inclusion of attenuation as a factor in modeling impacts to ground water that might result from the Proposed Action and Alternatives A and B, the effects of attenuation cannot be addressed quantitatively. Use of a range of concentration inputs in the groundwater model, as it is presently designed, negates the need for a separate "reasonable" or "worst case" result.

4.2.5 Recommendations for Final SEIS

6-48

The selenium transport modeling performed in support of the DSEIS demonstrates that long-term infiltration of water through the overburden and into the Wells Formation aquifer will likely result in detectable changes in groundwater quality attributable to the Proposed Action (and Alternatives). However, not accounting for certain planned BMPs in the modeling approach used in the Draft SEIS for the proposed action leads to unreasonable worst-case predictions of future impacts to groundwater quality and misleads the reader as to what impacts would reasonably be expected. Furthermore, model runs using leachate concentrations that are more representative of expected long-term geochemical conditions are needed for a balanced assessment of impacts.

Response 6-48

The groundwater model has been modified to include mitigation measures proposed by Simplot to reduce groundwater quality impacts. These measures are described in Chapter 2 of this FSEIS. The modified groundwater modeling results based on these mitigation measures are described in Section 4.3.1 of this FSEIS. The model input has also been modified to include a range of seepage chemistry that is more representative of long-term geochemical conditions, based on the results of the column testing and field data from Smoky Canyon Mine.

6-49

The following list summarizes our recommendations for revisions needed to improve the analysis of groundwater impacts for presentation in the final SEIS document:

- Present and discuss uncertainties and conservatisms associated with the model design, assumptions, set up and input values in the SEIS.
- Add detail to the BMP descriptions provided in Appendix 2B of the SEIS using the additional information included in these comments.
- Fully consider the planned BMPs so that models more accurately represent infiltration through seleniferous overburden in the disposal settings associated with Panel B and C mining practices (i.e., check overburden footprint areas, infiltration areas, and infiltration of collected runoff water within the disposal areas and revise as necessary).

6-49

- Recalculate the infiltration through seleniferous overburden and clean recharge to groundwater associated with the Proposed Action and use these results as the basis for all groundwater transport model runs used to evaluate the Proposed Action and Alternatives.
- Incorporate results from additional model runs that better represent the overburden disposal settings. Additional model runs are needed to represent probable leaching conditions across the entire overburden disposal area and over time. For example, the column test results from the first three pore volumes could be used to evaluate probable short-term leaching and transport conditions and results from all 10 pore volumes could be used to evaluate long-term leaching conditions.
- Eliminate references to specific time periods when discussing or using results from different pore volumes collected during column tests (e.g., reference to first pore volume as a 91-year time period). Indicate instead that changes along sequential pore volumes represent changing conditions over time.
- Add a discussion to compare model results from worst-case scenarios to those from scenarios that are more representative of expected future conditions. This discussion should inform readers of the uncertainties associated with both model approaches, including the ways in which they are conservative.

Response 6-49

Additional information related to the modeling uncertainties and conservatisms has been added to Section 4.3.1 of this FSEIS. This should better inform readers of the potential uncertainties associated with the modeling and the ways in which the modeling is conservative.

The additional detail of how Simplot will implement the management practices has been incorporated in Chapter 2 and Appendix 2B of this FSEIS.

The modified groundwater modeling incorporates the mitigative effects of the overburden margin runoff recharge areas proposed by Simplot. This modeling also incorporates more complete seepage chemistry inputs which predict changing concentrations of COPCs in the seepage over time, based on column tests.

The agencies have not revised the references to potential time periods in the FSEIS. The column test results are based on pore volumes with is an inherent characteristic of the material tested. The proposed overburden fills also have a certain pore volume per unit area which is a characteristic of the material. This pore volume represents a certain amount of water and it is assumed that a pore volume in the field is analogous to a pore volume in the column leach tests. The HELP modeling indicates that the cap will limit annual infiltration into the overburden to a limited and calculated amount. Thus the number of years required to equal the amount of water for one pore volume can be calculated and the time period required to introduce one pore volume into the overburden fill has been estimated (91 years). This does not mean that we are saying it will take 91 years for the first leachate to leak out of the overburden. This is likely to happen within a few years because of the high permeability of the overburden and the presence of preferential flow paths through the overburden mass. We are also not saying that uniform seepage rates and seepage chemistry are predicted over the entire overburden area. We recognize that the seepage rate and chemistry is likely to be heterogeneous under the overburden disposal area. It is useful for the public and the decision makers to understand that the leaching of the overburden fills is a long-term phenomena which is not likely to be exhibited in groundwater impacts for years after mining commences and these impacts are likely to have a prolonged duration.

4.2.6 Related Specific Comments

Specific comments regarding other aspects of the groundwater impact analysis are detailed below.

Page 3-16

6-50

The second sentence in the second paragraph on this page appears to state incorrectly "*...the chert is not expected to be inert with regard to being a potential source of soluble metals and selenium.*"
This sentence should be corrected to read: "...the chert is expected to be inert..."

Response 6-50

The recommended correction has been made to the language in this FSEIS.

Page 4-6, Column Leaching Test Data

6-51

The last sentence of the first paragraph from this section states that column testing was performed to provide information needed for identification of contaminants of potential concern "*...to be consistent with agency experience on past projects (Dry Valley Record of Decision).*" However, the use of column test results to evaluate selenium leaching from overburden and evaluate impacts to groundwater is not consistent with the approach used to evaluate groundwater impacts at Dry Valley where results from SPLP tests were used instead. If SPLP data were used to obtain the selenium concentrations incorporated in the transport model, then the model output would not show any area where exceedance of the selenium drinking water standard is expected. These results would be more consistent with the existing groundwater conditions and expectations based on the planned actions and future disposal conditions at this site.

Response 6-51

It is true that the Dry Valley FEIS utilized SPLP data for the groundwater impact analysis. The Dry Valley Mine Record of Decision required that the geochemical and groundwater impact analyses conducted with SPLP data be verified with column testing or the equivalent. This is the precedence that was referred to in the subject paragraph of the SEIS. The BLM and USFS determined prior to conducting this SEIS that SPLP data was useful for generally characterizing different overburden chemistries and for relative comparisons, but SPLP data was not, in itself, suitable for groundwater impact analysis.

Pages 4-38 to 4-42, Predicted Infiltration Chemistry

6-52

The discussion in this section acknowledges the difficulty and uncertainty associated with estimating the selenium content in overburden leachate that migrates to groundwater due to the numerous factors that control leachate chemistry, including the amount of infiltrating water, the mineralogic and physical characteristics of overburden materials and the ambient chemical conditions such as pH and oxidation potential within disposed overburden. It should also be noted in this section that all of the controlling variables listed may also vary by location and over time within the overburden disposal area.

Given the uncertainties regarding comparability and representativeness of field data from other overburden disposal sites, including those at Smoky Canyon, we find inclusion of model runs using 0.75 mg/L selenium as the model input for overburden leachate chemistry inappropriate for predicting even worst case groundwater impacts at Smoky Canyon.

Response 6-52

The recommended modifications to the discussion of the uncertainties in predicting overburden seepage chemistry has been added to the Predicted Infiltration Chemistry portion of Section 4.3.1 of this FSEIS.

The BLM and USFS note that, at the time the DSEIS was prepared, the average selenium concentration of the D Panel seep was 0.716 mg/l and some of the grab sample concentrations of this seep and other overburden seeps in the phosphate mining area in southeast Idaho are greater than 0.75 mg/l. However, the agencies have adopted a modeling approach for the Smoky Canyon Mine that uses a best fit curve of the column test data. The highest concentration on this curve is approximately 0.33 mg/l and decreases over time to an asymptotic value of approximately 0.047 mg/l. The results of the modeling using the best fit curve input data were also checked by using a starting value of 0.72 mg/l.

See Response 6-41

Pages 4-42 to 4-57, Groundwater Quality Impacts

Assumption No. 1

6-53 As detailed in the general comments above, the approach taken to select input values for the selenium transport model is highly conservative and results in inappropriate use of regional data to predict selenium concentrations in the overburden leachate.

6-53 In addition, the selenium concentration in overburden leachate that migrates to groundwater is held constant, at these artificially high levels, for the full 100 years of the model runs. This approach may not be appropriate for consideration of long-term leaching from heterogeneous overburden materials in the proposed disposal settings. The column tests performed using overburden materials from Smoky Canyon clearly show that the amount of selenium released from overburden decreases over time. Following an initial period when readily leached selenium is released to infiltrating water, the selenium content of infiltrating water drops and stabilizes.

6-53 As noted previously by Maxim *"A stochastic approach that accounts for the range of conditions observed in column testing and overburden seepage monitoring data and the uncertainties inherent in hydrological data should be used to understand the range of likely conditions. In addition, a transient modeling approach that addresses variations in predicted load over time should be strongly considered."*

6-53 The Draft SEIS is incomplete in that it does not include any discussion of the expected decrease in selenium release over time or the effects of those changes on the predicted impacts to groundwater. At a minimum, the effects of this simplifying assumption on the impacts predicted by the model should be clearly stated.

Assumption No. 2

6-54 The area included in the model for Alternatives A and B underestimates the actual area of seleniferous overburden since some seleniferous overburden will be temporarily placed outside Panels B and C during mining operations and before final disposal in the pits. When this additional area is considered, the differences in the predicted/modeled groundwater impacts from the Proposed Action and Alternatives A and B may actually be negligible.

Assumption Nos. 3 and 6

6-55 Because attenuation is not considered, the model can only overestimate the initial flux of selenium delivered to groundwater and the downgradient selenium transport rates within the Wells Formation.

Response 6-53

See Response 6-38.

Response 6-54

In the short term (less than 2 to 4 years) the temporary stockpiling of seleniferous overburden in the external overburden disposal area will have very little groundwater impact because significant seepage through the overburden is not likely to occur in this time frame. The impact analysis has been based on a 100-year period to approximate the amount of time required to infiltrate one pore volume through the overburden. The groundwater impact of the temporary stockpiles in this long time frame is negligible.

Response 6-55

See Response 6-47.

Tables 4.3-6 and 4.3-11

6-56 These tables present predicted concentrations of selected chemical parameters below the Panel B area. Based on the data presented here, it appears that the groundwater underlying Panel B would be a mixture of approximately 50 percent leachate and 50 percent Wells Formation groundwater from other recharge areas 100 years after overburden disposal. It is not clear from the SEIS discussions of the model whether these relative proportions are realistic to expect within the hydrologic setting of the Proposed Action area.

Tables 4.3-6 through 4.3-8, Tables 4.3-11 through 4.3-13, and Figures 4.3-6 and 4.3-10

6-57 The model run using 0.75 mg/L as the selenium concentration in water that infiltrates from overburden does not provide a realistic prediction of groundwater impacts because the representativeness of this input value has not been demonstrated for leachate that is generated from infiltration through overburden disposal areas that have the same design as described for the Proposed Action (and Alternatives). This point should be clearly made and/or this model run should be eliminated from the Final SEIS.

Figures 4.3-5 and 4.3-9

6-58 Use of alternative input values for the leachate selenium content, derived from the site-specific column tests, provides quite different results from those shown on these two figures. As stated above, use of the values recommended by Maxim in their Final Column Test Report (e.g., average of first three pore volumes) or values from the second or third pore-volume results is expected to indicate no exceedance of the selenium drinking water standard in Wells Formation groundwater outside the mineral extraction area and to indicate smaller scale impacts within that area.

Tables 4.3-6 and 4.3-11 and Figures 4.3-5 and 4.3-9

6-59 These two tables and two figures show the differences in modeled outcomes for the Proposed Action and Alternatives A and B. There is essentially no difference in the selenium concentrations predicted for groundwater under Panel B or the Culinary Well (see Tables). Instead, the areal extent of groundwater impacts is distinctly different (see Figures noted) due to the difference in the footprint area of seleniferous overburden modeled (additional 240+ acres in the Proposed Action model).

6-59 Note that the differences in the impact areas for the Proposed Action and Alternatives A and B would actually be less if the source area for Alternatives A and B were corrected to include temporary use of the external disposal site, as proposed.

6-59 The extent of impacts appears to be controlled entirely by the area of overburden disposal used in the models for the different alternatives. This result is counter intuitive as one may initially assume that greater volumes of overburden placed in a smaller area would ultimately result in higher selenium concentrations in groundwater than smaller volumes placed over a larger area. In fact, use of smaller areas for overburden disposal will result in leaching from overburden over a longer time frame than disposal over larger

Response 6-56

The reason for the relative lack of dilution effect on the seepage from the proposed B and C Panels is the site-specific hydrogeology of the site. Although the Wells Formation is a regional aquifer, the proposed mining is literally at the eastern edge of the Wells Formation in this part of Idaho and all recharge to the aquifer which will pass under the proposed mine disturbances occurs in the limited vicinity between the east edge of the mining disturbance and the east edge of the Wells Formation outcrop, less than ½ mile away. This limited recharge is responsible for the slow advection rate under the proposed mine site, which results in a relatively low amount of dilution. This is an unusual condition which does not occur at other phosphate mine sites in southeast Idaho.

Response 6-57

See Response 6-45.

Response 6-58

The BLM and USFS do not agree with Maxim's recommendation that an average of the first three pore volume concentrations is a better approximation of the 100 year seepage chemistry. As discussed in Response 6-38, we do not believe averaging the pore volume results is statistically valid because of the inherent, and intended, differences in the physical and chemical test conditions of each pore volume test. In addition, the best fit curve to the column test data indicates that initial seepage chemistry would be more concentrated than that indicated by the pore volume one concentrations. This is generally indicated in the field data for the Smoky Canyon Mine overburden seeps which have selenium concentrations greater than the pore volume one concentration. Thus we believe that a more realistic modeling approach is to take multiple concentration values off the best fit column test curve to predict concentrations at fractional pore volumes beginning at the first fraction of a pore volume and decreasing over time through multiple pore volumes. We agree with the comment, that at pore volumes 3 and greater, the weighted average selenium concentrations in the seepage are likely to be less than the current MCL. However, based on the HELP infiltration information, it would take approximately 91 years for each pore volume to move through the overburden fills so it could take approximately 250 to 300 years before pore volume 3 is reached.

Response 6-59

The BLM and USFS do not agree that temporary storage of seleniferous overburden in Alternative A will have a similar impact on groundwater as the Proposed Action (see Response 6-54). The commentor makes a good point that thicker seleniferous overburden may produce greater concentrations in the seepage but we have no data to allow an estimation of what these differences may be or their significance. This effect has been qualitatively considered in comparison of alternatives.

areas. This effect has not been considered in selection of Alternative A as the preferred action.

Alternative A – No External Disposal of Seleniferous Overburden

6-60

On page 4-59, in a discussion of model results for Alternative A, in which overburden is disposed across a smaller area but in thicker sections, it is pointed out that this difference in overburden placement could have an effect on the selenium concentrations in underlying groundwater, but, as pointed out in our previous general comment, "*This effect is not accounted for in the groundwater modeling.*" For this reason, it is difficult to compare the model results from the Proposed Action and Alternatives A and B, and it is not possible to identify the alternative that provides the highest degree of groundwater protection from the model results alone. This point should be better made in the DSEIS so that decision makers understand the limitations of the selenium transport model, and do not rely too heavily on the modeled outcomes, when identifying their preferred alternative and developing a mine plan for this area.

Response 6-60

As described in Response 6-59, the agencies have no data to support an objective analysis of the different selenium concentrations in seepage from different thicknesses of seleniferous overburden. However, we have recognized that this is possible in the text of this FSEIS. It is clear that permanent placement of approximately 240 acres more seleniferous overburden would expand the area of the groundwater impact by approximately the same acreage even though the volume of seleniferous overburden remains the same. We understand the limitations of the groundwater modeling with regard to predicting the quantitative water quality impacts with precision. This is explained in the DSEIS. We think the model results are reliable when comparing approximate areas of these impacts.

Section 4.3.1, Groundwater Impacts, Page 4-54

A brief discussion of the models' uncertainties is included here, and the reader is referred to the Groundwater Resources Technical Report for additional details.

6-61

Because a technically valid interpretation of the model results is so critical to the decision makers reviewing the DSEIS, the additional uncertainty discussion included in the technical report should be provided within the SEIS document itself along with the explanatory information that we suggest including in our general comments from Section 4.2.2.

Response 6-61

The recommended inclusion of the description of the model uncertainties contained in the technical report has been made to Section 4.3.1 of this FSEIS.

Section 4.3.1, Groundwater Impacts, Pages 4-54 to 4-55

6-62

This section discusses use of the first pore volume result from the column tests as the model input value for selenium in leachate and explains the conservative nature of this approach. On the basis of this conservative approach, a statement is made that "*...the actual long-term selenium concentrations in the groundwater under the proposed facilities could be 2 to 5 times lower than the concentrations estimated in the impact analysis.*"

6-62

This view is consistent with the following conclusion made in the modeling report prepared by Mayo and Associates (included as Appendix C to Technical Report 3.0 Water Resources):" *Modeling results indicate that the proposed mining operations will not result in groundwater contamination exceeding drinking water standards beyond the Proposed Action area...*"

6-62

If this is a technically valid interpretation of the model results presented in the DEIS, then it should have been clearly stated in the Summary prepared for Section 4.3, Water Resources (pages 4-20 to 4-22).

Response 6-62

The cited wording in the technical report was not included in the DSEIS because it was intended to be a general statement without regulatory significance. The extent of the area of groundwater concentrations greater than the MCL is factually reported in the SEIS and does not need to be modified by the cited statement from the technical report.

Section 4.3.2 Irreversible and Irretrievable Commitment of Resources, Groundwater Resources

6-63

We agree that the selenium transport modeling performed in support of the Draft SEIS demonstrates that long-term infiltration of water through the overburden and into the Wells Formation aquifer results in t detectable changes in water quality as a result of the Proposed Action (and Alternatives). However, it is not possible to delineate the areal extent or quantify the magnitude of those changes using the model output provided, as the DSEIS currently does, due to the large uncertainties associated with critical model inputs and the simplicity of the modeling approach, which may not account for numerous chemical and physical processes potentially controlling selenium fate and transport in the subsurface.

Section 4.3.3 Residual Adverse Impacts, Groundwater Resources

6-64

A statement is made here that the concentration of contaminants in infiltrating water is likely to decrease as "*steady state conditions are approached*," but it is not clear what conditions are being referred to. In addition, the 1000+ year time frame is unrealistic as there is not enough leachable selenium present in overburden to be released at the rates modeled for a period of more than 1000 years. A clarification of this statement, or more in-depth consideration of long-term effects including effects from reduction in selenium leaching rates over time, should be added to make this information useful to decision makers reviewing this document.

Response 6-63

The model results do predict certain ranges of concentrations of COPC in the Wells Formation aquifer at different time steps. These concentrations can be contoured and used to determine areas of impacts and compare alternatives. The uncertainties in the accuracy of these predictions were disclosed in Section 4.3.1 of the DSEIS and are elaborated upon in this FSEIS. Thus the uncertainty in the impact magnitude and delineation accuracy is recognized by the BLM and USFS as is the fact that these predictions have been rendered with all the available data using widely accepted methods by experienced groundwater professionals. We therefore believe that the predicted impacts are useful in determining potential compliance with State groundwater protection rules and in comparing impacts of various alternatives.

Response 6-64

Using information from Munkers (2000), the selenium concentration in the Middle Waste Shale from the Smoky Canyon Mine is generally below 150 mg/kg with some beds as high as 250 to 300 mg/kg. For this calculation, we have assumed the selenium concentration in the seleniferous overburden is 100 mg/kg. From the discussion of column test results in Section 4.1.1, the selenium content in pore volumes 3 and greater is approximately 0.047 mg/l. From the HELP 3 modeling, the Proposed Action seepage is approximately 14,800 cubic feet/acre/year over a total seleniferous overburden area of approximately 722 acres which equals 10.69 E6 cubic feet of water per year. Based on the above, the potential long-term annual selenium loading in the seepage would be:

10.69 E6 cf water x 62.4 lb/cf water x 4.7 E-8 conc. = 31.4 lb/yr

From Simplot, the total volume of Middle Waste Shale to be removed from Panels B and C is 14.94 E6 bank cubic yards. Using Simplot's tonnage factor of 1.65 tons/bcy, the tons of Middle Waste Shale would be 24.65 E6 tons. The total pounds of selenium present in this amount of Middle Waste Shale would be:

24.65 E6 tons x 2000 lbs/ton x 1.0 E-4 conc. = 4.93 E6 lbs

USGS studies in southeast Idaho have reported concentrations of selenium in unweathered and weathered Middle Waste Shale from different locations. We interpret these data to indicate that weathered Middle Waste Shale has about 50 percent the selenium concentration of unweathered shale. This is an indication of the amount of contained selenium that is leachable from the shale over geologic time. For this analysis, we will assume that 50 percent of the selenium in the shale would be leachable over the long term.

The time to leach out the available selenium (50 percent of the total content) in the Middle Waste Shale to be deposited in the Panels B and C overburden fills is:

(4.93 E6 pounds x 50%)/31.4 lbs/yr = 78,503 years

Recognizing that more selenium would be lost in the first few hundred years because of the higher concentrations in the seepage, the above figure would be

reduced significantly but it is still reasonable to describe the time frame over which selenium would be mobilized to seepage from the overburden fills as "thousands of years". This should not be interpreted as stating that there will be significant groundwater quality impacts for thousands of years. The column test data indicate that seepage from the overburden could have a selenium concentration less than the MCL within about 200 to 300 years. The selenium concentration in the groundwater would be expected to be less than the MCL during the second pore volume (100 to 200 years).

4.3 Mineral Resources

The regulations at 43 CFR 3500, entitled "Solid Minerals Exploration and Mining Operations," along with the Federal Land Policy and Management Act of 1976 (FLPMA) and the Mineral Leasing Act of 1920 (41 Stat. 437) require the agencies to analyze proposed mining operations to ensure that exploration and mining plans are consistent with and responsive to requirements of the lease, license, or permit.

Simplot acquired the federal phosphate leases Idaho 012890 and Idaho 026843 within the Smoky Canyon Mine area as early as 1962 in order to mine the phosphate ore deposits, including the B & C Panels. The intended use of the phosphate ore was (and still is) to provide feedstock for the Don Plant to produce fertilizer products.

Following an interval of permitted exploration activities and evaluation of the data gathered, the economic viability of a mine was established as a firm possibility. The regulations at 43 CFR 3500.0-5 define a valuable deposit as a deposit of a character that would justify further expenditure of means and labor with a reasonable prospect of success in developing a valuable mine. Based on the evaluation studies and the regulations, a conceptual mine plan was submitted to the BLM for the development of the economically recoverable resources within the Smoky Canyon Mine area. The 1982 final environmental impact statement (FEIS) for the Smoky Canyon Mine approved the Mine Sequence Option C of all the alternatives considered. This allowed the mining of five panels (A, B, C, D and E) within the Smoky Canyon Mine area.

The J.R. Simplot Company has complied with all the rules, regulations and requirements issued in accordance with the Mineral Leasing Act of 1920, the Federal Land Policy and Management Act of 1976 and 43 CFR 3500 Solid Minerals Exploration and Mining Operations as set forth in the above mentioned leases, attachments, records of decision or conditions of approval in those portions of the Smoky Canyon Mine area that have already been mined.

Following an interval of permitted exploration activities and evaluation of the data gathered, it was concluded that the economic viability of a mine was a firm possibility. 43 CFR 3500.0-5 defines a valuable deposit as a deposit of a character that would justify further expenditure of means and labor with a reasonable prospect of success in developing a valuable mine. Based on the evaluation studies and the aforementioned definition a conceptual mine plan was submitted the BLM for the development of the economically recoverable resources within the Smoky Canyon Mine area. The 1982 final environmental impact statement (FEIS) for the Smoky Canyon Mine approved the Mine Sequence Option C of all the alternatives submitted. This allowed the mining of five panels (A, B, C, D and E) within the Smoky Canyon Mine area.

The proposed project (Panels B and C) is the continuation of the original plan to mine all five (5) of these panels. The proposed action is designed to recover as much ore as is economically possible, so as to fully utilize this resource.

4.4 Wildlife Resources/Fisheries and Aquatics/ESA

4.4.1 Wildlife Resources

6-65

The Proposed Action and the Alternatives A and B will result in removal of 618 acres of forest and shrub vegetation, which will have a temporary impact on regional wildlife. Indeed, the Proposed Action and Alternatives A and B will have nearly identical impacts to regional wildlife. Simplot concurs with the DSEIS' conclusion that, over time, impacts to regional mammals and birds are not likely to be significant.

Response 6-65

Comment noted.

6-66

Simplot is concerned about potential confusion over a referenced study by Rattie and Garton that discusses selenium measurements in egg tissues at both "non-mining and mining areas" in southeast Idaho. The types of mining areas at which these measurements were taken should be specified so that the reader understands whether or not site conditions are similar to the Smoky Canyon project.

Response 6-66

Regardless of the type of mining area, the fact still remains that selenium levels in egg tissues on mining sites were reported by Rattie and Garton (2000) to be higher than non-mining sites.

Simplot is committed to reducing and mitigating impacts to wildlife by taking verifiable steps to protect wildlife, including capping and reclamation of the disturbed area to isolate seleniferous overburden from the surface environment.

4.4.2 Fisheries and Aquatics Resources

6-67

Smoky Creek from the mouth of the canyon to upstream of the Smoky Canyon Mine is intermittent and typically dry except during spring runoff. As a result, road building and mining activities associated with the Proposed Action and Alternatives are located in intermittent stretches of Smoky Creek and will not affect fisheries. Similarly, downstream impacts of the Smoky Canyon Mine, the Proposed Action, and Alternatives A and B will comply with applicable ambient surface water quality standards and not affect the fisheries.

Response 6-67

The agencies agree with the comment and have essentially stated as much in the DSEIS.

6-68

In some instances, particularly in DSEIS Section 4.8, the DSEIS is confusing and contradictory regarding highly speculative impacts on fisheries and aquatic resources. For example, the last sentence in the Summary on DSEIS 4-85 states that "road fill in Smoky Creek channel would create fish migration barriers for cutthroat trout and other native fish." Yet, DSEIS 4-86 reminds the reader that "[a]s stated in Section 3.8, Smoky Creek is intermittent at these crossings with flows too low to accommodate spawning trout." Similarly, DSEIS 3-101 says that "Roberts Creek is not perennial and lacks sufficient intermittent flow to support a fishery as is Smoky Creek several hundred feet upstream of the beaver ponds." Since the DSEIS repeatedly confirms that no fish were identified in the road crossing locations, this confusing language should be revised and the potential impact to fisheries should be removed from the DSEIS.

Response 6-68

The cited summary paragraph explains issues and indicators (concerns) identified from public and agency scoping, these are not necessarily a statement of fact relating to the local environment. These issues were then analyzed in the DSEIS in detail to quantify impacts to the related resources. There is no inconsistency in the cited text as written in the DSEIS.

6-69

For reasons not explained within the DSEIS, the document compiles information developed for the Dry Valley Mine FEIS regarding bioaccumulation of selenium and trace metals. This information suffers the same flaws as found in the Dry Valley Mine FEIS in that it fails to characterize the geographic applicability of the various Skorupa and Lemley studies, note the findings of their research putatively relative to the regional phosphate production area, or include conclusions from more regionally specific studies. Much of Skorupa's and Lemley's work cited is based in part on results from the Kesterson National Wildlife Refuge that had closed drainage systems so that constituents of concern from irrigation use were concentrated in that area. Additionally, and significantly, Kesterson Wildlife Refuge was used year round by waterfowl and shorebirds, while the Dry Valley South Extension area habitat and the Smoky Canyon Mine area habitat is used only seasonally by these species. Thus, both the nature of the system and the seasonal use of the habitat distinguish the Kesterson situation from Dry Valley Mine and from Smoky Canyon Mine. These important differences should be identified and the resulting implications discussed in the FSEIS.

In any case, the DSEIS concludes that "[l]ong-term impacts to aquatic resources as a result of bioaccumulation or uptake of selenium from seleniferous overburden are not anticipated from implementation of the Proposed Action or Alternatives when the proposed reclamation activities are carried out (i.e., capping seleniferous material with 10-feet of chert material and then 1 to 3 feet of topsoil)."

Simplot remains committed to taking these and other steps to reduce and mitigate impacts to fisheries and aquatic resources.

4.4.3 Threatened, Endangered, and Sensitive Species

The DSEIS devotes considerable discussion to the potential for impacts to threatened, endangered, and sensitive species, but ultimately concludes that "[t]he Proposed Action has limited potential to impact listed or sensitive species." While "the project area supports potential habitat for some listed and sensitive species," it is occupied by "only a few of these species." "No listed or sensitive plants have been found in the area, though potential Ute ladies'-tresses habitat and marginal habitat for Cache's beardtongue exist in the area."

According to the DSEIS, "[t]he highest probability of listed species use of the area would be bald eagle foraging at the tailings impoundment. Should bald eagles begin to regularly feed on waterfowl which in turn regularly foraged at the tailings ponds, or on fish inhabiting the ponds, the eagles could begin to accumulate elevated levels of selenium or other trace elements."

Response 6-69

The summary of the bioaccumulation of selenium in aquatic systems within the DSEIS was tiered from the Dry Valley Mine FEIS because it was the most recent compilation of data available. The Dry Valley Mine FEIS was published less than 6 months prior to the writing of the Smoky Canyon DSEIS and the agencies thought the general information on selenium in the Dry Valley FEIS was applicable to Smoky Canyon. It can be reasoned that the chemistry of selenium uptake in aquatic organisms (rates and concentration) occurs within the same parameters regardless of geography or the parent source of selenium. Many of the experiments to ascertain toxic effect levels of selenium in numerous animal species including salmonids in Califomia's Kesterson Wildlife Refuge were actually conducted in laboratories to control the environmental conditions.

6-70

Simplot concurs with the DSEIS' conclusions that threatened, endangered, and sensitive species will not be adversely affected by the Proposed Action or Alternatives. However, Simplot is concerned that the lengthy and plodding discussion of these issues confuses the reader. The sentence referenced in the preceding paragraph provides a good example of how highly speculative impacts on Bald Eagles (if (1) eagles began to regularly feed on waterfowl and if (2) those waterfowl regularly foraged at the tailings ponds or on fish inhabiting the ponds, then (3) eagles could begin to accumulate elevated levels of selenium or other trace elements, but "no studies have been conducted within the Cumulative Effects Area to specifically evaluate the effects of selenium in water, invertebrates, or wetland vegetation on wildlife") are offered as "the highest probability of listed species use of the area." If this is the "highest probability," scenario, the reader needs to understand the uncertainty (or probability) of such a scenario occurring. In other words, the discussion needs to focus on known effects, not speculative ones.

6-71

Also, the DSEIS fails to relate the "no effect" or the "may affect, but is not likely to adversely affect" determinations made in the Biological Assessment/Biological Evaluation (BA/BE), which is referenced, but not discussed in the DSEIS. Similarly, although the DSEIS claims that consultation under the Migratory Bird Treaty Act and Bald Eagle Protection Act is underway, it provides no detail.

Response 6-70

Baseline surveys conducted by Maxim did not find bald eagles utilizing the tailings pond. As a large body of water that supports fish and attracts some waterfowl, the tailings ponds represent a potential foraging area for wintering bald eagles. The possibility that bald eagles, a listed species, could begin to forage on waterfowl or fish inhabiting the tailings pond, therefore, must be addressed. Recent discussions with the Forest Service, conducted in conjunction with a USFWS evaluation of potential impacts to bald eagles under Section 7 of the Endangered Species Act have suggested the ponds are largely ice-covered by the time wintering bald eagles arrive in the Sage Valley area. The paragraph in question has been revised in the FSEIS.

Response 6-71

The DSEIS summarizes the findings (determinations) of the BA/BE documents, without recapping the "findings" included in the BA/BE. The BA/BE format sets a specific set of criteria for its findings. In the case of the Proposed Action, findings of "No Effect" and "May Affect - Not Likely to Adversely Affect" were made for listed species potentially inhabiting the area. A "No Effect" determination is warranted when a project or activity will not have any effect on a listed species or its critical habitat. A "May Affect - Not Likely to Adversely Affect" determination is warranted when it is found a project or activity will have effects on a listed species or critical habitat, but those effects are not likely to adversely affect listed species or critical habitat.

For sensitive species inhabiting or potentially inhabiting the project area, findings of "No Impact," and "May Impact Individuals or Habitat, But Will Not Likely Contribute to a Trend Towards Federal Listing or Cause a Loss of Viability to the Population or Species" were made. A "No Impact" determination is made when a project or activity will have no environmental effects on habitat, individuals, a population or a species. A "May Impact Individuals or Habitat, But Will Not Likely Contribute to a Trend Towards Federal Listing or Cause a Loss of Viability to the Population or Species" is warranted in cases where the effects of activities or actions on a species or its habitat are minor, or are consistent with Conservation Strategies of conservation of the species. Because sensitive species have been designated based on concerns for their viability, impacts to individuals or a population should be given careful consideration when making this determination.

5.1 Mineral Resources

5.1.1 Alternative A

The regulations at 43 CFR 3590, administered by BLM, require submittal of a mine and reclamation plan for BLM review. The regulatory scheme provides for orderly development of mineral deposits without waste or damage to deposits, and promotes maximum recovery using operating practices that will avoid, minimize, or correct damage to the environment. Section 3594.1(a) of the regulations requires mining operations to be conducted in a manner that yields maximum recovery of mineral deposits, while recognizing the need to protect other environmental resources.

Simplot recognizes the need to protect environmental resources and the importance of using operating practices that will avoid, minimize or correct damage to the environment. Management practices and mitigation measures have been developed for the mining operations to minimize or avoid adverse environmental impacts and to provide for the eventual reclamation of most of the disturbed land. This is exemplified by the acceptance of the recommendations of the Selenium Committee's Best Management Practices Guidance Manual and the development of the Reclamation Plans, the Storm Water Pollution Prevention Plan and Selenium Mitigation Action Plan. The latter plan addresses impacts from current mining in the E- panel and the past mining in the A- and D-panels, while the SEIS addresses mining scheduled for the near term at B & C Panels. These plans and other operating practices recognize and address the need to protect the environment.

6-72

However, the mine plan proposed by Alternative A, and even more so under Alternative B, seems contrary to the directive in 43 CFR 3590 and 43 CFR 3594.1(a) regarding the orderly development of mineral deposits without waste or damage to deposits while promoting maximum recovery. If Alternative A is selected, the recovery of 2.68 million tons of ore will be excluded from the mine plan, because the mine Plan submitted in the 1982 FEIS, and the subsequent detailed plans submitted for each of the panels, were based on the assumption of no rehandle. The Proposed Action, as well ash Alternative A and Alternative B, have been indirectly modified from the economically acceptable mine plan initially submitted in 1982 and most recently in June 1999.

The Proposed Action, Alternative A, and Alternative B all now require a certain percent of rehandle, amounting to 4%, 13% and 33% respectively. Under normal operating procedures, overburden or non-ore rock from the mine initially would be placed in external surface dumps (outside the pit area). As areas are mined to completion, overburden from subsequent mining areas would be used to backfill the mined- out pits.

Response 6-72

As shown in Appendix 1A, 43 CFR 3590 provides for "the orderly development of mineral deposits without waste"...and "promotes maximum recovery using operational practices that will avoid, minimize, or correct damage to the environment". The interpretation is at the discretion of the lead agency.

Alternative A was included in the environmental analysis because of the agencies' concern over the potential development of seleniferous overburden seeps at the downhill margin of the overburden disposal area. These types of seeps have been observed at existing overburden fills at the Smoky Canyon Mine and other phosphate mines in southeast Idaho.

The agencies recognize that they approved a mine plan for the B and C Panels after the 1982 FEIS was completed. However, the significance of the selenium issue was not recognized at that time. The agencies are within their authorities under NEPA to response to the new information that has been and is continuing to be produced on the selenium issue in southeast Idaho. In addition, the agencies can require modification to existing approved mine plans as required if changing conditions or information warrant [43 CFR 3592.1 (c)].

6-73

The mine plan for the Proposed Action and Alternative A calls for a portion of the rock in external overburden disposal sites to be picked up or remined and placed back in the mined out pits. The effect of rehandle is to increase the amount of burden handled with no increase in ore recovered. This increases the cost of recovering the ore. The agencies estimated the additional cost of the rehandle for Alternative A to be $5.3 million. However, our own calculated cost, based on our current operational figures, for the rehandle in Alternative A produces a more realistic figure closer to $6.8 million.

Response 6-73

Revised rehandling costs have been added to the description of the alternatives in this FSEIS.

6-74

As a result of the additional rehandle or increased burden to be moved, the economics of mining the panels must be refigured to meet corporate expectations. Based on past experience, the Smoky Canyon Mine knows that it can meet cost expectations if it keeps the stripping ratio within a certain range. The magnitude of the increase in the stripping ratio associated with Alternative A cannot be absorbed into the mining cost. The only way to reduce the increase in the effective stripping ratio due to rehandle is to eliminate some of the deep or high cover areas from the mine plan. However, the elimination of high cover also eliminates or leaves in the ground some of the previously recoverable ore. In addition, the interrelationship of the pits, for reasons of logistics, and the resulting highwall configuration, for reasons of safety, must also be taken into account. Using an iterative process of moving or changing the highwall and recalculating the stripping ratio for each scenario results in the loss of 2.68 million tons of recoverable ore or 22% of the original recoverable ore in B & C Panels. This represents one year's production at the current rate of extraction, so the expected 4.6 years of production in B & C Panels would be reduced to 3.6 years. This obviously contradicts the policy of the mine plan regulations to avoid waste and to endeavor to maximize recovery of the deposit.

Response 6-74

The information provided by Simplot in this comment has been added to Chapter 2 of the FSEIS.

6-75

The approved 1982 FEIS acknowledged that approximately 30 percent of the overburden and interburden waste that would be mined would have to be transported and placed in external dumps and that the remainder would be backfilled into mined-out pits. Under the Proposed Action for B & C Panels, only 29.2% of the total overburden and interburden would be placed in an external dump.

Response 6-75

The information provided has been added to Chapter 2 of this FSEIS.

6-75

The Approved Action Alternative from the 1982 FEIS allowed for the utilization of Smoky Ridge (site I). In the evaluation of the waste disposal sites the Smoky Ridge ranked the highest of all sites and was common to all the alternative mine plans. Overburden from B & C Panels would initially be placed in the surface Smoky Ridge dump. As areas that were mined to completion, overburden from subsequent mining areas would be used to backfill the mined out pits. The original Smoky Ridge site covered 300 acres. That which was submitted as the Proposed Action for the B & C panels covers only 267 acres.

6-76

The 1982 FEIS estimated that approximately 70 acres of mine pit would remain unreclaimed. Our current abandonment plan for all panels including the Proposed Action for B & C is considerably less than this, more like half the figure estimated in 1982. Under Option C, it was acknowledged that the mining of the five panels (A, B, C, D and E) would result in the south end of panel E being left unfilled and the southeast end of panel B being left unfilled. This means that no rehandle would be required to completely fill all the pits or to even partially fill any of the pits. Alternative A for B & C Panels does not allow for this now.

Response 6-76

The information provided in the comment has been added to Chapter 2 of this FSEIS.

5.1.2 – Alternative B

6-77

In the case of Alternative B, all of the rock in the external overburden disposal site will be picked up and placed back in the pits. As stated earlier, the effect of rehandle is to increase the burden handled with no increase in ore recovered with the consequent increase in the cost of recovering the ore. The agencies estimated the additional cost of the rehandle for Alternative B at $15.8 million. Our own calculated cost based on our current operational figures for Alternative B produces a cost figure of $16.8 million. An increase in cost of this magnitude would relegate the reserves of B and C Panels to the category of non-mineable. The remaining recoverable reserves in B and C would reduce the mine life to 1.6 years. Obviously, this alternative is inconsistent with the 1982 FEIS and with continued orderly operation of the Smokey Canyon Mine.

Response 6-77

The information provided has been added to the description of this alternative in this FSEIS.

5.2 Air Resources

The Smoky Canyon mine is located in an area that meets all the National Ambient Air Quality Standards (NAAQS) under the Clean Air Act. The ambient air monitoring sites in the area typically monitor background levels for criteria pollutants, which means the monitors cannot detect an impact from the mining activity. Furthermore, the area is designated Class II under the Prevention of Significant Deterioration program, which would allow for some degradation of air quality. (Class I areas, such as national parks, monuments, etc. present heightened concerns; the project here is not within such an area or even located within a proximity to such an area deemed relevant under the Clean Air Act.)

The criteria pollutant most often of concern in mining operations is particulate matter, measured as PM10 (that fraction of the Total Suspended Particulate (TSP) considered under Clean Air Act regulation to have a health impact). As the DSEIS notes (at 4.2.1), the particulate matter emissions are mainly generated by the extraction (as well as the handling and movement) of the ore and overburden. This fact makes the differences

between the Proposed Action and Alternatives A and B in the amount of material rehandled important for air quality purposes.

Under the Proposed Action, the estimated emissions of particulate matter air pollution remain in the neighborhood of particulate matter emissions from current operations – the emission level of 194 tons per year (tpy) of PM10 for existing operations only increases to 233.5 tpy of PM10 for the Proposed Action. [DSEIS, at Table 4.2-1].

6-78

Alternatives A and B both have tremendously greater impacts on estimated emissions of particulate matter, which is directly related to the amount of rehandling of material involved. Alternative A would require rehandling of 13% of the overburden, which is more than three times the amount of overburden rehandled under the Proposed Action. (The Proposed Action requires rehandling just 4% of the overburden material.) The difference with Alternative B becomes even more dramatic – it would require rehandling over eight times as much overburden as the Proposed Action. In other words, Alternative B would require that a full one-third of all the overburden to be moved twice.

6-78

This difference in amounts of materials moved, as well as differences in use and length of haul roads, results in estimated emissions for Alternative A of 330.5 tpy of PM10, which is more than one third higher than the Proposed Action estimate of 233.5 tpy. Again, Alternative B presents even more dramatic results; it more than doubles the estimated emissions level, from 233.5 tpy for the Proposed Action, to 498 tpy PM10 for Alternative B. The numbers grow even more dramatic when all particulate matter, not just the fraction less than ten microns, is considered. For the Proposed Action, the estimated TSP emissions are 486.5 tpy. Again, this remains in the neighborhood of the emissions from current operations (415 tpy). For Alternative A, the TSP emissions are 1093 tpy, more than twice the amount of the Proposed Action. For Alternative B, the TSP emissions graduate to 1400 tpy.

6-78

These increased emission levels obviously have an impact on local air quality, although the impact is not one that rises to the level of regulatory significance, as the DSEIS recognizes. For Alternative A, a 22 percent higher impact at five-mile receptor sites was predicted, when compared with existing conditions, but both levels were well within the NAAQS. Once again, Alternative B has the most deleterious impact on air quality – the impact at the five-mile receptor sites was predicted to be 29% higher (but still within NAAQS limits).

6-79

As the DSEIS notes (at 4.2.2.), air pollution readily dissipates with time and space, and thus does not represent an irreversible or irretrievable commitment of resources. However, the emissions during the time of the project are real and quanitifiable, and should be a factor that weighing into the selection of the Proposed Action, particularly when the impacts on other resources are concluded to be negligible (surface water) and over predicted under an ultraconservative model (groundwater).

5.3 Economic and Social Resources

5.3.1 – Alternative A

6-80

The economic impact of Alternative A would be to reduce the life of the B & C Panels by 1 year. The possibility of a temporary shutdown of the mine could arise if the next mine plan for Manning Creek could not be permitted and allowed to proceed within the 3.6 year life of the B & C Panels. This would be a very tight schedule to meet considering that the exploration drilling program for Manning Creek will not be completed until the middle of October and the mine plan will not be submitted until spring of next year, 2002.

Response 6-78

The comparisons described in the comment are shown in Tables 2.6-1 and 4.2-1 of the DSEIS and are described in Section 4.2.

Response 6-79

The comparison of the air emissions for the different alternatives is shown in Table 2.6-1 of the DSEIS.

Response 6-80

Under Alternative A, the costs of selective handling of overburden would change the economics of mining Panels B & C. This is suggested in the Draft SEIS text on the top of page 4-112. "In order to accommodate these increased costs, Simplot would consider revising the mine plan to reduce stripping ratios which would result in less ore being mined and a smaller utilization of the non-renewable phosphate resource." The agencies appreciate the Mine planning and scheduling required in order to maintain production commitments. However, there is no data provided to substantiate the potential for temporary shut down of the Mine. It is possible that Simplot would take measures to avoid even a temporary shut-down. The Mine could choose to extract all the ore as planned under the Proposed Action, however at a reduced rate of return.

6-81

Experience indicates that Simplot needs between one and one and a half years overlap between the shut down of one project and the startup of the next project. This provides time to open up the new pit while still maintaining current production commitments in the old. The overlap time is even more critical in this case since we will be installing an overland conveyor to move the ore from Manning Creek to the mill and must cover about 10 miles between projects. Considering that the approval time for mine plans has increased with each submission (with the latest hovering at 2 ½ years from submission to approval), a temporary shut down of the mine is a real possibility. If Smoky Canyon Mine runs out of ore because of the shortened mine life of B & C Panels, the fertilizer plant in Pocatello (the Don Plant) also will be at risk of not operating. The combination of shutdown of both the mine and the fertilizer plant, for even a relatively short period of time, would have an extremely deleterious impact on the economy not only of southeastern Idaho, but of the entire state.

Response 6-81

The elements of long term planning, experience, and expertise are evident in this scenario, however, there has been no data provided by Simplot to substantiate it. The possibility exists that Simplot could choose to utilize a temporary alternative source of ore , or mine deeper to recover additional phosphate ore from open pits at Smoky Canyon Mine (although lower grade phosphate ore may result), in order to maintain the operation of the fertilizer plant, should the operation of Panels B & C prove not to provide adequate overlap in production. The Mine could also proceed with extraction of ore as planned under the Proposed Action, however at a reduced rate of return. It is possible that the Mine would take all possible measures to avoid even a temporary shutdown, as noted in the response to comment 6-80.

5.3.2 Alternative B

6-82

Alternative B would very likely result in the closure of the Smoky Canyon Mine and the Conda Pump Station with the loss of 205 jobs. The Smoky Canyon Mine is the largest employer in the Star Valley area of Lincoln, County Wyoming. The mine impacts a four-county rural area near the Idaho-Wyoming border.

6-82

Most workers at the Smoky Canyon Mine live in the Star Valley area of Lincoln, County. Closure of the Smoky Canyon Mine would have a severe effect throughout the entire county. Employees of the Smoky Canyon Mine live in the rural communities of Fairview, Smoot, Afton, Grover, Auburn, Thayne, Freedom, Etna, and Afton Wyoming. These employees have a direct payroll of $9.81 million dollars, with an additional $3.79 million in medical, dental, education, and retirement benefits.

6-82

The Smoky Canyon Mine is located in Idaho's Caribou County. The mine pays over $500,000 to Caribou County for property taxes each year. In addition, the mine pays $2,075,000 in mineral royalties each year to federal, state and county governments. Caribou County receives just under $100,000 (4.8%) of the mineral royalty payments.

6-82

The Conda Pump Station, which is a pressure boosting operation for the ore slurry pipeline between Smoky Canyon Mine and the Pocatello fertilizer complex, is also located in Caribou County. With the closure of the Smoky Canyon Mine, the Conda Pump Station would also close, resulting in 13 additional people from Caribou County left without work.

6-82

Also, the viability of the Don Plant in Pocatello would be at risk. Alternative sources of feedstock for the plant could not be readily purchased on the open market because the Don Plant is designed to receive beneficiated ore concentrates, not raw ore. This limits potential suppliers to only those able to provide beneficiated ore concentrates. In addition, the processing systems at the Don plant are currently configured to process ore from the Smoky Canyon/southeastern Idaho area. Other sources of ore may require modification of the Don Plant process. Given the successful history of the Don Plant in consistently producing quality fertilizer products for over a half a century, this result is untenable.

Response 6-82

Under Alternative B, the additional costs of re-handling overburden would further change the economics of mining Panels B & C. As noted on page 4-112 of the Draft SEIS: "Of the three alternatives that result in continued operation of the mine and fertilizer plant (the Proposed Action, Alternative A, and Alternative B), Alternative B is the most costly to implement, and would result in the lowest ore recovery and a smaller utilization of the non-renewable phosphate resource." The increased environmental mitigation costs would decrease Simplot's rate of return in mining Panels B & C. As a result of the mitigation measures, Simplot could mine less ore. Simplot has indicated that, under this Alternative, they may choose not to mine Panels B & C, however, as indicated above, it is possible that the Mine would take all possible measures to avoid shutdown.

6-82

The few other phosphate mines in southeastern Idaho are vertically integrated operations with their own milling and processing facilities, and the processing facilities currently require all the ore produced by these mines. Alternative ore supplies for the Don Plant would require opening new mining operations in addition to those already in production or currently planned and permitted. Failing that, the Don Plant would have to shut down, with the subsequent loss of 450 jobs in the Pocatello area. The Don Plant has an annual payroll of $28 million, with another $10.8 million in medical, dental, education and retirement benefits. The Don Plant spends nearly $80 million annually in the local economy, with another $20 million annually spent in capital construction and improvements. The economic foundation of Pocatello, Idaho, located in Bannock County, would be shaken with a loss of this magnitude. The Don Plant is located in Power County, Idaho, near the Power and Bannock County lines. The Don Plant pays over $2.23 million in property taxes to Power County annually.

Chapter 6 Related Topics

6.1 Methods to Minimize Groundwater Resource Impacts

As discussed in Chapter 4 of these comments, the Proposed Action has the potential for groundwater degradation. Thus, a discussion is warranted of what can be done to prevent or minimize such degradation. This discussion focuses on two general methodologies: Best Management Practices (BMPs) and the installation of infiltration barriers.

6.1.1 Best Management Practices

The Idaho Mining Association published in 2000 a detailed manual on Best Management Practices for Active and Future Phosphate Mines (Montgomery Watson, 2000). The manual contains nearly 50 such practices. Of these practices, a number of them work to prevent or minimize selenium mobilization in the environment. Specific practices for the Proposed Action include:

- Characterization and selective handling of seleniferous materials
- Use of drainage channels on overburden o minimize infiltration
- Control of runon to overburden areas
- Avoiding perennial and significant drainages
- Design of sediment controls off overburden fills
- Overburden grading to maximize runoff
- Overburden pile aspect to maximize southern or western exposures and minimize Infiltration
- Diversion of haul road runoff to avoid overburden areas
- Avoiding placement of snow removal areas on overburden
- Installation of chert and topsoil caps over seleniferous materials
- Minimization of surface area of disposal sites containing seleniferous material
- Avoidance of sensitive groundwater sources
- Reclamation and revegetation to enhance evportranspiration
- Leachate formation and transport control through material consolidation practices

- Basal layer control such as limiting bench height
- Minimization of mining oxidation by immediately covering sensitive materials.
- Modification or elimination of low permeability foundation material to prevent seep formation

The following list provides explanatory details on how key practices that affect groundwater quality will be incorporated into the mining of Panels B & C:

6-83A

a. Design of Sediment and Runoff Controls

Sediment control basins (e.g., ponds and traps) will be located on native ground and thus will not contribute to infiltration through the seleniferous overburden. Under the mine plan for Panels B & C however, runoff collection basins will be constructed on the pit floors in Panels B & C as part of final reclamation. These basins will be composed of coarse rock (Rex Chert) over the Grandeur Limestone, which will be scraped clean of shale if necessary. The design intent of these basins is to collect clean, surface runoff from the final reclaimed surface for infiltration into the Wells Formation. This runoff would otherwise be lost as surface water flow and would not be considered as infiltration by the current transport model.

Response 6-83.A

See response 6-31.A

6-83B

b. Avoiding Perennial and Ephemeral Drainages

Surveys of the proposed mine areas and external overburden disposal site were conducted in preparation of the DSEIS to identify springs, seeps and other drainage features. Only two features were identified: Sheep Spring and Smoky Spring. The mine plan for Panels B & C locates overburden disposal areas so as to avoid placement within perennial or ephemeral drainages. In particular, the external overburden disposal site is located along the ridge top above the heads of surface drainage features. At Panel C, mining will remove existing drainages entirely. The Sheep Spring channel will be restored over the C Panel overburden backfill, as discussed below. Smoky Spring and the wetland area above it are both off the mine area over the Dinwoody Formation, which is the source of water.

Avoiding placement of seleniferous overburden over these drainage features eliminates the potential introduction of large volumes of water into the overburden, and consequently reduces the amount of water available for infiltration into the underlying Wells Formation.

Response 6-83.B

See response 6-31.B

6-83C

c. Control of Run-on

There will be no run-on to the Panel B backfill and the external overburden disposal site, both of which are along topographic highs. Diversion ditches are planned to route surface water run-on around the south part of the Panel C backfill. The construction would be similar to that used at Panel E currently. At Panel E, Simplot has captured the flow of a spring above the highwall and routed the flow around the active mine area. The flow is conveyed in a 10-foot-wide, 2-foot-deep channel with 1.5H:1V slopes and an overall grade of 4% to minimize erosion. On greater slopes, riprap, grass cover and/or protective mats would be used for additional erosion control.

Response 6-83.C

See response 6-31.C

Eliminating run-on of surface water from upslope areas will remove the potential for a portion of the run-on water to infiltrate the overburden.

6-83D

d. Drainage Channels on Overburden

The Sheep Spring discharge will be re-routed through a channel north of Panel C during the mining operation. Subsequent to mining, the spring discharge will be directed back to its approximate original course in a clay-lined channel over the backfill. The channel will be approximately 10 feet wide and 2 feet deep, with a 2-foot-thick clay liner. The backfill down to the base of the mined interval will be composed of the Rex Chert overburden to a distance of 50 feet from both sides of the new channel. Further, the pit floor will be scraped of shale to directly expose the permeable Grandeur Limestone. This construction will ensure that any water that escapes this channel will infiltrate vertically through permeable, non-seleniferous material to the Wells Formation.

Response 6-83.D

See response 6-31.D

6-83E

e. Overburden Grading

Final grading is accomplished as soon as practicable after overburden disposal. Approximately 3H:1V slopes are attained on overburden disposal areas with a minimum 2% grade on roads and the crowns of disposal areas. These grading measures will eliminate ponding and reduce the potential for incident precipitation and snowmelt to infiltrate the overburden.

Response 6-83.E

See response 6-31.E

6-83F

f. Overburden Pile Aspect

The mine plan for Panels B & C incorporates design features that maximize southern and western exposures of the overburden disposal pile and pit backfill slopes. The greater solar exposure on these slopes, relative to east- and north-facing slopes, will enhance evaporation and locally reduce infiltration into seleniferous overburden.

Response 6-83.F

See response 6-31.F

6-83G

g. Surface Area

Under the mine plan for Panels B & C, the footprint of the external overburden disposal area has been reduced to the maximum extent practicable. Minimizing the footprint of seleniferous overburden will reduce the amount of infiltration contacting seleniferous materials, and thereby reduce the percentage of recharge to the Wells Formation containing selenium.

Response 6-83.G

See response 6-31.G

These BMPs are expected to minimize the formation of dissolved selenium and if it should be formed, to reduce the likelihood of such material reaching groundwater.

6.1.2 Infiltration Barriers

6-84

Another potential method of protecting groundwater is construction of some type of physical barrier that prevents groundwater from infiltrating into the mine pits and overburden disposal areas. Such barriers, constructed of synthetic materials or clay, are common at solid waste landfills and similar disposal sites. Simplot evaluated the feasibility of such a barrier for Panels B & C. This evaluation included using clay from a nearby clay source.

6-84A

Specifically, for using the clay the following factors would need to be considered:

- Clay could only be hauled to the mine site for about five months of the year (mid-May to the end of September-middle of October).
- A dedicated road would need to be built to haul the clay to the mine. The existing road to the mine is not built to the specifications necessary to handle constant, heavy truck traffic. Nor does the existing road allow such truck traffic and concurrent public use.
- To meet air quality objectives, means would have to be made for suppression of dust on this road.
- Various permits and an EIS process would be needed to "mine" the clay, and to construct the road and other associated structures necessary for such a project. Thus, there would be significant environmental considerations from such a clay mine and new road that would need evaluation. The time frame for such environmental evaluations is inconsistent with the existing time frame for Panels B and C.

Response 6-84A

Please refer to the review of infiltration barriers in Appendix 2C of this FSEIS. The information provided in the comment has been incorporated in that review document.

6-84B

There are a number of practical, physical considerations that need to be considered for any barrier that is constructed.

- The slope distance on several of the reclaimed slopes will exceed 2,000 feet. It is not possible to place successive layers of crushed chert, clay and crushed chert in compacted lifts down these long slopes and maintain the integrity of any barrier. Likely, the slopes would have to be broken into one hundred foot high benches, thus giving a slope distance slightly over three hundred feet between the benches to emplace the material. This will decrease the capacity of overburden storage such that the footprint of the external dump will increase by 50%.
- Increasing the size of the external dump will necessitate the use of additional crushed chert and clay in the cap and will increase the amount of material that will require reclamation.
- The construction of "benches" will result in exceptional visual impairment, as it will not be possible to make the reclaimed area blend in with the surrounding topography.
- The differential settling often seen in backfilled and external overburden sites may occur. Differential settling of seven to eight feet does occur and cracks often develop. In order to protect the integrity of an infiltration barrier, measures will have to be taken to account for the settling.
- An unusual storm event could result in the loss of an entire slope. A slope over 2,000 feet long at 3:1 ratio, with an impermeable layer immediately below a highly permeable, blocky chert layer of an approximate twelve feet thickness would be susceptible to failure during an extreme storm event. The failure of such a slope could result in extreme water quality impacts in down gradient waterways due to sediment. Designing and building a "structure" to hold such a slope to handle during an extreme storm event would be very difficult.

Response 6-84B

The Infiltration Barrier Report, in the appendix to this FSEIS, describes the currently proposed slope configuration, and additionally proposed slope configurations that should address many of the considerations listed.

6-84C

Cost estimates were made for three synthetic liners (HDPE, PVC, and GCL) and a clay liner (see Appendix 8.9). The estimated costs for installing these barriers ranged from $82.4 million for the GCL liner to $107.7 million for the clay liner. The mine cannot absorb costs of this magnitude.

Response 6-84C

The Infiltration Barrier Report, in the appendix to this FSEIS, outlines the costs for all alternatives, some of which are less than the range of $82.4 million to $107.7 as listed in the comments.

6-84D

6.1.3 Summary

In conclusion, the installation of infiltration barriers at Panels B and C is not feasible due to the physical constraints in constructing such a barrier over a large area and due to the extremely high costs associated with such an undertaking. Moreover, these barriers pose their own environmental risks. Thus, the risks posed by infiltration barriers need to be accounted for when considering how best to protect groundwater versus other environmental factors. The Best Management Practices that are proposed for Panels B & C offer practical, effective means for minimizing groundwater contamination from the proposed project. As an infiltration barrier is not the panacea it may first appear, it must be rejected in favor of the BMPs, which can reliably protect the groundwater resource.

6.2 Application of State of Idaho Groundwater Quality Rule

As noted at DSEIS 2-40, the Proposed Action, Alternative A, or Alternative B each will cause some impact to ground water quality as a result of managing seleniferous overburden. Concentrations of contaminants of potential concern ("COPCs") contributed by seepage through the overburden are estimated to extend approximately the same distances as a result of the Proposed Action or either of the Alternatives. DSEIS 4-22.

6-85

Without diminishing the importance of taking specific and verifiable actions to eliminate or reduce project impacts on ground water, which Simplot is committed to do, it is critical that the DSEIS accurately describe the statutory or regulatory consequences of elevated levels of COPCs. In some instances, the DSEIS mischaracterizes the legal consequences of elevated COPCs. For example, the DSEIS states that:

Data collected at the overburden seeps at Simplot indicate concentrations of cadmium, manganese, selenium, sulfate and TDS were over the applicable groundwater quality standards.

DSEIS 4-39. This conclusory statement mischaracterizes the legal consequences of elevated COPCs in a number of ways:

6-85A

First, the discussion of seeps is intended to assess predicted infiltration chemistry. The DSEIS should not misapply ground water standards to surface water seeps.

6-85B

Second, while elevated levels of COPCs are identified in such data, those elevated levels are naturally occurring constituents found within a mineral extraction area. As a result, Idaho ground water quality standards do not apply to those elevated levels in the same manner as if the COPCs were introduced into uncontaminated ground water.

6-85C

Third, at DSEIS 4-44 and 4-45, the DSEIS suggests that ground water standards will be exceeded for some COPCs (manganese and selenium). Alleging exceedances presumes identification of the point at which compliance with ground water standards is required. That point of compliance has not yet been identified.

Response 6-84D

The Infiltration Barrier Report, in the appendix to this FSEIS, compares the various alternatives economically.

Response 6-85A

The Idaho groundwater quality standards do not apply to overburden seeps and the cited sentence from Page 4-39 of the DSEIS has been modified in this FSEIS to more clearly indicate that the comparison of the overburden seep water quality to the standards was not to make any legal conclusions but to help identify constituents of interest for further analysis in the groundwater impact analysis.

Response 6-85B

The IDEQ will make the determination as to the appropriate application of the Idaho Groundwater Quality Rule (GWQR) to the potential groundwater impacts predicted for the B and C Panels (see Letter #13).

Response 6-85C

The tables and text found in the DSEIS on pages 4-40 through 4-45 have been modified in this FSEIS to avoid interpreting the application of the numerical GWQR standards to the predicted impacts. This will be accomplished by the IDEQ in their preparation of a consent order for groundwater quality impacts from the B and C Panel operations.

6-85D

In Idaho, the Idaho Department of Environmental Quality ("IDEQ") protects ground water quality. Simplot has worked and consulted with IDEQ about ways to protect ground water quality at Smoky Canyon. Simplot understands that IDEQ believes that the potential ground water impacts anticipated from the Proposed Action or either of the Alternatives could be permitted under IDEQ's Ground Water Rule, which has a specific provision that addresses ground water contamination for mining operations.

> 06. Mineral Extraction. Naturally occurring constituents found in ground water within a specified area surrounding an active mineral extraction area, as determined by the Department, will not be considered contaminants as long as all applicable best management practices, best available methods or best practical methods, as approved by the Department, are applied.

6-85

IDAPA 58.01.011.400.06. By excluding a "naturally occurring constituent" from the definition of "contaminant," Section 400.06 of the Ground Water Rule renders these constituents not subject to the standards found in Section 200. As a result, the DSEIS cannot conclude, consistent with applicable law, that "applicable groundwater quality standards" are exceeded within the active mineral extraction area. The policy judgment underlying Section 400.06 is consistent and supports one of the policies for the Ground Water Rule generally:

> The policy of the state of Idaho is to protect ground water and allow for the extraction of minerals above and within ground water.

IDAPA 58.01.11.006.02.

6-85

The COPCs, including manganese and selenium, are "naturally occurring constituents" found in the shales at the Smoky Canyon Mine. For example, the selenium concentration of these shales are elevated when compared to the mean selenium concentration in rocks throughout the western United States. Thus, selenium would be expected to be present in ground water.

6-85

Simplot understands that IDEQ is working to develop a State-wide policy to define appropriate points of compliance for Idaho mining sites. Simplot anticipates that this policy will identify the mechanisms for determining the "active mineral extraction area" at mines throughout the State, including the Smoky Canyon Mine and the proposed development of Panels B and C. In addition, as noted in Chapter 4 of these comments, Simplot is committed to utilizing all applicable best management practices, best available methods, or best practical methods to eliminate or reduce ground water quality impacts of the COPCs.

6-85

However, at this point, it is fair to predict that ground water quality impacts associated with the Proposed Action or either of the Alternatives will comply with applicable ground water quality regulations and will not exceed applicable standards.

6-85E

Accordingly, Simplot requests that the text at DSEIS 4-39, 4-44, and 4-45 be changed to reflect that neither the Proposed Action nor either of the Alternatives is expected to exceed applicable ground water standards. In addition, Figures 4.3.3 through 4.3.10 and associated text at DSEIS 4-45 and 4-54 should be changed to

Response 6-85D

Letter #13 provides the IDEQ's interpretation of the GWQR to the predicted impacts for the B and C Panel operations. Simplot's comments are noted here but will be responded to by the IDEQ during their development of the consent order for the proposed operations.

Response 6-85E

The tables and text found in the DSEIS on pages 4-39 through 4-45 have been modified in this FSEIS to avoid interpreting the application of the numerical GWQR standards to the predicted impacts. This will be accomplished by the IDEQ in their preparation of a consent order for groundwater quality impacts from the B and C Panel operations.

reflect that the Proposed Action and either of the Alternatives would meet applicable ground water quality standards.

6.3 Tailings Ponds

The history of the tailings ponds and associated regulatory reviews were reviewed in Chapter 1. Besides this narrative history, Simplot provides below additional information on how the tailings ponds should be handled from a regulatory framework perspective during this current NEPA review.

6-86

6.3.1 The Tailings Ponds Are Not Currently Subject to NEPA Review

As noted in Chapter 1 above, the tailings ponds were subject to a site-specific EIS review in 1982 and 1983 and subsequent tailings ponds-specific EAs, most particularly in 1990. In addition, the tailings ponds' operation, closure, and reclamation are covered by existing federal and state requirements.

6-86

At this time, the tailings ponds are not subject to any ongoing permit or approval process. In NEPA terminology, there is no "proposal" for a federal action (whether or not a "major federal action,") concerning the tailings ponds. Without this prerequisite to NEPA review, no legal basis exists for review of the tailings ponds. There is no discretionary federal action.. Indeed, with respect to the tailings ponds, there is no proposal for action, federal or state, to evaluate under NEPA or any other statute. The tailings ponds are fully permitted and approved, and impacts of the tailings ponds have already been addressed and mitigated by other federal and state actions.

6-86

The DSEIS describes the tailings ponds in Section 2.1 as existing facilities and part of the current operations. The DSEIS properly omits discussion of the tailings ponds in Sections 2.2, 2.3, and 2.4 since they are not part of the Panels B and C "proposal." Finally, the DSEIS properly includes discussion of the tailings ponds in Section 4.16 as "cumulative" impacts within the cumulative effect area.

6-86

The CEQ regulations require that agencies consider actions that may be:

(1) Connected actions, which means that they are closely related and therefore should be discussed in the same impact statement. Actions are connected if they:

(i) Automatically trigger other actions which may require environmental impact statements.

(ii) Cannot or will not proceed unless other actions are taken previously or simultaneously.

(iii) Are interdependent parts of a larger action and depend on the larger action for their justification.

6-86

(2) Cumulative actions, which when viewed with other proposed actions have cumulatively significant impacts and should therefore be discussed in the same impact statement.

Response 6-86

The BLM and USFS have decided that the tailings ponds should not be included within the analysis of the Proposed Action and Alternatives because they are not connected actions and because they will be addressed under the site-specific AOC (see Responses 1-23 and 1-24). Simplot's comments are supportive of this decision.

6-86

(3) Similar actions, which when viewed with other reasonably foreseeable or proposed agency actions, have similarities that provide a basis for evaluating their environmental consequences [sic] together, such as common timing or geography. An agency may wish to analyze these actions in the same impact statement. It should do so when the best way to assess adequately the combined impacts of similar actions or reasonable alternatives to such actions is to treat them in a single impact statement.

6-86

Applying this regulatory guidance to the previously approved and currently operating tailings ponds, it is clear that the Panels B and C proposal and the tailings ponds are not "connected actions":

- The Panel B and C proposal does not "automatically trigger other actions which may require environmental impact statements" at the ponds since the ponds are already permitted and approved and already subject to a previous EIS and EAs.

6-86

- The Panel B and C proposal can proceed without any other actions to be taken "previously or simultaneously" at the ponds. Indeed, the ponds were designed, constructed, operated, permitted, and approved for the Smoky Canyon Mine as a whole and will exist and continue operation whether or not the Panel B and C proposal is approved.

- The Panel B and C proposal is not an "interdependent parts of a larger action" that "depend[s] on the larger action for [its] justification." The Proposed Action is not justified by any future action to be taken with regard to the tailings ponds.

6-86

Similarly, under the CEQ regulations, it is clear that the ponds are not "similar actions" that "when viewed with other reasonably foreseeable or proposed agency actions, have similarities that provide a basis for evaluating their environmental consequences together, such as common timing or geography." As noted above, there currently are no actions to be taken with respect to the previously approved and currently operating tailings ponds; thus, there are no "similar actions" to be evaluated in the same impact statement.

6-86

Finally, as noted above, Simplot concurs with the discussion of the tailings ponds as "cumulative actions," which "when viewed with other proposed actions have cumulatively significant impacts" and which are properly discussed in DSEIS 4.16

6-86

Simplot supports the DSEIS approach to addressing the previously approved and currently operating tailings ponds as "cumulative actions," but not as "connected actions" or "similar actions." At the same time, Simplot is committed in the SMAP and in undertakings with federal and state authorities, including EPA, BLM, Forest Service, Corps of Engineers, Idaho Department of Lands, Idaho Department of Water Resources, and Idaho Department of Environmental Quality to ensure that the ponds are operated in an environmentally protective manner.

6-86

In conclusion, Simplot believes that the DSEIS properly recognizes that the Proposed Action does not "federalize" the continued operation of the tailings ponds with respect to BLM or the Forest Service and that the ponds cannot become part

6-86

of the BLM administered "Smoky Canyon Mine Panels B and C Mine and Reclamation Plan" approval due to their location outside of the federal mineral lease boundaries. Further, it is not irrational or unwise to implement the Proposed Action without taking some future action related to the tailings ponds. On the contrary, the tailings ponds already are legally and structurally ready for the Proposed Action. The Proposed Action does not trigger any major future action at the tailings ponds, such as permitting or construction, nor does the Proposed Action preclude any future actions at the tailings ponds. The Proposed Action does not create a commitment for new actions at the tailings ponds and the Proposed Action can proceed without other major new actions at the tailings ponds. Finally, the Proposed Action and the tailings ponds are not interdependent to the point where one cannot exist without the other. The tailings ponds currently exist in support of other mining at Smoky Canyon. If for some reason the Proposed Action was not approved, the tailings ponds would be able to serve other future mine panels at the Smoky Canyon Mine that are currently under lease.

6.3.2 The Tailings Ponds May Be Evaluated Under the MOU/AOC and the SMAP

As discussed in more detail in Chapter 1 above, Simplot recognizes that existing and past mining activities at Smoky Canyon and elsewhere in Southeastern Idaho have caused selenium impacts. Simplot has worked hard, and funded the efforts of many others, including the University of Idaho, to understand better why phosphate mining and associated materials handling and waste management practices have caused elevated levels of selenium to cause problems within affected watersheds.

6-87

The tailings ponds properly are subject to the Smoky Canyon Mine Panels B & C Selenium Mitigation Action Plan ("SMAP"); the Memorandum of Understanding ("MOU") entered into among the USDA-Forest Service Region 4, Environmental Protection Agency Region 10, USDOI (Bureau of Land Management, Bureau of Indian Affairs, and Fish and Wildlife Service), The Shoshone-Bannock Tribes, and State of Idaho Division of Environmental Quality; and the Administrative Order on Consent ("C0/AOC") entered into among the Idaho Department of Environmental Quality ("IDEQ"), Environmental Protection Agency, Department of Agriculture, Forest Service, Department of the Interior, Bureau of Land Management, Fish and Wildlife Service, Bureau of Indian Affairs, Shoshone-Bannock Indian Tribes, and a number of mining companies, including Simplot.

6-87

As noted in Chapter 1.3.6 above, Simplot concurs with the discussion at DSEIS 2-49 concerning the SMAP and notes in particular that (1) many of the actions contemplated by the SMAP are prospective and not yet subject to review in the SMAP or in the DSEIS; (2) responsibility for many of the SMAP implementing actions will be subject to the lead of IDEQ, a state agency not participating in the DSEIS; (3) studies or actions evolving out of the SMAP are subject to CERCLA, which EPA, a signatory to the MOU and AOC, contends is not subject to NEPA; (4) future actions potentially to be taken under the SMAP are not presently ripe for NEPA review (even if it were allowed) since no "proposal" for a "major federal action" now exists; and (5) the range of studies or actions contemplated by the SMAP is significantly different from the range of actions and impacts being discussed in the DSEIS. All of these statements are particularly true of the previously approved and currently operating tailings ponds.

Response 6-87

As noted in Response 6-86 and other responses to comments, the BLM and USFS understand that the tailings ponds will be evaluated under the site-specific AOC and encourage timely commencement of site investigations and appropriate mitigation under that authority.

6-88

In addition, Simplot is committed to working with the Corps of Engineers, Idaho Department of Lands, Idaho Department of Water Resources, and Idaho Department of Environmental Quality to ensure that all plans and requirements pertaining to the ponds are current and reflective of new information, as it develops, regarding potential selenium impacts of the ponds. To date, Simplot is not aware of, nor does the DSEIS identify, any adverse impacts caused by selenium as a result of operating the tailings ponds. However, Simplot will remain vigilant, working through the SMAP and MOU/AOC process, for any unforeseen impacts of selenium at the ponds.

6.4 Soil Selenium Concentrations

6-89

Topsoil is a resource necessary for successful revegetation of disturbed areas. An important issue has arisen on the relationship between selenium concentrations in soil and those in the vegetation from such soils. Minimizing selenium uptake in vegetation is desirable so as to limit the migration of selenium into the environment from dietary uptake by mammals, birds, and other creatures grazing on the vegetation.

The USFS and BLM have developed interim soil guidelines for selenium concentrations in soil salvaged for reclamation purposes. The DSEIS then rates soils based on these interim guidelines.

6-90

Several soil units are included in the unsuitable category based on total selenium concentrations, however, on page 3-83 (second paragraph) the basis for this criteria is contradicted. The DSEIS states "The total concentration of selenium in soils does not directly determine the concentration of available selenium in the plants growing on these soils (Lakin, 1972 as cited in Bauer, 1997; Fisher, 1991[1])". This same assessment is confirmed by extractable selenium analysis results for soils from the Smoky Canyon mine presented on Table 3.4-6.

6-91

Vegetation accumulation of selenium may not be determined by, or correlated to, the total selenium in soils (Fisher, 1991; Skorupa, 1998). Many factors influence the degree of selenium uptake by vegetation, including soil pH, mineralization, soil moisture content, the speciation of selenium, and the type of plant species. Extractable selenium does not appear to correspond to total selenium concentration in soils, with all extractable concentrations below the detection limit for studies performed at Smoky Canyon Mine (JBR, 2000). In this respect, the relationship of soil selenium concentrations with vegetation accumulation is highly site specific and should be tailored to individual mine operations.

6-91

Site specific data for Smoky Canyon mine has shown elevated selenium levels in soil and vegetation on reclaimed areas that were treated with conventional methods such as seeding unsorted overburden with no topsoil or seeding topsoil placed directly over the unsorted overburden (JBR, 2000)[3]. In contrast, the north end E Panel External dump was reclaimed with a layer of chert separating the topsoil from the overburden in the manner proposed in the proposed action. This area had the lowest concentration of selenium in soil (mean total = 2.52 mg/kg, mean extractable = 0.002 mg/kg) and associated low concentrations of selenium in vegetation (mean total 0.36 mg/kg) (JBR, 2000). Although the 2.52 mg/kg selenium in soil exceeds the guidelines, the extractable selenium, 0.002 mg/kg, is far below the

Response 6-88

It is true that the DSEIS does not identify any specific selenium impacts caused by the tailings ponds. Various subparts of Section 4.16 in the DSEIS indicate that site-specific studies related to potential impacts from the tailings ponds have not been completed. This FSEIS updates the information in Section 4.16 that has come to our attention since the DSEIS was prepared. Some of these data indicate that selenium bioaccumulation may be occurring in resident bird eggs collected in the vicinity of the tailings ponds (see Section 4.16.8 of this FSEIS). The BLM and USFS believe that additional studies of the environmental impacts of selenium related to the tailings ponds should be conducted under the site-specific AOC.

Response 6-89

Comment is noted.

Response 6-90

Suitability for growth medium is based on NRCS limitation ratings as well as the USFS/BLM interim guidelines for selenium content. Some soil map units have been rated as unsuitable due to the presence of rock outcrops or excessive coarse fragment content. One soil map unit within the study area was determined unsuitable solely on the basis of selenium content. Map unit ECS represents 5.18 acres within the study area and has been identified as having a total selenium content of 5 to 8 mg/kg, and extractable selenium <0.1 mg/kg, which exceeds the interim guidelines for suitability. This was an error, such soil is not unsuitable but is questionable for use in reclamation. The correction has been made in this FSEIS. Soils which have been rated as questionable are relatively low in selenium concentration and not extensive in the area, therefore, mixing with suitably rated soils during soil salvage operations should dilute the concentration of selenium to comply with the interim guidelines.

Suitability ratings for selenium concentration in soils are based on the current USFS/BLM interim guideline which is the applicable guideline for growth medium suitability. The statements in the DSEIS are not contradictory if the interim guideline is applied. The USFS and BLM will cooperate with Simplot in future testing to develop site-specific soil suitability criteria.

Response 6-91

Comment is noted. The current USFS/BLM interim guidelines for selenium are the applicable soil suitability guidelines. Any proposed modification(s) to these interim guidelines for consideration of the specific site conditions would need to be discussed with the applicable agencies to initiate policy change for this guideline.

recommended guidelines. In addition, analyses of the Smoky Canyon Mine reclamation data indicate that the soil extractable selenium shows greater correlation with total selenium in vegetation than total selenium in soils (Page 4-138). None of the topsoil used in the north end E Panel External Dump exceeded 0.002 mg/kg extractable selenium. Site specific data from this reclamation area are more useful as an indicator of potential selenium accumulation associated with the proposed action than off-site studies or evaluation of areas that used dissimilar reclamation techniques.

6-92

Baseline conditions of the B and C Panels confirm that both soil extractable selenium and selenium in vegetation are within safe and recommended concentrations (Maxim 2000). Total selenium in soil, although a poor predictor of plant accumulation, was found to exceed the 1.0 ppm guideline in four of the nine soil types identified (Maxim, 2001b). Total selenium concentrations ranged from less than 1 mg/kg to 8 mg/kg. The more important metrics, the soil extractable selenium and the selenium in vegetation, were both in the non-detectable range.

6-93

The selection of the interim guidelines for selenium concentrations was based on evidence from a single scientific paper (Jump and Sabe, 1989). Other studies have not arrived at the same conclusion that total selenium of 1.0 ppm results in 0.1 ppm extractable selenium which can accumulate to 5 ppm selenium in vegetation. The species referenced in this study was saltbush (*Atriplex* sp.), a secondary selenium accumulator. In light of the limited data to support these findings, the selenium control measures prescribed for reclamation efforts, and the evidence of non-accumulation in similar on-site reclamation, the 1 mg/kg total selenium agency recommendation for topsoil suitability appears overly conservative. Maximizing the thickness of the topsoil layer by using a mixture of all available topsoil will enhance reclamation success and facilitate the eventual establishment of shrubs and trees. Furthermore, actual plantings on the reclaimed areas will avoid any primary and secondary accumulators that may be a risk for bioaccumulation.

Vegetation samples were collected in conjunction with soil sampling in July, 2000 at ten locations within the project area (Maxim 2000)[4]. A total of 20 vegetation samples were collected (grass and forbs were sampled separately at each location). Vegetation and soil results from this sampling program are summarized below:

Table 4
Soil and Vegetation Sampling Results from Maxim's Final Baseline Study for Smoky Canyon Mine Panels B & C
Vegetation Resources

Site	Selenium in Vegetation[1]	Selenium in Soil[2]
SC-SS-1	<1	<1
SC-SS-2	<1	<1
SC-SS-3	<1	4
SC-SS-4	<1	<1
SC-SS-5	<1	8
SC-SS-6	<1	<1
SC-SS-7	<1	5
SC-SS-8	<1	<1
SC-SS-9	<1	<1
SC-SS-10	<1	2

Response 6-92

See Response 6-91.

Response 6-93

The Interim Selenium Soil/Vegetation Guidelines and Standards are conservative and are based on the most current available information. Until more site-specific information becomes available, the interim guidelines apply. The soil guidelines indicate that soils having total selenium content less than 1.0 mg/kg and extractable selenium content less than 0.1 mg/kg are suitable for reclamation. Soils with total selenium content greater than 1 mg/kg and extractable selenium less than 0.1 mg/kg are considered questionable for use in reclamation. Some small quantities of native soils at the B and C Panel site have total selenium contents greater than 1 mg/kg but none of these soils have extractable selenium greater than 0.1 mg/kg. Therefore, these soils are questionable for use in reclamation. The narrative and maps in the SEIS have been modified to reflect this. Because the selenium concentrations in many of the questionable soils is relatively low, and not extensive in the area, mixing during soil salvage operations should reduce the concentration of selenium.

1 - Vegetation samples included both grass or grasslike plant and forb samples.
2- Soil result shown is highest concentration of total selenium reported for each location. Up to 4 soil samples per location were collected to provide data on each soil horizon.
"<" = indicates that the element was not detected above the given quantity.

6-94 Elevated selenium concentrations in soils clearly do not correlate with elevated concentrations in vegetation. The references listed above and this site specific data clearly support that none of the soils sampled to date should be excluded from salvage based on selenium concentrations.

6-95 Both the soil and vegetation sampling data that was presented in Maxim's vegetation resources baseline report (Maxim 2000) is relevant data that should be presented in the DSEIS instead of just summarized in the vegetation data on page 3-87.

6-96 In summary, Simplot objects to the region-wide selenium guidance level of 1 mg/kg total selenium as inappropriate and unsupported by research. A site specific level should be established due to the lack of a strong relationship between soil and vegetation selenium concentrations. This appears to be related to varying pH, clay content, mineralogy and the concentration of competitive ions in soil and the e- affect they have on selenium uptake by plants. The site specific level should be based on extractable selenium, not total selenium.

Chapter 7 Summary - Proposed Final Action

The DSEIS for the Smoky Canyon Mine, Panels B & C represents the latest entry in a long line of regulatory documents and environmental analyses for the Smoky Canyon Mine. The selenium contamination issue that has arisen from historical phosphate mine sites in southeastern Idaho provided much of the impetus for this supplemental analysis. The J.R. Simplot Company has taken a leadership role in addressing the selenium issue technically (environmental impact studies, developments of BMPs, etc.) and in developing the necessary framework (CO/AOC). Simplot is continuing that leadership role by funding research by the University of Idaho to better understand how selenium becomes mobilized in the environment and how to treat existing seeps containing elevated selenium concentrations. The Proposed Action for Panels B & C incorporates the most current mining management practices for minimizing the potential for selenium mobilization in the environment, consistent with Simplot's leadership role.

The technical and factual data conclusively support that **the final agency action should be the Proposed Action for the following reasons**.

6-97 - **Surface Water Quality is Protected.** The environmental analysis of the Proposed Action used a very conservative analysis to determine that no detectable concentration of contaminants of potential concern (including selenium) would occur in Lower Smoky Creek due to the mining of B & C Panels.

Response 6-94

Soil suitability was determined based on current USFS/BLM interim guidelines for selenium which is the applicable guideline in place. Topsoil mixing during salvage operations can be used to allow utilization of the ECS soil type.

Response 6-95

Complete sampling data from Maxim's baseline report has been included in this FSEIS.

Response 6-96

The USFS has decided that in the future the *Interim Selenium Soil/Vegetation Guidelines and Standards* will apply to all phosphate mining operations in the USFS administered land unless site-specific investigations meeting the approval of the USFS have been completed which show that other guidelines and standards can apply. Simplot has completed site-specific studies that indicate the proposed cap design and use of native soils for reclamation of the B and C Panels should comply with the interim guidelines. If Simplot wants site-specific soil guidelines different than the interim guidelines, it can participate in additional studies in cooperation with the USFS to develop these site-specific guidelines.

Response 6-97

The mining practices proposed by Simplot are protective of surface water quality. There is no difference between the Proposed Action, Alternative A and Alternative B with regard to surface water quality impacts due to runoff from disturbed areas. There is a potential increase in the occurrence of seleniferous overburden seeps from the Proposed Action compared to the alternatives because there is more acreage of seleniferous overburden in the Proposed Action. The additional design and construction measures proposed for the margins of the external overburden fills mitigates this concern (see Chapter 2).

6-98

- **Best Management Practices for the Handling of Seleniforous Materials will be Used.** Simplot will handle and dispose of selenium-containing materials in accordance with the best management practices described in these comments and in the DSEIS. Thus, even in the external overburden disposal site contemplated by the proposed action, the likelihood of the long-term potential for developing seleniferous overburden seeps is minimal.

6-99

- **Groundwater Quality is Protected.** As discussed in great detail in these comments, the predicted impacts on groundwater as described in the DSEIS are greatly overstated and are not consistent with the technical data or past mining impacts. The modeling of groundwater should include more realistic selenium concentrations from the overburden and pit sites and include the benefits of the BMPs utilized. This analysis would show that the change to groundwater selenium concentrations is limited and confined to the lease boundaries. The State of Idaho Groundwater Quality Rules allow concentration increases in the groundwater of naturally occurring constituents within the Mineral Extraction Area as long as "all applicable best management practices, best available methods or best practical methods, as approved by the Department, are applied." The Rules also provide for a regulatory mechanism (such as a Consent Order, permit, etc.) to be used to define the Mineral Extraction Area, approve BMPs and establish monitoring plans to ensure that the Groundwater Quality Rules are met. The State of Idaho will require the J.R. Simplot Company to protect groundwater quality consistent with the State of Idaho rules and regulations.

6-100

- **Optimization of the Mineral Resource Occurs.** The Proposed Action will result in rehandling 4% of the overburden removed from the pit, while Alternative A would require rehandling of 13% of the overburden material. This additional rehandling will cost an additional $6.8 million with no reasonable justification. Such a cost increase will not survive a realistic cost-benefit analysis and would make the ore costs uncompetitive. In addition, such costs from this higher level of rehandle would require the mine to reconfigure the mining plan. **This would result in the loss of** 2.68 million tons of recoverable ore, or **22% of the original recoverable ore in B & C panels**.

6-101

- **Sustainable Mining.** The Proposed Action would provide 4.6 years of production at the current rate of extraction. However, Alternative A, due to the mine plan changes described above, would only provide 3.6 years of production. Alternative A is inconsistent with the optimization of the mineral resource. Without reasonable justification Alternative A could lead to a temporary shutdown of the mine if the mine plan for Manning Creek is not permitted and allowed to proceed within this 3.6 year lifespan. The current approval time for mine plans is approximately 2.5 years; also at least one year is needed (and more likely 1.5 years) to make site preparations necessary to mine in Manning Creek. Thus, if Alternative A is selected, a mine shutdown is a real possibility. Such a shutdown also may have ramifications for the J.R. Simplot Company fertilizer plant in Pocatello. Today's global marketplace is a very

Response 6-98

In the DSEIS the proposed management practices mitigated some of the agencies' concerns about seleniferous overburden seeps but there was still some doubt as to the effectiveness of these management practices. The additional mitigation in this FSEIS proposed by Simplot along the margins of the overburden fills to enhance vertical percolation with surface runoff is considered to be significantly more effective. The BLM and USFS remain concerned about the occurrence of seleniferous overburden seeps but this is less likely with the inclusion of this additional mitigation. This is a site specific issue which appears to be effective for the Smoky Canyon Mine site because the external overburden fills overlie permeable bedrock. This may not be the case for other sites where the overburden fills are placed over less permeable materials.

Response 6-99

The groundwater modeling included in this FSEIS has been modified in response to the public comments. These modifications make the model more realistic in its configuration, the seepage input chemistry, and the incorporation of the proposed management practices. The description of the new modeling configuration and the results is contained in Section 4.3.1 of this FSEIS. The modified water quality impact predictions show that the water quality impacts should be confined roughly under the footprint of the disturbed mine area and within the lease boundaries. As indicated in Comment Letter # 4, we understand the IDEQ will enter into a Consent Order with Simplot regarding the predicted groundwater impacts. This Consent Order will define the mineral extraction area, identify required management practices, and establish appropriate monitoring.

Response 6-100

Simplot provided additional cost information for Alternative A in its comments on the DSEIS. Simplot also provided new information in its comments that Alternative A would result in the loss of ore that would be recoverable in the Proposed Action. This new information has been incorporated into the comparison of alternatives in Section 2.6 of this FSEIS.

The agencies have reviewed Simplot's claims of the financial impacts of certain mitigation costs. Granted, such mitigation costs would be a change to Simplot's existing mine plans and their economics but necessary environmental protection measures need to be incorporated into the mining plans whenever the need for such measures is demonstrated. Simplot then would adjust the mine plans to incorporate the required environmental protection measures into the mine design and operations in the most cost-efficient manner.

Response 6-101

The potential mine shutdown indicated by Simplot for Alternative A (and presumably Alternative B) is based on the premise that approvals to mine the next area in line after Panels B and C are not received in time. The BLM and USFS are not responsible for long-term mine planning at any mining operation under their jurisdiction; that is the responsibility of the mine operator. Adequate permitting

competitive environment, with considerable imports of fertilizer and fertilizer feedstocks from overseas. Thus, requirements that increase costs unnecessarily, especially without environmental benefit (such as would happen with Alternative A) make it more difficult for existing operations, such as the Smoky Canyon Mine, to continue.

Also, other elements of the final proposed action should include the following:

- The tailings pond is not to NEPA review in this Proposed Action. The tailings ponds were subject to site-specific EIS review and subsequent tailings ponds-specific EAs. In addition, existing plans and other requirements govern the tailings ponds' operation, closure and reclamation. Furthermore, the CO/AOC will address any issues arising from selenium at the tailings pond through site-specific work as contemplated in the agreements between the J.R. Simplot Company and numerous agencies as described in the Area-Wide Consent Order and Administrative Order on Consent.

6-102

- Topsoil is a limited precious resource, necessary for successful revegetation of disturbed areas. The region-wide selenium guidance level of 1 mg/kg total selenium is inappropriate and not supported by site-specific studies. For Smoky Canyon, a site-specific concentration can be developed from existing work, and the key parameter should be extractable selenium, not total selenium. Such a site-specific value, based on extractable selenium concentrations, should be used for Smoky Canyon.

6-103

The J.R. Simplot Company looks forward to working with the agencies to incorporate these comments into the final mine plan for Panels B & C.

Chapter 8 Appendices

8.1 Key Documents Cited

8.2 Smoky Canyon Mine Project Approval

8.3 Stormwater Pollution Prevention Plan

8.4 Memorandum of Understanding Concerning Contamination from Phosphate Mining Operations in Southeastern Idaho

8.5 Consent Order/Administrative Order on Consent

8.6 Administrative Consent Order for Work Related to Area-Wide Investigation

8.7 Groundwater Infiltration Calculations and Modeling Results

8.8 Final Column Test Report

8.9 Groundwater Infiltration Barrier Cost Estimates

time should be planned into Simplot's schedule and mine plan submittal time. Impacts to the Simplot's long-term plans from selection of an alternative for Panels B and C are recognized and have been taken into consideration by the agencies (see Section 2.6 of this FSEIS).

Response 6-102

Comment noted.

Response 6-103

The USFS has communicated with all phosphate mine operators in Idaho and recommended site-specific studies that will be conducted by the USFS to establish site-specific soil suitability guidelines. Simplot will be able to participate in these studies if it desires. In lieu of site-specific studies for any one site, the USFS will utilize the *Interim Selenium Soil/Vegetation Guidelines and Standards* to assist with decision making on suitability of growth medium and acceptability of reclamation vegetation. Based on the topsoil characteristics described in Section 3.4, and the ability to blend various soil resources in handling, there should be no need abandon any topsoil resources in the disturbed area for Panels B and C.

Letter #7

Agrium Conda Phosphate Operations*
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Soda Springs, ID 83276
Tel: 208-547-4381
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October 11, 2001

File No.: MI-01-004

Jeff Cundick
Bureau of Land Management
Pocatello Office
1111 N. 8dAve.
Pocatello, ID 83201

RE: Comments to Simplot's Smoky Canyon DSEIS

Dear Mr. Cundick:

Agrium has six comments regarding the groundwater portion of the Smoky Canyon Mine DSEIS.

7-1

Comment #1 - Agrium feels that the predictions of leachable selenium from the backfill, and resulting models of possible groundwater contamination, should incorporate more site-specific data values. We feel that the 0.75-ppm Se value, which represents the 90th percentile of values reported for 25 different Southeast Idaho sites, is scientifically invalid for a site-specific study. We believe it should be removed from the final EIS because it is misleading and confuses significant issues related to mitigation. Although the monitoring data should be considered as a frame of reference for the groundwater study, and it is reasonable for the agency to evaluate a "reasonable, worst case value", the 90th percentile value from these data should not be used as an input to model site-specific impacts to the groundwater resource. Agrium. is concerned that there is no lithologic control for the areas where the sampling took place. No one knows what amounts of seleniferous material were in a given sampling area, making it very risky to select values at either end of the observed distribution. A more scientifically accurate use of the available data would be to use the data from the site specific column tests, which show good agreement with the average concentration of values (0.06 to 0.08 mg/L) measured regionally in overburden seeps. These predictions should be compared with site-specific field measurements, such as the Panel D and E seeps, although the lack of lithologic controls for these locations should be considered in any interpretation. As the 0.24 value is close to the mean for the regional selenium concentrations in overburden seeps, it is a much more logical upper bound for modeling predictions than the third highest value measured in Southeast Idaho. In particular, the model should very carefully address the fact that any groundwater impact on a site-wide scale will represent a mixed composition of lithologies with a chemistry that is not unrealistically estimated by a single worst case value from monitoring data collected at locations with unknown hydrogeochernical conditions. A predictive effort that models a range of likely (probable) conditions including a

Response 7-1

The revised approach to the groundwater modeling for the B and C Panels no longer uses the 0.75 mg/l value over the modeled time frame. The 0.75 mg/l used in the DSEIS to model the impact of overburden seepage on ground water quality was selected to include the highest average concentration (0.716 mg/l) observed at the two seeps from Smoky Canyon (D and E Panel seeps). The value 0.75 mg/l is not the 90th percentile of the southeast Idaho overburden seep and spring data and was not selected for that reason. As stated in the memorandum accompanying the data for southeast Idaho in Appendix 4B of the DSEIS, the agencies cautioned the reader about the lack of significance of statistics derived from those data and thus statistical values for the regional database were not used in the impact analyses for the Smoky Canyon Mine. The agencies agree with Agrium that the southeast Idaho data provide a reasonable frame of reference for selenium concentrations in different general settings but the data from that database should not be used in site-specific impact analyses for the reasons stated in the comment.

The agencies have modified the groundwater impact analysis for the B and C Panels to utilize the column test data and extend the usefulness of these data with a best fit curve which can be used to obtain input concentrations at fractional pore volumes other than the weighted average column test data themselves. As discussed in Response 6-34, the range of selenium concentration values now being used in the groundwater analysis appear to be reasonable when compared with the Smoky Canyon and regional field data. The upper selenium value used in the revised groundwater impact analysis is 0.33mg/l which is approximately the same as the average value for the Smoky Canyon E-Dump seep (0.31mg/l), or the average of the longest time period data base for the lower Pole Canyon Creek monitoring station by TRC Mariah (0.36 mg/l). It is greater than 20 out of 23 samples (87 percent) from the revised overburden seep data in the regional southeast Idaho data base (Appendix 4B). It is higher than the average value for the revised overburden seep data in the regional data base (0.25 mg/l) and is significantly higher than the geometric mean for the revised overburden data (0.088 mg/l), which is more appropriate to use than the average value for this data set which is not normally distributed.

To check the results of the best fit curve of column test data, a starting selenium value of 0.72 mg/l was used, the curve was recalculated and these input data were used to remodel the groundwater quality impacts. The higher starting point was selected to be equal to the average selenium value for the Smoky Canyon Mine D Panel Seep (0.716 mg/l) to account for this site-specific data.

The "0.24 value" cited in the comment is not referenced to the DSEIS so we are not sure what the comment means when it indicates this value is a much better upper bound for modeling predictions because it is close to the mean for the regional southeast Idaho data. The value of 0.24 mg/l appears on Table 4.3-4 of the DSEIS and is the selenium concentration for a December 2000 sample of the E Panel Seep. We do not agree that a single sample value for one field sampling location at the Smoky Canyon Mine should be used for the upper bound of the impact modeling, even if it is close to the arithmetic average of the overburden

reasonable, worst case condition, is necessary to facilitate alternatives analysis and evaluate any appropriate mitigation.

Comment #2 - Agrium is concerned that the likely case scenario modeled in the DSEIS is based on an overly conservative value, 0. 181 mg/L Se. To begin with, this value is incorrect; as it was calculated using only the highest reported value from two replicate columns, for each of the critically important center waste shale units (altered and reduced). These columns were run to address sub-sampling concerns (i.e. nugget effects); the results of the two columns should therefore be averaged to fairly represent material on a run-of-mine basis. In addition, this value lies well above the median for the monitoring data, and is itself more appropriately a reasonable, worst case basis for evaluation.

7-2

seeps from the southeast Idaho data base. Such a value cannot be considered representative of the proposed B and C Panel overburden leachate.

Data collected on site can and should be considered in the environmental analysis keeping in mind that certain data may not be representative of large volumes of overburden at the site over time. This is because discrete sampling locations at certain seeps or wells may only represent the local conditions within the overburden at those locations.

The column tests were purposely designed to be representative of the various lithologies and geochemistry in the B and C Panel overburden so data from these tests should already address the comment that the impact analysis should represent a mixed composition of lithologies. The approach currently used in the revised groundwater impact analysis described in this FSEIS is to use the weighted average column test data and extend their usefulness by applying a best fit curve to the data. This allows a range of values to be run in the groundwater model and better simulate the decreasing concentrations expected over time. Using this approach negates the need for singular concentrations to represent the "reasonable" or "worst case" condition.

Response 7-2

The agencies believe the value of 0.181 mg/l does correctly represent the pore volume one weighted average concentration for selenium. The comment is correct that two columns of Center Waste Shale were included in the column testing for both altered and reduced overburden samples but averaging the values of these replicate columns is not considered appropriate in this case. It is not typically considered statistically valid to average only two values from any population of random values. A minimum of three samples is required and six samples is generally considered the lowest number from which to derive useful statistics with measurable significance. However, if the sample population in question were considered adequate, the value used as an estimator should be the Upper Confidence Limit (UCL) of the mean at the appropriate confidence level. If this value were calculated for the total selenium concentrations for pore volume one from columns SCC4 and SCC5 (0.205 and 0.404 mg/l respectively) the UCL of the mean at 95 percent confidence would be 1.57 mg/l which is much higher than either of the individual data values.

Additional justification for not averaging the replicate column data is the large difference in the data from the supposed replicates. For example, columns SCC4 and SCC5 are supposed to be replicates therefore the expectation is that the results from these columns should be similar. The total selenium concentration for column SCC5 is 0.404 mg/l which is almost 100 percent higher than the concentration in SCC4 (0.205 mg/l). The selenium VI concentration in the SCC5 leachate is 0.165 mg/l which is more than 23 times higher than the 0.007 mg/l concentration for SCC4. These columns did not meet the expectation of replicates with respect to selenium and averaging these separate values would mistakenly ignore the wide variability exhibited by the data. The wide variability further demonstrates the insufficient size of the sample population (two) for statistical values with any significance. In this case where the data is intended to be used in an important groundwater impact analysis, prudence demands that a

7-3

Comment #3 - Pertaining to the column tests and the fact that only the first pore volume leachate concentration was used, we feel this is not traditionally or scientifically the proper procedure. While this is clearly the most conservative approach, it fails to be the most reasonable or likely prediction, because the initial pore volume is likely to be strongly affected by secondary salts that result from drilling and subsequent drying. The initial pore volume has not established equilibrium with the overburden itself. The first, second, and third pore volume concentrations, averaged together, yield values that are appropriate as inputs for the groundwater modeling. This is supported by the fact that the run-of-mine average of the first three pore volumes (0.08 1 mg/L) is very close to the median value for the regional monitoring data (0.078 mg/L). This should yield a much more statistically probable prediction of backfill leachate chemistry. This is especially true when one considers the conservative nature of the hydrologic model itself, which has several simplifying conservative assumptions with their own inherent uncertainty.

* A Registered Name of Nu-West Industries, Inc.

conservative value be selected from the available data, which is what was done. The higher of the two replicate values (0.404 mg/l) was selected for the calculation of the weighted average selenium value of pore volume one.

We cannot respond to the comment that indicates 0.181 mg/l lies well above the median for the monitoring data because the monitoring data in question is not described. In any event, use of the median value for any population of monitoring data does not necessarily help describe a "reasonable" or a "worst-case" value for impact analysis.

Response 7-3

It is impossible to quantify the impact of secondary salts in the drill hole cuttings used for the column testing. The potential development of secondary salts from drilling and drying is likely to be offset to some extent by the rinsing effect of the in-situ soluble mineral content as the samples were removed from the ground during wet drilling and collection. This effect also cannot be quantified. While it is plausible that the first pore volume has likely not established equilibrium with the overburden itself, the test protocol was not designed to attain overall equilibrium conditions in the columns. Rather, the testing was specifically designed as a sequential test to disclose any differences in the leachate from the columns with increasing amounts of leaching. No one pore volume was intended to represent the worst case, or the most likely prediction of leachate concentration on which to base ground water modeling. The effects of oxidation that will result from the wetting and drying cycle within the actual overburden fills over time were also not apparently assessed as intended. The application of air for 24 hours between pore volumes, did not, as evidenced by the declining Eh (oxidation-reduction potential) over the successive pore volumes, appear to enhance oxidation of less mobile forms of selenium.

The average concentration of selenium over the first three pore volumes is not a valid statistic in this application because the different pore volumes do not represent the same sample population and cannot be analyzed together statistically. The purpose of sequential leaching of columns is to obtain a range of concentrations representative of increasing degrees of leaching with additional application of water. Each pore volume from each column is purposely different than any other pore volume both physically and chemically. These intended differences, and the expected different results, demonstrate that the separate pore volumes from any one column are not from the same random population. They are purposely not random so averages of these values have no meaning. Accordingly, any similarity between the average of the first three pore volumes and "the median for regional monitoring data" cited in the comment is purely coincidental. Also see Response 6-38.

7-4

Comment #4 - We would like to see attenuation and source depletion addressed in the groundwater assessment. Obviously natural attenuation occurs within the aquifer, and there has been no discussion or consideration given to this subject in the groundwater portion of the DSEIS. Likewise, the column test data clearly show that the release of selenium and other trace elements declines very rapidly and becomes stable at much lower concentrations after 3 or 4 pore volumes.

Response 7-4

Chemical attenuation was already addressed in the groundwater assessment of the DSEIS. Please note the wording in item 3. of the Groundwater Quality Impacts Section of the DSEIS on page 4-43 of that document. This clearly indicates that chemical attenuation was considered and was assumed to be negligible in the vadose zone under the overburden fills and in the groundwater aquifer. This is repeated on page 4-54 of the DSEIS. The reason for this is that, in its sampling of the Culinary and Industrial Wells during 2000, Simplot analyzed the water for speciated selenium and showed that almost all the selenium was present as selenate (Se^{+6}). Speciated selenium analyses were also conducted for the column test studies done for the groundwater impact assessment for this SEIS. Those data show that most of the pore volume samples contained about equal parts of selenite (Se^{+4}) and selenate. Thus the column test data indicate that much of the seepage draining from the overburden should already be selenate. As described on page 3-12 of the DSEIS, selenate is the most geochemically mobile inorganic form of selenium. According to the National Institute of Health selenate is poorly attenuated chemically (http:sis.nlm.nih.gov/cgi-bin/sis). Jon Munkers described potential chemical treatments for dissolved selenium and indicated that adsorption and reduction reactions were the most likely methods of chemical attenuation in nature (Munkers, 2000). Munkers (2000) reviewed the literature and provided information and citations on the adsorption of selenate and selenite in soils and minerals. This research showed that selenite and selenate are generally not adsorbed to clays. Selenite is adsorbed on iron or manganese oxyhydroxides to various degrees but selenate is generally not adsorbed at pH values greater than 5.5 to 7. The Wells Formation is not known to have abundant iron or manganese minerals for adsorption and the pH of water from the aquifer ranges from 7 to 8 so chemical attenuation of selenate is not likely.

The upper Wells Formation (Grandeur member) is a siliceous limestone with significant secondary permeability. The middle Wells Formation, the unit containing the aquifer of concern, is a sandy limestone and calcareous sandstone. There is no reason to believe from this lithologic description that the Wells Formation matrix contains suitable clay materials or other minerals with large quantities of cation exchange capacity for adsorption. The calcareous and siliceous mineralogy is also not likely to provide a suitable source of reagent to produce reduction reactions. Finally, there have been no studies conducted at the Smoky Canyon Mine to determine site-specific chemical retardation factors for interaction of selenium in seepage water with the matrix materials.

For all the above described reasons, it was decided that there was insufficient information available at the Smoky Canyon Mine at this time to select defensible chemical attenuation factors for the groundwater flow and contaminant transport modeling in the DSEIS and this is still the case for this FSEIS.

The BLM and USFS agree that the column test data show that the mobilization of selenium and other trace elements declines and becomes stable at low concentrations after 3 or 4 pore volumes. However, the data for the column test pore volumes beyond pore volume 3 were not made available to the agencies by Simplot until during the public comment period on the DSEIS. In response to the information in the column test data, and public comments on the DSEIS, the

7-5

Comments #5 - A great deal of the predicted ground water impacts reported in the DSEIS are based on data from the culinary and industrial wells at the mine site. It seems likely that these wells could serve as a pump, drawing water from seleniferous materials into their cones of influence, and implying contaminant migration that would not otherwise occur. This possibility should be evaluated and discussed in the final document.

7-6

Comment #6 - None of the modeling addresses the best management practices proposed by Simplot. Basing the modeling on results of monitoring at existing facilities, which were constructed using different management practices that were not intended to address selenium release potential, a conservative bias is introduced. We feel that addressing these six issues will yield a better understanding of what the site-specific impacts will be to the groundwater/aquifer due to meteoric water infiltrating through the overburden.

Thank you for your consideration of our issues and if you have any questions or would like to further discuss these issues, please don't hesitate to call me at (208) 574-2420.

Sincerely,

Alan D. Haslam
Mine Manager

CC: Wendell Johnson
Darrel VandeWeg

groundwater impact analysis in this FSEIS has been modified to incorporate the effects of concentrations of contaminants in the overburden seepage that begin at elevated levels but decline rapidly over time. These modifications to the input values in the groundwater impact modeling has resulted in impact descriptions that are modified from those shown in the DSEIS.

Response 7-5

The Culinary and Industrial wells have undoubtedly served as pumps drawing ground water into their cones of influence. This may have accelerated the flow of contaminated groundwater from the sources of these impacts toward the locations of the pumping wells. However, the appearance of the selenium contamination first occurred in about 1996 and has remained since then. It is our understanding that the Industrial Well has not been pumped much since about 1991 and is only pumped in response to water shortage conditions in the tailings basin (see Page 4-36 of the DSEIS). During 2000 sampling of both the Culinary and Industrial wells by Simplot showed similar selenium concentrations in both wells. This would indicate that pumping the Industrial Well has likely not caused an appreciable acceleration of the movement of groundwater contamination toward the wells because the selenium contamination was already present in the Industrial Well in 2000 when it began pumping in a significant manner for the first time in years.

The selenium contamination in the ground water pumped by the Culinary Well may have been accelerated toward this location by the pumping of that well but that does not likely control the source of the contamination, only the rate of its transport through the aquifer. This is because the potential source of the contamination, the overburden disposal fills for Panel A are above the ground water table and changes to the water table from pumping the water supply wells would not directly affect the movement of seepage water through the unsaturated overburden fills. A discussion of this has been added to Section 4.16.3 of this FSEIS.

Response 7-6

The modeling of groundwater impacts in the DSEIS did fully incorporate the effects of the management practices proposed by Simplot. The overburden cap is the primary management practice proposed to mitigate impacts to the surface environment. This cap does not include any infiltration barrier to reduce the flux of seepage from the overburden fills and the infiltration rate through the cap, as calculated by the HELP model, was used as input to the groundwater modeling. Simplot has indicated in their public comments on the DSEIS that certain overburden management practices can incorporate permanent infiltration areas to introduce clean recharge water into the groundwater aquifer. This proposal was not recognized as part of the original Proposed Action and was therefore not analyzed in the DSEIS. These modifications have been added to the discussion of the Proposed Action and Alternatives in Chapter 2 and have been analyzed in the groundwater section of Chapter 4 of this FSEIS.

Letter #8

PO Box 220
Afton, WY
83110

August 25, 2001

Jeff Cundick
SEIS Team Leader
Bureau of Land Management
1111 North 8th Avenue
Pocatello, Idaho 83201

Dear Mr. Cundick,

I appreciate the opportunity to comment on the Smoky Canyon Mine plan and the draft EIS. Once again I found the draft EIS to be well written and very informative. I appreciate the effort that went into it and thank those who had a part in its preparation. I also found the meeting in Afton to be very informative and the people from Simplot to be extremely helpful and patient with my questions.

The solution to the Selenium problem seems to be a work in progress. It appears to me that what Simplot is trying to do is put all Selenium in a box. This will work fine as long as all of the selenium gets put in the box and as long as there are no leaks in the box. I am a bit skeptical that these conditions can be totally accomplished. It is clear from the Selenium Mitigation Action Plan that Simplot has some concerns since words like "maybe" and "possibly" are used so often.

Capping the overburden is most likely the right thing to do and I believe it will mitigate the problem. I do not believe it is a total cure. An extensive monitoring program is also necessary to detect selenium seepage and insure that corrective action is taken when necessary. If this is not already part of the mine plan it should be part of the mine plan.

8-1

Sedimentation is still a major concern to me, although I sense that the mining industry and the BLM feel they have it under control. The one excuse that I find intolerable is "There was a sedimentation problem already (because of grazing etc.) so we can cause some sedimentation too." Errors of the past are not an excuse for errors in the future and standards of the past are not sufficient for standards of the future.

8-2

Response 8-1

The Smoky Canyon Mine Environmental Monitoring Plan has been appended to this FSEIS, and includes a description of measures to detect selenium seepage from overburden disposal areas.

Response 8-2

The mention in the DSEIS of other land uses which may have been, or continue to be, contributing sediment to area streams is simply intended to provide an accurate environmental context in which to assess impacts of the Proposed Action and Alternatives. The intent of project design components, implementation of appropriate management plans, and environmental monitoring described in the DSEIS and in this FSEIS is to minimize sedimentation impacts to the extent possible, regardless of other ongoing, non-mining contributing sources or past impacts from sources including mining.

8-3

Related to sedimentation is mention in the EIS that activity will be kept at least 50 feet from streams. The normal standard in National Forests for camping is 200 feet. This would seem to be a minimum for phosphate mining which must be harder on streams than a camp site.

8-4

There is a projected reduction in stream flow because of the mining activity. I admit to a possibly far fetched idea but I'll put it out for discussion anyway. Why not take water from the aquifer and put it into the stream. The initial reaction when I mentioned this to the people from Simplot was that they would have to drill to deep. This may well be true but I would like the idea to receive more considered thought before it is rejected.

8-5

Stream quantity should be monitored as well as quality. It is probably silly to mention that monitoring quantity and quality is not enough. Corrective action must be taken if previously established standards are not met.

Noise is apparently not a problem because of the remote location of the mine. I mention here only because this will become more of a concern to me when the mining activity moves south to Manning Creek. It is not too early to think of future mitigation measures.

Sincerely,

Peter M. Riede

Response 8-3

The reviewer is correct to state that both camping and phosphate mining activities have the potential to cause stream sedimentation. However, in the case of phosphate mining and the related activities described in the Proposed Action, stringent management restrictions are in place, and include much more than just a distance criterion. As stated in Section 2.1.5 on page 2-9 in the DSEIS, proposed access and haul roads, including those in proximity to Smoky Creek, have been designed for proper surface drainage and include the use of various BMPs to control erosion and sedimentation. As stated in Section 2.4.1 on page 2-32 in the DSEIS, pit locations would include a minimum 50-foot wide vegetated buffer zone. Further, the relevant management strategy contained in INFISH (USFS, 1995) establishes a 50-foot slope distance away from intermittent streams in non-priority watersheds as the general area in which mineral developments, roadway construction and similar activities should be avoided in order to meet Riparian Management Objectives.

Response 8-4

This FSEIS predicts permanent reductions in the watershed area to Smoky Creek and Roberts Creek which are expected to reduce average annual runoff yields. These reductions are not predicted to be large or to have noticeable consequences to stream ecosystems or downstream water uses. The cost associated to provide supplemental water to these streams during the life of the project would be extensive and is unwarranted because perennial aquatic habitat and riparian vegetation in lower Smoky Creek and Roberts Creek are supported by spring discharge which is not expected to be impacted by the B and C Panel development.

Response 8-5

Flow rate would be monitored along with water quality, as described in The Smoky Canyon Mine Environmental Monitoring Plan, which has been appended to this FSEIS. As stated by the reviewer, corrective action would be taken if established standards are not met.

Letter #9

August 29,2001

Jeff Cundick
SMS Team Leader
Bureau of Land Management
1111 North 8" Avenue
Pocatello, ID 83201

RE: Smoky Canyon Mine DSEIS

Dear Mr. Cundick

Please accept these comments from Idaho Rivers United on the Draft Supplemental Environmental Impact Statement for the Smoky Canyon Mine, Panels B & C. Idaho Rivers United is a statewide river conservation group with approximately 2000 members.

9-1

IRU is concerned about the impact that this project will have on native fish, particularly Yellowstone cutthroat trout. Many of the creeks running through the area that will be impacted by this project support Yellowstone cutthroat trout as well as brown trout *Idaho Department of Game Fisheries Management Plan,* 2001-2006. Yellowstone cutthroat trout are in decline such that the Idaho Department of Fish and Game (IDFG) has designated them as a category A species of special concern.

9-1

It is largely because of concerns about the fate of Yellowstone cutthroat trout that one of IDFG's goals for the South Fork Snake River drainage, which includes the project area, is to "minimize impacts of land use and development on fish habitat and water quality." Idaho Department of Game Fisheries Management Plan, 2001 - 2006.

9-2

Accordingly, the Forest Service and BLM must design this project so as to cause no impact on water quality and habitat. This includes not impounding streams for road crossings. Even where fish passage is provided, impoundments in a stream cause serious disruption of the river system and can have major water quality impacts

Response 9-1

Surface water quality downstream of Panels B and C are expected to comply with applicable ambient water quality standards and not affect the fisheries in the South Fork Snake River drainage as a result from the Proposed Action and the Alternatives. Impacts to fishery resources are not anticipated during mining operations or after mining operations are completed. The Proposed Action and Alternatives require capping seleniferous overburden with 8 feet of chert and 1-3 feet of topsoil preventing the mobilization of selenium downstream in Smoky Canyon. The Storm Water Pollution Prevention Plan specifies that sediment carried by surface runoff would be contained within the Smoky Canyon Mine site utilizing various containment structures such as dikes, ponds, sediment traps, catch basins, berms, and check dams. These structures would help to prevent sediment from entering Roberts and Smoky Creeks. In addition, Best Management Practices such as the preservation of existing vegetation near natural drainages, revegetation of disturbed areas, and agency mitigation measures would also help to prevent sediment from runoff water flow in previously disturbed areas from discharging into the creeks and drainages.

Response 9-2

Smoky Creek from the mouth of the canyon to upstream of Panels B and C is intermittent and typically dry except during spring runoff. The drainage channel in this area is not fish habitat. As a result, road building, culvert placement, and mining activities associated with the Proposed Action and Alternatives I should not affect fisheries.

The USCOE is reviewing Simplot's plans to build the road crossings of Smoky Creek. The BLM and USFS will cooperate with the USCOE and State agencies to ensure that the stream crossings built for the B and C Panels comply with their requirements.

9-3 The Forrest Service and BLM must also ensure that no mine waste enters the water supply. Pole creek is already one of the most polluted creeks in Idaho due to mine waste. And as Simplot acknowledges in the Selenium Mitigation Action

9-4 Plan, there are elevated levels of selenium at Smoky Canyon. The Forest Service and BLM must not allow any further degradation.

9-5 There must be complete backfill of all pits. All waste must be placed back in the pits and pits must be completely filled to prevent water accumulation that becomes contaminated. It must also be re-contoured to its natural contours and re-vegetated.

Thank you for this opportunity to comment.

Sincerely,

Sara C. Denniston

Response 9-3

Mine overburden includes seleniferous and non-seleniferous material. Seleniferous overburden would be selectively placed to avoid interactions with surface waters, as described in Appendix 2B of the DSEIS. As described in Section 2.1.5 on page 2-9 of the DSEIS, siting of non-seleniferous overburden disposal sites would avoid direct stream disturbance, and storm water catch basins would control runoff and sedimentation from these mine wastes. Mill tailings are discharged to a no-discharge tailings disposal facility, as described in Section 2.1.6 on page 2-10 of the DSEIS, and thus would not enter the water supply.

Response 9-4

The DSEIS presents all available water quality data for Smoky Creek in Smoky Canyon and these data show all surface water quality in the canyon meets state and Federal water quality criteria. The agencies plan to work with the State and Simplot to ensure that the water quality is protected in Smoky Creek. The agencies plan to address the existing water quality issues at the current mining operations through a site-specific AOC.

Response 9-5

Although complete backfill of all open pits, returning all overburden back to the pits is a typical expectation from the general public, the BLM and USFS have not established any requirement that this must be done in all cases. For some mining operations, the swell for the mined overburden may exceed the pit volume vacated by removal of the phosphate ore and all the mined overburden cannot fit back into the pit without a significant mounding of the overburden above the original ground elevation. For other mining operations, part of the overburden removed from any one pit may be used as pit backfill elsewhere at the mining operation and so this overburden cannot be placed back in the original pit. This is exactly the case for the proposed B and C Panel operations where a significant part of the overburden from the proposed pits will be used to complete the A Panel backfill. Finally, site-specific material handling considerations must be evaluated to determine the appropriate degree of pit backfilling within reasonable economic limits, based on haul profiles, double handling requirements, and mine scheduling. The BLM and USFS must be able to take these and other site-specific factors under consideration when determining an appropriate level of pit backfilling for any one mining operation.

In the case of the proposed B and C Panel operations, complete backfilling of the open pits is not required to prevent groundwater accumulation in the pits because the pit bottoms are higher in elevation than the groundwater table. The backfilling that has been proposed for the A, B, and C Panels in the Proposed Action and the Alternatives will achieve natural looking final contours for much of the area which will be revegetated.

Letter #10

October 11, 2001

Jeff Cundick
SEIS Team Leader
Bureau of Land Management
1111 North 8' Avenue
Pocatello, ID 83201

Re: Comments to the Draft Supplemental Environmental Impact Statement - Smoky Canyon Mine, Panels B& C

Dear Jeff:

The Greater Yellowstone Coalition (GYC) submits the following comments on the Draft Supplemental Environmental Impact Statement (DSEIS) for the Smoky Canyon Mine (SCM). Our comments generally follow the format of the DSEIS for ease of review. We have also provided comments to the separate document included with the DSEIS, the Selenium Mitigation Action Plan (SMAP). Finally, we provide a summary at the end of our comments that highlights our principal concerns.

As a general comment, the DSEIS fails to 1) completely outline the impacts of the current mining operations to the environment; 2) outline appropriate mitigation measures, and; 3) insure that mining expansion will not adversely effect the environment. Without an adequate discussion of these three issues, neither the public nor the decision makers can accurately evaluate the impacts of this proposal.

SMOKEY CANYON MINE, PANELS B& C, DRAFT SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT:

I. CHAPTER 1: INTRODUCTION / PURPOSE AND NEED

10-1

Section 1.4 of the DSEIS states that the proposed mining of Panels B&C at SCM can be implemented in compliance with the Caribou National Forest Land and Resource Management Plan (LRMP)(USFS 1985) and the Draft Revised Forest Plan (USFS, 2001). The LRMP and the National Forest Management Act prohibits the agency from implementing or approving projects that fails to comply with federal and State water quality standards. As it clearly states in this DSEIS, these standards are currently not being met. Future mining at SCM will only exacerbate the existing problems. Therefore, the DSEIS clearly violates the LRMP and the Revised Forest Plan.

Response 10-1

The Revised Forest Plan is not final and will not be binding until it is. Until that time, this project is subject to the requirements of the 1985 Caribou LRMP. The National Forest Management Act (NFMA) states that Forest planning shall provide for compliance with requirements of the Clean Water Act, the Safe Drinking Water Act, and all substantive and procedural requirements of Federal, State, and local government bodies with respect to the provision of public water systems and the disposal of waste water. (36 CFR 219.23) This requirement applies to the Forest Plan in general, not necessarily site-specific projects. In the context of Forest planning, an individual project may not meet these requirements but overall, the Forest's management program would be in compliance. The 1985 Caribou LRMP does, however, require that mineral operations meet or exceed State Water Quality Standards and Wastewater Treatment Requirements. (USFS, 1985, III-60) Further, lessees are required to dispose of wastes containing injurious materials or other potential contaminants in a manner that will not cause degradation of surface or ground water. While it would necessitate a Forest Plan amendment, an individual project could deviate from those requirements. However, the agencies will not approve a project that does not comply with federal law or is not approved by State agencies enforcing State law.

The proposed B and C Panel operations are anticipated to comply with Federal and State surface water quality standards. IDEQ regulates groundwater quality in Idaho. As indicated by their comment letter (Letter #4) the IDEQ intends to enter into a consent order with Simplot to ensure compliance with the Idaho Ground Water Quality Rule. The Idaho regulations do not include a permitting process which approves future impacts of any particular action before it is constructed but they do include provisions for monitoring and responding to groundwater contamination which would be the intent of the consent order. If the IDEQ has indicated that development of the proposed B and C Panel operations can proceed as proposed in the DSEIS, under the auspices of the proposed consent order, the BLM and USFS will not determine that the proposed operations cannot proceed for reasons of compliance with State groundwater quality regulations.

The management of current water quality impacts from the existing mining operations has been determined to not be within the scope of the NEPA analysis of the B and C Panels (see Section 2.8 of the DSEIS). Rather these impacts will be studied and remediated under the CERCLA process described in the HMEII Report. A revised version of that document is in the appendix of this FSEIS.

10-2 Both the LRMP and Revised Forest Plan are in draft form at the present time. What steps are being taken in ensuring the DSEIS will meet the needs of the final LRMP and Revised Forest Plans?

II. CHAPTER 2: DESCRIPTION OF THE PROPOSED ACTION AND ALTERNATIVES

A. Proposed Alternative: External Overburden Disposal of Seleniferous and non-seleniferous media

10-3 According to the proposed alternative, 18.74 million cubic yards of excess overburden, both containing the seleniferous middle waste shales and other overburden will be disposed of at an external disposal area of approximately 244 acres. It is stated in the DSEIS that seleniferous material placed in overburden dumps can and has led to seeps of selenium contaminated water. Why does Simplot support an alternative that only exacerbates an already existing problem? Additionally, this proposed alternative is a clear contradiction to the Best Management Practice (BMP) to limit the placement of seleniferous material in overburden disposal sites.

10-4 The proposed alternative neglects to describe how infiltration will be reduced at the backfilled pits and the external overburden disposal areas. The capping media is described as at least 10 feet of non-seleniferous chert and limestone overburden covered by 1 to 3 feet of topsoil. This material, once compacted, has been geotechnically evaluated and does not adequately act as an impermeable layer that inhibits vertical infiltration.

Response 10-2

To clarify, the LRMP and Revised Forest Plan are the same document. The commentor is correct, the 1985 Caribou Land and Resource Management Plan (LRMP) is being revised at this time. The draft Revised Forest Plan and DEIS were released in April of 2001 and the comment period ended in November. The Forest is presently cataloguing the public comments and will address those comments while preparing the Final Revised Forest Plan (RFP). Until the revision is complete, however, the Smoky Canyon EIS must comply with the 1985 Caribou LRMP. Since the Smoky Canyon Final EIS will come out before the Final RFP, the project is required to comply with the current (1985) LRMP. When the final RFP is issued, the Forest would look at the Smoky Canyon operation and make sure it complies with the direction in the RFP. If it was not in compliance, the Mine and Reclamation Plan would be modified. Since the Forest anticipates changes in the mining standards and guidelines between the 1985 LRMP and final RFP, the Smoky Canyon Interdisciplinary Team has been keeping touch with the Forest Plan IDT. Since we cannot *insure* consistency with a document that has not been finalized, coordination is the best avenue.

Response 10-3

Simplot has supported the development of site-specific management practices for the proposed B and C Panel operations which reduce the potential for overburden seeps developing in the future. The proposed overburden cap would eliminate the potential surface exposure of seleniferous overburden and provide a buffer area of non-seleniferous overburden between the outer margin (toe) of the slope on the cap and the closest seleniferous overburden within the overburden fill (see Figure 2.2-5 in the DSEIS). As described in Appendix 2B, other management practices such as basal layer control, modification of low permeability foundation material, elimination of low permeability foundation material have been adopted by Simplot to further reduce the potential for overburden seeps. The applicability of these management practices to the Proposed Action and Alternatives has been better described in Chapter 2 of this FSEIS.

The agencies contend that there is no BMP that limits placement of seleniferous overburden in external overburden disposal sites in a universal manner. The pros and cons of seleniferous overburden disposal in pit backfills v. external fills should be determined on a case-by-case basis. External placement of seleniferous overburden can be important for maximum utilization of the phosphate resource and can be considered where site characteristics and application of mitigative measures indicate that the potential for overburden seeps is controlled.

Response 10-4

Applicability of infiltration barriers to the proposed B and C Panel operations is described in Section 2.7 of this FSEIS and the appendix.

10-5 Following reclamation, a significant highwall will remain if actions outlined in this alternative are carried out. How is this consistent to the reclamation objective of having the final surface blend with surrounding natural topography?

B. Alternative A: Handling of Wasterock to Eliminate External Disposal of Seleniferous Waste (Agency preferred Alternative)

10-6 This alternative requires that all seleniferous overburden shale be backfilled in the mine pits and covered with 11-13 feet of non-seleniferous chert and topsoil. This alternative reduces the need for capping the external overburden disposal since all overburden placed in external dumps is essentially non-seleniferous. While this alternative reduces the surface area of overburden that contains seleniferous material, it still neglects to describe how infiltration will be reduced at the backfilled pits.

C. Alternative B: No External Wasterock Disposal

10-7 This Alternative includes complete backfill of all the overburden, and further reduces the highwall that would remain under the proposed alternative and Alternative A. This alternative would require 33 % re-handling and extend the period of reclamation 21 months. Why isn't the re-handling and extension of reclamation "disclosed" as a positive economic impact in the SEIS? The extension would likely keep employees working for a longer period of time. Apparently, the 30 % "swell" factor is not an issue for completion of mining activities in Panels B and C. If this is the case, and all excavated materials can be backfilled into existing pits, why do the above alternatives include overburden disposal areas if they are not needed?

D. Alternative C: No Action Alternative

10-8 The Proposed alternative, and Alternatives A and B lack any discussion of infiltration barriers and adequate discussion of mitigation measures; this is the only alternative that adequately ensures protection of human health and the environment.

Response 10-5

The significant remaining highwall after reclamation is complete will be the B-Panel highwall. This is necessary for economic development of the phosphate resource. The remaining highwall would not be visible from the public road and would represent a small fraction of the total disturbance which would be regraded to blend with the natural topography. The remaining highwall would be smaller than typical residual highwalls in the phosphate mining industry.

Response 10-6

Applicability of infiltration barriers to the proposed B and C Panel pit backfills is described in Section 2.7 of this FSEIS and the appendix.

Response 10-7

The Alternative B discussion for the Star Valley area in Section 4.14 of the DSEIS does disclose that wages would be paid for the additional 21 months required to reclaim the site under this alternative.

Swell of the rock volume does occur in the Smoky Canyon operations like other mining operations but the proposed B and C Panel operations include backfilling an additional open pit, Panel A, which allows placement of more overburden into open pits than would be possible if only the B and C Panel pits were available for backfilling. The reason why external disposal of overburden is necessary is the scheduling of material handling during mining. All overburden removed from the B Panel cannot be immediately backfilled into open pits and some overburden must be placed in the external disposal site because there is no other place for it to go, at the time it is mined. If this material was to be replaced into the open pit at a later date, it must be remined and hauled back to the pit. This results in the increased mining costs discussed in Section 4.14 of the DSEIS. Eliminating the additional material handling and the associated costs results in some overburden being permanently placed in the external overburden disposal site.

Response 10-8

Section 2.7 of this FSEIS has been modified to include a discussion of infiltration barriers and a detailed discussion of the applicability of this mitigation measure to the proposed B and C Panel operations has been added to the appendix of this FSEIS. The groundwater impact analysis for the Proposed Action and Alternatives A and B has been modified to better simulate the effects of the seepage from the overburden fills and mitigation measures that will be applied for these impacts. The groundwater impacts discussion in Section 4.3.1 of this FSEIS shows that human health and the surface environment should not be impacted by the groundwater quality impacts predicted for the Proposed Action or the Alternatives. The IDEQ regulates groundwater quality in Idaho and has determined that the B and C Panel operations and groundwater impacts described in the DSEIS can go forward under a consent order with the IDEQ. Based on the above information, the agencies have determined that the preferred alternative reasonably avoids and minimizes adverse effects on the quality of the human environment.

10-9

E. Summary

The DSEIS failed any discussion regarding comprehensive cleanup for SCM's past and current operations. Minus such a cleanup element for past and current contamination problems, the SEIS fails to meet one of NEPA's most important requirements; failure to identify and analyze a full range of reasonable alternatives.

10-10

None of the action alternatives proposes to avoid impact on the groundwater in the SCM area. While all phosphate mining in southeast Idaho has resulted in selenium contamination, it appears that the problem at the SCM is aggravated by site elevation, topography and drainage patters. The above alternatives fail to make it clear that mining can occur at this site without significant environmental damage.

III. CHAPTER 3 / 4: AFFECTED ENVIRONMENT / ENVIRONMENTAL CONSEQUENCES

10-11

Although it is stated repeatedly throughout the DSEIS that current impacts are not fully understood, it is known that surface water, groundwater, soil, and vegetation within the SCM area is contaminated with elevated levels of Se, in addition to other contaminates. The DSEIS fails to adequately address how these current impacts will be mitigated. The following comments to Chapters 3 and 4, "Affected Environment" / "Environmental Consequences" includes only a brief summary of GYC's principal concerns to the environmental media. When a viable alternative is proposed for SCM expansion, GYC can then evaluate impacts accurately and will be able to submit more detailed comments with regard to impacts to each of the sensitive receptors within the cumulative effects area.

Response 10-9

Known information related to the environmental impacts from the existing mining and milling operations at the Smoky Canyon Mine was presented in Section 4.16 of the DSEIS. This section, and Section 2.8, describe the future process that will be followed by Simplot and State and Federal agencies in studying and mitigating the existing selenium impacts at the mine. The Selenium Mitigation Action Plan, now called the HMEII Report, which was distributed along with the DSEIS provides further information on how existing mining impacts will be addressed under CERCLA. Under the existing Memorandum of Understanding, which preceded preparation of the DSEIS, the BLM, USFS and other Federal and State agencies agreed to enter into regional and site-specific investigations and mitigation at phosphate mine sites in an organized manner, reducing duplication of effort to the extent possible. In the spirit of these previous agreements, the BLM and USFS determined during the planning of the B and C Panel SEIS to exclude impact analysis and mitigation for the existing mine site which would be the subject of efforts under the MOU. For the scope of the B and C Panels, the agencies did develop three alternatives to the Proposed Action, including the No Action. The agencies evaluated the only reasonable range of alternatives that were apparent, consistent with existing approvals and limitations on development of the phosphate resource.

Response 10-10

The Proposed Action and Alternatives are predicted to result in selenium contamination of the underlying groundwater. Modifications to the modeling approach in this FSEIS to better incorporate information from the overburden column testing and certain mitigative effects of the clean water infiltration at the margins of the overburden disposal areas show that the area of predicted groundwater impacts is significantly less than described in the DSEIS. Analysis of environmental impacts under NEPA does not necessarily require the agencies to eliminate significant environmental impacts but, using all practicable means, to avoid or minimize possible adverse effects on the quality of the human environment [40 CFR 1500.2]. The BLM and USFS believe that all the alternatives considered in the DSEIS reduce adverse environmental effects to the surface environment where humans may be exposed to these effects. The alternatives considered include what is reasonable to mitigate the environmental impacts in technically and economically practical and feasible manners [51 FR 15618, April 25, 1986].

Response 10-11

Please refer to Response 10-9 for the agencies' determination on how existing impacts from current mining at Smoky Canyon should be addressed.

A. Water Resources

10-12 GYC's primary concern regarding the impacts to water resources in the SCM area is related to the groundwater. The DSEIS states that "impacts to water quality in the Wells Formation aquifer from seepage through the proposed overburden facilities is expected to be an irreversible and irretrievable commitment of this groundwater resource." While this might be true considering the alternatives outlined in the DSEIS, impacts to groundwater could be minimized, if not eliminated, by incorporation of various infiltration management practices. It appears that due to various inconveniences and higher costs necessary mitigation measures are not even being considered.

10-13 It appears that Simplot plans on relying solely on natural attenuation of the contaminants in the groundwater. In order for this to be an adequate solution, a risk-based analysis must be completed, and a complex assortment of monitoring points must be installed to ensure attenuation is taking place at a rate appropriate to the protection of the surrounding environment. The DSEIS does include results from modeling that indicates concentrations of Se exceeding drinking water standards up to 2,000 feet down gradient of the disturbed area.

B. Soil and Watershed

10-14 GYC's primary concern of impacts to soil and watershed at SCM is related to erosion. According to the DSEIS there will be a significant conversion of forested land to nonforested cover types. This would cause erosion to be higher for years following reclamation until reforestation is successful. This increased level of erosion is in addition to large portion of the soils within the watershed as rated with a high hazard of erosion.

The conversion of thousands of forested acres to non-forested acres will seriously affect water quality and water resource values. An earlier and faster snowmelt would lead to a variety of impacts to water resource values. Heavier sediment loading, earlier run-off, impacts to water rights, warmer water temperatures and so forth.

C. Vegetation

10-15 GYC's primary concern regarding impacts to area vegetation is related to Se uptake by vegetation on previously reclaimed sites. The DSEIS has indicated that vegetation on previously reclaimed sites at SCM have high concentrations of Se. While implementation of the BMP of covering seleniferous material with 11 to 13 feet of nonseleniferous overburden and topsoil may adequately reduce Se levels in vegetation on upcoming reclaimed areas; what measures will be taken to reduce Se uptake in vegetation on previously reclaimed sites?

Response 10-12

A more detailed analysis of the feasibility of incorporation of infiltration barriers into the overburden disposal practices is included in Appendix 2C of this FSEIS. In addition, the mitigative effects of clean water recharge at the margins of the overburden fills has been incorporated into the groundwater impact analysis (see Section 4.3.1 of this FSEIS). This information shows that water quality impacts to groundwater cannot reasonably be eliminated at the B and C Panels but it can be minimized as shown.

Response 10-13

As described in item 3. on page 4-43 of the DSEIS and again in the third bullet on page 4-54, chemical attenuation was not incorporated in the groundwater impact analysis. The groundwater quality impacts predicted by the model results shows the estimated concentrations of the COPCs in equilibrium with the natural groundwater flow in the area, not including attenuation. The down gradient extent of the selenium concentration greater than the MCL has been modified with the modeling results discussed in Section 4.3.1 of this FSEIS to roughly coincide with the limits of the mine disturbance.

Response 10-14

The Proposed Action does not involve "thousands of forested acres" as erroneously stated by the reviewer. Instead, disturbance would occur over 618 acres; the large majority of these disturbed acres would be subject to sediment and runoff control measures designed to reduce sediment loading to streams and regulate runoff timing and peak flows.

Response 10-15

Measures to address selenium accumulation in previously reclaimed lands will be developed as described in the HMEII Report. See Section 2.8 in the DSEIS. The HMEII Report is included as an appendix to the FSEIS and describes the process for studying existing impacts at the mine.

D. Wildlife

10-16

GYC's primary concern regarding impacts to wildlife is the impacts to big game. Fragmentation of the landscape as a result of mining could result in large-scale, long-term impacts to wildlife by causing changes in natural distribution patterns, and possible overuse of nearby habitats. A large portion of the watershed down gradient from the SCM is critical winter range for big game. What actions will be implemented to insure protection of this winter range? What actions will be implemented to limit forage of seleniferous vegetation on previously reclaimed sites? What actions will be taken to limit use of the tailings pond that will remain indefinitely following mining?

E. Fisheries and Aquatic Resources

10-17

GYC's primary concerns regarding impacts to fisheries and aquatic resources are related to the surface water/groundwater interaction, and tailings pond. Although the DSEIS seems to concentrate on direct impacts to surface waters, by introducing contaminates to the groundwater, any expansion proposal will ultimately result in impacts to surface water down gradient from the SCM due to seeps and springs that are abundant in the SCM area. Simplot seems to disregard the fact that groundwater and surface water are hydrogeologically interconnected. In addition, the DSEIS fails to provide adequate measures to ensure tailings pond waters will not adversely affect the fisheries and aquatic resources.

Response 10-16

The potential for altering distribution patterns and causing overuse of other habitat areas are disclosed in the DSEIS. These impacts are expected to be short term as the animals would adapt to the changes in the landscape and reclamation activities would eventually return the area to useful habitat

The scope of this DSEIS does not cover the potential for unknown or unforeseen activities that might occur on identified big game critical winter habitat located away from the Project Area. This area would not be impacted by the proposed B and C Panel operations.

No actions are currently being considered to limit forage of vegetation on previously reclaimed sites.

No actions are currently being considered to limit use of the tailings pond. The tailings ponds will be closed under the authority of the Idaho Department of Lands and this subject is beyond the scope of this SEIS or the authorities of the BLM and USFS (see Letters #5 and #12).

Response 10-17

Section 3.3.4 of the DSEIS describes the groundwater hydrology of the Smoky Canyon area and describes how the Wells Formation aquifer does not support surface streams or seeps and springs within the B and C Panel area. Section 4.3.1 of the DSEIS describes that there is no pathway for discharge of impacted groundwater from the Wells Formation aquifer to surface waters anywhere within the estimated area of those groundwater impacts.

Table 3.3-7 and the narrative on page 3-38 of the DSEIS indicates that the current water quality in Tygee Creek downstream of the tailings ponds complies with applicable aquatic life criterion. In fact, the water quality downstream of the tailings ponds has actually improved since the tailings ponds were built. The tailings ponds will be included in the CERCLA studies described in Section 2.8 of the DSEIS to further investigate their environmental impacts and prepare a long-term closure plan that will address current and potential future impacts to wildlife.

F. Social and Economic Values

10-18 The DSEIS fails to provide a discussion of the relationship between the cost/benefit analysis and un-quantified environmental impacts, values, and amenities. This is a serious omission and must be remedied before a decision can be made. NEPA requires that the agencies explicitly acknowledge what the public is being asked to trade away in order for Simplot to make a profit from the public's resource. In addition, the DSEIS fails to disclose the amount of financial difficulties that Simplot or the public will have to bear if the mine faces an early closure.

G. Cumulative Effects

10-19 The DSEIS states it is still for the most part unclear what the additive contribution to selenium levels in the cumulative effects area is. The agencies need to delay permitting this proposal until they can understand this important issue. It appears that even though the agencies don't adequately understand the effects of their decision they are willing to put the public at risk by assuming the impacts will be insignificant.

10-20 In a recently completed research project, Conservation Science, Inc. rated the Caribou Mountains ecological megasite as one of the most ecologically important, yet most threatened units of the Greater Yellowstone Ecosystem. According to this report "Progress toward conservation goals can be achieved most efficiently by protecting first the highest priority megasites.... The greatest incremental gains are achieved by protecting the 15 megasites in quadrant 1..." The Caribou Mountains megasite falls within quadrant I and the Smoky Canyon Mine lies within this megasite. Given this area's importance to the overall ecological health of Greater Yellowstone, GYC believes that the federal and state agencies responsible for ensuring the public lands, waters, wildlife, and health are protected, should, at the minimum, require that current environmental impacts caused by the Smoky Canyon Mine operations are being actively cleaned up, before permitting new projects or expansions. Sadly, this is not the case. In fact it appears that it will be years, if not decades, before the significant contamination currently being inflicted on the environment by the Smoky Canyon Mine will be mitigated.

H. Summary

In summary, Chapters 3 and 4 can only be superficially evaluated due to the inadequate list of viable alternatives. Once a viable alternative is proposed, impacts to the environment can then be accurately addressed. Even with a superficial evaluation of impacts it is clear that unacceptable, detrimental effects will occur to water resources, soil and watershed, vegetation, and wildlife.

Response 10-18

The resources that provide some unquantifiable values to the public, that would be affected by the proposed development of Panels B and C are described in the individual resources sections, i.e., Recreation, Visual Resources, etc. Although the DSEIS does not contain a full cost/benefit analysis to aid in evaluating environmental consequences, the Social and Economic Resources impacts section describes community services, mineral royalties, employment/wages in a general sense, and the incremental cost of reclamation under each alternative. A statement has been added under the Proposed Action, and Alternatives A and B regarding the implied connection between employment and quality of life, which is addressed in the DSEIS under No Action. We believe the SEIS has indicated those factors not related to environmental quality, which are likely to be relevant and important to the decision.

In order for Simplot's mine to be a viable business, it is essential that it make a profit over the long run. The public resources that are being developed, are developed in response to public and industry demand, and according to regulations as they apply to such development on public lands.

The financial burden of reclamation is taken into account in the reclamation bonding process. The SEIS has not evaluated in detail the social and economic impacts from premature closure of the mine because this is not reasonably anticipated to occur. Simplot already has the lease and an approved mine plan for the B and C Panel development. The agencies are conducting this SEIS to evaluate the environmental impacts of this development in light of new information on selenium and are determining appropriate mitigation measures to address these impacts. As described in this FSEIS, the mitigation measures that have been developed should allow continued operations at Smoky Canyon while reasonably addressing the environmental impacts.

Response 10-19

As described in Section 2.8 of the DSEIS, the BLM and USFS have determined that selenium impacts from the existing mining operations should be investigated and mitigated under the MOU and AOCs developed for this purpose. The agencies disagree with the commentor that permitting Panels B and C must be delayed until the investigations and mitigation planning for the current mining have been concluded. The agencies have not decided that all environmental impacts from the B and C Panels are insignificant. All the potential environmental impacts from the proposed B and C Panel operations have been thoroughly reviewed in the DSEIS and the agencies believe approval of the preferred alternative will not place the public at risk

Response 10-20

In order to thoroughly reply to this comment would require reading and studying Dr. Noss's report; this report is not currently available. However, even if it were, it is beyond the scope of the DSEIS to analyze the potential impacts of the Proposed Action on the Greater Yellowstone Ecosystem.

IV. APPENDIX 2B: BEST MANAGEMENT PRACTICES

10-21 This section of the DSEIS states that after each BMP a summary of how it is or will be implemented at the SCM is provided. No such summary is provided. Listing of the BMP's to be utilized at the SCM is meaningless unless an implementation plan is also provided. Many of these BMP's were not being practiced during the mining and reclamation of existing SCM pits and overburden sites. How will these BMPs be applied to A, D, and E panels?

A. Erosion, sedimentation and selenium control BMP's

10-22 In describing the capping of the seleniferous overburden there is no discussion on reduction of infiltration. The cap "would protect the underlying seleniferous overburden from erosion or root penetration and would store water for evapotranspiration within the cap." What about infiltration into the overburden by snow melt and other precipitation?

B. BMP's for dissolved selenium.

10-23 The BMP for source control in avoidance of permanent placement of overburden in perennial and ephemeral drainages is crucial. Why is it that both panels B and C lay within the smokey creek drainage? This is clearly a contradiction of the BMP. This BMP discusses avoidance of "permanent" placement; does this mean that temporary placement will be allowed?

10-24 In the discussion of source control, why isn't limiting overburden disposal sites discussed? When the surface area of the overburden disposal site is reduced, the total amount of infiltration to the site can be reduced in a linear manner.

10-25 This BMP also states that disposal sites should be free from existing springs, seeps and other water sources. What about placement of panel B directly down gradient of sheep spring? This also seems to be a direct contradiction of this BMP.

Response 10-21

Many of the management practices presented in Appendix 2B of the DSEIS do include site-specific descriptions of how they will be implemented at Smoky Canyon. The wording of the introductory comments in the Erosion, Sedimentation and Selenium Control management practices has been changed to indicate that all of the management practices in that document specifically apply to the proposed B and C Panel operations at the Smoky Canyon Mine. The wording in the Dissolved Selenium management practice document has been revised to clarify how these would be applied at the proposed B and C Panel operations.

Response 10-22

The effects of infiltration into the overburden by snow melt and other precipitation have been analyzed in Section 4.3.1 of the DSEIS. More discussion on the feasibility of incorporating infiltration barriers into the cap design has been included in the appendix to this FSEIS and summarized in Section 2.7 of this FSEIS.

Response 10-23

Panels B and C lie within the Smoky Creek drainage because that is where the phosphate ore is located. Overburden disposal from the B and C Panel operations would take place within the Smoky Creek drainage area but would avoid permanent placement of overburden in Smoky Creek itself.

Response 10-24

Minimizing the surface area of seleniferous overburden disposal sites is discussed on the top of page 5 of the Dissolved Selenium management practices in appendix 2B of the DSEIS.

Response 10-25

The Groundwater Sources section of the Dissolved Selenium management practice indicates that overburden should not be placed over seeps and springs which may introduce groundwater into the overburden fill. This is not the case for the overburden placed down gradient of Sheep Spring because the spring is located above and outside of the planned pit backfill. The water from the spring would be carried over the top of the pit backfill in compliance with the Drainage Channels on Overburden management practice. The channel would be approximately 10 feet wide and 2 feet deep. The pit backfill immediately under the channel and for 50 feet either side of the channel margin would not contain seleniferous overburden and the channel itself would be lined with a 2-foot thick clay infiltration barrier to reduce seepage from the channel into the backfill.

10-26 If the BMP of avoidance of drainages is properly implemented, why is there a section that discusses BMPs for drainage channels on overburden? This is a direct contradiction to the source control BMP. Part of the BMPs include installation of an infiltration barrier layer on top of the seleniferous overburden to reduce infiltration of stream water. What is this barrier made of; what is its life span; what is the permeability of this barrier; why isn't this infiltration barrier discussed as a BMP for reducing infiltration into all overburden/and backfilled areas? It is not clear how the sheep spring channel (running directly over C panel backfill) will be managed.

10-27 In the discussion of run-on control the BMP's list installation of permanent diversion ditches around overburden disposal sites. How is this consistent with the reclamation plan to return all disturbed areas to their pre-mining conditions? How will the complete change of normal drainage effect the surrounding environment? Will these permanent ditches be maintained indefinitely?

10-28 In the discussion of overburden grading it is stated that slope would be increased to increase runoff (and likely decrease infiltration) at the same time as taking care not to grade too steep to increase erosion. How exactly will this be accomplished?

10-29 In discussion of overburden pile aspect, the BMPs maximize southern and western exposures because they are typically "drier" than north and east aspects. I am quite sure, that annual precipitation does not vary on such a small scale. What I believe this BMP is trying to target is that north and east facing slopes have the tendency to retain snow-pack over a longer period of time. Whereas south and west facing slopes are subject to more freeze-thaw cycles due to more wintertime sun exposure. I am not quite sure, this BMP is warranted; west and south facing slopes would be subject to increased erosion.

Response 10-26

It is not always possible to completely avoid drainage channels on overburden, especially where pit backfills are concerned. This is because the pit excavations must occur where the ore is located and small drainage channels may cross the open pits. These can be temporarily diverted during active open pit operations but it is desirable to re-establish the channels over the pit backfills for permanent routing. In these cases, designs can be provided which reduce the potential for infiltration of water from the channels into seleniferous overburden fills. See Response 10-25 to see how the Sheep Creek channel would be carried over the C-Panel backfill at Smoky Canyon. The reason why such an infiltration barrier is not proposed for all overburden fill areas is explained in the appendix to this FSEIS and in Section 2.7.

Response 10-27

As described in Responses 10-25 and 10-26 above, the larger drainage channel crossing the C-Panel backfill will be re-established over the final backfill. The permanent diversions proposed for C-Panel will be for small ephemeral drainage channels which will be rerouted but will still discharge to Smoky Creek. The diversion of such channels will not affect riparian or aquatic conditions because the small ephemeral drainages do not contain these characteristics. The permanent rerouting of these channels will not affect riparian or aquatic conditions in Smoky Creek because it is not a perennial channel in the reach that would be affected by the diversion. The diversion channel will be designed to be permanently stable without maintenance by being excavated into rock or lined with rip rap.

Response 10-28

Overburden fills that are flat, or nearly so, do not shed runoff as fast as those that are graded with a slope. Experience has shown that regraded slopes steeper than about 3h:1v are difficult to reclaim with topsoil and vegetation which are the main components of erosion control for slopes. Installation of final slopes on overburden fills up to maximum angles of about 3h:1v is what is envisioned in the Overburden Grading management practice.

Response 10-29

The GYC is correct in their interpretation of the Overburden Pile Aspect management practice in that it refers to the melting off of snow pack and increased solar exposure and ground surface temperatures that occur on south and west facing slopes compared to north and east slopes. Sublimation and evaporation, enhanced by southwesterly winds that scour these aspects also contribute greatly to the drier condition of these exposures. West and south facing slopes would tend to have less soil moisture for vegetation use and would not support final mountain brush and forest ecosystems as well as north and east slopes but are not necessarily more subject to erosion if the slope angles are not too steep and the vegetation that does exist is sufficiently developed. These exposures are more likely to support a permanent vegetation cover dominated by drought tolerant grasses which can thrive in these conditions.

10-30

The BMP that discusses the capping of overburden material will not include an infiltration barrier "because of the lack of infiltration barrier construction material availability, its cost, and the logistical and environmental issues related to transportation of this material to the mine site." There appears to be no BMP that limits infiltration and exposure to the groundwater. The agencies' responsibility is to ensure environmental protection and compliance with environmental law and regulations; costs and logistics should not be the deciding factors.

10-31

While the BMPs addressing foundation material appears to limit the amount of lateral seepage, it does nothing to address the problems of vertical seepage and impacts on groundwater. To the extent that groundwater is even mentioned we are given the following information, "impacts of this seepage on groundwater quality would be evaluated." The elevated levels of se currently present in the groundwater in the vicinity of the SCM should provide ample evidence that vertical infiltration must be reduced. The methods of reducing vertical infiltration are implemented during construction/backfill of disposal areas. How will infiltration be reduced after the fact?

Response 10-30

A more detailed analysis of infiltration barriers is contained in the appendix to this FSEIS. The information presented describes the technical and financial challenges that exist in covering all seleniferous overburden fills at Smoky Canyon with an infiltration barrier. The revised Proposed Action and Alternatives described in this FSEIS presents an alternate mitigative measure of enhancing local recharge of the groundwater with clean runoff which appears to reduce the groundwater quality impact significantly. The agencies have dual responsibilities of managing natural resources under their jurisdiction for multiple use, including mineral extraction, while controlling the environmental impacts to reasonable levels. Costs and logistics need not be deciding factors when they are not practically prohibitive. NEPA requires analysis of a range of reasonable alternatives and briefly disclosing why other potentially applicable alternatives were eliminated from detailed study [40 CFR 1502.14]. Reasonable alternatives are those that are practical or feasible from the technical and economic standpoints using common sense rather than simply being desirable [51 FR 15618, April 25, 1986]. The agencies have evaluated infiltration barriers as potential mitigation for seepage into overburden fills at Smoky Canyon and have determined that this would not be technically and economically practical or feasible.

Response 10-31

The agencies have attempted to objectively disclose the environmental impacts from the proposed development of the B and C Panels at Smoky Canyon. The type and extent of the groundwater impacts from the proposed operations have been presented in Section 4.3.1 of the DSEIS in a conservative manner and have been shown to not affect human health or the surface environment. The modeling results presented in Section 4.3.1 of this FSEIS show a reduced area of groundwater quality impact due to applications of mitigation measures. Use of infiltration barriers to cover the overburden fills of the B and C Panel operations has been evaluated and the technical and economic challenges appear to be insurmountable for the proposed operations (see appendix to this FSEIS). The IDEQ regulates groundwater quality in Idaho and has indicated that the proposed operations and groundwater impacts described in the DSEIS can go forward under a consent order with Simplot (see Comment Letter #4). Based on the above information, the BLM and USFS have determined that construction of infiltration barriers over the overburden fills at Smoky Canyon will not be required for approval of the mining operations.

V. OVERALL SUMMARY OF COMMENTS TO THE DSEIS:

10-32

In the selection of the proposed alternative it appears that rather than placing public health and the public's interest first and foremost, the agencies appear to be putting the economic well being of Simplot first.

Response 10-32

Public health has been considered in the development of the SEIS. The mine design and the included management practices have addressed the currently known potential impacts to human health and the environment from selenium. The control measures included in the mine plans for Panels B and C are designed to control the mobilization of selenium and other COPCs to the air, surface water, ground water, soil, and vegetation so as to prevent unsafe exposure of humans, livestock and wildlife to these COPCs. To protect these surface resources from the effects of selenium and the other COPCs, the mine plans purposely direct any contamination mobilized from overburden into the subsurface in a controlled manner. Mitigation of groundwater quality impacts has limited the extent of these impacts and addressed potential water quality impacts to the drinking water supply provided at the mine site. There are no indications that either public or private water supplies will be rendered unsafe by the Proposed Action or Alternatives and there are no known connections between the ground water aquifer and the surface environment within the area of the aquifer that is predicted to be impacted.

Public interest can be measured in many different ways. Salaries and benefits paid to the employees of the Smoky Canyon Mine, and additional employees at the Don Plant in Pocatello, were also considered in the SEIS. Simplot also provides significant income to vendors and suppliers of services to the Smoky Canyon Mine. The fact that the Smoky Canyon operations are already an established and significant economic segment of the local and regional economies is important to the agencies in making their decisions on prudent management of the Federal resources related to the development of the B and C Panels. In addition, the agricultural products produced by these operations have established value and utilization in the economy of the United States and the world.

It should also be remembered that the decision to approve the mining at Smoky Canyon, including the B and C Panels, was made years ago by the agencies after reviewing the environmental impacts in the 1982 FSEIS. The purpose of this SEIS is not to reconsider that previous decision but to analyze the environmental impacts of the B and C Panel mining in light of current information and select appropriate mitigation measures to reasonably address the impacts.

SMOKEY CANYON MINE, PANELS B& C SELENIUM MITIGATION ACTION PLAN:

I. INTRODUCTION

10-33

This document's title, "smokey canyon mine, panels b&c selenium mitigation action plan"(SMAP) is misleading. The introduction of the document actually states that impacts from current mining in the e-panel and past mining in the a and d panels are addressed in this document and that "impacts" of panels b and c are discussed in the DSEIS.

10-34

The SMAP recognizes that current impacts to the environment still need to be investigated, and that mitigation will be undertaken subsequent to further investigation. Isn't the initial EIS supposed to disclose to the public the impacts and mitigation measures prior to completion of the work? This is an important step that needs to be considered in the decision making process (i.e. can the proposed work be carried out that will " prevent or eliminate damage to the environment")[3].

II. BACKGROUND

10-35

The SMAP states that general mitigation objectives are covered under the Administrative Order of Consent (IDEQ, 2001); has this document been open to review from the public? In referring to a site-specific AOC the background states this document "will be signed by Simplot and the Forest Service". Shouldn't this document be completed prior to any expanded work at SCM?

The Selenium Mitigation Action Plan was a document prepared by Simplot to describe the future process of study and mitigation under the site-specific AOC. Simplot has provided the following responses to comments 10-33 through 10-50.

Response 10-33

Simplot agrees with this statement. As a result the "Smoky Canyon Mine, Panels B&C Selenium Mitigation Action Plan" (SMAP) has been re-drafted and re-titled as the "Smoky Canyon Mine, Historic Mining Environmental Impact Investigation" (HMEII). This new title as well as additional text in the document is intended to make clear to the reader that this document is not a regulatory document, but rather a description of the enforceable mechanisms through which impacts due to current and past mining practices will be addressed. In contrast, potential future impacts are covered under the NEPA process and addressed in the SEIS.

Response 10-34

Mining was approved at the Smoky Canyon Mine in the original EIS issued in 1982. Public disclosure of environmental impacts, mitigation measures and all other NEPA requirements were covered in the original EIS. This is a supplemental EIS for development of B&C panels that was originally permitted in the 1982 EIS. Mitigation measures addressing selenium contamination, not included in the '82 EIS, have been developed under the NEPA process and are contained in this SEIS.

The impacts and mitigation measures due to current and historic mining practices will be addressed during the site investigation (SI) and engineering evaluation/cost assessment (EE/CA) work that is required under the site-specific Administrative Order on Consent (AOC) to be entered into by the United States Forest Service, the State of Idaho, and the J.R. Simplot Company.

Response 10-35

For clarification, development of B&C panels at SCM is not an expansion of the mine. The mine, including B&C panels, was originally approved in the 1982 EIS and subsequent mine plan. The mining of Panels B and C is a continuation of that original mine plan. This supplemental EIS was required after the discovery of elevated selenium levels in the environment of the eastern Idaho phosphate area.

The Area-Wide AOC, for which the Idaho Department of Environmental Quality is the lead agency, has been available to the public, and now is attached to the HMEII.

The SI and EE/CA work required under the site-specific AOC will address pre-existing environmental effects due to current and historic mining. The AOC will be available for public review through the Idaho Department of Environmental Quality (IDEQ), once finalized.

10-36 The following sentence needs to be re-phrased: "subsequent site-specific sampling will take place to that end as part of the forest service site-specific AOC for SCM" [4]. What does this mean? Again, will the public have the opportunity to review this document? Furthermore, this "site-specific" sampling, should be discussed in the DSEIS/ SMAP as a part of monitoring and mitigation activities.

10-37 The DSEIS and the SMAP have identified Se contamination problems in both surface and groundwater since at least 1997. Trends in data collected since then have not indicated a reduction in contaminant concentrations. It is obvious that current "mitigative" measures are not working; this leaves an even greater doubt in the minds of the public.

10-38 The SMAP states that data from a sampling event in 2000 was not included, this data, and any data collected to date should be included in the DSEIS so impacts to the environment can be adequately evaluated.

10-39 As a general comment to the SMAP, in several locations "the method detection limit accepted for selenium in southeastern Idaho". What is this based on?

III. FUTURE EFFORTS

10-40 Future efforts are described as determining data gaps and preparing a sampling and analysis plan. This apparently seems to be the logical next step of many towards mitigation. The SMAP states that impacts will be mitigated through a consensual CERCLA process. Is CERCLA/superfund appropriate in this case?

Response 10-36

Subsequent site-specific sampling in the context of the questioned sentence means that additional sampling will be done at SCM as part of the SI work required under the site-specific AOC. The site-specific sampling reference in the sentence in question is part of the work that will be done under the requirements of the AOC for currently mined or historic mining at SCM. The work plans that detail the sampling plan are being developed in concert with the AOC. Again, once final, this AOC will be available for public review by contacting IDEQ. The lead agencies under the AOC are tasked with providing public review of the results of the site investigation and proposed mitigation for Smoky Canyon Mine.

A detailed monitoring plan for current and future mining in B&C panel is included as an appendix in the SEIS.

Response 10-37

Current "mitigative" measures, such as the chert cap placed over seleniferous shales on active overburden disposal areas, are recent best management practices (BMP's). Remediation techniques have not yet been applied to previously mined areas, as these remedies are subject to the CERCLA 401 authority. Investigation continues, and will result in the application of mitigative measures to these areas as the EE/CA concludes. Concluding that current mitigative measures are not working is premature at this point. Additional sampling and monitoring of these BMP's has been incorporated into the monitoring plan for B&C panels to gauge the effectiveness of these and other proposed BMP's to address the issue.

Response 10-38

Simplot agrees that additional data inclusion in the HMEII is appropriate. The revised version includes data from 1998 – 2001 for not only selenium, but also cadmium, manganese, zinc and molybdenum.

Response 10-39

The method of detection limit is established by EPA protocol. This is a statistical procedure utilizing blanks to eliminate interference with the instrument in calculating the statistically accurate value of the analyte. In this case, the University of Idaho has a specific procedure to reduce interference and provide a detection limit much lower than previously allowed.

Response 10-40

The decision to employ the CERCLA 401 removal action for the specific site investigations was part of the area wide consent order process and jointly agreed upon by all the federal and state agencies. The 401 authority is different than the Superfund (the trust fund as opposed to the statute) and employs different processes and steps.

10-41 The SMAP does not discuss any capping of the 3 existing overburden areas.

IV. MEDIA SPECIFIC ISSUES

10-42 The SMAP acknowledges that elevated levels of selenium are present in the surface water, the groundwater, and soil and vegetation. The only discussion regarding mitigation of these problems is "Simplot will work with the forest service, etc. to investigate and mitigate releases as necessary."

10-43 The SMAP does not address any contaminants other than selenium. A recent USGS publication (the Phosphoria formation at the hot springs mine in southeast Idaho: a source of selenium and other trace elements to surface water, groundwater, vegetation, and biota") indicates that there are also potential contamination problems from Cd, Zn, Cu, Cr, Mo, As, Ni, V, U, REE, Ba, Co, Ga, Th, and Sc. The DSEIS should thoroughly discuss the implications of this potential contamination and the Mitigation Action Plan needs to address mitigative measures that will be taken to address these other contaminants.

10-44 The SMAP states that interim standards were developed for the Dry Valley Mine EIS and will likely be used for SCM. Geomorphically, the Dry Valley Mine site is dramatically different from the Smoky Canyon site. Why are the referenced interim standards in place at the Dry Valley Mine considered appropriate for the Smoky Canyon Mine? What data was the decision to use these standards based on?

10-45 The discussion of mitigation of the tailings ponds is grossly inadequate. When mining is complete what will happen with the water? The SMAP just says the tailing surface will be covered with topsoil and re-vegetated. What precautions will be taken to reduce infiltration and uptake of Selenium? What types of actions are currently in place to inhibit wildlife from using these ponds?

V. SITE SPECIFIC RESEARCH AND ACTIONS

10-46 As the SMAP states, several methods of reducing selenium concentrations in water and soils have been proven to be effective. How will Simplot use these treatment technologies to help reduce levels of selenium? The DSEIS states, "Simplot is not aware of a reliable, technically feasible and economically reasonable method for treatment...."

Response 10-41

Alternatives for mitigation at the historic overburden areas as well as all other portions of the previously mined area will be developed in the EE/CA process. The SEIS explains that the mitigated proposed alternative does include chert and topsoil capping of the of A pit. Additionally, portions of D panel and most of the E panel have already been, or will be capped with chert and topsoil.

Response 10-42

The EE/CA process will require extensive investigation concerning mitigative alternatives. Without an adequate technical information base, it is premature to address mitigation in the HMEII. This information base will be established through the SI and EE/CA process.

Response 10-43

Simplot has included data for other analytes in the HMEII. However, the SI and EE/CA process will address other contaminants of concern in the previously mined areas at SCM that may require mitigative measures.

Response 10-44

Simplot agrees with these concerns. The decision to apply the Dry Valley interim soil standard at SCM should be addressed by the agencies.

Response 10-45

Simplot acknowledges GYC's concern about the tailings ponds information and as a result has expanded this section in the HMEII to further outline the procedures that will be followed in developing a new abandonment plan for the ponds.

Response 10-46

Experimental passive treatment methods have been conducted on a small-scale basis at SCM, such as the introduction of potato waste, iron or cheese whey. The preliminary data indicates some promise in reducing levels of selenium; however, these small-scale studies have yet to be proven in a large-scale, long-term field application. In addition, they have not been approved by any regulatory agency. Simplot is committed to investigating potential mitigative measures and has been an industry leader in this area as evidenced by its work with the University of Idaho. Simplot places high priority on sustaining earth's resources.

10-47

Why is the proposed methods discussed in the SMAP, such as introduction of potato waste, iron, or cheese whey, not reliable or technically feasible? What is the basis for the statement that it is not "economically reasonable"? Once again, the economic gain of the mining company seems to have a higher priority then the protection of human health and the environment.

Response 10-47

As the SMAP states, several methods of reducing selenium concentrations in water and soils have been proven to be effective. How will Simplot use these treatment technologies to help reduce levels of selenium? The DSEIS states, "Simplot is not aware of a reliable technically feasible and economically reasonable method for treatment..."

Experimental passive treatment methods have been conducted on a small-scale basis at SCM, such as the introduction of potato waste, iron or cheese whey. The preliminary data indicates some promise in reducing levels of selenium; however, these small-scale studies have yet to be proven in a large-scale, long-term field application. In addition, they have not been approved by any regulatory agency. Simplot is committed to investigating potential mitigative measures and has been an industry leader in this area as
evidenced by its work with the University of Idaho. Simplot places high priority on sustaining earth's resources.

The quote "economically reasonable" is from the BMP document in Appendix 2B. The complete sentence that was quoted read, " At the present time, Simplot is not aware of a reliable, technically feasible and economically reasonable method for treatment in perpetuity of collected seepage from overburden disposal facilities." The SMAP also indicated that, "the long term effectiveness or maintenance requirements of selenium control treatments are unknown at this time." The wording in these documents does not preclude future application of some type of treatment for selenium control. The agencies and Simplot are merely acknowledging that reasonably feasible treatment methods for use at Smoky Canyon have not currently been identified. This will be an objective of the work done under the site-specific AOC.

VI. INTERIM ACTIONS

10-48

The SMAP states: "in the interim, Simplot is taking proactive steps to reduce the potential for selenium releases." What steps are they referring too?

Response 10-48

The proactive steps taken by Simplot to reduce the potential for selenium mobilization are set forth in detail in the Best Management Practices Guidance Manual for Active and Future Phosphate Mines prepared by Montgomery Watson.

For example, Simplot has begun capping seleniferous material in the active overburden disposal areas with 8 – 10 feet of chert and topsoil to prevent the mobilization mechanism (oxidation) for selenium from occurring, and to thus prevent vegetation and animal life from coming into contact with selenium. In addition, we have restricted grazing for sensitive species such as sheep on areas with suspected selenium elevated vegetation. Cross valley fills are no longer a part of mine design, selenium containing shales are not stacked where seeps or springs may come in contact with material. Storm water is preferentially directed to areas away from the shales, and reclamation efforts are designed to minimize ground water percolation.

10-49 In addition, the SMAP states, "many historical BMPs intended to manage sediment may have a positive effect on reducing selenium releases at the source even though they were not specifically designed to do so." What is this statement based on? If this were the case why are elevated levels of se and other contaminates still present on and near reclaimed areas of the SCM?

VII. OVERALL SUMMARY OF COMMENTS TO THE SMAP

10-50 In conclusion, the SMAP is severely inadequate; there seems to be no "Action" part of the "Mitigation Action Plan". This Plan needs to be greatly expanded and re-submitted prior to approval of the DSEIS. This is crucial in ensuring the public of protection to human health and the environment.

10-51 The agencies responsible for land and resource management should require mitigation measures that have a high probability of protecting the public health and public resources rather than accepting measures that are the least costly to Simplot.

Response 10-49

The primary concerns addressed by historical BMP's were to minimize erosion from disturbed areas and minimize sediment loading in local streams. This is accomplished by soil stabilization, seeding and revegetation, stream and precipitation runoff diversion, precipitation runoff collection and dispersion and sediment collection. However, any historical BMP that minimizes the contact of precipitation (including snowmelt) from disturbed areas of a mine or which minimizes sediment collection in the precipitation runoff will help to reduce selenium mobilization. While these historical BMP's help reduce the mobilization of selenium, they obviously do not eliminate it. The purpose of the MOU, Area-Wide AOC, and site-specific AOCs discussed in the HMEII all coincide with the recognized need to pursue additional BMP's to address selenium mobilizations.

Response 10-50

Simplot appreciates GYC's comments and have done our best to address the concerns outlined in these comment in the revised "Historic Mining Environmental Impacts Investigation" as well as in direct response to these comments. The HMEII is not itself an enforceable regulatory document, and so the observation regarding "action," with respect to this particular document, is accepted. However, the HMEII (particularly as reformulated) provides a roadmap to the other avenues by which the impacts of past mining will be investigated and evaluated. These "other avenues" are the MOU and the AWAOC, which are attached in the HMEII in addition to the site-specific AOC, which is expected to be finalized, before the SEIS ROD is signed. Simplot fully expects that there will be plenty of action under these legally enforceable documents, and will welcome GYC's participation.

Response 10-51

The agencies agree with this comment. The mitigation measures that have already been incorporated into the Proposed Action, and those measures that have been included in the Mitigation and Monitoring section of this SEIS demonstrate the agencies' resolve and Simplot's interest in addressing environmental impacts with methods that are known to be effective or are likely to be effective. Many of these mitigative designs and practices are clearly not the least expensive choice. The agencies are also aware that economics must be considered in responsible utilization of the public resources.

10-52

CONCLUDING STATEMENT:

GYC is not opposed to expansion of the Smoky Canyon Mine, if and when it can be demonstrated that past contamination problems can be cleaned up and future contamination can be prevented. However, it is clear after a careful review of the DSEIS and the SMAP, that there are not adequate assurances that past and future contamination are adequately addressed, and that the proposed expansion is significantly pre-mature. The DSEIS fails to identify a viable alternative, fails to adequately address impacts to the environment, and finally fails completely in discussion of mitigative measures for past, current, and future mining efforts. In conclusion, GYC strongly opposes the proposed action and the action alternatives described in the DSEIS.

Sincerely,
Gwen Gerber
Greater Yellowstone Coalition
Idaho Office

Response 10-52

The agencies share GYC's concerns over the need for study and remediation of the existing selenium contamination issues at the Smoky Canyon Mine. A rigorous process has been specifically developed, with involvement by all interested Federal and State agencies, to address the existing contamination issues through the Area-wide and Site-specific AOCs. The BLM and USFS are fully supportive of this parallel (AOC) process to study and remediate the existing contamination at the mine within the near future. This AOC process is scientifically robust, broad in scope, legally enforceable, and is intended to be reasonably aggressive with regard to schedule. The land management agencies believe this process will adequately address past and current contamination issues. Therefore, the land management agencies have not included study and remediation of the existing contamination within the scope of analysis for this SEIS and believe that decisions on the Proposed Action and Alternatives can be made without answering all the questions related to the existing contamination issues.

The agencies disagree with GYC's assertion that the environmental analysis failed to adequately address impacts to the environment, propose viable alternatives, or apply mitigative measures for future mining in the B and C Panels.

With regard to the environmental impacts from the Proposed Action and Alternatives, the agencies believe that mitigative measures proposed for the B and C Panel development have included reasonable responses to the current understanding of the selenium contamination issue. The proposed mine plan is designed to eliminate exposure of seleniferous overburden to the surface environment with the result that long-term mobilization of selenium from the B and C Panel disturbances to surface water, air, soil, vegetation, humans, livestock, and wildlife should be eliminated or greatly reduced to levels that are not a problem. An extensive set of site-specific management practice has been developed for the B and C Panel operations to reduce mobilization of selenium and other COPCs.

The release of contaminants to groundwater has been mitigated to the extent that the impacts are predicted to be confined to the Wells Formation aquifer in the vicinity of the mine where there are no known connections to the surface environment or public drinking water supplies, other than Simplot's own water supply for the mine. The water quality impacts to the groundwater are not predicted to exceed drinking water standards at the Simplot water supply well and they are predicted to be largely confined to the area directly under the mine disturbance area.

The agencies conclude that future contamination issues related to the B and C Panel development have been addressed to a reasonable degree, based on the current information base and reasonable mitigation has been incorporated.

The environmental analysis has also shown that other environmental impacts of the B and C Panels, such as physical disturbance of water resources, wetlands, fisheries, soil, vegetation, grazing, wildlife and other surface environmental resources are reasonably mitigated by the planned operational environmental protection measures and long-term reclamation activities. Social, economic, cultural resources, recreation, wilderness, Native American concerns, and

environmental justice issues have also been evaluated and no significant impacts have been identified.

To ensure that the effectiveness of the applied mitigation measures is demonstrated, detailed monitoring plans have been developed and approved by the agencies. In addition, the agencies will be involved with the on-going site-specific AOC process and will incorporate information obtained from those investigations into their future management of the land and mineral resources at the Smoky Canyon Mine. These lessons will also be incorporated into the B and C Panel operations to the degree reasonably practicable.

The agencies disagree with GYC's assertion that the environmental analysis failed to adequately address impacts to the environment, propose viable alternatives, or apply mitigative measures for future mining in the B and C Panels.

With regard to the environmental impacts from the Proposed Action and Alternatives, the agencies believe that mitigative measures proposed for the B and C Panel development have included reasonable responses to the current understanding of the selenium contamination issue. The proposed mine plan is designed to eliminate exposure of seleniferous overburden to the surface environment with the result that long-term mobilization of selenium from the B and C Panel disturbances to surface water, air, soil, vegetation, humans, livestock, and wildlife should be eliminated or greatly reduced to levels that are not a problem. An extensive set of site-specific management practices has been developed for the B and C Panel operations to reduce mobilization of selenium and other COPCs.

Letter #11

Caribou County Commissioners
P.O. Box 775
Soda Springs, Idaho
(208) 547-4324

LLOYO M. RASMUSSEN
Commissioner Oistrict #3

BRUCE M. OREOGE, Chairman
Commissioner Oistrict 92

WM. BART CONLIN
Commissioner Oistrict #1

October 12, 2001

Mr. Jeffrey Cundick,
Mining Engineer
U. S. Bureau of Land Management
111 N 8th,
Pocatello, ID 83201

Dear Mr. Cundick

We are writing on behalf of the citizens of Caribou County, Idaho in support of the proposed actions as stated in the Draft Environmental Impact Statement, (DEIS) for the J.R. Simplot Company's Smoky Canyon Mine.

11-1

We have carefully reviewed the three alternatives, and have interviewed Simplot Company officials on the three alternatives. We have also sought input from other citizens in the county. We based our judgment, or the proposed alternative that best meets the standards and expectations we have established for Caribou County. We believe that alternatives A and B, to different degrees, would curtain or completely stop the Simplot Company from further exploration and development of the rich mineral resources of Caribou County.

Response 11-1

Comment noted.

Caribou County is the center of Idaho's important phosphate industry. Over the years Caribou County has worked closely with this industry, and its thousands of employees. The Simplot Company alone pays over $500,000 annually in property taxes to Caribou County. In addition, the mine pays $2,275,000 in mineral royalties each year to federal, state and county governments.

Simplot Company has been operating the Smoky Canyon mine in Caribou County for nearly 20 years. In that time, Caribou County has maintained a wonderful working relationship with the Simplot Company and its employees. We know that the Simplot Company is deeply committed to its environmental stewardship in our forest areas and is an outstanding corporate citizen of this area.

11-2

Caribou County has many Federal Lands Leasing Areas (FLLAs) scattered throughout our large county boundaries. The FFLA's are the driving force of our economy. Federal law requires the BLM to encourage the best use of designated resources identified on public lands. Caribou County believes that phosphate extraction is the best use.

Response 11-2

Comment noted.

Further, the supplemental DEIS is the result of selenium issues which have arisen since the original Smoky Canyon mine plan was submitted in 1982. The Simplot Company and Caribou County are involved with a state/federal, Administrative Order of Consent, (AOC), under which, state, federal and private resources are being deployed to identify and solve recent selenium issues. In addition to participating with the AOC, Simplot Company has retained its own consultants and has been working extensively with the University of Idaho to mitigate any risk to livestock, wildlife and people in the area.

11-3

The social economic importance of the phosphate industry to Caribou County is proven by the fact that nearly 40% of the wage and salary employment come form the phosphate mining and manufacturing sectors. The average monthly wage for the manufacturing sector was $5,768 in 1998, compared to $4,029 for the mining sector. These compare to the average monthly wage for all other industrial sectors at $2,733.

Response 11-3

Comment noted.

11-3

The Simplot Smoky Canyon Mine provides employment for 200 people. The mine provides the phosphate rock for the Pocatello, Idaho fertilizer manufacturing plant which employs nearly 500 personnel. Continued employment for these individual is contingent upon the mine remaining operational.

11-4

We urge you to act with swiftness to approve the proposed alternative. Many families in our county will be affected by unnecessary delays in approval of this action.

Response 11-4

Comment noted.

Sincerely,

Bruce Dredge
Chairman of Commissioners

Letter #12

December 3, 2001

Jeff Cundick
Bureau of Land Management
111 N. 8th
Pocatello, Idaho 83201

SUBJECT: Tailings Pond at Smoky Canyon Mine, RP-744

12-1

Reclamation of the tailings impoundment at the Smokey Canyon Mine is included in J.R. Simplot Company's reclamation plan on file with the Idaho Department of Lands. Since the plan was submitted in 1983, it does not specifically address selenium related issues. This need not delay analysis and completion of the Supplemental Environmental Impact Statement (SEIS).

Most of those in attendance at the September 9, 2001 draft SEIS meeting agreed that the tailings impoundment should be analyzed in the upcoming site investigation under the Administrative Order on Consent (AOC) instead of the SEIS. I will contact Jeff Jones from the United States Forest Service (USFS) about including some more specific language in the AOC concerning the tailings impoundment. Since the impoundment is on private land, perhaps the involvement of the Idaho Department of Water Resources (IDWR) and the Idaho Department of Lands (IDL) should be specifically mentioned in the AOC. The AOC should also state that the approved plans held by IDL, IDWR, and others may need to be modified based on the results of the site investigation. I spoke with Rick Clegg from the Department of Environmental Quality (DEQ). He did not see any problems with including these things in the AOC.

IDL does have specific authorities that pertain to operation and reclamation of the tailings impoundment. IDL administers the Rules Governing Exploration and Surface Mining in Idaho (IDAPA 20.03.02). Section 140.008 of these Rules requires that tailings impoundments be designed, constructed, operated, and decommissioned (reclaimed) so they do not constitute a hazard to human or animal life. This section also states that hazardous chemical residues within the tailings pond shall be detoxified or covered with an adequate thickness of non-toxic material, to the extent necessary to achieve water quality standards in adjacent surface waters. Selenium may constitute a hazard, and it might be considered a hazardous chemical residue. The site investigation will, hopefully, clarify these issues.

If the site investigation indicates the approved plan should be modified to mitigate potential hazards, then IDL will work with J.R. Simplot Company to modify the plan. I spoke with Bruce Winegar from J.R. Simplot Company on November 29, 2001. He understands that reclamation of the tailings impoundment may need to be changed due to the issues associated with selenium. Plan modifications can be requested by the Department under Section 090.01 of the above Rules. This section of the Rules allows the department to identify a material change that requires a change in the reclamation plan. A material change, as defined in Section 010.15 of the Rules, could substantially modify surface water management, or it may increase the overall estimated reclamation costs by more than 15 percent. Selenium issues could easily fall under on of these definitions. Changes to the

Response 12-1

This letter from the Idaho Department of Lands (IDL) indicates that the IDL has regulatory authority over final reclamation of the tailings ponds at the Smoky Canyon Mine; will seek to be involved in site-specific AOC studies related to selenium impacts from the tailings ponds; and will require any appropriate changes necessary for final reclamation of the tailings ponds in compliance with State requirements.

reclamation plan must be reviewed and approved by the IDL. IDL may also require a bond that covers the actual cost of reclamation.

IDWR has specific authorities that pertain to the tailings dam. IDWR administers the Mine Tailings Impoundment Structures Rules (IDAPA 37.03.05). Proposed modifications to the stream diversion or the dam must be submitted as a modification to the approved dam abandonment plan. These modifications must be reviewed and approved by IDWR. IDWR requires a bond that covers the cost of dam abandonment. Please contact Sonny Hornbaker (208-327-7951) for further information.

Thank you for the opportunity to clarify how the tailings impoundment at the Smokey Canyon Mine will be handled by the state agencies. If you have any other questions, please call me at the above number.

Sincerely,

(Signed)

Eric Wilson
Mined Land Reclamationist

CC: Jeff Jones, USFS
Dave Tomten, EPA
Rick Clegg, DEQ
Bruce Winegar, J.R. Simplot Co.
Sonny Hornbaker, IDWR
Boyd Cook, IDL

Letter #13

Mr. Jeff Steele, Manager
BLM, Pocatello Field Office
1111 N. 8th Avenue
Pocatello, ID 83201

Re: DEQ comments on Smoky Canyon Mine expansion and the Groundwater Quality Rule.

Dear Mr. Steele:

13-1

This letter addresses your question regarding whether the Smoky Canyon Mine expansion will violate state ground water quality law, as set forth in the Idaho Ground Water Quality Rule (GWQR). In order to answer your question, DEQ made several assumptions.

First, BLM has predicted the operation of the Smoky Canyon mine will cause ground water quality to exceed the numerical standard for selenium set forth in section 200.01a of the GWQR. There are disputes over the accuracy of the modeling that led to this prediction, and there is a level of uncertainty with respect to any such modeling. For purposes of this letter, however, DEQ will not debate the results of the modeling.

Second, DEQ and Simplot will enter into a consent order designed to ensure compliance with the GWQR. Consent Orders are authorized by the Idaho Environmental Protection and Health Act, Idaho Code section 39-108 (3)(a)(v) and 39-108(3)(b). If a party complies with the terms of a consent order, DEQ is precluded from pursuing any enforcement with respect to the violation that is the subject of the consent order. Therefore, if Simplot complies with a consent order designed to address potential violations of the GWQR, then DEQ will be precluded from pursuing enforcement with respect to those potential violations.

The GWQR implements certain policies from the Idaho Ground Water Quality Plan adopted by the state legislature in 1992. One of these policies specifically relates to mining and reads as follows: "Mining. The policy of the state of Idaho is to protect ground water and allow for the extraction of minerals above and within ground water." GWQR, section 006.06.

Section 400.06 of the GWQR also specifically relates to mining. Section 400.01 generally prohibits a release, leaching, etc. of a contaminant into the environment in a manner that causes a ground water quality standard to be exceeded. Section 400.06, however, provides that naturally occurring constituents found in ground water within a specified area surrounding an active mineral extraction area, as determined by the Department, will not be considered contaminants, as long as all applicable best management practices (BMPs), best available methods (BAMs) or best practical methods (BPMs), as approved by the Department are applied. For Smoky Canyon Mine this means that, while active mining is continuing, the GWQR allows levels of selenium to be released in ground water at levels that exceed ground water quality standards, if (1) the elevated levels are limited to the area, specified by DEQ, surrounding the active mineral extraction area, and (2) BMPs, BAMs, and BPMs approved by DEQ are applied.

Response 13-1

This letter indicates that IDEQ would allow the proposed operations to go forward under the jurisdiction of a consent order to be implemented before operations begin. Compliance with the consent order would take primacy in the IDEQs administration of Idaho Ground Water Quality Rule (GWQR) for this project. IDEQ states in the letter that "Simplot will be in compliance with the GWQR to the extent it complies with the consent order and any elevated levels of selenium are within the area identified by the IDEQ surrounding the active mineral extraction area." The consent order will include provisions to ensure Simplot will be responsible to take appropriate actions, as required by the IDEQ to respond to any groundwater contamination greater than GWQR standards.

DEQ and Simplot intend to enter into a consent order that defines the area surrounding the active mineral extraction area; that identifies relevant naturally occurring constituents; that identifies approved BMPs etc.; and that requires ground water monitoring. Simplot will be in compliance with the GWQR to the extent it complies with the consent order and any elevated levels of selenium are within the area identified by DEQ surrounding the active mineral extraction area.

The exemption provided in section 400.06 only applies during active mineral extraction. In addition, according to BLM's prediction, there may be contamination from the mine operation beyond any reasonable definition of the active mineral extraction area. In these instances, the general ground water quality standards apply.

Sections 200 and 400.01 prohibit releases of contaminants that exceed a ground water quality standard. When a release exceeding the standards does occur, DEQ may require the responsible party to take appropriate response actions. GWQR, section 400.03.

The GWQR also provides for situations in which a standard is not exceeded, but ground water degradation occurs that is deemed significant by DEQ. In these circumstances, DEQ may require a number of actions be taken in response to the degradation. GWQR, section 400.02.

DEQ intends to include in the consent order with Simplot provisions that will require Simplot to establish natural background levels, and to take those response actions required by the GWQR if levels exceed natural background. In this way, DEQ will ensure Simplot's compliance with prevention measures in section 400.02. In addition, because the consent order requires monitoring, reporting and a response when levels are below standards but above natural background, Simplot will have to take measures to prevent contamination that may exceed the standard.

In the event levels of contaminants do exceed standards, the consent order will provide a mechanism to ensure Simplot takes those appropriate actions that are required by section 400.03 of the GWQR. Section 400.05 provides that DEQ may allow site-specific levels that vary from a standard, based on consideration effects to human health and the environment, for remediation conducted under the Department's oversight or other situations authorized by the Department in writing.

In addition, the GWQR allows for a reclassification of an aquifer allowing less stringent standards to apply. GWQR, section 350.01.c. While not an option DEQ would likely support based upon current information, it is possible that the aquifer under the proposed mine expansion could be recategorized in the future to allow anticipated or actual degradation. Thus, sections 400.05 and 350.01.c provide DEQ the flexibility to allow elevated levels of contaminants the release of which would otherwise cause a violation of the GWQR.

In sum, the consent order as described herein will provide the framework for DEQ to ensure compliance with the GWQR. The consent order will require actions to remediate or prevent levels of selenium in ground water that exceed ground water quality standards. The consent order will also require Simplot to respond as

required by the GWQR in event levels of selenium are elevated above standards as a result of mining operations.

While a consent order will provide DEQ the mechanism to ensure compliance with the GWQR, there may be circumstances where there are elevated levels of contaminants from Smoky Canyon Mine that are outside the scope of the consent order. These may occur many years from now. DEQ can not anticipate whether such elevated levels will violate the GWQR given latitude allowed under the rule for site-specific levels and recategorization.

It is hoped this communication adequately addresses issues raised by BLM concerning groundwater quality and the state's "Ground Water Quality Rule". Please feel free to contact me at 236-6160 if you have questions or need clarification.

Sincerely,

(Signed)

Mark Dietrich
Regional Administrator

Cc: Steve Allred, DEQ Director -- Boise
Dave Mabe, DEQ Water Program Administrator -- Boise
Doug Conde, DEQ Deputy Attorney General -- Boise
Jeff Cundick, BLM -- Pocatello
Jeff Jones, USFS -- Soda Springs
Phil de Henaut, USFS -- Soda Springs
Chris Gebhardt, EPA -- Seattle
Dave Tomten, EPA -- Boise

Letter #14

Comment Form - Smoky Canyon Draft SEIS

14-1

Proposals A and B have extensive cost increase's, which may make it impossible to continue. Which would have a dramatic impact on not only this community but food production in genral. With out phosphate it would be impossible to feed the world. This is a worldwide concern not just here.

The proposed action seems to be sufficient to control the selenium issue's with on going test's to insure that a problem does not occur.

14-2

Testing of water sheds and vegatation seem to be working. With the additional SEIS study I see no reason to be concerned. I think Simplot will do all that is possible to control the issue.

With all of the current activities and testing in place, I feel comfortable with the current effort Simplot employ's. I drink the water, eat the game, and ride horses through this area. Simplot is in the farming and ranching business and would be determental to overlook this issue.

Kelly Booth
P.O. Box 1381
Afton, Wyo 83110

Response 14-1

Thank you for the comment. Refer to responses 6-80, 6-81, and 6-82.

Response 14-2

Thanks for the comment.

Letter #15

Comment Form - Smoky Canyon Draft SEIS

The issues I was concerned about was explained to me in a satisfactory manor, that of the silenium issue. I feel this project should go ahead on schedule as Smoky Canyon Mine has planned.

15-1

If this project is postponed it will affect more than just the Smoky Canyon Workers. I am a school teacher, the school district will loose a lot of money and good teachers if Smoky Mine is shut down. Also the business in the Valley.

I hope approval will be given for the 1984 proposal to the Smoky Canyon Mine.

Eldena Grover
P.O. Box 85
Auburn, WY 83111

Response 15-1

Thanks for the comment. See responses 6-80, 6-81, and 6-82.

Appendix 1A

Laws and Regulations for Mining on Public Lands

Laws and Regulations for Mining on Public Lands

- 43 CFR 3500, Solid Minerals Exploration and Mining Operations (administered by BLM and USFS); Federal Land Policy and Management Act of 1976; and Mineral Leasing Act of 1920 - These laws, in combination with other agency plans (i.e., Caribou National Forest Land and Resource Management Plan and BLM Pocatello Resource Management Plan) require the agencies to analyze proposed mining operations to ensure that exploration and mining plans are consistent with and responsive to requirements of the lease, license, or permit.

- 43 CFR 3510, Phosphate Leasing (administered by BLM) - Lists procedures for qualified applicants to obtain rights to develop deposits of phosphate on federal land that is available for leasing.

- 43 CFR 3590, Solid Minerals (Other Than Coal) Exploration and Mining Operations (administered by BLM) - Requires submittal of a mine and reclamation plan for BLM review. Provides for orderly development of mineral deposits without waste or damage to deposits, and promotes maximum recovery using operating practices that will avoid, minimize, or correct damage to the environment.

- 43 CFR 3592 (administered by BLM) - Establishes requirements for permit applications for mining on land leased from the federal government. These requirements include submittal of exploration and mining plans which detail the proposed exploration, prospecting, testing, development, or mining operations to be conducted by the applicant and/or leasee. BLM reviews the proposed mining activity with USFS specialists and receives input from USFS regarding disturbance and reclamation of portions of the proposed mining action that would occur on land administered by USFS.

- 43 CFR 3594.1(a) - Requires mining operations be conducted in a manner that yields maximum recovery of mineral deposits while recognizing the need to protect other environmental resources.

- 36 CFR 251 Subpart b - Stipulates that entities that propose to occupy National Forest System land for specified purposes must obtain a Special Use Permit from USFS.

- Sections 404 and 401 of the Clean Water Act (CWA), administered by USCOE, regulate activities that would fill or dredge wetlands and other waters of the U.S. Section 401 of the CWA requires any applicant for a federal license or permit that may result in discharge of a pollutant to waters of the US to obtain a certification from the state of Idaho (IDEQ) that the proposed discharge will comply with applicable effluent limitations and water quality standards. These two permits are applied for in a Joint Application for Permit. Information in the Joint Application for Permit is also submitted to the Idaho Department of Water Resources (IDWR) to obtain a Stream Alteration Permit.

- NEPA of 1969 - Requires that federal agencies use a multidisciplinary approach to evaluate potential impacts of the proposed detailed mine plan on the human environment. The agencies are required to compile an EIS to disclose to the public what the decisionmaker considered in reaching the decision.

- Non-Federal Actions - Mining and reclamation plans requiring protection of nonmineral resources and reclamation of land affected by exploration and/or mining must be authorized by IDL pursuant to the Idaho Administration Procedures Act (IDAPA).

- The Bevill Amendment excludes phosphate waste from being considered hazardous waste. As specified in 40 CFR §261.4(6)&(7), "The following solid wastes are not considered hazardous wastes: Solid waste from the extraction, beneficiation, and processing of ores and minerals (including coal, phosphate rock, and overburden from the mining of uranium ore)."

Appendix 1B

Native American Consultation

Smoky Canyon Mine SEIS
Native American Consultation

1.0 Introduction

The public scoping effort for this NEPA action attempted to reach all publics and agencies concerned with phosphate mining in southeast Idaho. The mailing list included individuals, agencies, or groups who had expressed an interest in similar projects. The mailing list would be updated to include others who expressed an interest in the project by request or by responding during the initial scoping sessions. The scoping included, official notices, scoping letters to those on mailing list, notices in local newspapers, and two open house public meetings. The specific components of the initial scoping included:

1) Notice of Intent (NOI) for the SEIS was published in the Federal Register on March 24, 2000

2) A legal notice was published in the *Idaho State Journal* on March 28, 2000 and in the *Star Valley Independence* on March 30, 2000. A news release was also published in the *Idaho State Journal* on March 28, 2000, in the *Star Valley Independence* and *Caribou County Sun* on March 30, 2000.

3) Scoping letters were sent to 170 individuals, groups and agencies in March 2000.

4) The public meetings were held in Afton, Wyoming on April 17th and in Pocatello on April 18th. A scoping handout was distributed to all attendees that explained the commenting process.

5) A scoping summary was prepared in May 2000 that detailed the scoping process and recorded all comments received to date. Thirteen comment letters, five comment forms, and one e-mail comments were received.

2.0 Native American Consultation

The federal agencies are required by law (Archaeological Resources Protection Act of 1979 and National Historic Preservation Act of 1966) and regulation to consult with Native Americans on actions that may affect their traditions or uses of public lands. Specifically the agencies are required to follow the Section 106 process as recorded in 36CFR800 - Subpart B as revised July 1, 2000. The Native Americans should comment on proposed actions and participate in decisions prior to implementation as the fruits of consultation. The goal of the BLM Manual Section 8160 is to "assure that tribal governments, Native American communities, and individuals whose interests might be affected have a sufficient opportunity for productive participation in BLM planning and resource management decision making." To this end the Pocatello BLM Field Office has continued consultation with the Native Americans associated with southeast Idaho.

During the public scoping process the following Native American organizations were contacted via the comment letter:

Shoshone-Bannock Tribes
Tribal Land Use Commission
Fort Hall, Idaho 83203

Mr. Keith Tinno
Chairman, Fort Hall Business Council
Shoshone-Bannock Tribes
P.O. Box 306
Fort Hall, Idaho 83203

Duane Thompson, Supt.
US Bureau of Indian Affairs
Fort Hall Agency
P.O. Box 220
Fort Hall, Idaho 83203

No responses were received from the comment letters or through the public meeting process. To fully engage the Native Americans in the scoping process Richard Hill of the BLM furnished a list of contacts for tribes in southeast Idaho.

Southeast Idaho was the location of some of the traditional lands of the large Shoshone Nation which occupied lands in Idaho, Montana, Wyoming, Utah, and Nevada prior to settlement. The Bands in southeast Idaho included the Eastern Shoshones which occupied lands in the Bear River drainage of Idaho and southwestern Wyoming, the Northwestern Shoshones that occupied lands in the Bear River drainage of Idaho and in northwest Utah and northeast Nevada, and the mixed band of Bannocks and Shoshone that occupied the upper Snake River drainage.

Fort Hall was established in 1834 by a Nathianal Wyeth as an early trading post and during the western settlement in the 1800s became an important trading and supply post on the Oregon Trail. A presidential executive order established a 1.8 million acre Reservation in 1867 at Fort Hall for the Shoshone and Bannock Bands. A survey error reduced the Reservation to 1.2 million acres and continued encroachments over the years reduced the Reservation to its present size of 544,000 acres. Today the tribes are organized as a sovereign government and provide services with revenues from agriculture, tourism, and gaming enterprises.

3.0 Consultation

Joseph M. Jarvis of JBR Environmental Consultants, Inc., the third-party SEIS contractor, contacted several tribes on the contact list furnished by the BLM.

Contact:

May 17, 2000
Genevieve Q. Edmo
Land Use Director
Shoshone-Bannock Tribes
P.O. Box 306
Fort Hall, Idaho 83203

I met with Genny Edmo in her office at Fort Hall and discussed the scoping for the proposed mining of B & C panels at the Smoky Canyon Mine. I explained that we would like to make the presentation that was done at the open houses and then take a tour of the mine area. She then

explained to me when the Land Use Policy Commissioners met and when the Cultural Committee met. She also explained that Tuesday was the regular meeting day for Tribal Council of which Claudeo M. Broncho was the acting chairman. She also explained that new officers would be elected on June 13th. Genny and I decided that June 7th would be a likely date for the mine tour.

Contact:

May 17, 2000
Bruce G. Parry
Executive Director
Northwestern Band of the Shoshone Nation
108 East Forest St.
Brigham City, Utah 84302

I met with Bruce Parry and Patty Madsen, cultural resource specialist, at their offices in Brigham City and explained the mine plans in B & C panels and the location and operation of the Smoky Canyon Mine. They were interested but the mine site was not within the band's traditional territory. Bruce then produced a map that showed the different tribal/band territories of the Shoshone Nation. He explained that the Northwestern Band's prehistoric territory was mostly within the watershed of the Bear River in southeast Idaho, thus, the Smoky Canyon Mine site in the Snake River drainage was not of their immediate concern. He did request that they be put on the mailing list to receive the DSEIS.

Letter:

May 18, 2000
Claudeo M. Broncho
Acting Chairman
Shoshone-Bannock Tribes
P.O. Box 306
Fort Hall, Idaho 83203

I addressed a letter to Mr. Broncho proposing a date of June 7, 2000 for the mine tour to Smoky Canyon. I proposed that we could present the open house information on June 8, 2000 to the Land Use Commissioners and the Cultural Committee. I explained in the letter the information on the SEIS and that I had previously met with Genny Edmo and discussed the proposed mining in Smoky Canyon.

I never did receive a reply to this letter.

Phone Call:

May 26, 2000
Genevieve Edmo
(208) 478-3733

I called Genny but she had taken leave because of a family situation. I was referred to Maxsene Edmo who worked for the Land Use Commissioners office. I explained the situation and she said I should go through Curtis Farmer, Land Use Commissioner, to set up a tour and presentation. I faxed her the letter I had sent to Claudeo Broncho on May 18, 2000.

Fax:

June 01,2000
(208) 237-9736
The original letter to the acting chairman was faxed to Maxsene Edmo and Curtis Farmer as they were unaware of this letter.

Phone Call:

June 5, 2000
Curtis Farmer & Maxsene Edmo
(208) 478-3826

I talked with Curtis and Maxsene on a conference call and Curtis said they could not meet the June 7th schedule for the mine tour. They had conflicts with other tribe scheduled meetings.

SEIS Conference Call:

June 12, 2000
See Minutes dated 7/15/00
It was decided that the next scheduled mine tour would need to be after 7/04/00.

Phone Call:

June 23, 2000
I called Maxsene Edmo and Curtis Farmer to discuss tour date and it was tentatively agreed to schedule the tour for July 19, 2000 and the presentation for July 20, 2000. After the phone call I e-mailed John Cunningham at Smoky Canyon Mine and advised him of the new mine tour date of July 19th.

SEIS Conference Call:

June 26, 2000
See Minutes dated 6/28/00
I reported that the Native American mine tour and presentation was tentatively set for July 19-20,2000. Bruce Winegar and John Cunningham of Simplot would not be available on these dates, other arrangements would need to be made for someone at the mine to conduct the tour. Jeff Cundick suggested that the tribal attorney and archaeologist be contacted regarding the mine tour.

Phone Call:

July 06,2000
I talked with Curtis Farmer and he said July 19, 2000 is out for the tour as they have tribal meetings that day. We discussed other dates and came up with August 02, 2000. Curtis said about 8-9 people would be on the tour including a BIA person.

E-Mail:

July 06, 2000
I sent an e-mail to Bruce Winegar and John Cunningham advising of the cancellation on July 19, 2000 and requesting they confirm the date of August 02, 2000 for a mine tour. The e-mail was copied to Jeff Cundick of BLM, Phil de Henaut of USFS, and Brian Buck of JBR.

Letter:

July 07, 2000

I sent a letter to Curtis Farmer confirming the date of August 02, 2000 for the mine tour with the presentation still confirmed for July 20, 2000. I also explained that Smoky Mine had confirmed the date of August 02, 2000 for the mine tour.

SEIS Conference Call:

July 10, 2000

See Minutes dated July 10, 2000

It was confirmed with all on the call that the mine tour with the Native Americans was scheduled for August 02, 2000. All but Phil DeHenaut of USFS would be able to meet this date and be on the tour. John Cunningham asked that I call and discuss the agenda for the tour, and we discussed the agenda during a phone call on July 11, 2000.

Phone Call:

July 17, 2000

I talked with Curtis Farmer about the mine tour on August 02, 2000 and he said 5-6 people are planning to go on the tour. He confirmed the date of August 02, 2000 was good.

Phone Call:

July 26, 2000

I called Curtis Farmer but he was not available.

SEIS Conference Call:

July 31, 2000

See Minutes dated August 04, 2000

I reported the mine tour with the tribal representatives is set for August 02, 2000. I will travel to Fort Hall and pick up 5-6 representatives and bring them to the mine for the tour. John Cunningham will arrange the tour and lunch at the mine. Joe will pick up scoping presentation materials for August 03, 2000 presentation at Fort Hall. Jeff Cundick of the BLM will attend both days.

Mine Tour:

August 01, 2000

I traveled to Pocatello in anticipation of the tour scheduled for August 02, 2000. I talked with Curtis Farmer en route and he canceled the tour because of conflicting meetings on August 02, 2000. We then agreed to reschedule the mine tour for August 22, 2000. I contacted John Cunningham at the mine and told him of the change of plans for the tour.

SEIS Conference Call:

August 14, 2000

See minutes dated August 19, 2000

I informed all that the mine tour was rescheduled for August 22, 2000.

Phone Call:

August 15, 2000

I called Curtis Farmer to confirm dates of August 22, 2000. He confirmed date and attendance of 7-8 people.

Mine Tour:

August 21, 2000

I contacted Jeff Cundick of the BLM and Phil DeHenaut of the USFS about the tour scheduled for tomorrow. I also e-mailed John Cunningham to confirm the tour was a go on the 22nd. The mine tour was completed on August 22, 2000 with five people from Fort Hall on the tour. The mine provided lunch and a tour of all the mine operations and the mill. Those attending included:

Curtis Farmer - Land Use Commissioner
Maxsene Edmo - Land Use Commission
Susan Hanson - CERCLA/RCRA Program Manager
Sam Hernandez - BIA Agricultural Engineer
Dan Christopherson - Wildlife Biologist for Tribes

I discussed the need to respond to the agencies with comments about the proposed mine plan. Generally, the participants did not have any specific comments during the tour. Curtis Farmer has worked at a phosphate mine so he was familiar with the mine operation. Maxsene Edmo did say that there was no knowledge of any band members having lived in the area of the Smoky Canyon Mine recently nor any memory of members would had lived in the area.

Phone Call:

September 05, 2000

I called the Land Use Commission and talked with Maxsene Edmo about a comment letter. She said they were working on a letter but did not commit to when the letter would be completed.

This was my last contact with the Shoshone-Bannock Tribes at Fort Hall.

Appendix 2A

Original 1999 Mine Plan

PANELS B AND C
1999 MINE PLAN

The original proposed mine plan for Panels B and C was submitted by J. R. Simplot, Smoky Canyon Mine (Simplot) to the Bureau of Land Management and U.S. Forest Service on June 30, 1999. It was reviewed by the BLM and USFS and a determination was made to prepare a Supplemental Environmental Impact Statement. Following the scoping for the SEIS, Simplot decided to modify its original mine plan to reduce environmental impacts and better comply with the 1982 Record of Decision for the Smoky Canyon Mine. The revised mine plan subsequently became the Proposed Action for the SEIS. The following description of the original mine plan is provided to allow the reader of the SEIS to understand the differences between the original and revised mine plans.

The detailed plans submitted by Simplot on June 30, 1999 (**Figures 1 and 2**) for approval included two proposed modifications of the currently approved general mine plans for Panels B and C including: 1) no additional backfilling in the south half of Panel A, and; 2) constructing a new overburden disposal site to the east of Panel B instead of utilizing the remaining portion of the approved Smoky Ridge (I) site.

Approximately 139.064 MMT of ore and would be removed during 4.8 years of active mine life. The area of the two open pits would be 554 acres. Most of the overburden from the pits would be used to backfill them and the remaining open pit of Panel A. Approximately 45.815 million loose cubic yards of excess overburden would be placed on a new external overburden disposal site that would cover approximately 185 acres. The total pit and overburden disposal site disturbance would be 739 acres.

Panel B would consist of four pits which would combine to form one large pit that would have a foot wall contact at the top of the hill on the south side of Panel B and extend downslope approximately 2,200 feet. The main highwall of the pit would be located on its north and northeast edge. This highwall would be approximately 4,600 feet long and have a maximum height of about 300 feet. The bottom of the pit at its north end would be at an elevation of approximately 6,770 feet which is about equal to the elevation of the Smoky Creek channel, approximately 1,200 feet away horizontally. The intermittent nature of Smoky Creek in the reach along Panel B, combined with the distance of the pit bottom from the creek suggests that there should be no creek water entering the pit bottom. Drilling in the Panel B area did not intercept any ground water at an elevation above the proposed pit bottom elevation so ground water should not be encountered in the open pit.

The Panel C pit would extend for approximately 6,400 feet along the west side of Smoky Canyon. It would be mined downdip approximately 400 feet toward the west from the foot wall contact which is located roughly 50 to 500 feet from the existing access road in the canyon. The trees and other vegetation in this buffer zone would be undisturbed. For all but the southern end of the pit, the foot wall contact would be at least 40 feet above the level of the access road. The pit would have one highwall approximately 6,400 feet long with a maximum height of about 480 feet. The bottom of the pit in its north end would be at an elevation of approximately 6,890, which is about 110 feet below the elevation of the Smoky Creek channel, approximately 550 feet away horizontally. The bottom of the pit in its southern half would be at an elevation of approximately 7,040, which is about 60 feet below the elevation of the Smoky Creek channel, approximately 750 feet away horizontally. The intermittent nature of Smoky Creek in the reach along Panel C, combined with the distance of the pit bottom from the creek suggests that there should be no creek water entering the pit

bottom. Drilling in the Panel C area did not intercept ground water above the design elevation of the bottom of the pit so ground water is not expected to be encountered in the open pit.

The proposed open pits would be located on either side of Smoky Creek. The creek would be crossed in two locations by road fills. One of these road fills already exists for the mine access road and would be widened to accommodate the 100-foot width of a new haul road exiting the south end of Panel C. This widening of this road would require installation of an additional 100 feet of culvert and road fill in the creek. A second, new haul road fill would be constructed across Smoky Creek in a separate location at the north end of Panel C. This road fill and culvert would impact approximately 270 linear feet of the creek. The existing USFS road in Smoky Canyon would cross the proposed haul roads at grade in both locations. To enable an at-grade crossing on the northern crossing, approximately 2,100 linear feet of the existing access road would need to be relocated and a new road crossing of the creek would be required with a culvert. These public road crossings would be protected with manned guard stations and traffic control signs posted on either side.

Construction of a new haul road from the north end of Panel B would parallel Smoky Creek for approximately 6,800 feet and the north edge of this road surface would be located approximately 200 to 350 feet laterally south of the creek channel. The northern portion of this road fill slope would encroach on the creek in a number of locations along a 1,600-foot long reach including and extending south from the northern haul road crossing of the creek. Two shorter areas of haul road fill encroachment on the creek channel, totaling approximately 200 feet would exist along the haul road just south of the B Panel pit. Culverts would be placed in the creek channel at all these haul road fill encroachment areas. This would total approximately 1,800 feet of culvert.

Approximately 45.815 million loose cubic yards of overburden would be placed in an external overburden disposal site located east of the Panel B which would cover approximately 185 acres. This site would include currently unleased USFS land which would need to be included in a lease modification. The footprint of the disposal facility would be purposely located within topographic ridges to the north and south so that all runoff from the site would be directed in existing ephemeral drainages to the Tailings Pond No.2. No runoff from the site would be allowed to enter either Smoky or Roberts creeks.

The 1999 mine plan indicated that middle shale overburden would be placed either as backfill into open pits or beneath a layer of very low selenium content chert. All other overburden would be handled as a mixture and placed on the overburden disposal site as delivered from the pits.

Backfilling and regrading would cover all areas of the Panel B pits and would result in covering all highwalls of Panel B with 3h:1v slopes. Backfilling of the Panel B would result in a flat area in the northern portion which would not retain impounded runoff water. The external overburden disposal site would have maximum regraded slopes of 3h:1v. The Panel A backfill would have maximum slopes of 3h:1v.

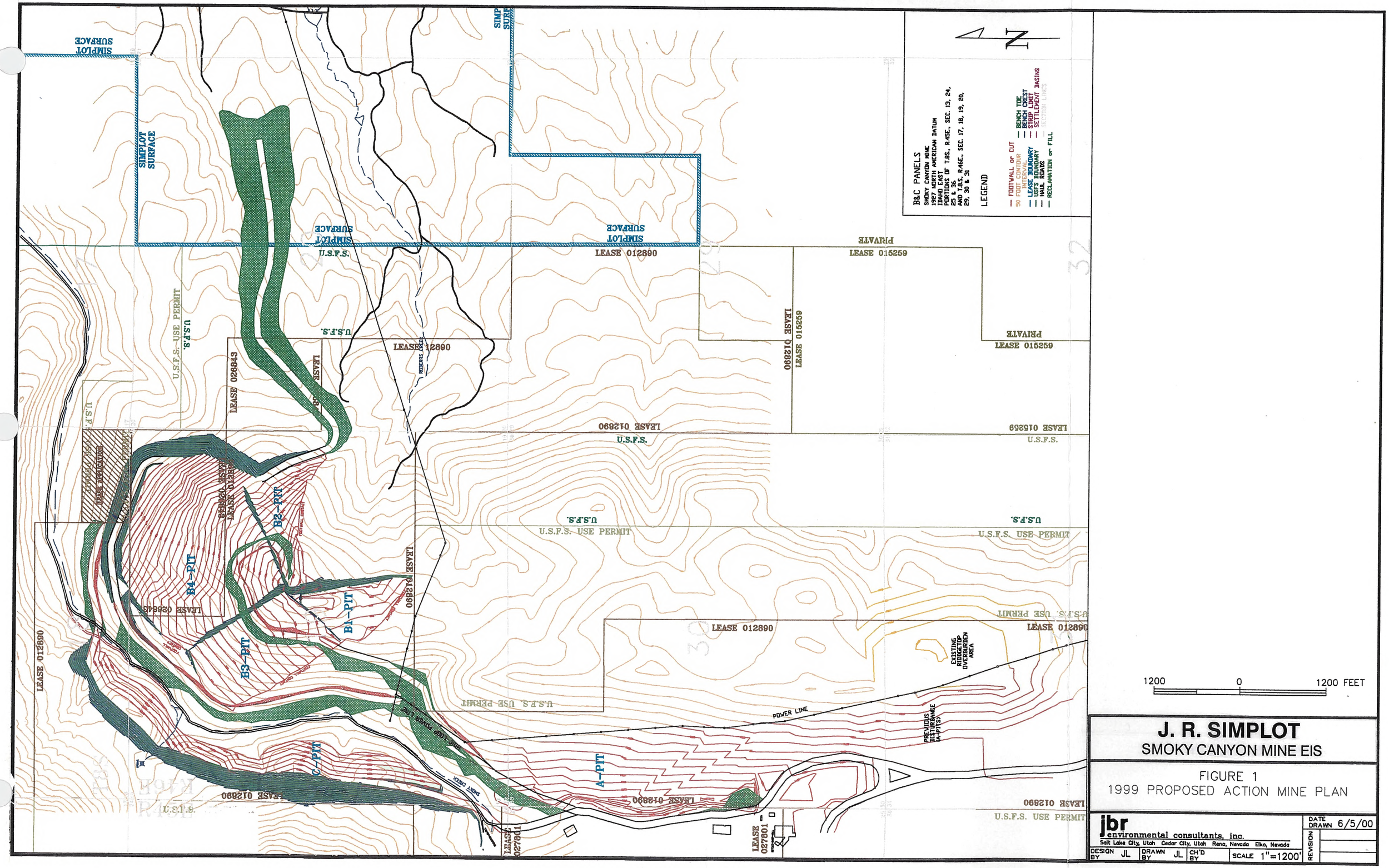
The backfill of the Panel C pit would have a maximum slope of 3h:1v. Panel C Pit would have two areas of exposed highwall remaining after backfilling. The total length along the base of these highwalls would be approximately 4,100 feet. The maximum height of the exposed highwalls would be about 250 feet. Because of the vegetated buffer zone along most of the Panel C pit, these highwalls would not be visible along most of the pit length but would be visible from the southern end of the pit near the road junction. The backfill along the bottom of the highwalls would be graded to prevent impounding conditions along the base of the highwalls.

Existing mine, maintenance, administrative, and milling facilities would be used during the mine period. Ore from the new panels would be handled in the existing mill facilities and tailings would be deposited in the existing tailings disposal facilities. Ore concentrate would be transferred to the Don Plant in Pocatello, Idaho via the existing slurry pipeline transportation system. Water usage would continue as in the past with no increase in water consumption for the operations above that which is already approved.

All regraded disturbed areas would be covered with 1 to 3 feet of topsoil and reseeded with the following seed mix.

Smoky Canyon Mine Seed Mix	
Species	**Rate* (lbs/acre)**
Sanfoin	2.7
Intermediate Wheat Grass	15.7
Smooth Brome Grass	15.8
Timothy	5.3
Sheep Fescue	5.3
Orchard Grass	5.2
Total	50.0

* Rate is in pounds of pure live seed per acre.



J. R. SIMPLOT
SMOKY CANYON MINE EIS

FIGURE 1
1999 PROPOSED ACTION MINE PLAN

jbr environmental consultants, inc.
Salt Lake City, Utah Cedar City, Utah Reno, Nevada Elko, Nevada

DESIGN BY	DRAWN BY	CH'D BY	SCALE	DATE DRAWN	REVISION
JL	JL		1"=1200'	6/5/00	

B&C PANELS
SMOKY CANYON MINE
1927 NORTH AMERICAN DATUM
IDAHO EAST
PORTIONS OF T.8S., R.45E., SEC. 13, 24, 25, & 36,
AND T.8S., R.46E., SEC. 17, 18, 19, 20, 29, 30 & 31

LEGEND

- FOOTWALL or CUT
- 50 FOOT CONTOUR
- INTERMEDIATE CONTOUR
- LEASE BOUNDARY
- USFS BOUNDARY
- HAUL ROADS
- RECLAMATION or FILL
- BENCH TOE
- BENCH CREST
- STRIP LIMIT
- SETTLEMENT BASINS
- SECTION LINES

N

1200 0 1200 FEET

J. R. SIMPLOT
SMOKY CANYON MINE EIS

FIGURE 2
1999 PROPOSED ACTION
RECLAMATION PLAN

jbr environmental consultants, inc.
Salt Lake City, Utah Cedar City, Utah Reno, Nevada Elko, Nevada

DESIGN BY	DRAWN BY	CH'D BY	SCALE	DATE DRAWN	REVISION
JL	JL		1"=1200'	6/5/00	

drawings\SIMPLOT_FSEIS\Figures-FEIS\App 2A Fig 2.dwg

Appendix 2B

Best Management Practices

BEST MANAGEMENT PRACTICES
for
EROSION, SEDIMENTATION AND SELENIUM CONTROL
at the
SMOKY CANYON MINE
PANELS B and C

Various design and management practices have been recognized over time by regulatory agencies and the mining industry to be effective in controlling environmental impacts from mining operations. Some of these practices have wide applicability throughout the industry and have a significant history of proven effectiveness when properly implemented. These proven management practices have also been described in publications that are accepted as standard references by persons with operating and regulatory responsibilities. These widely-accepted and proven management practices are herein referred to as "Best Management Practices" (BMPs). Examples of BMPs are those described in the manual published by the Idaho Department of Lands (IDL), *Best Management Practices for Mining in Idaho* (1992). The BMPs described by the IDL (1992) are generally accepted practices for control of runoff, erosion, sediment transport, and revegetation of mining areas.

Use of existing BMPs for control of selenium mobilization and migration from phosphate mines was reviewed by the Idaho Mining Association and described in two publications, *Existing Best Management Practices at Operating Mines* (2000), and *Best Management Practice Guidance Manual for Active and Future Mines* (2000). These two IMA manuals also described adaptations of accepted BMPs for control of selenium and proposed some new management practices for selenium control that had not been previously published. The BMPs described in the IMA manuals are a mixture of proven management practices, such as those published by the IDL, and other management practices that may be widely practiced but their effectiveness has not yet been fully proven to the regulatory agencies. Because of the wide application of the management practices described by IMA, and their widespread familiarity through being described in the two publications, these are still referred to herein as BMPs.

Following is a list of BMP's for control of erosion, sedimentation, and selenium mobilization in runoff and/or sediment that would be implemented for the Simplot Smoky Canyon Mine Panels B and C Proposed Action and Alternatives. General descriptions of these BMP's have been published either by the IDL and/or IMA and are considered herein to likely be effective at the Smoky Canyon Mine. The citations to these publications follow each BMP description.

Although a number of metals and other contaminants can potentially be released from mine overburden materials, including cadmium, zinc, arsenic, lead, and others, the primary contaminant of concern is selenium. Control of the mobilization of selenium would also result in the control of the other potential contaminants. Generally, selenium mobilization can be reduced by any BMP that reduces contact between water and seleniferous overburden or reduces erosion and sedimentation in surface water run-off (IMA, 2000a and 2000b).

Geochemical assays, extraction tests, and column leach tests on Phosphoria Formation rocks at the Smoky Canyon Mine have demonstrated that the Meade Peak member shales have interbedded intervals of high to low selenium content. For purpose of proper application of these Best Management Practices, the Smoky Canyon Mine will consider all shale overburden from the stratigraphic interval extending from

the Hanging Wall Mudstone to the Fish scale Shale to be seleniferous overburden. Rex Chert (including limestone) has been demonstrated by testing to be essentially non-seleniferous.

Overburden Fill Grading

Grading of overburden disposal facilities would minimize run-on of water and control the velocity of surface water flow on the overburden fills. This would reduce erosion and thereby control sediment. During operation, the surface of fills would be graded with a minimum grade of 2% back away from the dumping face so that surface flow over the fill face are reduced and to eliminate ponding on the fill surface to reduce infiltration of precipitation into the overburden. During reclamation, the fill slopes would graded at a maximum 3h:1v (horizontal:vertical) slope to reduce surface water run-off velocity. [IDL 1992, IMA 2000a]

Haul Road Run-Off Controls

Grading and other controls on haul roads can control run-off and minimize surface water velocity, thereby reducing erosion and sedimentation. Haul roads would be graded away from fill slopes, or crowned, so that concentrated flow is not allowed to run along or across and erode the roads. Maintenance of berms similarly prevents run-off. Other controls such as appropriately located rolling dips, water bars, and water deflectors would be used to reduce erosion of the road surface or road base. [IDL 1992, IMA 2000a]

Construction of Fills for Roads and Facilities

Fills or road or parking areas would be constructed of chert material and would be designed with slopes and temporary vegetation, as applicable, to reduce generation of sediment from run-off from these areas. [IMA 2000a, 2000b]

Snow Removal

Removal of significant snow accumulations can reduce the erosive force of run-off when warm weather causes snow to melt. Snow removal would be practiced to prevent sediment contained in the removed snow from being released outside of the run-off control area. Snow removal would also be conducted in active overburden disposal areas to reduce the entrainment of man-made accumulations of snow in the overburden disposal facilities to the extent practicable. Snow disposal areas would be located where snow melt would flow to sediment control ponds or open pits. [IMA 2000a]

Concurrent Reclamation

Reclamation of disturbed areas that are no longer needed for active mining operations would be conducted concurrent with other mining operations. This would reduce the amount of disturbed acreage that is unreclaimed at any one time and shorten the overall duration of mining and reclamation activities for the project as a whole. [IDL 1992, IMA 2000a, 2000b]

Soil Salvage and Reuse

Salvaging usable topsoil and vegetation growth medium from disturbed areas prior to mining is important for the long-term reclamation success of these areas. Soil destined to be salvaged would be analyzed for selenium and other contaminants to make sure it is suitable for use as growth medium on the disturbed areas. Trees and vegetation would first be removed from the proposed disturbed areas and then suitable topsoil would be removed and either be direct hauled to regraded surfaces ready to receive topsoil or would be placed in topsoil stockpiles. [IDL 1992, IMA 2000a, 2000b]

Soil stockpiles would not be located on steep terrain and would be protected from erosion. Temporary crops of vegetation would be established on stockpiles to reduce soil loss over the life of the stockpile.

Placement of topsoil controls sedimentation by enhancing establishment of vegetation which in turn reduces erosion. Use of topsoil that is low in selenium also reduces the amount of selenium that is carried as sediment by surface waters, prior to establishment of vegetation. Under the Proposed Action and Alternatives, a layer of one to three feet of topsoil would be placed over external and/or backfill overburden disposal facilities.

Soil Stabilization

Stable reclaimed areas would be promoted through the use of soil stabilization techniques such as: placement of soil on slopes that are 3h:1v or less; scarifying soil surfaces to reduce run-off; seedbed preparation to enhance the germination rate of seeds; incorporation of fertilizer and other methods to enhance successful growth of vegetation; use of swales and channels on the reclaimed surfaces where needed to carry concentrated flows of run-off, and; use of soil stabilization methods such as netting in critical, steep slope areas. [IDL 1992, IMA 2000a, 2000b]

Capping Seleniferous Overburden

Seleniferous overburden that is left exposed to the surface environment can contribute selenium in both particulate and dissolved forms to runoff. It can also contribute to bioaccumulation through vegetation growing in it. All areas of seleniferous overburden would be covered with eight feet of chert which testing has shown to be very low in selenium content. One to three feet of topsoil would then be spread on top of the chert layer to complete the cap. This cap would protect the underlying seleniferous overburden from erosion and would help store water for evapotranspiration before it contacts seleniferous material. The thickness of the cap would also minimize bioaccumulation of selenium in reclamation vegetation growing on the surface of the cap. [IMA 2000b]

Pit Backfilling

Pit backfilling is not typically necessary to control erosion and sediment control because the pits contain these impacts. However, pit backfilling and subsequent revegetation would restore these areas to stable and productive post-mining uses. Pit backfilling in the A, B and C Panels would allow these areas to be revegetated, which would reduce the potential for erosion and support the post-mining land use. [IMA 2000a]

Riprap and Gabions

Chert riprap would be placed in areas subject to erosion, such as below culverts, drainage outlets and ditches thereby reducing erosion and sedimentation. Gabion walls made of chert would also be selectively used to protect road fills from erosion by flowing water. [IDL 1992, IMA 2000a, 2000b]

Culverts

Installation of culverts at appropriate locations can eliminate contact between flowing water and man-made fills. This reduces the potential for erosion of the fills, and subsequent sedimentation. Under the Proposed Action and Alternatives, Smoky Creek would be routed in metal culverts under the constructed haul road fills. These culverts would have a minimum diameter of 30 inches and would be designed to safely pass the peak stream flow during a 100-year storm event. The culverts would be covered with enough chert to carry the anticipated traffic loads. Culverts would be bedded in clay or soil at their inlets

to prevent undercutting. The outlets would be at the stream grade to prevent scouring and chert riprap would also be used at these locations to reduce erosion. [IDL 1992, IMA 2000a, 2000b]

Run-on Collection/Runoff Control

Drainage and diversion channels would be constructed as necessary to divert run-on water around disturbance areas and collect runoff from disturbed area to route it to settling ponds and other sediment control features. Ditches would be excavated with the berm placed on the downhill side of the ditch. These ditches would be designed to pass the 100-year, 24-hour storm event without damage or erosion. Temporary ditches would be backfilled during reclamation. The location of the B Panel and external overburden disposal site facilities on a drainage divide would eliminate run-on. Run-on collection and diversion channels would be constructed above the C Panel disturbance. These would be 10 feet wide and 2-feet deep with 1.5h:1v side slopes and an overall grade of 4% to control erosion. Riprap, grass cover and/or protective mats would be used as necessary for additional erosion control. [IDL 1992, IMA 2000a, 2000b]

Sediment Control

Construction of sediment traps, catch basins and sediment settling ponds can reduce the velocity of flowing water and allow sediment in water to settle out in a controlled manner. This reduces the amount of sediment carried off-site to surface water that could potentially be dropped out as uncontrolled sedimentation. Runoff from disturbed areas would be directed to sediment ponds or silt traps to contain sediment entrained in the runoff water. Sediment ponds would be designed to contain the runoff and sediment from the 100-year, 24-hour storm event in the control area plus a 2.5 inch snowmelt event. The ponds would be fitted with spillways that are sufficiently armored (including freeboard) to dissipate energy from the calculated flow to prevent damage to the impoundments in the event of an overflow situation. Maintenance of the ponds would be done to provide the design capacity for sediment and water at all times. Management of these facilities includes periodic cleaning to remove sediment and restore capacity. The installation and maintenance of sediment ponds to control sediment in runoff from disturbed areas has been an ongoing condition for operation of Simplot's Smoky Canyon Mine. This practice would continue under the Proposed Action and Alternatives. [IDL 1992, IMA 2000a, 2000b]

Seeding and Revegetation

Revegetation of disturbed slopes reduces run-off quantity and velocity that would otherwise contribute to runoff volumes. As soon as practicable disturbed areas would be graded, topsoiled and revegetated with species acceptable to the regulatory agencies. Portions of overburden disposal facilities that are constructed to their design extent would be revegetated the following spring or fall. Seeding would be done with proven techniques such as hydroseeding, rangeland drill, or broadcast and drag covered. Seedbed preparation would consist of scarifying to break up compaction and fertilizer addition. Seedbed preparation and seed drilling on slopes would be conducted following the topographic contour to minimize production of downslope channels for runoff. [IDL 1992, IMA 2000a, 2000b]

Range Management

Livestock grazing in reclaimed areas would be controlled until they have become stabilized and are deemed ready for grazing by Simplot and the U.S. Forest Service. [IDL 1992, IMA 2000a, 2000b]

References

Idaho Department of Lands (IDL). 1992. Best Management Practices for Mining in Idaho, Boise, Idaho.

Idaho Mining Association (IMA). 2000a. Existing Best Management Practices at Operating Mines, southeast Idaho Phosphate Resource Area Selenium Project. Montgomery Watson, 2000.

Idaho Mining Association (IMA). 2000b. Best Management Practice Guidance Manual for Active and Future Mines. Montgomery Watson, 2000.

BEST MANAGEMENT PRACTICES
and
MANAGEMENT PRACTICES
for control of
DISSOLVED SELENIUM
at the
SMOKY CANYON MINE
PANELS B and C

Impacts identified during preparation of the Supplemental Environmental Impact Statement for the Smoky Canyon Mine Panels B & C Proposed Action and Alternatives are primarily associated with the potential for selenium or metals leaching and mobilization and subsequent contamination of ground and surface water. Although a number of metals and other contaminants can potentially be released from mine overburden materials, including cadmium, zinc, arsenic, lead and others, the primary contaminant of concern is selenium.

Releases of seepage from overburden disposal sites ultimately originate from the infiltration of water into these facilities. Reduction of infiltration into overburden is therefore the first step in control of dissolved selenium releases from overburden disposal facilities. Additionally, disposal sites should be free from existing springs, seeps and other water sources.

Geochemical assays, extraction tests, and column leach tests on Phosphoria Formation rocks at the Smoky Canyon Mine have demonstrated that the Meade Peak member shales have interbedded intervals of high to low selenium content. For purpose of proper application of these Best Management Practices, the Smoky Canyon Mine will consider all shale overburden from the stratigraphic interval extending from the Hanging Wall Mudstone to the Fish Scale Shale to be seleniferous overburden. Rex Chert (including limestone) has been demonstrated by testing to be essentially non-seleniferous.

Widely-accepted and proven design and management practices to control environmental impacts are herein referred to as "Best Management Practices" (BMPs). Examples of BMPs are those described in the manual published by the Idaho Department of Lands (IDL), *Best Management Practices for Mining in Idaho* (1992). Use of existing BMPs for control of selenium mobilization and migration from phosphate mines was reviewed by the Idaho Mining Association and described in two publications, *Existing Best Management Practices at Operating Mines* (2000), and *Best Management Practice Guidance Manual for Active and Future Mines* (2000). These two IMA manuals also described adaptations of accepted BMPs for control of selenium and proposed some new management practices for selenium control that had not been previously published. The BMPs described in the IMA manuals are a mixture of proven management practices, such as those published by the IDL, and other management practices that may be widely practiced but their effectiveness has not yet been fully proven to the regulatory agencies. Because of the wide application of the management practices described by IMA, and their widespread familiarity through being described in the two publications, these are still referred to herein as BMPs.

In addition to the BMPs described by IDL and IMA, Simplot has proposed new design and management practices that appear to be technically and operationally feasible for the Smoky Canyon Mine but have not previously been implemented, thus their effectiveness is unproven. The agencies are not referring to these practices as BMPs until their effectiveness has been shown and so these will be referred to herein as "management practices".

This document also describes some management practices that were reviewed and found to not be applicable to the Smoky Canyon Mine Panels B and C.

BEST MANAGEMENT PRACTICES

Following are Best Management Practices (BMPs) that would be used to mitigate dissolved selenium-related impacts of phosphate mining at the Simplot Smoky Canyon Mine B and C Panels (Simplot). These are in addition to other BMPs related to control of erosion and sediment transport from mining activities which would also assist in controlling selenium.

Avoid Perennial Drainage Channels

Locating overburden disposal facilities to avoid perennial drainage channels would reduce infiltration of stream flow into the overburden. French drains and culverts constructed under overburden disposal areas to convey stream flow past the disposal site may not be reliable in the long-term to prevent stream flow from contacting overburden. When these drainage conveyances fail, the overburden disposal site may act as a dam causing infiltration of stream flow into the mass of the overburden where it may cause leaching of the overburden and potential geotechnical instability of the disposal site. Precipitation and snow melt can also migrate downward through these facilities picking up potential contaminants. The contaminants could then enter the water flowing under or through the overburden. French drains or culverts under overburden disposal fills would not be required for the Proposed Action or Alternatives because none of the overburden disposal areas would be located in perennial drainage channels. Permanent placement of seleniferous overburden material in perennial channels would be avoided, but crossing drainages with temporary road fills is required to access the mining areas. These crossings would be built from chert and designed so they can be reshaped during reclamation to resemble the surrounding area. They are designed with culverts to convey the stream through the material and these would be removed at the end of the crossing life. [IMA 2000a, 2000b]

Avoid Ephemeral Drainage Channels

Ephemeral and intermittent drainage channels can temporarily carry significant quantities of water which can infiltrate into overburden disposal sites along the channel bottoms at these times. Avoidance of these features in the location of seleniferous overburden disposal sites would reduce the effects of this infiltration on the overburden. Location of disposal sites on flat or convex topography, or toward the upper portion of slopes will typically avoid significant drainage channels. Panel B and the external overburden disposal site would be located on a drainage divide so these facilities would avoid most ephemeral drainage channels. Ephemeral channels that cross the proposed C Panel disturbance would be collected and diverted around the active mining area. Avoiding placement of seleniferous overburden over these channels would eliminate the potential introduction of runoff water into the overburden. Permanent placement of overburden material in ephemeral drainages would be avoided, but crossing drainages with road fills would be required to access the mining areas. These crossings would be built from non-seleniferous chert material and designed so they can be reshaped to resemble the surrounding area. They are designed with a culvert to convey the stream through the material and would be removed at the end of the crossing life. [IMA 2000a, 2000b]

Control of Surface Water

Where overburden disposal sites are located on slopes, run-on of clean unimpacted water onto the overburden site, with the attendant infiltration, from these upland watersheds would be reduced through installation of permanent diversion ditches to route the collected water around the overburden disposal

site as necessary. The grades of diversion ditches would match the grade of the natural ground at their inlets and outlets. The diversion ditches above the Panel C pit would be similar to those in use in the Panel E pit. At Panel E, Simplot has captured the flow of a spring above the highwall and routed the flow around the active mining area. The flow is conveyed in a 10-foot-wide, 2 foot-deep channel with 1.5H:1V slopes and an overall grade of 4% to minimize erosion. On greater slopes, biotechnical stabilization, grass cover, protective mats, or rip rap would be used for additional erosion control. Vegetation species used for biotechnical stabilization or grass cover would be acceptable to the regulatory agencies. Topography may restrict the elimination of all run-on due to hills and valleys. Run-on control with diversion ditches appears to be feasible for approximately 60% of the C-Panel. The runoff in these areas would be monitored as part of the Storm Water Pollution Prevention Plan (SWPPP) and modified as necessary. By eliminating run-on of surface water from upslope areas, the amount of run-on water infiltrating the seleniferous overburden would be reduced. The B-pit backfill and the ridge top overburden area would be topographic high points and there would not be any run-on to these areas. [IMA 2000a, 2000b]

Design of Sediment Controls

Control of runoff and sedimentation at mine sites often incorporates features purposely designed to retain water. These features may include sediment ponds, silt traps, and diversion ditches. To the extent possible these features would be located off areas of seleniferous overburden and this would minimize the effect of infiltration from these features on the overburden. Sediment control basins (E.G., ponds and traps) would be located on native ground off overburden fills and thus will not contribute to the infiltration through seleniferous overburden. Under the mine plan for Panels B and C however, runoff recharge areas would be constructed on the pit floors in Panels B and C as part of reclamation. These areas would be composed of coarse rock to collect clean runoff water from the surface of the cap and direct it into the Wells Formation. This runoff would otherwise be lost as surface water flow and would not be considered as clean recharge by the current transport model. [IMA 2000a, 2000b]

Overburden Grading

Final grading would be completed as soon as possible following overburden disposal. Infiltration of precipitation into seleniferous overburden would be reduced by increasing runoff from the sites through regrading. The top surfaces of overburden disposal sites will be graded for positive drainage of precipitation and snowmelt to avoid ponding. Approximately 3H:1V slopes would be constructed on the overburden disposal sites with a minimum 2% grade on roads and tops of the disposal areas. These grading measures would eliminate the ponding and reduce the potential for incident precipitation and snowmelt to infiltrate the overburden. [IMA 2000a]

Overburden Pile Aspect

Infiltration into seleniferous overburden disposal sites would be reduced by designing the major aspect of the site, where possible, to maximize southern or western exposures. The soil in these orientations is typically drier than north and east aspects due to increased ground temperature, sublimation and wind scour of snow, and evapotranspiration and would locally reduce the amount of infiltration on these areas. All of the Panel A backfill would be west facing as is all of the haul road area from Panel B to Panel A, and part of the Panel B backfill. Part of the Panel C backfill would be south facing. [IMA 2000a, 2000b]

Haul Road Runoff

Haul roads and roadside ditches would be designed to avoid directing runoff from these features onto external overburden disposal sites which would reduce the infiltration of this water into the overburden. [IMA 2000a]

Snow Removal

Introduction of large quantities of snow into active overburden areas can result in increased infiltration of snow melt into the overburden and potential destabilization of overburden slopes. Man-made accumulations of additional snow on active overburden areas would be avoided, to the extent practicable, by disposing of snow that is picked up for any purpose in designated areas where the snow and snow melt will not be incorporated into an active overburden disposal facility or percolate into overburden. [IMA 2000b]

Characterization and Selective Handling of Seleniferous Overburden

To maximize effectiveness of other BMPs it is necessary to accurately identify those materials with highest selenium concentration for selective handling. The overburden materials to be removed from Panels B and C have been geochemically tested for total and leachable selenium Simplot has determined from geochemical testing that all Meade Peak shale overburden between the Hanging Wall Mud and the Fish Scale shale would be handled as seleniferous overburden. This would be verified during mining with periodic testing of "chert" materials for selenium. [IMA 2000a, 2000b]

Reclamation and Revegetation

Reclamation and revegetation, in addition to being erosion control BMPs, also limit infiltration and therefore, the formation of dissolved selenium. As soon as practicable overburden fills would be reclaimed and revegetated to decrease infiltration by establishing plants that are selected because they consume water by transpiration. [IMA 2000a, 2000b]

Material Consolidation

The majority of the selenium is typically present within overburden in mineral forms that have low solubility. When these minerals are oxidized the selenium can be converted to more soluble species that are then susceptible to being leached from the overburden by infiltrating water. Overburden is exposed to oxygen during mining and handling activities. Reduction in hydraulic and gas permeability of the overburden can potentially reduce the oxidation of the material. Permeability of granular materials can be reduced through reduction in porosity. Moderate reductions in porosity of large quantities of overburden can be reasonably produced by the loaded haul truck traffic itself through placement of the overburden in lifts that can be consolidated by the haul traffic. Additional benefits include enhanced fill stability, greater backfill potential, and increased control of placement. Simplot has already incorporated moderate overburden consolidation practices into all its external overburden handling by reducing external overburden bench height to 50 feet. Where additional external seleniferous overburden consolidation is warranted on a site-specific basis, this bench height can be reduced. Based on the loaded weight of Simplot's haul trucks, reasonable maximum material consolidation can be achieved with a minimum bench height of about 10 feet. [IMA 2000a, 2000b]

Mining Oxidation

The rate of oxidation of the seleniferous overburden after it is removed from the open pit is unknown and the importance of oxidation of this material during the actual mining activities compared to afterwards is also unknown. Unweathered or poorly weathered seleniferous overburden in the mine pit may be

present in a non-oxidizing condition in-situ. When this material is blasted, loaded, hauled and dumped it is mixed with atmosphere which can begin the oxidizing process. Additional handling of this material can further add to the oxidizing process. It is therefore prudent to minimize the exposure of the material to the atmosphere through timely handling of the material from its in-situ location in the pit to its placement in the final overburden disposal site. Exposure to weathering in the overburden disposal site can also be reduced by rapid burial of the material with more material and timely deployment of the BMPs discussed above. It is Simplot's common practice to remove material directly from the pit to the final destination. Logistically it is difficult to cap all material immediately after placement (i.e. when building 50 foot lifts, lack of chert cap material in the current area etc.). Simplot would cap the material as soon as it is logistically possible. [IMA 2000b]

MANAGEMENT PRACTICES

The following management practices have been proposed for use at the Smoky Canyon Mine as indicated in each description:

Drainage Channels on Overburden

Where the final design for the handling of an ephemeral drainage area of significant size (example: Sheep Spring drainage) is to route the ephemeral channel over the overburden disposal site, the channel design would incorporate features to reduce mobilization of selenium from the overburden. These features can include: separating the channel from the seleniferous overburden with enough thickness of non-seleniferous, durable rock to prevent future erosion of the overburden by the stream flow; lining the channel with an infiltration barrier layer on top of seleniferous overburden to reduce infiltration of stream water, and; avoiding placement of seleniferous overburden directly under the proposed stream channel.

The Sheep Springs discharge would be re-routed through a channel north of the Panel C during the mining operation. Subsequent to mining, the Sheep Spring channel would be restored over the C Panel backfill to its approximate original course. The channel grade would match natural grade at its inlet and outlet. The channel would be constructed approximately 10 feet wide and 2 feet deep with a 2-foot thick clay liner on the channel bottom and sides to reduce infiltration of water from the channel into the pit backfill. The overburden directly underlying the channel bottom, and for a distance of 50 feet on either side of the channel would consist of chert or other non-seleniferous overburden. The channel surface would be protected with chert and revegetated with species acceptable to the regulatory agencies. This is to prevent infiltration from the channel into seleniferous overburden. To expose the Grandeur Limestone at the base of this backfill the pit floor would be scraped to ensure that any water that escapes this channel would infiltrate vertically through permeable, non seleniferous material to the Wells Formation.

Surface Area

Total infiltration for any one set of overburden site surface and material characteristics is dependent on the area of the overburden disposal site exposed to the infiltration. Under the mine plans for Panels B and C, the footprint of the external overburden disposal area would be reduced to the minimum area possible. The minimization of this footprint would reduce the amount of infiltrate seeping into seleniferous materials, reducing the percentage of recharge to the Wells Formation and the area of a potential infiltration barrier. When the surface area of the overburden disposal site is reduced by increasing the thickness of the overburden, the total amount of infiltration into the Wells Formation can be reduced in

a linear manner. One way of achieving this reduction is to place the overburden in open pits rather than in an external storage site. Simplot's current plan uses the maximum grades haul trucks can negotiate to build overburden disposal areas to the minimum area feasible.

Groundwater Sources

Groundwater can enter overburden disposal sites where such sites contact discharges of groundwater at natural seeps or springs. When overburden is placed in an open pit, groundwater flowing into the pit may also enter the overburden backfill. The effect of this groundwater infiltration is site specific. Where groundwater flow through the overburden is oxygenated, leaching of selenium may occur. In situations where groundwater alternately wets and allows for drying of overburden, leachate concentrations in seepage may increase. When the overburden is placed below the water table and is then permanently saturated with the groundwater and oxygen in the system is limited, the dissolution of selenium may be reduced or arrested by the lack of oxygen in the saturated zone. Geological studies have indicated that the footwalls of the proposed B and C Panel pits would be located more than 60 feet above the local water table so pit backfill would not likely be in direct contact with groundwater.

Basal Layer Control

Typical overburden disposal site construction results in a basal layer of coarse rock particles at the base of the disposal site through gravitational segregation of overburden as it rolls down the outer slope of the disposal site when dumped by the haul trucks over the edge of the slope. For any one type of overburden, higher lift slopes (thicker lifts) tend to produce more size segregation of overburden than lower slopes (thinner lifts). The segregation can also be dependent on lithology with harder rock having a wider range of particle size, and larger maximum particle size than softer rock.

One effect of this basal layer of coarse rock on the overburden disposal site is that it can provide a high permeability layer for the selective lateral movement of water seepage in the disposal site. This can result in seeps appearing at the toe of the disposal site. This may be important where the overburden is place in topographic drainages that may tend to channel the seepage to a specific low point.

Another effect is that the coarse basal layer can provide an avenue for atmospheric penetration into the base of the overburden disposal site which then introduces oxygen into the overburden where it can potentially contribute to mineral oxidation.

To reduce either of these effects, the permeability contrast between the overburden and foundation material can be reduced by eliminating the coarse basal rock layer formed by gravitational segregation during end dumping of the bottom bench of the overburden disposal facility. This could be done by having dozers push material down the face of the bottom bench while it is being built to mix the coarse rock with finer material located higher in the pile profile. Alternatively, the bottom bench could also be constructed by plug-dumping to minimize formation of the coarse basal layer.

Another approach would be to build one or more dikes of compacted earth or overburden in the foundation of a new overburden disposal facility to: 1) break the lateral continuity of the coarse basal rock layer of the overburden disposal facility, and 2) retain seepage water within the overburden to allow it to infiltrate vertically instead of migrating laterally. These dikes would be constructed on the foundation area to heights of over 5 feet and the overburden would be placed on top of them in a standard manner. Simplot intends to follow this BMP in the topographic low points along the east margin of the external

overburden disposal site in the Proposed Action to reduce the potential for formation of overburden seeps.

When the lateral permeability of overburden piles is decreased, it may be important to determine that the vertical percolation rate of the foundation materials is sufficient to avoid buildup of positive pore pressures in the base of the overburden pile which could reduce the geotechnical stability of the pile. In addition, impacts of this vertical percolation on groundwater quality would need to be evaluated.

Modification of Low Permeability Foundation Material

Where a layer of low permeability foundation material exists under the overburden, there is the potential for downward seepage in the overburden to migrate laterally where it may exit in seeps at the base of the outer slope of the overburden. The vertical permeability of the foundation materials should at least be sufficient to allow vertical percolation of seepage from the base of the overburden with minimal lateral migration of this seepage. This is particularly important where overburden is placed on slopes and/or in drainages where the underlying foundation topography can concentrate and enhance lateral seepage along the base of the overburden. To ensure this does not occur, it may be necessary to increase the vertical percolation rate of the foundation materials under some overburden disposal facilities.

Along uniformly sloping foundations of overburden disposal sites where there is a low permeability layer in the foundation, this layer can be scarified or removed from strips that are oriented parallel to the topographic contour on spacings that are appropriate for the required seepage infiltration rate.

Where overburden is to be placed in a topographic drainage valley with a low permeability layer in the foundation, in addition to the above mentioned treatments on the topographic contour, infiltration pits can be constructed at spacings down the channel in the bottom of the drainage to intercept and infiltrate concentrated lateral seepage moving down the channel.

When seepage from overburden into underlying foundation materials is expected, impacts of this seepage on groundwater quality would be evaluated.

The proposed external overburden disposal facility is located on outcrop of the Wells Formation which is known to be a permeable recharge area. Once the topsoil is removed, there should be no impermeable layers left on top of this formation. Simplot would inspect the overburden disposal foundation area after topsoil removal and conduct percolation testing to determine if ripping or blasting is required.

Elimination of Low Permeability Foundation Material

To prevent seepage at the face of external overburden disposal sites, the hydraulic contrast between high permeability overburden and low permeability foundation materials would be reduced by eliminating the low permeability layer in the foundation by removing it or increasing its permeability before placing the overburden on the site. Low permeability horizons in topsoil and subsoil under specific areas of overburden fills would be removed during topsoil stripping. Low permeability strata left in the bottoms of open pits could also be stripped or ripped to expose more permeable rock. In some cases the entire area of the overburden site may not need to be stripped of the low permeability layer if enough of an area under the downstream slope of the overburden pile is stripped to provide the necessary percolation area to handle the seepage for the rest of the overburden site. When seepage from overburden into underlying foundation materials is expected, impacts of this seepage on groundwater quality would be evaluated.

All low permeability soil material would be removed by Simplot from under the runoff recharge areas around the margin of the external overburden disposal site to reduce the potential for overburden seeps. Low permeability shale will also be removed from under the proposed runoff recharge areas in the pit backfills. The remaining shale in the bottoms of the pits in these locations would be removed to expose the Grandeur Limestone beds.

Control of Groundwater Impacts

Where groundwater quality impacts are predicted from infiltration of seepage from seleniferous overburden fills, control of these impacts should be investigated. Reductions in the concentration and/or quantity of the contaminants at the source is the preferred approach. Alternatively, the lateral extent of the contamination in the groundwater can be controlled by use of a variety of approaches which must be determined by site-specific investigations and feasibility studies.

The reduction in the quantity of seepage from the overburden fills can be accomplished by reducing the infiltration into the overburden with the BMPs previously described. For the Smoky Canyon site, the infiltration into the top of the seleniferous overburden would be reduced to the degree reasonably feasible with controlling the flow of surface water onto and over the overburden fills, reducing man-made accumulations of snow on active overburden fills, locating sediment control ponds off the overburden fills, capping all seleniferous overburden, and topsoiling and revegetating regraded overburden areas as soon as practicable.

In addition to reducing the quantity of seepage into the overburden fills, Simplot would reduce the strength or concentration of the seepage impact on the groundwater through the incorporation of enhanced, localized recharge of clean runoff water in the vicinity of the seleniferous overburden fills. This would be implemented at the margins of these fills and would greatly increase the amount of clean water recharging the Wells Formation aquifer in these areas. The HELP modeling has showed that the total amount of meteoric water available for infiltration into the overburden through the cap is about 4 inches and the amount of runoff water from the surface of the cap is about 13 inches. The total contaminant load is carried to the groundwater through the 4 inches of seepage water. However, when the 13 inches of runoff water is also be recharged to the groundwater, a total of 17 inches of local recharge would result, of which, the seepage quantity would be approximately 24 percent. This greatly reduces the concentration of selenium and other COPCs in the combined quantity of water locally entering the groundwater. The result of this reduction in concentration of the combined water flows from the overburden fills to the groundwater is that the concentration of the contaminants in the groundwater are also reduced.

PRACTICES CONSIDERED BUT NOT ADOPTED

The following management practices were reviewed and determined to not be applicable at the Smoky Canyon Mine.

Infiltration Barrier Cap

Infiltration, vegetation uptake and erosion of seleniferous overburden can be limited by construction of a cap system. A typical optimized cap design includes from the top down: 1) an upper evapotranspiration and erosion control layer of topsoil and subsoil of moderate hydraulic permeability to store infiltration until it can be evaporated or transpired by vegetation; 2) a high permeability, coarse grained, lateral drainage layer of rock or gravel to act as a hydraulic break and to convey water laterally so that hydraulic head on

the underlying low permeability layer is reduced; 3) a low permeability infiltration barrier layer to restrict infiltration, and 4) firmly compacted, uniform slope on the underlying overburden. The thickness of the evapotranspiration and erosion control layer should be sufficient to contain most of the root zone for the vegetation to maximize the effectiveness of the evapotranspiration, minimize root penetration of the infiltration barrier layer and protect the underlying overburden from erosion. This thickness is typically 4 or more feet. The lateral drainage layer thickness should be sufficient to reduce the blinding effect of infiltration of fines from the overlying layer, control upward migration of water by capillary action and soil moisture gradients, and discourage root penetration. This thickness is typically two or more feet. The infiltration barrier layer thickness depends on the permeability of the material and the degree of infiltration allowable. Lower permeabilities for this material can allow lesser thicknesses. For clay materials with permeabilities of 1×10^{-7} cm/sec this thickness typically would be one foot or greater. For lower permeabilities, lesser thicknesses are possible, with consideration of minimal thickness necessary for stresses caused by overburden on top of this layer. Synthetic membranes can also be used. [IMA 2000b]

Where infiltration barriers and lateral drainage layers are designed as part of a cap, accommodations must be included for handling the water collected in the lateral drainage layer. These layers should be designed with a slope to provide for the lateral drainage of the water that accumulates on top of the infiltration barrier layer. This may be a significant quantity of water where it exits the down hill end of the lateral drainage layer and will then need to be managed as surface water discharged from a mining facility. In addition, for the lateral drainage layer to be effective in reducing hydraulic head on top of the infiltration barrier layer, the slope and the length of the drainage path in the lateral drainage layer should be designed for the allowable amount of head. This may require installation of drainage pipes within this layer that would individually discharge to a surface water course or would be connected in a manifold arrangement to one or more main discharge pipes. Such piping may become a maintenance issue.

Design of layered caps that include infiltration barrier layers on top of overburden should include analysis of differential settlement and slope stability which could affect the integrity and the slope of the barrier layer. This is not as important for the other more permeable cap layers where their hydraulic performance is not degraded by differential settlement. Slope stability issues can become important if the infiltration barrier is built on a slope. Differential settlement can be mitigated through consolidation and compaction of the overburden under the cap.

The optimal balance of cap characteristics for any one site is very dependent on the site conditions. For example, where an infiltration barrier layer is not built, the lateral drainage layer is also not required. In this case, the only layer remaining would be the evapotranspiration and erosion protection layer which can still cause a reduction in net infiltration into the underlying overburden by storing evapotranspiration water within the cap above the underlying overburden.

An extensive review of the feasibility of incorporation of infiltration barriers into the overburden cap design for the Proposed Action and Alternatives was completed as a separate document from these BMPs called, *Infiltration Barriers - Review of Feasibility for the Smoky Canyon Mine*. The types of infiltration barriers investigated included: synthetic plastic membranes, geosynthetic clay liners, bentonite amended clay or overburden, asphalt paving, soil cement, and two types of sprayed materials. Native clayey soil or compacted overburden was found to have permeabilities that were too high to be effective infiltration barriers and this deficiency would need to be mitigated by incorporation of bentonite into these materials to reduce their compacted permeability. This would require that the overburden be crushed prior to mixing with the bentonite (this would also be the case for soil cement). These earth liners, and the

asphalt paving or soil cement would be susceptible to cracking through differential settlement of the overburden so their effectiveness as infiltration barriers is suspect. The synthetic liners would be more resistant to differential settlement but are also more expensive than other types of infiltration barriers. All of the infiltration barriers reviewed would be difficult to very difficult to install on the long 3H:1V slopes of the regraded overburden fills and would potentially destabilize these slopes geotechnically. These problems indicated that construction of the infiltration barrier on the outer edges of each lift of the overburden fills would be more practicable and geotechnically stable. The cost of including any of the technically feasible infiltration barriers into the cap at Smoky Canyon was shown to be economically infeasible because the cost would eliminate economic viability of the mining operations. In addition, other effective mitigation measures have been proposed by Simplot that are economically feasible.

Because incorporating an infiltration barrier in the cap would not be reasonable, Simplot would construct a cap over areas of seleniferous overburden that did not include an infiltration barrier layer. The cap would consist of 8 feet of chert overburden and 1 to 3 feet of topsoil . This cap would not be constructed over areas of non-seleniferous overburden. Simplot believes this cap design would provide protection of the seleniferous overburden from erosion and would prevent penetration of grass and forb roots into the seleniferous overburden. It would control infiltration into the seleniferous overburden by providing storage capacity for evapotranspiration water within the cap material.

Collection and Treatment of Overburden Seepage

Reduction in infiltration into overburden fills may be achieved by: 1) reducing infiltration into the top of the overburden through construction of an infiltration reduction cap incorporating a lateral drainage layer and an infiltration barrier on top of seleniferous overburden, and/or 2) collecting infiltration at the base of the seleniferous overburden through construction of a lateral drainage layer and infiltration barrier layer at the bottom of the overburden. Water collected and discharged from the upper lateral drainage layer would not have contacted seleniferous overburden and can likely be routed to surface streams with minimal or no treatment. Water collected and discharged from the lower lateral drainage layer will have percolated through seleniferous overburden and will likely not be suitable for discharge to surface streams without treatment. All planned water discharge from the mine will be sampled for contaminants prior to discharge being approved. This treatment would need to reliably reduce selenium and other contaminant concentrations to applicable surface water quality standards for perpetuity. Water treatment is expensive and can be a partially successful remedy for contamination. The necessary state and federal discharge permits would also need to be obtained for indefinite terms.

Based on Smoky Canyon Mine and regional overburden seep data, the selenium content of the water collected at the base of the overburden would be greater than that allowable for discharge to surface streams. Treatment of this water would require a reduction in selenium concentration to meet current cold water aquatic life criteria (0.005 mg/l). Possible future changes (reductions) to the federal selenium ambient stream standard could change (increase) the required selenium reductions in the treatment process. Other contaminants in the collected water would likely require lesser reductions in concentrations before discharge to surface waters.

At the present time, Simplot is not aware of a reliable, technically feasible and economically reasonable method for treatment in perpetuity of collected seepage from overburden disposal facilities. Based on this, Simplot's plan is to reduce the potential for any surface discharges of overburden seepage and to reduce the groundwater impacts through incorporation of runoff recharge areas to locally increase the amount of clean water recharging the Wells Formation aquifer.

COMPARING FEASIBILITY AND EFFECTIVENESS

Feasibility and effectiveness of these BMPs and management practices will generally be controlled by site specific conditions. Some of these practices are more universally applicable while others may not be applicable in some cases. The relative effectiveness of some of these practices is difficult to say with certainty because before and after comparisons at any one site have not been done. However, general mining and civil engineering experience can be used to assess the potential effectiveness of many of these practices. Only monitoring over time can validate whether management practices by themselves or cumulatively are protective of the environment. The comparisons of management practices are shown in the following table:

BMP	FEASIBILITY	EFFECTIVENESS
Avoid Perennial Drainage Channels	This will typically be feasible because overburden sites can usually be located to avoid perennial streams. Current experience with French drains indicates significant stream water quality contamination can occur when seleniferous overburden is placed over perennial streams. This indicates the need for avoiding placement of seleniferous overburden in them.	Field experience indicates effectiveness in protecting perennial stream water quality is very high when the decision is made to avoid placing seleniferous overburden in a perennial stream.
Avoid Ephemeral Drainage Channels	Like avoiding perennial drainages, this will typically be feasible because overburden sites can usually be located to avoid major ephemeral channels. Where this is not feasible, the type of mitigation applied can be tailored to the significance of the ephemeral channel in question and the amount of seasonal water it carries.	Effectiveness depends on the significance of the ephemeral channel and the duration and amount of stream flow that typically occurs. Where channels are significant and carry large quantities of stream flow, locating overburden sites out of these channels can significantly reduce input into the overburden water balance.
Control of Run-on	Collection and diversion of run-on from upland watersheds in ditches is feasible and commonly practiced in the mining industry.	Effectiveness is typically high because all run-on that is eliminated is completely removed from the input category of the overburden water balance.

BMP	FEASIBILITY	EFFECTIVENESS
Drainage Channels on Overburden	The engineering feasibility of protecting ephemeral channels from underlying seleniferous overburden has been demonstrated from experience. The actual selection of the design for any location will depend on site-specific conditions such as availability of materials of construction.	Effectiveness in reducing contact of seleniferous overburden with surface water, and infiltration of surface water into overburden will vary greatly depending on final design considerations. The effectiveness of different infiltration barrier designs can be shown through calculations.
Design of Sediment Controls	Location of sediment and runoff collection ponds off of areas of seleniferous overburden disposal is typically feasible. In some sites, topographic and other constraints may make this difficult or impossible. In these cases, mitigation of seepage from the sediment controls will need to be included in their design.	Where sediment control facilities are located off seleniferous overburden, the effectiveness in reducing infiltration from these into the overburden will be complete. Where these facilities are located on such overburden, the effectiveness will depend on the design of liners to limit seepage from the facilities.
Overburden Grading	Constructing overburden sites to eliminate ponding and encourage runoff is feasible at all sites. Final grading of large masses of overburden can be expensive but these costs can be reduced through facility design which is commonly done.	Effectiveness of reducing infiltration by enhancing runoff varies with site-specific conditions of grade, precipitation, vegetation cover, and material properties. This can be shown through site-specific calculations.
Overburden Pile Aspect	Feasibility of selecting the major aspect of an overburden pile to be pointing south or west will depend on site-specific plans and topography.	Effectiveness will be site-specific because increased evapo-transpiration on south and west aspects depends on elevation, vegetation cover and climate.
Haul Road Runoff	Designing haul roads so they do not add water to the tops of overburden disposal sites is generally very feasible with little additional cost.	Effectiveness is generally high because the simple action of reducing run-on to overburden has a direct effect on the water balance of the overburden disposal site. All the run-on that is eliminated is completely removed from the input category of the overburden disposal site water balance.

BMP	FEASIBILITY	EFFECTIVENESS
Snow Removal	Managing significant snow to reduce incorporating snow melt into overburden is universally applicable and very feasible through normal mining practices. The main variability will be the site-specific diligence practiced in reducing snow incorporation into active overburden disposal sites.	Effectiveness is generally high because reducing snowmelt into overburden directly affects the water balance of the overburden disposal site. All the snowmelt that is avoided is 100% removed from the input category of the overburden disposal site water balance.
Cap	The technical feasibility of this has been shown at many mining projects. The financial feasibility of building an infiltration reduction cap depends greatly on availability of construction materials and costs to construct the cap. Construction of an infiltration barrier as part of the cap at Smoky Canyon is not considered to be feasible.	Effectiveness depends on site conditions such as climate, vegetation, material properties, layer configurations and drainage considerations. Effectiveness can be shown by calculations.
Surface Area	The feasibility of surface area reductions for overburden sites is controlled by site specific conditions. The smallest surface area designs may have high construction costs.	Total infiltration into an overburden site is directly proportional to its surface area. Any reduction in area will be completely effective in achieving a proportional reduction in total infiltration.
Groundwater Sources	Will typically be feasible because overburden sites can usually be located to avoid known seeps and springs. In certain cases, topographic and land ownership constraints may limit location flexibility for some overburden sites in which case there may be little alternative but to locate overburden over seeps and springs and mitigate the impacts. This should not be seleniferous overburden.	Any amount of water entering the overburden through seeps or springs is a direct contribution to the input category of the water balance for the site. Any reduction of groundwater flow into the overburden will be 100% effective in reducing the seepage water balance by an equal amount.

BMP	FEASIBILITY	EFFECTIVENESS
Characterization and Selective Handling of Overburden	Feasibility to characterize seleniferous overburden is usually good and can typically rely on assay and geologic data. Feasibility of selective handling the seleniferous overburden is site-specific depending on the costs and amount of double handling required. Rehandling a significant amount of overburden to selectively locate it can be unfeasible due to costs.	Effectiveness depends on the goal of the selective handling. Selective handling is often an essential component of other BMPs in which case the effectiveness of is a combination of the different BMPs being made possible by the selective handling.
Reclamation and Revegetation	Restoring vegetation on overburden disposal surfaces is feasible and required by land management agencies to develop a stable, post-mining land use.	Effectiveness of vegetation in limiting infiltration depends on the type of vegetation, cover density, climate and root depth. Effectiveness can be shown by calculations.
Material Consolidation	Construction experience on engineered fills has shown the technical feasibility of this. The financial feasibility will depend on site-specific mine economics. High degrees of compaction are expensive while lesser amounts of planned consolidation may be more economically feasible.	Effectiveness has been shown through experience in design of heap leach sites and municipal and industrial waste disposal facilities. Effectiveness can be demonstrated through site-specific materials testing and comparison with other sites.
Basal Layer Control	Control of basal layer texture through plug dumping or dozer placement has been shown to be technically feasible through general mining experience. The financial feasibility will be site-specific, controlled by access and topography.	Effectiveness can be qualitatively shown by experience with building engineered drains. The inclusion of fine material into coarse drain material has been known to plug drains. By comparison, purposely mixing fine and coarse material should have the same effect of reducing permeability of basal layers.

BMP	FEASIBILITY	EFFECTIVENESS
Mining Oxidation	Feasibility to reasonably reduce oxidation during overburden handling can be fair to good for most operations where the subject overburden is typically handled from the pit to the final disposal site and then covered with more material in a matter of days. Where temporary storage and double handling of overburden is required, it may be unfeasible to minimize this affect on the subject material.	Studies have shown that un-oxidized overburden has potentially more leachable solutes than oxidized material. Studies have also shown that oxidation of such material can result in the mobilization of selenium. What has not been shown is the kinetics of this oxidation and how much the handling during mining contributes to this.
Modification of Low Permeability Foundation Material	Technical feasibility of the excavation or scarifying methods has been shown through general mining experience. The financial feasibility will depend on the area to be treated, type and thickness of the layer to be modified and access.	Effectiveness depends on the percolation rate of the foundation materials. If there is a low permeability layer in the foundation that can be modified to greatly improve its percolation rate, this can potentially be very effective in reducing seeps at the toe of the overburden piles.
Elimination of Low Permeability Foundation Material	Technical feasibility has been shown through general mining experience. The financial feasibility will depend on the area to be treated, type and thickness of the layer to be modified and access.	Effectiveness depends on the percolation rate of the foundation materials. If there is a low permeability layer in the foundation that can be removed to expose a much more permeable foundation material, this can potentially be very effective in reducing seeps at the toe of the overburden piles.
Collection and Treatment of Overburden Seepage	Collection of overburden seepage from the base of overburden is feasible. The treatment of the collected seepage to surface water discharge standards in perpetuity is not currently considered to be feasible.	Field experience in other mineral industry segments indicates that effective seepage collection systems can be constructed while effective and reasonable treatment systems for the collected water have not been demonstrated.

BMP	FEASIBILITY	EFFECTIVENESS
Control of Groundwater Impacts	Groundwater impacts can be reduced at the source by controlling the quantity and/or concentration of contaminants in seepage from the overburden facility. For the Smoky Canyon site, the major control on groundwater impacts would be through reductions in concentration of contaminants in the groundwater through enhanced local recharge of runoff water.	Groundwater modeling of the effects of enhanced local recharge indicates a significant reduction in concentration of contaminants in groundwater downgradient from the runoff recharge areas.

References

Idaho Mining Association (IMA). 2000a. Existing Best Management Practices at Operating Mines, southeast Idaho Phosphate Resource Area Selenium Project. Montgomery Watson, 2000.

Idaho Mining Association (IMA). 2000b. Best Management Practice Guidance Manual for Active and Future Mines. Montgomery Watson, 2000.

Appendix 2C

Infiltration Barriers Review of Feasibility

INFILTRATION BARRIERS

Review of Feasibility
for the
Smoky Canyon Mine

March 4, 2002

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INFILTRATION BARRIERS

Review of Feasibility for the Smoky Canyon Mine

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Executive Summary

This evaluation of infiltration barriers was prepared for the Bureau of Land Management and the U.S. Forest Service in response to agency and public comments on the Draft Supplemental Environmental Impact Statement for the Smoky Canyon Mine Panels B and C. The intent of this evaluation was to determine the potential feasibility of using infiltration barriers on the overburden disposal fills proposed for the B and C Panel operations to reduce groundwater contamination from seepage of meteoric water through those fills. Judgements related to evaluating the feasibility of infiltration barriers are site specific and physical and economic conditions that need to be considered in making these judgements vary widely between operations. This study and its results apply specifically to the Smoky Canyon B and C Panel operations and the statements and conclusions contained herein are not intended by the agencies to necessarily apply to any other mining operation or location without prior site-specific evaluation.

A number of design criteria and objectives are proposed in this report with the two main ones being that the infiltration barrier must be resistant to expected differential settlement in the overburden fills and must reduce the seepage rate through the overburden by at least 55%. The 55% reduction was calculated with ground water impact modeling and was determined to be the minimum reduction necessary to eliminate predicted concentrations greater than the Idaho Ground Water Quality Standards [IDAPA 58.01.11.200] for selenium and manganese outside of the mine disturbance footprint. A seepage reduction of approximately 80% would be required to completely eliminate concentrations of selenium and manganese greater than the ground water quality standards anywhere under the proposed mine disturbance.

Two earth infiltration barrier designs were reviewed including barriers built of crushed mine overburden shale from the B and C Panels or clayey earth borrowed from the Salt Lake Formation located east of the mine operations. Both of these materials have average permeabilities that are too high to meet the design objectives and would require bentonite amendments to produce a uniformly low permeability. This requirement for amending the materials with bentonite eliminates the potential for using run-of-mine shale for construction purposes because it contains too high a percentage of large and hard particles to be uniformly mixed with the bentonite. Only crushed overburden shale could be successfully blended with the bentonite to produce the uniform mixture required. Using overburden shale for the infiltration barrier would also expose water on the barrier to elevated levels of selenium in the shale which would be picked up by the water as it drains off the infiltration barrier. Mixing bentonite with either earth material would be very difficult on the proposed 3h:1v slopes of the overburden fills. It is also questionable if the earth infiltration barriers would be successful in withstanding the differential settlements expected to occur in the overburden fills, although the bentonite amendment would help in this regard. This concern, in theory, could be mitigated if the overburden fills were compacted or consolidated to reduce the differential settlement.

Overburden fills commonly experience differential settlement which deforms the surface of the fills in an irregular manner. Significant cracking and differential settlement has been observed on the surfaces of the existing overburden fills at Smoky Canyon. Such deformation would strain any infiltration barrier constructed in such fills and barriers not able to withstand the strain could crack or tear. This condition could, in theory, be mitigated by compacting or consolidating the overburden within the fills. Compaction of the overburden would add considerable cost to the construction of the overburden fills. Alternatively the fills could be allowed to consolidate and settle for an extended period of time before the infiltration barrier was built. This would add a significant rehandling cost for the chert overburden, increase environmental impacts and extend the time period the mining operation would be unreclaimed.

Three man-made, sheet-type infiltration barriers were evaluated including high density polyethylene (HDPE), polyvinyl chloride (PVC), geosynthetic clay liner (GCL). All of these liner types can withstand

significant strain from differential settlement without increases in permeability so they are superior in this regard to the earth infiltration barriers. All of these flexible barriers require careful installation on uniform, smooth subgrades of crushed shale (100% minus 3/4 inch) to provide the required support and all of them require a cover layer of crushed chert (100% minus 3/4 inch) to protect them from being torn or punctured by the overlying run-of-mine chert. These crushed overburden layers would each be about 12 inches thick and would add considerable cost to the installed cost of the liner materials themselves.

A spray-on, asphalt-based soil sealant was reviewed. It would have potential problems withstanding differential settlement and does not have the uniform permeability characteristics of the other synthetic liner materials investigated.

A spray-on asphalt elastomeric asphalt membrane was also reviewed and was found to be resistant to differential settlement. It would have the same need for a smooth-rolled, crushed shale subgrade and a crushed chert cushion layer as the sheet-type barriers. It would be very difficult to uniformly apply this material to the proposed 3h:1v slopes of the overburden fills but it could be applied to the 2% slopes. It would also require construction of an asphalt storage and mixing facilities at or near the mine.

Soil-cement and asphalt paving infiltration barriers were evaluated. The soil cement mixture would have the same limitations as the bentonite amended option reviewed above and would not be able to be accomplished with run-of-mine overburden. This would require crushing shale or chert to make a uniformly fine material that could be mixed with the cement. This would also be the case for making the asphalt paving on site; it would require a source of crushed rock aggregate. Both of these alternatives have the negative characteristics of being very difficult to apply to 3h:1v slopes and not being able to withstand the differential settlement in the overburden fills unless the settlement was controlled by compaction or consolidation of the overburden itself.

Water that is collected on top of an infiltration barrier would need to be disposed of in an environmentally acceptable manner. Estimates of the water quality draining from the top of infiltration barriers made of non-seleniferous materials and seleniferous shales are made in this report. It appears that this water should comply with applicable surface water quality standards and primary ground water standards if non-seleniferous materials were used in the construction of the infiltration barrier. If overburden shales were used for construction of the barrier, it is estimated that the concentration of selenium and some other parameters could be greater than surface water and ground water quality standards as applicable. This water would need treatment before being discharged to the surface environment. Treatment of this water would add considerable cost to the overall project. However, at the Smoky Canyon Mine, a feasible low-cost method for disposal of this water is to recharge it to the Wells Formation in constructed recharge areas at the margins of the overburden fills. In the case of using overburden shales for the infiltration barrier, introduction of this water at the margins of the overburden fills would introduce this seleniferous water into the groundwater instead of discharging it to the surface streams. For this reason, water treatment costs have not been added to this feasibility analysis.

A number of configurations for infiltration barriers were evaluated including construction on two types of 3h:1v slopes and on the outer edges of the tops of each lift. Although all the infiltration barrier designs reviewed could be constructed on 3h:1v slopes, there would be difficulties involved in building any of the infiltration barriers on the expansive 3h:1v slopes at Smoky Canyon and the final result would have questionable slope stability. A more stable and practical approach to building the infiltration barriers would be to build them in a stepped configuration along the 3h:1v slopes (Stepped Lined Slope). Alternatively the infiltration barrier could be placed on the outer edges of each overburden lift before the overall 3h:1v sloped is constructed (Crest Lined Slope configuration). This later approach would allow normal construction techniques for all the infiltration barriers evaluated and would significantly reduce the

slope stability concerns. It also had the lowest construction costs compared to the other slope configurations, in part because the crushed shale subgrade could be thinned from 12 inches to 6 inches.

The ranking of the per acre costs of the different infiltration barriers, for the Alternatives A & B, Crest Lined Slope configuration are:

Infiltration Barrier	Cost/Acre
Salt Lake Formation w/ 5% bentonite	$67,276
Crushed Overburden Shale w/ 5% bentonite	$53,982
Geosynthetic Clay Liner	$53,632
PVC membrane	$48,373
Spray-on Asphalt Membrane 6	$46,047
HDPE membrane	$45,452

The estimate for the Salt Lake Formation material could also be greater because of material acquisition costs for the borrow material.

Based on the information contained in this feasibility review, the most feasible material for an infiltration barrier at the Smoky Canyon Mine B and C Panels appears to be a synthetic membrane consisting of HDPE, PVC, or GCL. The most feasible configuration appears to be the Crest Lined Slope. The water collected on top of this infiltration barrier would not be expected to be contaminated so it could either be recharged into the Wells Formation or discharged to the surface. The overall cost of including this infiltration barrier into the cap design is estimated to be approximately $33MM to $39MM for the Proposed Action and $22MM to $27MM for the Alternatives. If mitigation of differential settlement was required in addition to the use of these materials, the added cost for the compaction of the overburden would need to be added to the cost of the infiltration barriers themselves.

Adding an infiltration barrier to the Proposed Action (using the Crest Lined Slope configuration) would add $33MM to $39MM on top of the $4.8MM rehandling and reclamation costs already included in that alternative for a total overburden environmental mitigation cost of $37.8 to $43.8MM. Using the same infiltration barrier design for Alternative A would add $22MM to $27MM on top of the $10.85MM for rehandling and reclamation costs already included in that alternative for a total overburden environmental mitigation cost of $32.9MM to $37.9MM. Adding the infiltration barrier design to Alternative B would add $22MM to $27MM on top of the $22.7MM for rehandling and reclamation costs already included in that alternative for a total overburden environmental mitigation cost of $44.7MM to $49.7MM. Using site-specific information on costs and productivity for the Smoky Canyon Mine operations, the BLM has determined that adding an infiltration barrier to the B and C Panel operations would make those operations economically unviable.

It must be emphasized that the feasibility analyses contained in this report for the Smoky Canyon Mine B and C Panels are only generally applicable to other mining operations and locations and do not replace the need for site-specific feasibility analyses for use of infiltration barriers at other locations. This must include the problem of disposing of the water that would be collected on the top of the infiltration barriers.

INFILTRATION BARRIERS

Review of Feasibility for the Smoky Canyon Mine

1.0 Background

1.1 Objective

The main objective of this report is to provide information on the potential feasibility of constructing infiltration barriers over the seleniferous overburden disposal areas of the proposed B- and C-Panels at the Simplot Smoky Canyon Mine. This feasibility is based on a review of technical and cost characteristics of the alternative infiltration barrier designs that were considered potentially applicable for the Smoky Canyon Mine. The feasibility of infiltration barriers described herein is applicable to both external overburden fills and pit backfills.

1.2 Proposed Overburden Management

Proposed open pit phosphate mining at the Smoky Canyon Mine would require removal of overburden rock belonging to the Phosphoria Formation from the B and C Panels. The overburden lithology consists of hard chert and cherty limestone of the Rex Chert Member, hereafter referred to as chert, and carbonaceous phosphatic mudstones and shales of the Meade Peak Member, hereafter referred to as overburden shales (**Figure 1.2-1**). The overburden shales at the Smoky Canyon Mine are known to contain variable concentrations of selenium and other metals and metalloids which can possibly contribute to environmental contamination if not handled appropriately (BLM and USFS, 2001). The chert overburden at the Smoky Canyon Mine is not considered to be a potential source of contamination like the shales.

Overburden would be used to backfill the previous open pit for the A Panel (BLM and USFS, 2001). It would also be used to partially backfill the B and C Panel pits. Excess overburden that is not placed in the pit backfills would be placed in an external overburden disposal site located immediately south of the B Panel pit. The Proposed Action would include disposal of overburden shales in an external overburden disposal site. The Alternative A would only allow chert to be disposed in the external site. Alternative B would allow temporary overburden disposal at the site but all overburden would be returned to the open pits in this alternative. The reader is referred to the Smoky Canyon Mine, Panels B and C for a complete description of the Proposed Action and Alternatives related to overburden management.

1.3 Proposed Cap Design

Simplot intends to segregate the overburden shale from the relatively clean chert during mining and to construct a soil and chert cap over all areas of seleniferous overburden (**Figure 1.3-1**). The overburden fill design for the Panels B and C would consist of the following components from the bottom to the top:

- Shale overburden that is compacted in its upper few feet by heavy mining traffic,
- 8 feet of run-of-mine chert, and
- 1 to 3 feet of topsoil.

The intent of the proposed chert and topsoil cap is to bury the overburden shale with enough clean rock and soil to permanently remove the shale from contact with surface runoff and potential erosion and also contact with flora and fauna. The chert thickness and durability would provide the desired erosion protection and it will also contain most of the roots of vegetation growing over the overburden after reclamation, which would reduce their contact with the shale. This would reasonably minimize transport and bioaccumulation of selenium and other metals and metalloids from the shale into the surface environment.

The design of the proposed chert and soil cap was not intended to include a low-permeability infiltration barrier which would limit infiltration from the cap into the overburden shale. However, the cap as proposed would reduce the exposure of the shale to only the net infiltration remaining after all evaporation and plant transpiration occurs from annual infiltration stored within the soil and chert cap.

1.4 Infiltration Issue

Annual precipitation at the Smoky Canyon Mine is approximately 34 inches, mostly as snow (**Figure 1.3-1**). The environmental fate of this annual precipitation at the proposed overburden fills has been modeled with the HELP V3.07. A portion (13 inches) of this annual precipitation runs off the ground surface and the rest either evaporates, is used by vegetation or infiltrates into the ground. The proposed topsoil and chert cap would hold much of the infiltration so it can be evaporated and transpired by vegetation each year. A small amount of the annual infiltration (4 inches) is expected to penetrate through the cap each year and become net recharge to the underlying overburden shale. The shale could be leached by this net recharge and soluble constituents may be carried out the bottom of the overburden shale as seepage. This seepage could percolate downward through the underlying limestone and sandstone of the Wells Formation eventually entering the ground water aquifer contained in the Wells Formation.

Although the annual amount of infiltration entering the overburden shale each year would be limited to about 4 inches, this infiltration is not expected to migrate uniformly through the shale, rather it likely will flow downward in an unpredictable manner influenced by the complex effects of material segregation, stratification, and channeling within the mass of the overburden fill. End dumped overburden tends to segregate it into coarse fragments at the bottom of the fill slopes, mixed fines and coarse in the middle, and finer material near the top. This causes inclined layers to be formed parallel to the outer fill slope and a general horizontal stratification within each lift of the overburden fill. Water flowing downward through this material tends to preferentially flow in the most permeable zones called channeling (Whiting, 1985). This can cause high unsaturated seepage velocities within the overburden fill (Nelson and McWhorter, 1985). Channeling of flow in overburden fills is expected to be the primary method of water transport in that media. Monitoring of water movement through unsaturated rock is extremely difficult (EPA, 2001).

Laboratory testing of the Center Waste Shale at the Smoky Canyon Mine has indicated that a number of constituents could be leached from the shale in concentrations that are greater than surface water or ground water protection standards. These are: cadmium, manganese, selenium, sulfate and total dissolved solids. Surface water impacts from this leachate could occur if overburden leachate discharged from the overburden fills as surface runoff or at seeps or springs. Utilization of various Best Management Practices at the mine should prevent this from happening (BLM and USFS, 2001). Vertical percolation of leachate from the overburden shale could recharge the permeable Wells Formation which underlies all areas of overburden disposal at the proposed mine operations. This formation contains an unconfined aquifer of potable quality water. Groundwater flow and contaminant transport modeling has indicated that contamination of the ground water could occur from the addition of these constituents in the overburden seepage. Selenium and manganese concentrations in the ground water below the overburden fills are estimated to be greater than the Idaho Ground Water Quality Standards [IDAPA 58.01.11] (equivalent to Federal Drinking Water Standards) for these constituents. Cadmium, sulfate,

and TDS concentrations are not expected to be greater than their ground water standards under the overburden. The standard for selenium is a primary drinking water standard, based on protection of human health. The manganese standard is a secondary one, based on aesthetics for use of the water in residential settings. The primary concern is therefore for the selenium concentration in the ground water.

One way of reducing the ground water impact is to reduce the annual amount, or loading, of contaminants added to the ground water each year from the overburden seepage. It is assumed there is little that can be done to reliably reduce the concentrations of the contaminants in the seepage beneath the overburden fills. Simplot has worked with the University of Idaho for a number of years investigating various approaches toward reducing the leaching of constituents from the overburden shale in-situ and treating seepage after it has exited the overburden. It is possible that one or more of these research endeavors may mature into future mitigation techniques to reduce the contaminant loading to the ground water but none of these technologies have been incorporated into proposed mitigation measures for the mine at this time. Natural chemical attenuation of the contaminants may also occur to various degrees as the seepage flows through the overburden, the underlying vadose zone, and within the aquifer itself. No predictive studies have been conducted to date regarding the levels of attenuation that can be expected to occur in this flow path so quantifying this attenuation is not possible at this time. Additional study may result in usable estimates of natural attenuation to be used in contaminant transport modeling at Smoky Canyon in the future.

The other way to reduce the loading of the contaminants into the groundwater is to reduce the quantity of water in the seepage from the overburden fills. This can be done by increasing the runoff from the surface, increasing evapotranspiration of water from the cap materials, and/or installing a low-permeability infiltration barrier between the overburden shale and the chert portion of the cap. The amount of water that runs off the surface of the reclaimed overburden fills is largely controlled by the slope of the surface and the vegetative cover. Both of these characteristics are relatively fixed by design and reclamation requirements for post-mining land use and these characteristics have already been included in the HELP infiltration modeling. Evapotranspiration is largely controlled by the vegetation growing on the earth materials being evaluated and climate. The general climatic conditions at the Smoky Canyon Mine site have already been included in the HELP model. The micro-climatic conditions influenced mostly by the aspect (direction) of the reclaimed slopes has already been included the design of the facilities. This report addresses the feasibility of the remaining variable on net infiltration into the overburden shale, constructing an infiltration barrier as part of a revised cap design.

1.5 Design Criteria

Construction of the infiltration barrier must comply with some basic design criteria based on physical and operating conditions at the mine. These basic design criteria are:

- Construction of the infiltration barrier must occur concurrently with mining and building the overburden fills to avoid delays in mining or reclamation and excessive double handling of construction materials.

- The infiltration through the barrier must at least be controlled to an extent that State ground water quality standards are complied with outside the boundaries of the disturbed area.

- The infiltration barrier must not fail under the differential settling conditions likely to occur in the overburden fills.

- The infiltration barrier must not be punctured or torn by the earth and rock materials immediately overlying and underlying the infiltration barrier.

- The materials of construction for the infiltration barrier must be permanently resistant to weathering or physical degradation in their long-term application.

- The infiltration barrier must not itself contribute to mass instability of the overburden disposal facilities.

- Water that is diverted from the top of the infiltration barrier must be handled in a controlled manner that complies with applicable regulations, does not result in contamination of the surface environment, and does not contribute to instability of the overburden fills.

1.6 Overburden Slopes

Most of the reclaimed surfaces for the B and C Panel development will be slopes ranging from about 1v:5h to about 1v:3h. This means that most of the area of an infiltration barrier would be constructed under these slopes so the impact of slopes on the construction and long-term functioning of the infiltration barrier must be considered.

1.6.1 Current Plan

Overburden would be hauled from the open pits to the locations of the pit backfills or the external overburden disposal area and end dumped in 50-foot vertical lifts (**Figure 1.6-1**). Each lift would have an outer slope about 1v:1.5h which is the angle of repose for the overburden. The top of each lift would be sloped at approximately 2 to 4% back from the outer edge of the lift except the very top lift of the fill which would have a 2 to 4% slope toward the outer edge of the fill for drainage. Each lift of overburden shale would be extended outward to a defined location at which point only chert would be dumped along the face of the lift until the outer edge of the lift reached the final design extent. Each lift would be built in this manner with seleniferous overburden being placed in the interior of the lift and chert being placed along the outer edge. After the final top lift is installed in the same manner as previously described, an additional 8 feet of chert would be installed on the entire top surface of the lift. The outer chert edges of each lift would be pushed down with dozers and the outer slope regraded to a final slope of 3:1, ensuring that a minimum 8 feet of chert would cover all seleniferous overburden. A 1 to 3 foot layer of topsoil would then be placed on all chert surfaces.

This overburden handling approach makes efficient use of the existing mine designs and practices. All overburden can be efficiently hauled with large mining trucks which would dump directly onto the outer face of each lift eliminating extra handling of the overburden at the overburden fill. The 8-foot chert layer on the outer 3h:1v slope is also efficiently achieved with large dozers that can move the material downhill at a low unit cost.

The foundation area of the external overburden disposal site and the foot walls under the pit backfills would be prepared by selective removal of low permeability materials and installation of earth berms on the contour as necessary to reduce the potential for lateral migration of seepage at the base of the overburden fills. These practices would direct any seepage exiting the base of the overburden fills into the subsurface where it would not result in contamination of the surface environment. The margins of the external overburden disposal site and certain areas of the pit backfills would also be fitted with zones of permeable chert fill to collect clean surface runoff from the capped and reclaimed overburden areas and direct this clean water into the subsurface to mitigate groundwater quality impacts.

1.6.2 Uniform Lined Slope

The overburden shales for this alternative would be installed the same as described in Section 1.6.1, along with some of the chert (**Figure 1.6-2**). The initial width of the chert margins at the outer edge of each lift would be narrower in this alternative. The overall slope would be graded to a 3h:1v gradient as before. Then at least 12 inches of minus 3/4 inch crushed shale subgrade would be spread and

compacted over this regraded surface. An infiltration barrier would be placed over the compacted crushed shale subgrade. An additional 12-inch thick layer of minus 3/4 inch crushed chert would be installed over the infiltration barrier if it were constructed of plastic membrane, geosynthetic clay liner (GCL), or elastomeric spay-on asphalt. The protective cushion layer would not be necessary if the infiltration barrier were constructed from Salt Lake Formation earth or from overburden. Section 2 of this report provides detailed descriptions of each of these infiltration barriers. Run-of-mine chert would be placed over the infiltration barrier to a total thickness of 8 feet. The maximum slope distance for this alternative could be as much as 2000 feet.

Logistically, this configuration would be difficult to build because of the long slopes. The earth construction materials would need to be pushed down long slope distances with dozers. The dozers and compaction equipment would be able to traverse up and down the slopes but other equipment such as trucks, loaders, soil mixers etc. would not be able to safely move on the slopes. The plastic membrane liners could be built on the 3h:1v slopes but the extensive area and length of these slopes would be difficult to line. There would also be concerns about stability of the overlying cap from sliding on the infiltration barrier. This would be less of a concern for the earth barriers compared to the plastic membranes. Increased stability for the membranes could be obtained by using rough sided material.

1.6.3 Stepped Lined Slope

The layering of this design would essentially be the same as Uniform Lined Slope described in Section 1.6.2. However, the stepped lined slope would incorporate a step out bench approximately 100 feet wide every 100 vertical feet resulting in a maximum slope distance of 300 feet between benches (**Figure 1.6-3**). This would break up the long slope into a number of shorter slopes which would increase the stability of the overall slope. Its main advantage would be to allow trucks and other machinery to traverse the slope along the contour delivering construction materials at a number of elevations along the slopes which would improve the logistics of construction. A disadvantage of this design is the lengthening of the overall slopes by the added benches. This would increase the length of the slopes by about 17% over the Uniform Lined Slope and thus the slope area requiring lining would increase by the same factor.

1.6.4 Crest Lined Slope

This alternative would place the overburden in the same manner as the current plan described in Section 1.6.1 except that the outer portion of each lift would be constructed with a 2% grade toward the outer crest of each lift for drainage (**Figure 1.6-4**). The infiltration barrier would be built on top of the outer portion of the flat component of each lift. The outer edge of the infiltration barrier would extend to about 75 feet past the edge of the shale crest to provide infiltration protection for the 1.5h:1v slope on the shale. The edge of the infiltration barrier would also be at least 8 feet inboard of the point where the outer crest of each lift would be graded down to a 3h:1v chert slope. The earth infiltration barriers would be built on a subgrade of overburden that would be compacted by the mine hauling equipment eliminating the need to crush shale and compact the subgrade. If the infiltration barrier were built of plastic membrane or GCL, a subgrade layer of crushed shale would still be required to cover voids and sharp rocks in the top of each lift but the compacted surface under this subgrade layer could allow it to be thinned from 12 inches to 6 inches. A cushion of fine crushed chert would need to be placed over the synthetic infiltration barriers before any run-of-mine overburden was placed over them but this cushion layer would not be required if the infiltration barrier were constructed of earth. Regrading to an overall 3h:1v slope would then be accomplished and 1 to 3 feet of topsoil would be installed.

The logistical advantage of this design is that all of the overburden could generally be handled with the same methods as the current plan. The concerns over building the infiltration barrier on long slopes would be eliminated. The concerns for the destabilization of the final slope on top of the 3h:1v infiltration barrier would also likely be eliminated but site-specific designs would need to be checked for slope stability. The crushed shale subgrade for synthetic materials could be thinned from 12 inches to 6 inches, saving costs for this layer. A potential disadvantage of this design is that it would consume more chert

because of the need to extend the chert zone at the outer edge of each lift further than the current mine design to allow extension of the infiltration barrier to protect the shale slope from infiltration. This effect could be reduced by decreasing the thickness of each overburden lift. For example, reducing the lift thickness to 30 feet would reduce the width of the infiltration barrier extension from 75 feet to 45 feet. Another disadvantage of this design is that there would be some overlap (20') of the infiltration barrier built on each lift.

2.0 Infiltration Barriers

An infiltration barrier is a layer of earth or man-made materials that has a significantly lower permeability than the materials it is intended to protect from infiltration of meteoric water (rain and snow melt). The typical sequence of layering for an infiltration barrier, from bottom up is as follows (**Figure 2.0-1**):

- Graded and compacted waste material subject to infiltration of meteoric water,
- Compacted subgrade of fine material to provide a hard and uniform base for placement of the infiltration barrier,
- Infiltration barrier,
- Drainage layer and protective fine cushion layer for geomembranes,
- Subsoil layer to provide subsoil for evapotranspiration and to protect the drainage layer and infiltration barrier from erosion, frost, roots and animals, and
- Topsoil to support vegetation growth.

The waste material to be protected from infiltration is the foundation for the infiltration barrier system and should be compacted at least in its upper part to provide a firm footing for construction of the overlying infiltration barrier. The final grade of the waste material will set the grade of all overlying layers and should be designed for positive drainage of runoff (2+%) to avoid ponding. At the Smoky Canyon Mine, this material would be the overburden shales which are generally consolidated by being dumped in 50-foot lifts by very heavy truck traffic but the upper few feet of each lift of shale is well compacted to a high density by the haulage traffic. The regraded slopes of the overburden would not be compacted by the truck traffic and would be somewhat compacted with dozers.

Where the waste material might have a rough surface with voids or sharp objects protruding above the surface, it is not suitable for direct placement of an infiltration barrier. An earth infiltration barrier must be placed on a hard compacted subgrade. The compaction of the earth infiltration barrier will not be possible if the underlying subgrade is uncompacted, rough or included open voids. Where the infiltration barrier will be constructed with a flexible synthetic membrane, the subgrade must be smooth rolled and hard to provide a firm, uniform surface to evenly support the membrane and protect it from sharp points or edges. At the Smoky Canyon Mine, this subgrade could be made of overburden shale crushed to 100% minus 3/4 inch, spread with dozers, and then compacted with a roller compactor.

The infiltration barrier is typically made of compacted, low-permeability earth 12+ inches thick, or a man-made material like a flexible plastic membrane, geosynthetic clay liner which consists of clay granules sandwiched between two layers of polyester fabric, or a sprayed elastomeric asphalt membrane. The infiltration barrier should be carefully constructed to be free of gaps or holes which can leak water into the underlying materials.

Meteoric water percolating down through the material overlying the infiltration barrier is prevented from downward percolation by the barrier and accumulates on top of the barrier. This water must be drained off laterally to prevent accumulation of a thick saturated zone on top of the barrier. For earth infiltration barriers, this is critical because the leakage rate of these types of barriers is quite sensitive to the overlying thickness of any saturated media. Drainage is typically handled by covering the infiltration barrier with a lateral drainage layer having a high permeability. This coarse and permeable drainage layer can also act as a capillary break layer and protect the infiltration barrier from root penetration or upward migration of moisture. Manmade materials like plastic drainage net or polyester filter fabric can also be used for the lateral drainage layer although slope stability considerations are critical because of the low coefficient of friction between layers of plastic materials. At the Smoky Canyon Mine the drainage layer would be the base of the 8-foot thick chert layer. If the infiltration barrier was made of compacted earth, the run-of-mine chert could be placed directly on top of the infiltration barrier. If the barrier was made of plastic membrane, GCL, or spray-on asphalt a 12-inch thick cushion layer of chert crushed to 100% minus 3/4 inch would be placed directly on top of the infiltration barrier and then the rest of the run-of-mine chert would be placed over this. The cushion layer would have good drainage properties and would protect the infiltration barrier from being damaged by the run-of-mine chert

The drainage layer and infiltration barrier must be protected from erosion or frost damage by a layer of earth. This layer also protects the underlying materials from grass and most herbaceous plant roots and animal burrows. It must be thick enough to provide all of these functions, when combined with the overlying topsoil. At the Smoky Canyon Mine the 8-foot thick chert layer would provide this protective layer and it would be covered with 1 to 3 feet of topsoil.

A topsoil layer provides the growth medium for a perennial cover of vegetation which stabilizes the surface from erosion and removes much of the annual infiltration of meteoric water through root uptake (evapotranspiration).

2.1 Earth Infiltration Barriers

2.1.1 Overburden Material

The mining operations remove a large quantity of rock overburden from the open pits during the extraction of the phosphate ore. This overburden material is a potential construction source for earth infiltration barriers. The overburden from the phosphate mining at the Smoky Canyon Mine consists of the Phosphoria Formation which is chert and limestone in its upper portion and interbedded mudstones and shales in the lower portion. The chert and limestone overburden must be blasted during mining and is hard and resistant to weathering in the overburden fills. Various types of laboratory leach tests on this material from the Smoky Canyon Mine have shown it to have very low levels of soluble selenium in leachate. The mudstones and shales have been altered and weathered to varying degrees but are also relatively hard in the open pits at Smoky Canyon and must be blasted or ripped with dozers during mining. These materials can undergo additional weathering and softening in the overburden fills, depending on their initial alteration condition.

Run-of-mine overburden is removed from the open pits and placed into large overburden fills with large mining equipment. The maximum particle sizes of this material are limited only by the handling capacity of the mining equipment so it tends to have a wide variety of particle sizes ranging up to individual particles greater than one cubic yard. This type of rocky, blocky material is not suitable for construction of earth infiltration barriers because the infiltration barrier must contain a high percentage of fine materials (silt and clay) and be compacted to a high density in order achieve the desired low permeability. Large particles are difficult to mix with finer material which is necessary to fill all the voids between the large particles. The large particles also resist compaction and reduce the degree of compaction of the finer material surrounding the large particles. Shale in general can have a wide range of physical and mineralogical properties which affect its susceptibility to weathering and softening once exposed to

surface conditions which can produce a softer, soil-like material that might be suitable for construction purposes.

The Center Waste Shale of the Phosphoria Formation in southeast Idaho is sometimes altered to clay minerals and is then relatively soft. At some phosphate mines in southeast Idaho, altered overburden shales have been mined with scrapers and this material has been used for construction of compacted, engineered fills having low permeability (personal communication W. Johnson, 2001). Where the Center Waste Shale is altered and amenable to compaction in lifts to lower its permeability, it could possibly be utilized for construction of infiltration barriers having the target permeability of E-7 cm/sec or less.

Unlike other phosphate mines in southeast Idaho, none of the Center Waste Shale at the Smoky Canyon Mine is reportedly altered to soft, soil-like material (Raymond, 2001a). The primary minerals in the rock have not broken down to form clay minerals that would reduce permeability. All of the overburden shale at Smoky Canyon is reportedly hard, requiring ripping with dozers and blasting to remove it from the open pits. This material would not be suitable for construction of an infiltration barrier without crushing and potentially mixing with other earth or bentonite to produce a low enough permeability.

Surficial sampling of shale from over 30 locations on the existing overburden fills was conducted during 2000 for chemical analyses (JBR, 2000). These samples were hand dug from test holes about 18 inches deep and the shale materials encountered were very difficult to dig with many hard, well indurated particles in sizes from 1 to over 8 inches in diameter. Sieve sizes of some of the samples taken from these test holes are shown in Table 2.1-1. It must be noted that particles greater than 3 inches in diameter were discarded from the samples when they were taken in the field so the reported sieve data do not include the larger particle sizes found in the field and recorded in the field notes.

These data show the fine silt and clay material (minus #200 mesh) content in the samples that can contribute to low permeabilities ranged from about 11 to 44%. In general, the higher the percentage of fines in a soil, the lower its permeability. There is no specific threshold for a minimum required amount of fines in a soil intended for use in an infiltration barrier because the percentage and type of clay contents is also important.

The field and laboratory data demonstrate how variable the fines content is in the Smoky Canyon Mine overburden shale even after years of exposure to surface conditions. Samples Q01 through Q08 were taken from the A Panel external overburden fill which was constructed in 1984. The A Panel is the closest existing panel to the proposed B and C Panels and its overburden properties are expected to be similar to that which will be encountered in the B and C Panels. The shale from the surface of the existing A Panel overburden fill has been exposed to weathering for over 17 years and still has not uniformly softened into clay material. Permeability testing results for these samples is discussed in Section 3.2.

Table 2.1-1 Gradation for Overburden Shale at the Smoky Canyon Mine

Sieve*	Q01-S3	Q01-S4	Q04-S2	Q04-S4	Q06-S4	Q08-S5	Q12-S4	Q13-S3	Q19-S3
1.5"	100	97.3	100	81.7	100	100	100	100	100
3/4"	80.4	78.7	86.2	71.1	91.1	84.4	95.1	100	100
3/8"	73.7	66.3	72.6	57.8	76.1	68.1	74.3	88.6	82.0
#4	65.0	57.7	59.5	46.7	64.5	52.4	57.2	79.4	69.6
#10	57.7	46.8	45.3	37.3	54.8	38.4	43.8	70.0	57.3
#20	53.7	39.5	36.8	31.5	49	30.0	37.3	61.7	48.7
#40	51.2	33.8	31.4	27.5	45.3	22.5	33.8	55.8	43.0
#60	49.1	28.8	27.7	24.5	42.4	18.0	31.3	50.7	38.7
#100	46.7	24.5	24.7	22.0	39.1	14.5	28.8	45.7	34.6
#200	43.6	20.7	21.5	19.2	35.1	11.2	25.3	39.7	30.0

* Data are the percent finer than the screen opening size shown.

Run-of-mine chert and limestone overburden at the Smoky Canyon Mine does not contain any clay and is not suitable for constructing infiltration barriers. Run-of-mine shale is too hard and blocky, with large rocks, to be used as is for infiltration barriers. Both the chert and shale could be crushed and screened to produce finer material although the lack of clay mineral in the crushed chert would not allow it to be used for constructing a low permeability infiltration barrier. It could be used to construct a high permeability drain and cushion layer on top of the infiltration barrier. The shale does not contain abundant free clay but the shale particles could potentially be reduced by crushing to enable the material to possess a lower permeability when compacted.

One issue that would need to be evaluated if overburden shale was used to construct the infiltration barrier would be the selenium content of the shale used to construct the infiltration barrier. Water moving laterally on top of such an infiltration barrier could pick up dissolved selenium and other contaminants which could be a potential source of contamination to the receiving water. Testing has not been conducted on samples of the Center Waste Shale from the Smoky Canyon Mine to try to predict the water chemistry of drainage from on top of an infiltration barrier constructed of the Center Waste Shale

In summary, there is more than enough overburden shale material to be mined from the future open pits for use as construction material for earth infiltration barriers but the hard, blocky physical characteristics of this material do not allow it to be used for this purpose as it is produced run-of-mine. The run-of-mine shale has particle sizes that are too large and has insufficient uniformity for producing infiltration barriers. This could be mitigated somewhat by processing the material in a crushing and screening plant to reduce the particle sizes and produce a greater percentage of fines. This crushed material may still not have a low enough permeability unless sufficient soft clay can be liberated by processing and moisture conditioning. If this cannot be achieved with the material as is, bentonite could be added to reduce the permeability to the desired range.

2.1.2 Salt Lake Formation

The Salt Lake Formation covers an extensive area to the east of the Smoky Canyon Mine (**Figure 2.1-1**). The Smoky Canyon Mine tailings disposal facility is located within the outcrop area of the Salt Lake Formation. Drilling done for Tailings Dams No. 1 and No. 2 have demonstrated that the Salt Lake Formation is present under all areas of the tailings and is overlain with alluvial and colluvial deposits

ranging up to about 30 feet thick (Forsgren-Perkins, 1983, 1988). The Salt Lake Formation in these borings was described as consisting of reddish clay, clayey silts, and silty sands and gravels which represent the weathered portions of the Salt Lake Formation. These materials were soft enough to be drilled with augers and were subsequently excavated for use in the construction of the tailings dams.

Numerous in-situ permeability tests in borings up to about 80 feet deep located throughout the tailings facility area indicated that the Salt Lake Formation has a uniformly low permeability ranging from practically impermeable (no water take during the test) to approximately 1 ft/yr in the clay beds and up to about 40 ft/yr in the coarser beds (Forsgren-Perkins, 1983, 1988). Some borings intercepted a few zones of anomalous permeabilities in the Salt Lake Formation with permeabilities of up to 600 ft/yr. The alluvial and colluvial sediments above the Salt Lake Formation have reported in-situ permeabilities ranging from about 200 to about 2,000 ft/yr.

Simplot has extensive construction experience with the Salt Lake Formation materials and has identified through drilling and test pits enough of the material to be used for past and future construction of the tailings dams. Permeability testing of compacted samples of this material resulted in the tailings dam design engineers relying on a permeability value of 1 E-6 cm/sec which is suitable for construction of the tailings dams and could presumably produce earth infiltration barriers of the same permeability.

Simplot has indicated that sufficient quantities of low-permeability clay for use in the infiltration barrier construction have not yet been identified through existing geologic and geotechnical data and more investigations would be required to prove the availability of the necessary volume of this material. This investigation would also need to prove the physical characteristics of the deposits to demonstrate that the target gradation and permeability could be achieved with the material delineated. Exploration for this material would occur on Simplot's private land first. If insufficient quantities of acceptable material were discovered on this land, additional private land would need to be purchased for the purpose of developing sufficient quantities of material. This would add an acquisition cost to the borrow material which is unquantifiable at this time.

The material in the borrow pits would need to be developed through borings and/or test pits to describe the quantities and characteristics of the materials. Borrow pits would then be designed to produce the required volume of earth material. Based on a 1-foot thickness for the compacted infiltration barrier, the required volume of earth material on an in-place basis is about 1,166,000 bank cubic yards for the B and C Panel overburden areas. If the average excavation depth in the borrow pits was approximately 8 to 12 feet, this would require greater than 60 to 90 acres of borrow pits including reasonable side slopes would increase these areas.

The quantity of earth material to be hauled from these borrow pits for the B and C Panel infiltration barrier would be approximately 1,458,000 loose cubic yards. Assuming 4 years would be required to construct the infiltration barrier, approximately 18,225 loaded 20 CY trucks per year would pass up the Smoky Canyon access road from the borrow pits to the B and C Panel overburden areas. Assuming a 5-month construction season, 12-hour work days and 6 days per week for the hauling would result in about 13 truck loads per hour. This is a large amount of truck traffic on this public road and the existing road would need to be reviewed for adequate design (width, drainage, curvature, sight lines, subgrade, and road surface) for this quantity and mixture of traffic. If the engineering evaluation of the road indicated it did not meet public road design criteria, it would need to be reconstructed or the public use of the road would need to be curtailed. The timing of the haulage (day or night shift) would be part of this evaluation. Reconstruction of the existing road through the Forest would require design and permit approvals from the U.S. Forest Service and likely the U.S. Corps of Engineers for disturbance to the stream channel.

An alternative haulage scenario would include construction of a private haul road from the borrow pits to the mine area. This road would be built through currently undisturbed areas in Smoky Canyon and

would require design review and permitting by the U.S. Forest, including an Environmental Assessment, prior to its approval and construction.

In summary, sufficient quantities of Salt Lake Formation construction materials are present east of the mine area but geological exploration is necessary to identify the required amount of suitable deposits. It is possible that quantities that could be developed on existing Simplot property might be insufficient and additional property may need to be purchased. Engineering and permitting issues need to be resolved for use, and possible reconstruction, of the existing access road up Smoky Canyon, or construction of a new private haul road. Finally, geotechnical and geochemical testing would need to be done on representative samples of the Salt Lake Formation to demonstrate its viability for use in constructing an infiltration barrier.

2.1.3 Bentonite Amendment

Where the maximum grain size of earth material is not a problem but there is insufficient fines or clay material in the material to produce the desired permeability, clay (such as dry bentonite) can be mixed into the material to decrease its permeability. The permeability of a granular earth material can typically be brought down to the desired range of E-7 cm/sec with the addition of from 3 to 8 percent by weight of powdered sodium-bentonite. This will typically cause this mixture to behave similarly to a material containing about 50 percent non-bentonite clay.

Bentonite clay is produced in commercial quantities from large deposits in Wyoming. Different grades of bentonite products are available from fine crushed (chips) to finely ground material. The mineralogy and chemistry of the bentonite is also variable depending on the source. Bentonite consisting of sodium montmorillonite clay has the best swelling properties. For construction purposes, bentonite is typically shipped in bulk truck loads which can be off-loaded to storage silos, spreading equipment or dumped in windrows or piles.

The dry bentonite is spread over a loose lift of earth material to be treated and is with large rototillers. It is essential that the powdered bentonite be thoroughly mixed with the earth being treated. This is easier in dry soils and dry weather as wet weather can impede handling and mixing of the bentonite. The mixing equipment also cannot handle large rocks in the material being treated which can damage the equipment. Depending upon the site-specific conditions, anywhere from 3 to 8 passes of the mixing equipment may be needed to mix the material (Goldman, 1990). During mixing of the bentonite into the earth material, compaction water is added to moisten and activate the bentonite after which the material is compacted. After compaction, the infiltration barrier must be covered with earth to protect it from drying and frost action.

For a 12-inch thick earth infiltration barrier with an assumed unit weight of 110 pounds per cubic foot, a 3 - 8% admixture of bentonite would be approximately 3.3 to 8.8 pounds per square foot or about 72 to 191 tons of bentonite per acre.

Application of bentonite-amended earth infiltration barriers is inhibited by wet and cold weather to the same extent as a normal compacted earth infiltration barrier. The completed barrier would be susceptible to frost damage like the earth barrier but a barrier made with bentonite would have increased capability to heal fractures because of the extreme plasticity of the bentonite. This characteristic would also make this type of infiltration barrier more resistant than a compacted earth barrier to increased permeability by differential settlement of the overburden fills.

There is a potential that bentonite could be mixed directly into the upper 12 inches of overburden without having to produce a crushed material for this purpose. This would require greater concentrations of bentonite in the mix and would produce a less uniform a mixture than using fine earth or crushed rock. The mixing equipment typically used for making bentonite-amended liners may not be able to be used for the run-of-mine overburden and less efficient mixing equipment like plows, dozer rippers or grader

scarifiers could be used. It is unlikely that this type of mixing could produce as uniform a low permeability material as the roto-tiller equipment.

Bentonite is typically applied to the earth material being treated directly from the bentonite vendor's haul trucks. This would not be possible on the 3h:1v slopes and would require transfer of the bentonite to silos on site and then loading special agricultural fertilizer spreaders to haul the bentonite to the application site and apply it. These vehicles would be able to operate only directly up and down the slopes and this activity could be hazardous due to the instability of this equipment on such slopes. The mixing equipment necessary to work the bentonite into the earth to be treated may also not be able to work safely on the 3h:1v slopes.

In summary, adding bentonite to earth material such as the Salt Lake Formation material or crushed overburden can likely produce uniform permeabilities in the range of E-8 to E-7 cm/sec. It cannot be uniformly added to the in-situ, run-of-mine overburden at Smoky Canyon because the large particles would interfere with and damage the typical mixing equipment. Use of other mixing methods including plows, dozers and graders may be possible but would not produce as uniform a product. Adding bentonite to the 3h:1v slopes may not be realistically feasible for the large amounts of such slopes at the Smoky Canyon Mine. Alternate orientations for the infiltration barrier which are more feasible to construct are discussed in Section 1.6 of this report.

2.2 Geosynthetic Clay Liner

A geosynthetic clay liner (GCL) material contains granulated dry sodium bentonite sandwiched between two geotextile fabrics. It comes in large rolls (2,700 lbs each) and is applied to the ground like carpet. The field seams are simple shingled overlaps with granular bentonite used between the layers to seal them together. The subgrade should be rolled smooth and made free of sharp rocks or other protrusions over 0.5 inches high before applying the GCL. The material is deployed off rolls down the slope with the seams parallel to the fall line.

GCLs can withstand 10 - 15% tensile strain before hydraulic conductivity increases. Different GCLs have different slope stability characteristics and installation on slopes greater than 3h:1v is not recommended.

The GCL subgrade requirements are similar to those for a plastic membrane and rough rocky subgrades with sharp points and voids are not allowable. Such a surface would require covering with a finer earth subgrade which is smooth rolled. The material also needs to be covered with at least 12 inches of fine crushed rock or soil to provide confining pressure prior to the GCL being exposed to moisture. It is more immune to frost damage than compacted earth infiltration barriers and can be installed in sub-freezing temperatures. However, it cannot be installed in wet weather because the material absorbs water and becomes too heavy to handle in that condition. GCL should also not be allowed to hydrate without the soil cover. Handling heavy rolls of GCL is done with specialized construction machinery and this loaded machinery could traverse straight up and down the 3h:1v slopes but would not be able to safely traverse the slopes on the contour. The alternate configurations (Stepped Lined Slope and Crest Lined Slope) described in Section 1.6 would mitigate this concern.

2.3 Polyethylene Membrane

Polyethylene membrane infiltration barriers are typically made of high density polyethylene (HDPE), low density polyethylene (LDPE), or very flexible polyethylene (VFPE) of various thicknesses. The LDPE and VFPE are better suited for applications where their increased flexibility are desirable. Synthetic membranes are thin, from about 40 to 80 mils, and can be punctured by sharp objects such as tools, sticks or sharp rocks. This requires that the membrane be placed on a compacted subgrade that has been rolled hard with a smooth roller to eliminate sharp rock edges and provide a strong base to support

the membrane uniformly. A cushion cover layer is required to prevent puncturing the membrane from rocks on top of the membrane although care should be taken to only place fine crushed material (minus 3/4 inch) directly on the liner. In general, the more angular, hard, and large the materials are in the immediate cover over a synthetic membrane, the thicker the membrane should be to resist puncturing. Synthetic plastic membranes are sometimes installed under or between geotextiles for puncture protection but this can have a destabilizing effect on slopes because of the low friction between these synthetic materials. If the subgrade under the membrane has a low permeability itself, the seepage through any holes in the membrane will be retarded by the low permeability subgrade.

Plastic membranes have a relatively high thermal expansion and contraction with changing temperatures. Liner installation must take into consideration the range of temperatures the membrane is likely to experience in its operational life and make sure that adequate provision for expansion and shrinkage is provided in the installed material.

Plastic membranes installed at the Smoky Canyon Mine would need to be installed on uniform, compacted subgrades of earth or fine-crushed shale and also need to be covered with fine-crushed chert. The logistical difficulties involved in spreading and compacting these fine earth materials on the long slopes would be about the same for a plastic membrane as for a compacted earth infiltration barrier. Building the portions of the cap over the plastic membrane would be difficult on the long slopes because of the potential for slippage of these overlying layers on the plastic membrane. Use of double rough-sided membrane would help stabilize the slopes.

The membranes are tough and yield to strain by stretching so they are expected to be more resistant to differential settlement that infiltration barriers made of compacted earth. This is the case if the differential settlement was gradually applied to the membrane over a horizontal distance. Localized shear from settlement could also shear the plastic membrane material. A plastic membrane would not be able to be built in high winds, extreme cold, or wet weather.

The high degree of thermal expansion on the large exposed areas of membrane would need to be taken into consideration when building the membrane to avoid tears when the membrane was subjected to cooler temperatures.

Polyethylene membrane is extremely tough and resistant to cold, punctures, and tears. It cannot be solvent welded and is seamed in the field with specialized heat welding equipment and practices. Welding is inhibited during extreme cold and wet weather.

The large rolls of membrane could be carried down the long slopes by special equipment but vendor trucks would not be able to traverse these slopes safely. The alternate configurations (Stepped Lined Slope and Crest Lined Slope) described in Section 1.6 would mitigate this concern.

2.4 PVC Membrane

Polyvinyl Chloride plastic membranes have been installed for more than 40 years in a wide variety of applications. The membranes come in typical thicknesses of 20, 30 and 40 mils.

The benefits and difficulties described for the polyethylene plastic membranes would essentially be the same for PVC. One major difference between the two materials is PVC's susceptibility to becoming brittle in low temperatures and degraded when subjected to prolonged sunlight exposure. Polyethylene is not subject to these concerns. PVC has an installation advantage over polyethylene in that it is solvent welded in the field so all seams can be made with low-tech tools and practices whereas the polyethylene requires specialized heat welding equipment and practices. PVC membrane should not be handled at temperatures below freezing.

2.5 Others

2.5.1 Soil Cement

Soil cement is a mixture of Portland cement and earth which never becomes fluid in its preparation. Approximately 5 to 15% by weight of cement is added to the dry earth to be treated. The cement must be thoroughly mixed with the earth to be treated. This can best be done by plant mixing the dry aggregate and cement and then hauling it to the place of use, spreading it, adding moisture, and then compacting. Alternatively, the cement can be added to the surface of the earth to be treated and then mixed in with rototillers or plows. After the dry mixing is completed, water is added along with more mixing to hydrate the cement and provide compaction water. The soil cement is then compacted to the required density and allowed to cure.

The soil-cement infiltration barrier would be built with similar construction equipment as the compacted earth infiltration barrier and its construction would be very similar in practice to the bentonite amended infiltration barrier, replacing the bentonite with Portland cement. Construction would be impeded by cold temperature and precipitation, like the compacted earth barrier. Like the bentonite amended earth, it is possible that the cement could be incorporated into the in-place overburden surface with plows, dozers or graders, moisture conditioned and recompacted to form the soil cement infiltration barrier. It is doubtful if the particle size of the run-of-mine material treated would allow the scarification and mixing required to thoroughly blend the cement in with the overburden. Large overburden particles

would inhibit use of efficient scarifying and mixing equipment like discussed earlier for bentonite amendments.

Like the bentonite amendments, it would be very difficult to mix the soil cement on the 3h:1v slopes. The alternate configurations (Stepped Lined Slope and Crest Lined Slope) described in Section 1.6 would mitigate this concern.

Hardened soil cement is brittle and would yield to differential settlement of the overburden fills with frequent fractures that would significantly degraded the hydraulic performance of the infiltration barrier. This could be mitigated with compaction and consolidation of the overburden fills to reduce the differential settlement of the infiltration barrier. The difficulties with doing this are discussed in Section 3.2. The long-term hydraulic condition of fractures through the infiltration barrier is uncertain. Where there is swelling clay in the infiltration barrier, or fines are washed into the cracks by infiltrating water, the cracks may become less permeable over time.

2.5.2 Asphalt Paving

Asphalt paving has been used as lining in industrial settings and has a low permeability when it is mixed with sufficient asphalt and then compacted to a high density. Asphalt paving is a mixture of asphalt binder and aggregate. The asphalt acts as a cement to hold the aggregate particles together and also fills the porosity of the compacted pavement to reduce its permeability to water. The asphalt must be a fluid when mixed with the aggregate and this can be accomplished by heating straight asphalt, dissolving asphalt in a volatile hydrocarbon solvent, or emulsifying the asphalt with water and other chemicals. After the fluid asphalt is mixed with the aggregate the mixture is spread on a compacted subgrade and then compacted to a high density. The asphalt subsequently solidifies and binds the mixture to a semi-solid mass. The aggregate in the asphalt paving typically represents 75 to 96% of the mixture. The aggregate particles should be durable and widely graded to produce a dense pavement. The typical maximum particle size for aggregate is 3/4 to 1 inch diameter. The minimum thickness of asphalt paving that is typically applied is approximately 2 - 3 inches.

A compacted asphalt paving infiltration barrier would be less brittle than soil cement but would still be relatively brittle and susceptible to frequent fracturing when yielding to differential settlement in the

overburden fills . This could be mitigated with compaction and consolidation of the overburden fills to reduce the differential settlement of the infiltration barrier. The difficulties with doing this are discussed in Section 3.2.

It would require large amounts of asphalt material and would also require crushing chert for use as aggregated in the asphalt paving mixture. Installation of the asphalt paving would be less susceptible to temperature and moisture than the compacted earth infiltration barrier and would also be more resistant to frost.

It would be logistically very difficult and expensive to install an asphalt pavement on the extensive 3h:1v slopes. The alternate configurations (Stepped Lined Slope and Crest Lined Slope) described in Section 1.6 would mitigate this concern.

2.5.3 Sprayed Asphalt

Asphalt-based soil sealant layers are commonly included in highway projects under pavements to seal the subgrade from moisture penetration. The asphalt is typically thinned with an organic solvent and is applied hot from a tanker truck with a spray bar. The asphalt penetrates the surface that is treated and forms a relatively impermeable zone about 1/4 inch thick. The asphalt must be applied to fine grained material in order to fill the voids and eliminate the porosity.

Earth treated with sealant would be subject to cracking with differential settling like the asphalt pavement. This could be mitigated with compaction and consolidation of the overburden fills to reduce the differential settlement of the infiltration barrier. The difficulties with doing this are discussed in Section 3.2.

Another asphalt-based, thermoplastic, elastomeric membrane is available that is sprayed onto surfaces to be sealed, typically with a geosynthetic fabric acting as the substrate. The asphalt is applied hot from a tanker truck with a spray bar. It is typically sprayed to a thickness of about 65 mils and is self seaming. Surface preparation consists of smooth rolling the subgrade to eliminate large voids, and to prevent sharp, angular projections.

Curing takes approximately 24 to 48 hours depending on ambient conditions. The top one inch of the subgrade soil should have a moisture content of less than 5% before the material is sprayed which means the material cannot be applied in wet or cool weather. The cured material is relatively immune to oxidation and degradation by UV with earth cover to protect it.

The application of the spray-on elastomeric liner material is typically done from large tanker trucks which would not be able to traverse the long 3h:1v slopes at Smoky Canyon. The alternate configurations (Stepped Lined Slope and Crest Lined Slope) described in Section 1.6 would mitigate this concern. The application could be made a distance from the tanker truck with manual hoses but this would increase the cost and decrease uniformity of application. Special spray bar equipped dozers connected with hoses to the tanker trucks could possibly be used to apply the material to the slopes in the Stepped Lined Slope configuration.

Application of the spray-on liner material is susceptible to being impeded by cold temperatures and precipitation. Because this material must be prepared hot, transported in tanker trucks, and immediately applied, it would be logistically difficult to provide the large quantities of this material required for a remote location like the Smoky Canyon Mine. It is assumed that use of this material would require construction of a significantly sized asphalt storage, heating, and blending terminal at or near the mine. This is unlike the other synthetic materials which can be stockpiled at the mine site ready for use when needed.

3.0 Hydraulic Performance

3.1 Seepage Reduction Objectives

The real purpose of any infiltration barrier is to permanently reduce the amount of seepage from the overburden fills to the underlying ground water. The effectiveness of an infiltration barrier to reduce seepage can be estimated by comparing the amount of seepage through the infiltration barrier to the seepage amount if the barrier was not present. The ultimate measure of the infiltration barrier is whether or not it achieves the goal of limiting groundwater impacts to a satisfactory level. This goal is based on site-specific hydro-geologic conditions and environmental regulatory requirements and infiltration reduction does not necessarily need to be 100% effective to meet the goal.

If the goal of limiting groundwater impacts is to reduce the impact to the greatest degree possible, then the only infiltration barriers that will meet this goal are those that have the highest effectiveness at reducing seepage. Past experience with managing industrial process solutions and hazardous wastes indicates that these types of infiltration barriers are those incorporating synthetic plastic membranes constructed directly on top of thick clay subgrades having a maximum permeability of E-7 cm/sec.

On the other hand, if the goal is to reduce groundwater impacts to some acceptable level, then more flexibility can be incorporated in design of the infiltration barriers to achieve this goal. At the Smoky Canyon Mine, the ground water impacts have been shown to be confined to a deep aquifer with no potential for surface discharge within the area of expected impact. Thus reduction of groundwater contaminant levels to surface water protection criteria is not necessary. Idaho regulatory policy is to maintain and protect ground water quality for existing and projected future beneficial uses and prevent contamination of ground water to the maximum extent practical (IDAPA 58.01.11.006). Ground water quality standards have been adopted by the State and these standards are not to be exceeded unless otherwise allowed by the Idaho Department of Environmental Quality (IDAPA 58.01.11.200). These water quality standards are based on Federal maximum contamination levels (MCLs) in public drinking water supplies. There are situations where ground water quality is specially regulated and certain impacts could potentially be allowed, including constituents found within a specified area of an active mineral extraction area (IDAPA 58.01.11.400). Precedence set at the Dry Valley operation by IDEQ indicates that groundwater concentration greater than the MCLs may be allowable as long as they are confined within the lease boundary, or better under the actual mine area.

It is assumed that the minimum objective for an infiltration barrier at the Smoky Canyon Mine B and C Panels would be to confine any groundwater concentrations greater than MCLs to within the mine disturbance area for Panels B and C.

Ground water modeling of the impacts from seepage through the proposed overburden fills at the Smoky Canyon Mine has predicted that concentrations of selenium and manganese would be greater than State ground water quality standards under the overburden fills. Ground water modeling using different seepage rates has been done for the Smoky Canyon Mine Panels B and C (**Figure 3.1-1**). The ground water modeling has shown that a seepage rate reduction of approximately 55%, compared to the current cap design and assuming seepage chemistry stays the same, is required to contain groundwater concentrations greater than MCLs under the mine area. To completely eliminate concentrations greater than MCLs would require an 80% reduction in seepage rate.

For this analysis, it is assumed that a minimum seepage rate reduction of 55% is required of any infiltration barrier considered for use at Smoky Canyon Mine in order to meet the design goal of complying with State ground water quality standards outside the B and C Panel mine area boundary.

3.2 Earth Infiltration Barriers

An infiltration barrier made of earth can have a wide variety of permeabilities based on the physical characteristics of the earth used to construct the infiltration barrier, how it is constructed, and the conditions it is exposed to during its life.

Permeability of a granular material is based on the relative distribution of different grain sizes within the material, shape of grains (or pores), degree of compaction, and mineralogy. Earth permeability must be determined on a site-specific basis because of the wide variability in the above described characteristics. The earth used for an infiltration barrier can have a wide variety of grain sizes, including coarse grains up to about 2 inches in diameter, as long as there is also enough fine content. Infiltration barriers that are about 12 inches thick should have grain size gradations with about 95% less than 3/4-inch to 1-inch diameter (Van Zyl, 1988). Larger maximum grain sizes can be accommodated in thicker infiltration barriers but earth with particles larger than 2-inch diameter is not recommended for low permeability liners. There must be a significant quantity of fine-grained sand, silt and most importantly, clay, within the compacted earth to produce a matrix with poorly connected, irregularly-shaped, small-sized pores and a large percentage of coarse material is typically accompanied by a lack of fines in the mixture.

The permeability of clayey earth liners decreases with increasing density or compaction. This is due to the reduction in overall porosity, pore size, and interconnectedness of pores as the amount of compaction increases. Earth density is increased through addition of compactive effort to physically rework the particles closer together and increased moisture which tends to lubricate the particles. The maximum density of an earth material, for any one type of compactive effort, is achieved at the optimum moisture content. For clayey soils used in infiltration barriers, high compactive effort using heavy sheeps foot or vibratory rollers and moisture contents within about a percent plus or minus of the optimum moisture content is necessary to achieve maximum dry density and minimum permeability. Earth infiltration barriers should be placed in loose lifts of about 6 to 9 inches (Goldman, 1990).

Clay content in earth materials not only reduces their permeability but also makes them more susceptible to changing physical properties depending on their moisture content. Earth with a higher clay content is more plastic than earth with low clay content which means the clayey material can deform more under stress instead of breaking. This is advantageous where infiltration barriers built of earth need to be resistant to deformation caused by settling of the underlying foundation or impacts from overlying rocks.

This plasticity is largely controlled by moisture content. It is therefore important to control the moisture content of clayey earth materials within defined ranges in order to compact them to high enough densities where their permeabilities will be low. If the moisture content of the earth becomes too high, they will be difficult or impossible to compact to specification unless they are allowed to dry. This can be difficult in wet, cool weather as clayey earth tends to dry slower than more granular earth. This can limit the weather conditions in which such materials are used for construction to the warmer months of spring through early fall.

It is also necessary to maintain earth infiltration barriers in a moist, frost-free condition after they are built. When moist plastic soils are allowed to dry out, they tend to shrink and crack, again losing strength and increasing in permeability (EPA, 1994). Cracking can dramatically increase the overall permeability of a earth infiltration barrier. The moisture content of an infiltration barrier is typically preserved by covering with enough earth soon after the infiltration barrier is constructed to prevent the loss of moisture through evaporation. It is important that the timing of the compaction of the earth infiltration barrier be coordinated with placement of the earth cover so the infiltration barrier is exposed to evaporation for the minimum time feasible.

Freezing conditions are also deleterious to earth infiltration barriers. Construction of earth infiltration barriers is practically impossible in freezing conditions because the difficulty in controlling moisture for

compaction. The relatively high moisture contents of earth infiltration barriers makes them susceptible to damage in freezing temperatures. When the frozen earth warms and the ice melts, the strength of the earth material may be decreased and the permeability increased. It is therefore necessary to protect earth infiltration barriers from freezing by burying them beneath enough earth equal to the maximum frost depth for the site climatic conditions.

In the case of the Smoky Canyon Mine site, freezing conditions can occur between September and May so construction of earth infiltration barriers can realistically only be considered in late May through September. The proposed 8-foot thick chert cover and 1 to 3 feet of topsoil would be more than sufficient to protect an underlying earth infiltration barrier from frost.

Another deleterious effect on earth infiltration barriers can be introduction of vegetation roots and or burrowing by animals. Roots may be attracted to the soil zone immediately on top of the infiltration barrier because of the elevated soil moisture conditions at that depth, especially in a dry climate. This can be mitigated by covering the infiltration barrier with a layer of well-drained material which tends to reduce capillary rise of this moisture and accelerate the lateral drainage of free water. In addition, providing sufficient thickness of cover to retain infiltration moisture between the top of the infiltration barrier and the ground surface to contain most of the vegetation roots well above the infiltration barrier will also reduce this effect. The 9- to 11- foot thickness of the proposed chert and earth cover should provide sufficient protection for an infiltration barrier located between the base of the chert and the overburden shale.

Foundation settlement under the infiltration barrier can cause deformation of the infiltration barrier and possible damage. Overburden fills are subject to long-term consolidation and settlement under the weight of the material. The amount of this settlement can be large (a few percent of the total fill thickness), and uneven in its distribution. Differential settlement can result in stretching of the infiltration barrier to conform to the settlement which can lead to cracking in earth infiltration barriers (BC Canada, 1989). Strains of as little as 0.3 percent may cause cracking of earth liners (Van Zyl, 1988). Laboratory studies of the performance of clay earth liners subjected to differential settlement of 3 percent showed that permeability of the earth liners increased immediately after the differential settlement occurred followed by gradual decreases in permeability which was attributed to some self-healing characteristics of the clay (Goldman, 1990). Simplot has observed differential settlement of up to about 7 to 8 feet with surface crack development at the existing Smoky Canyon Mine overburden fills (Raymond, 2001b).

Small amounts of settlement of an infiltration barrier can be mitigated somewhat by compaction of the immediate foundation subgrade materials to help spread the strain out over a larger area. However, large amounts of differential settlement cannot be mitigated by the subgrade alone and need to be reduced by increasing the density of the overburden fill itself. In typical engineered fills requiring strength and low settlement characteristics, high bulk densities are achieved with use of specialized compaction equipment to compact relatively thin lifts (less than 1 - 2 feet) of earth along with careful control of the moisture content of the earth being compacted. This specialized compaction approach is difficult to accomplish with earth incorporating large rocks, such as run-of-mine overburden. Use of the compaction equipment also adds a cost to the construction of the fill which is approximately $0.25 to $0.60 per cubic yard (Means, 2002). The total volume of overburden beneath the cap of the B and C Panels is more than 42 million loose cubic yards (MMLCY). To compact all this material like an engineered fill would cost an estimated $10.5MM to 25.2MM.

For mine overburden a more cost-effective method of compaction is to place the run-of-mine overburden in thin lifts that can be compacted by driving the loaded haul trucks over the lifts. The maximum thickness of these lifts varies widely with the physical characteristics of the overburden material and the haul traffic but would typically be less than 5 feet. Such thin lifts would typically be built by plug dumping the overburden and then grading it out with dozers. The amount of material pushed by the dozers would be approximately 50% of the total overburden volume that is plug dumped. This would add a cost, of about

$0.20 to 0.25 per cubic yard to the overburden handling cost for all the overburden beneath the B and C Panel cap (42 MMLCY). For the Smoky Canyon B and C Panels overburden, this would cost approximately $8.4MM to $10.5MM. 100% of the overburden fill may not need to be compacted to reduce differential settlement to an allowable level and evaluation could be made as to the overall settlement that could be expected with placing overburden in end-dumped lifts which would then be partially compacted. For example, an overburden fill could be constructed in 10-foot lifts which would then be compacted in roughly their upper half by the truck traffic. Thicker lifts would have a lesser percentage of their overall volume that would be compacted.

Alternatively, the overburden fills could be constructed and then allowed to naturally settle for a period of time before the infiltration barriers are installed and the final cap placed. This would allow most of the differential settlement to occur and the fills to stabilize before the infiltration barriers are applied. The time frame for this is uncertain but could be on the order of years. This approach would upset the normal overburden handling because none of the chert cap could be placed until the infiltration barrier was installed. The chert would need to be placed in a temporary fill(s) until the time came to apply the cap at which time the chert would be reloaded and hauled to the regraded overburden fills. This would require double handling of all the chert cap material, which would greatly increase the mining costs for the B and C Panels. The estimated cost to double handle all the chert overburden is $20MM. In addition to the extra cost, temporary storage of all the chert would require additional disturbed area for the chert fills which would have to be placed outside of the area required for the rest of the overburden. This would expand the overall disturbed area for the B and C Panel facilities with the additional environmental impacts that would occur from this additional disturbed area.

Waiting for the overburden fills to settle naturally would also extend the time period that the seleniferous overburden would be exposed to the surface environment before being capped. During this time the overburden surface would be subject to weathering and erosion which would extend the exposure of nearby surface streams to discharges of seleniferous water and sediment. Reclamation vegetation would not be planted during this time but native vegetation and weeds could infest the area and could bioaccumulate selenium. Wildlife would be exposed to the seleniferous ground surface, and possibly vegetation, during this time. Extending the exposure of the seleniferous material to the surface environment would increase the oxidation of the seleniferous shale at and near the surface of the overburden fill which could liberate more soluble selenium than if this surface was covered with the cap.

Compacted overburden material from the existing surfaces of the overburden shale fills at the Smoky Canyon Mine was tested for permeability and found to have an in-place permeability of 8.4 E-6 cm/sec (JBR, 2001). When a 1-foot thick layer of this material, positioned between the 8-foot thick chert cap layer and the underlying overburden shale, was modeled in the HELP model, it produced an overall infiltration rate of about 4 inches per year. This is the base case for overburden infiltration. A series of HELP model runs were then made with a range of assumed permeabilities for a 1-foot thick infiltration barrier with lower permeabilities (JBR, 2001b). The results of these model runs are shown in Tables 3.2-1 and 3.2-2.

Table 3.2-1 Seepage Reduction for Earth Infiltration Barriers (3:1 slope)

Material Permeability (cm/sec)	Infiltration Rate (inch/year)	Seepage % Reduction
1×10^{-7}	0.53	86.8
5×10^{-7}	1.69	57.8
7×10^{-7}	2.03	49.3.
1×10^{-6}	2.39	40.3
3×10^{-6}	3.35	16.3
5×10^{-6}	3.48	13.0

Note: All infiltration barriers evaluated were 12-inches thick at a 3h:1v slope with drainage every 1500 feet. Seepage % reduction is the base case infiltration rate (4 inches) less the predicted reduced rate, divided by the base case infiltration rate, times 100.

Table 3.2-2 Seepage Reduction for Earth Infiltration Barriers (2% slope)

Material Permeability (cm/sec)	Infiltration Rate (inch/year)	Seepage % Reduction
1×10^{-7}	0.93	76.8
3×10^{-7}	1.89	52.8
5×10^{-7}	2.43	39.3
1×10^{-6}	3.09	22.8
3×10^{-6}	3.92	2.0
5×10^{-6}	3.95	1.3

Note: All infiltration barriers evaluated were 12-inches thick at a 2% slope with drainage every 500 feet. Seepage % reduction is the base case infiltration rate (4 inches) less the predicted reduced rate, divided by the base case infiltration rate, times 100.

The information in Tables 3.2-1 and 3.2-2 indicates that a 1-foot thick earth infiltration barrier built at the base of the chert cap layer would need to have a maximum permeability of about 5 E-7 cm/sec if built on a 3h:1v slope and 3 E-7 cm/sec if built on a 2% slope to comply with the design objective of preventing exceedances of the MCLs outside of the mine area by building an infiltration barrier with a seepage reduction of at least 55%.

In actual practice, the permeability goal of an earth infiltration barrier should be lower than just that required to reduce seepage by 55%. This is because an earth infiltration barrier is susceptible to localized areas of higher permeability due to natural variations in material properties of the infiltration barrier as constructed, potential leakage through cracks from differential settlement, and potential deep roots. For these reasons, a target permeability for an earth infiltration barrier would likely be 1 E-7 cm/sec.

To further test the potential permeability that could be obtained from compacted overburden shales, 9 samples from the same soil testing program described in Section 2.1.1 were tested for permeability. All particles greater than 3/4 inches in diameter were removed from the shale samples before testing for permeability. The samples were then moistened to about 11% and compacted in a triaxial testing cell to a dry unit weight of about 126 pounds per cubic foot (PCF) which is the average measured unit weight of the compacted overburden shale in the field (Nelson Engineering, 2000). The samples were then tested for hydraulic conductivity in the triaxial test cells with an overburden weight of 1000 pounds per

square foot (PSF) and 5500 PSF simulating the overburden weight from about 9 feet and about 50 feet of chert overburden. The permeability results are shown in Table 3.2-3.

Table 3.2-3 Permeabilities for Overburden Shale at the Smoky Canyon Mine (cm/sec)

Weight	Q01-S3	Q01-S4	Q04-S2	Q04-S4	Q06-S4	Q08-S5	Q12-S4	Q13-S3	Q19-S3
1000	1.3 E-5	2.6 E-5	1.3 E-7	1.7 E-7	2.2 E-5	8.3 E-6	2.3 E-7	5.5 E-7	5.2 E-7
5500	5.8 E-6	1.0 E-5	9.5 E-8	9.8 E-8	4.0 E-6	4.0 E-6	1.5 E-7	2.5 E-7	2.3 E-7

Note: Weight is overburden pressure in pounds per square foot.

The compacted overburden shale permeabilities shown in Table 3.2-3 indicate a wide range of permeabilities from 9.5 E-8 to 2.2 E-5 cm/sec with an average of 7.9 E-6 cm/sec for the 1000 psf overburden pressure and 2.7 E-6 cm/sec for the 5500 psf overburden pressure. Of the 1000 psf overburden pressure tests, 3 of 9 met the permeability objective of 3 to 5 E-7 cm/sec. Of the 5500 psf overburden pressure tests, 5 of 9 met the permeability objective. The data show the beneficial effect of increasing overburden pressure which tends to compact the shale infiltration barrier beyond its initial density, which lowers its permeability. The wide range of permeabilities indicates the lack of homogeneity in this material and, although a significant percentage of samples met the permeability objectives, 67% of the 1000 psf tests failed to meet the design objectives and 44% in the 5500 psf tests also failed. The average permeabilities indicate that crushed overburden shale, by itself, would not meet the design objective permeability (3 to 5 E-7 cm/sec) throughout the 700+ acres that would be covered with the infiltration barrier.

The overall average permeability of the fine shale overburden is too high to meet the design objective and indicates that all shale used for constructing an infiltration barrier would need to be crushed to 100% minus 3/4 inch and addition of bentonite to this material would be required so the material could have uniformly low permeabilities. It should also be noted that the above derived permeabilities, and any other earth permeabilities measured in a laboratory, can be different than what can actually be accomplished in the field. Comparison of laboratory and field permeabilities have typically shown that laboratory permeabilities can be lower than what is measured in the field (Nordquist, 1986, and Daniel, 1984).

3.3 Synthetic Infiltration Barriers

Unlike natural earth materials, synthetic infiltration barriers have permeabilities that are uniformly low and manufactured into the product. The typical values for permeability of the GCL, HDPE and PVC synthetic infiltration barriers are shown in Table 3.3-1 along with the seepage percent reductions they would achieve at the Smoky Canyon Mine site, based on HELP modeling of a cap design that included these materials (JBR, 2001c). The seepage reductions of any of these synthetic membrane infiltration barriers are clearly much greater than that required to meet the design objective of complying with State ground water quality standards at the margins of the mine disturbance. These materials potentially could reduce the seepage rate to the point where no groundwater concentration greater than MCLs would be present anywhere under the mine area.

The actual installed permeability of a synthetic liner is always greater than its material permeability because of seam flaws and punctures in the liner (Giroud and Bonaparte, 1989 and Giroud, 1992). This was accounted for in the HELP modeling by incorporating the effects of liner defects, seaming defects, liner subgrade properties, and liner to subgrade contact.

Table 3.3-1 Effectiveness of Synthetic Liner Infiltration Barriers (3:1 Slope)

Material	Permeability (cm/sec)	Infiltration Rate (inch/year)	Seepage Reduction Effectiveness (%)
GCL (0.6 cm)	3 to 5 E-9	0.26	93.5
HDPE (40 mil)	2 E-13	0.025	99.4
PVC (40 mil)	2 E-11	0.81	79.8

Design and construction characteristics that may affect the installed hydraulic properties of a synthetic membrane liner are: protection of the liner from impact loading and punctures, placing it on a smooth low permeability subgrade, installing the material with consideration of shrinkage and expansion, and installing on slopes no steeper than 3h:1v.

The natural and synthetic infiltration barrier materials evaluated herein are considered to be stable and long-lived when constructed properly and removed from the effects of surface exposure and weathering. These construction materials have been accepted in the past by State and Federal agencies for constructing facilities with critical requirements for long-term infiltration control such as hazardous waste disposal sites, radioactive waste disposal sites, municipal landfills, mine heap leach pads and tailings ponds.

4.0 Infiltration Barrier Drainage Management

4.1 Drainage Collection

If an effective infiltration barrier is installed within an overburden cap, a significant portion of the annual infiltration amount through the upper portion of the cap will be diverted on top of the infiltration barrier and will begin to produce a zone of saturation extending upward into the material immediately overlying the infiltration barrier. This water will tend to migrate laterally in response to the overall slope of the cap system. The water will eventually flow down slope to the lowest point of the cap where it will flow out of the cap to the surface environment. The flow and discharge of drainage water from on top of an infiltration barrier is typically controlled through the use of perforated collection pipes which drain to closed header pipes (**Figure 4.1-1**) The slope of the infiltration barrier, permeability of the drainage layer overlying the barrier, and the spacing of the perforated interceptor pipes controls the height of the saturated zone on top of the infiltration barrier. Controlling the saturated zone height is important because the seepage through the infiltration barrier is largely controlled by the hydraulic head on top of the barrier. Minimizing the head of the saturated zone on the infiltration barrier will therefore reduce the seepage rate through the barrier. A drainage piping system also provides control over where the water will exit the cap which is necessary for designing and permitting treatment and discharge facilities.
Drainage piping used to collect water on top of an infiltration barrier is typically slotted, corrugated polyethylene pipe. The collection pipes are aligned at a slight angle to the topographic contours of the infiltration barrier with uniform spacing selected with standard formulas based on the agricultural drain equation (Van Zyl, 1988). These collection pipes flow to solid-wall header pipes that are typically aligned directly down slope to discharge locations. The collection pipes are light gauge polyethylene which need to be protected from impacts by large rocks in the overlying materials. For this reason, the collection piping is typically covered with a berm of sand, gravel or crushed rock to protect the piping while still allowing water to flow into the piping. The protective berms also provide filtering of the water entering the collection pipes to reduce the suspended sediment entering the piping system. This reduces the risk of clogging the piping with sediment. Water migrating downward through the cap can potentially carry suspended sediment which can be moved laterally by the flowing water to the pipe collection system.

Another mitigative design to prevent clogging of the piping is designing the pipe gradients for high enough water flow velocities to carry suspended sediment to the discharge instead of allowing it to be deposited in the piping. Properly designed, HDPE drainage collection piping systems should be extremely durable and require no maintenance.

HELP modeling for the Smoky Canyon Mine cap design assumed the longest lateral distance for water draining downslope along the top of the infiltration barrier on the 3h:1v slopes was 1,500 feet and 500 feet for the 2% slopes. The maximum average saturated zone thicknesses predicted by the model on top of the infiltration barriers were less than 12 inches, which is acceptable. The longest flow distances on the top of the infiltration barrier in the conceptual design of the 3h:1v and the 2% slopes (see Section 1.6) are generally within the modeled maximum drainage distances so inclusion of drainage collection piping in the Smoky Canyon Mine cap would be minimal.

Based on the required effectiveness to comply with the State ground water protection standards, an earth infiltration barrier at the Smoky Canyon Mine would need to divert approximately 55% of the annual base case infiltration, equal to approximately 2.2 inches of water (0.55 x 4"), or about 0.183 acre-feet per acre of infiltration barrier. Based on the map area of the Proposed Action cap, 722 acres, this amount of water would equal 132 acre feet per year for the entire area of infiltration barrier. On an annual average, this flow rate would be approximately 82 gpm for the entire area. However, climatic records used for the Smoky Canyon Mine indicate that approximately 18.7 inches or about 56 percent of the annual precipitation falls as snow during November through March (JBR, 2000a) so approximately the same amount of the annual drainage from the infiltration barrier could be expected to occur after the snow melt occurs in April, May and June. Including a 2-month lag time for movement of the infiltration through the cap and then through the drainage layer would equal an approximate 5-month long drainage period. This amount of water (74 acre-feet) discharged over 5 months would equal a flow rate of approximately 112 gpm for the entire area.

If a synthetic membrane or GCL was used for the infiltration barrier, the amount of water draining from the top of the barrier would be at least about 80 to 99% of the base case infiltration rate, equal to about 0.267 to 0.33 acre-feet per acre of infiltration barrier. All the drainage values calculated above would need to be multiplied by a factor of 1.46 to 1.8 in order to estimate the amounts of water draining off the synthetic infiltration barrier.

The drain system water would need to be removed from the lateral drainage layer on top of the infiltration barrier from multiple locations around the periphery of the overburden fill slopes. As these are spread out over a wide area between the Roberts Creek (External Overburden Disposal Site) and Smoky Canyon Creek (A, B, and C Panels) watersheds, multiple facilities would need to be constructed to receive, infiltrate, treat, and/or discharge this water.

4.2 Water Quality

The water leaving the infiltration barrier drainage system would have passed through the 1 to 3 feet of topsoil and 8 feet of chert. Water passing through the topsoil could have chemistry similar to that obtained in soil past extract tests done during the soil and vegetation baseline studies (Maxim, 2000). These results are shown in Table 4.2-1.

Table 4.2-1 Estimated Water Quality of Seepage Through Native Topsoil (mg/l)

Parameter	Average Value	Ground Water Standard	Aquatic Life Standard
Arsenic	Not Analyzed	0.05	0.19
Cadmium	0.0032	0.005	0.0017
Chromium	0.050	0.1	0.314
Copper	0.011	1.3	0.021
Lead	0.004	0.015	0.005
Mercury	Not Analyzed	0.002	0.000012
Nickel	0.02	0.1	0.283
Selenium	0.005	0.05	0.005
Silver	Not Analyzed	0.1*	0.0034
Zinc	0.28	5*	0.188

Aquatic life standards calculated for 200 mg/l hardness.
* = Secondary ground water standard
Data from Maxim, 2000

The results shown in Table 4.2-1 indicate that the water percolating through the topsoil could have concentrations greater than the aquatic life standards for cadmium and zinc. It should be noted that natural runoff from these soils has not apparently affected existing surface water quality in Smoky Creek and Roberts Creek which currently complies with all surface water quality standards. It should be noted that concentrations of parameters in long-term seepage through the topsoil would be lower than were measured in the baseline soil paste extracts.

The quality of the water infiltrating through the chert portion of the cap is expected to be similar to that observed during column testing of the overburden conducted during the SEIS baseline studies (Maxim, 2001). These data are shown in Table 4.2-2.

The data contained in Tables 4.2-1 and 4.2-2 indicate that water discharged from an infiltration barrier drainage system at Smoky Canyon would likely comply with applicable surface water standards. The water quality also complies with ground water quality standards except for manganese which is slightly elevated in the chert leachate, however manganese is a secondary standard. This assumes that the water collected from the top of the infiltration barrier did not become contaminated from contact with overburden shale. This would be the case if the infiltration barrier were constructed of man-made materials or Salt Lake Formation material, although testing of that material would need to be conducted to verify this. If the infiltration barrier were constructed of overburden shale, testing of the shale would be necessary to determine if contamination of the water could occur from contact with the shale.

Table 4.2-2 Estimated Water Quality of Seepage Through Chert (mg/l)

Parameter	Maximum Value	Ground Water Standard	Aquatic Life Standard
Arsenic	0.001	0.01	0.19
Cadmium	0.0005	0.005	0.0017
Chromium	0.005	0.1	0.314
Copper	0.01	1.3	0.021
Lead	0.001	0.015	0.005
Manganese	0.097	0.05*	NS
Mercury	<0.0002	0.002	0.000012
Nickel	0.05	0.1	0.283
Selenium	0.006	0.05	0.005
Silver	0.003	0.1*	0.0034
Sulfate	84	250*	NS
TDS	270	500*	NS
Zinc	0.05	5*	0.188

Aquatic Life Standards calculated for 200 mg/l hardness.
NS = No standard set
* = Secondary ground water standard
Data from Maxim, 2001.

At the Smoky Canyon Mine the concentration of selenium in water moving along a layer of compacted Center Waste Shale might be expected to be similar to the water collected in the bottom of the A Panel pit which is partially runoff from the exposed shale left on the foot wall slope of the open pit. Past sampling of the A Panel pit water has indicated selenium concentrations of 0.064 mg/l and 0.097 mg/l which are higher than the surface water aquatic life standard of 0.005 mg/l. At these concentrations, water discharging from the top of an infiltration barrier having water chemistry similar to the A Panel pit would need to be treated before being discharged to surface streams.

Another source of potential predictive data for drainage from the top of an infiltration barrier made of overburden shales is water quality from runoff from existing overburden shale surfaces at phosphate mines. Regional data on selenium concentrations in water samples from runoff collection ponds from southeast Idaho phosphate mines was presented in Appendix 4B of the Final SEIS for the B and C Panels. The average concentration of selenium in these sources was 0.08 mg/l which compares favorably with the values for the A Panel pit water discussed above.

Extensive sampling and column testing of the different B and C Panel overburden shales at Simplot in 2000 resulted in the parameter concentrations shown in Table 4.2-3. These concentrations were from overburden shale that had been obtained from drill hole cuttings in the B and C Panel areas. The range of the weighted average data from Pore Volumes 1 through 10 are shown in the table.

The weighted average results for the column test indicate that water in contact with overburden shale could potentially have concentrations greater than the aquatic life standards for cadmium and selenium. These would potentially be greater than the ground water quality standards for manganese, selenium,

sulfate and TDS although only the selenium is a primary (health based) standard. However, it must be noted that the column tests are indicative of water passing through a thickness of the overburden shale and not flowing along a surface of the shale. Therefore, the column tests predict maximum concentrations that are likely higher than would be the case for water discharging from a drainage system built on top of overburden shale. Once the specific source of overburden shale for the infiltration barrier was identified, testing would need to be conducted to better predict water chemistry of the drainage from over the infiltration barrier.

Table 4.2-3 Column Test Weighted Average Results Overburden Shale (mg/l)

Parameter	Range of Values	Ground Water Standard	Aquatic Life Standard
Arsenic	<0.001 - 0.003	0.01	0.19
Cadmium	<0.0001 - 0.002	0.005	0.0017
Chromium	<0.005 - 0.011	0.1	0.314
Copper	<0.01 - 0.01	1.3	0.021
Lead	<0.001 - 0.001	0.015	0.005
Manganese	0.035 - 0.164	0.05*	NS
Mercury	<0.0002	0.002	0.000012
Nickel	<0.05 - 0.08	0.1	0.283
Selenium	<0.002 - 0.181	0.05	0.005
Silver	<0.003	0.1*	0.0034
Sulfate	65 - 273	250*	NS
TDS	206 - 599	500*	NS
Zinc	<0.05 - 0.078	5*	0.188

Aquatic life standards calculated for 200 mg/l hardness.
NS = No standard set
* = Secondary ground water standard
Data from JBR (2000)

4.3 Water Disposal

Water collected on top of the infiltration barrier would be recharged into the Wells Formation at the margins of the overburden fills and pit backfills. The foundation at the edge of these fills would be stripped of any low permeability materials to reduce the potential for overburden seeps from lateral flow of seepage at the base of the fills (see Section 1.6.1). The infiltration barrier can be designed to route the water collected on top of the barrier to these same recharge areas where the collected water would be recharged to the Wells Formation aquifer. If recharge of the water draining off the infiltration barrier to the Wells Formation was not allowable, it would have to be discharged to the surface environment.

Discharge of this water to surface streams would need to be done in compliance with Federal National Pollution Discharge Elimination System (NPDES) permit requirements. It is unclear whether the discharge could be permitted under the storm water permit regulations or if it would need to go under the point source discharge regulations. EPA would require that the effluent meet New Source Effluent Limitations before being discharged to surface streams.

If construction of the treatment and discharge facilities would physically impact stream channels and/or wetlands permit applications required by Sections 401 and 404 of the Federal Clean Water Act would be required. Permit applications (Section 401) would need to be submitted to the Idaho Division of Environmental Quality (IDEQ) who would also require that State surface water quality standards are complied with in the receiving streams. Disturbance of Waters of the U.S. including wetlands would need to be reviewed under a Section 404 permit application submitted to the U.S. Corps of Engineers (USCOE).

Design and operation of treatment works would depend on the raw water chemistry and the applicable effluent discharge limitations. Various types of treatment processes are available for reducing selenium and metals concentrations in mine water including:

- Chemical reduction with iron,
- Precipitation and clarifying,
- Absorption,
- Biological reduction catalyzed with iron and organic nutrients, and
- Wetland reduction and clarifying.

Specific treatment design would need to be demonstrated through laboratory and pilot scale testing using a range of anticipated raw water chemistry values. The costs for this treatment could be considerable but were not included in this analysis because of the preferred disposal technique of recharging the water into the Wells Formation.

5.0 Cost Estimates

Cost estimates were prepared for the infiltration barriers that potentially meet the design objectives including: flexible liners (HDPE, PVC, and GCL), bentonite-amended Salt Lake Formation or crushed overburden shale, and spray-on asphalt membrane. The cost estimates used design description information from the preceding sections of this report, unit costs from standard sources, vendor and construction contractor estimates, and maps provided by Simplot. In addition, these costs assumed that all the construction work on the infiltration barriers would be by contractors and not by Simplot mine crews. This is because Simplot has indicated they do not have capacity to add this work to their existing mining capabilities. The results were calculated for each infiltration barrier type for each of the three slope configurations. Spreadsheet printouts are found at the end of this report in **Appendix A**.

5.1 Assumptions

The following assumptions were used for the cost estimates shown in the spreadsheet tables at the end of this report.

1. A swell factor of 25% was used to convert bank cubic yards to loose cubic yards for the clay material hauled from the Salt Lake Formation borrow pits. A swell factor of 30% was used for the run-of-mine overburden material.

2. All run-of-mine material is assumed to weigh 1.65 tons per cubic yard (cy).

3. The Cat 365 excavator was assumed to have a 5 cy capacity, an 85% bucket fill factor, and a 0.83 efficiency factor. Cycle time of 1/2 minute was from the Caterpillar Performance Handbook (CPH), 31st edition.

4. The D-10 dozer was assumed to have a 75% operator factor, 0.83 efficiency factor, and a 1.6 grade factor. The normal hourly production of 380 cy was from the CPH.

5. The Cat 994 rubber-tired loader was assumed to have a heaped bucket capacity of 23 cy, a bucket fill factor of 0.75, and an efficiency factor of 0.83. The normal hourly production of 904 cy was from the CPH.

6. The Cat 825 compactor was assumed to need four passes to obtain the required compaction, an average speed of 6 mph, and a 0.83 efficiency factor. The normal hourly production of 899 compacted cy was from the CPH.

7. Equipment operating costs were from the CPH. Labor hourly costs were obtained from Simplot with a fringe escalator of 40%.

8. Crushing and haulage unit costs for the Salt Lake Formation clay material were obtained from Salt Lake City based experienced contractors.

9. A 10% lap and scrap factor was utilized to determine the final area for each of the flexible liner alternatives.

10. The period available for haulage of clay from the Salt Lake Formation was assumed to be April through September, 6 days per week, 12 hours per day.

11. Haulage costs from the mine to the crushing locations do not need to be included. This is because the run-of-mine rock would be hauled to the crusher by Simplot in their mine haul trucks.

5.2 Comments on Simplot (MFG) Cost Estimates

In its comments on the Draft Supplemental Environmental Impact Statement, Simplot included an October 9, 2001 memo from MFG, Inc. which reviewed previous JBR Environmental Inc. estimates of infiltration barrier costs. A copy of the MFG memo is found in **Appendix B** of this report. In general, MFG indicated that the JBR estimates appeared to be reasonable without need for further comment except for the following items:

1. *New Haul Road Construction* - A separate haul road was recommended for movement of Salt Lake Formation material from the vicinity of the tailings ponds to the mine. The cost estimated proposed by Simplot for this item was $570,000 which has been incorporated in the cost estimates in Appendix A of this report.

2. *Dust Suppression and Haul Road Maintenance* - Cost estimates for dust suppression on the above described haul and maintenance of the road surface were offered by Simplot as $804,000 and $1,340,000 respectively and have been incorporated in the cost estimates in this report.

3. *Bentonite Addition to Clay* - The cost ($30,260 per acre) for adding 5% bentonite to the Salt Lake Formation material was provided by MFG and has been used in the cost estimates in this report for both the Salt Lake Formation material and the crushed overburden shale.

4. *Additional Subgrade Requirement* - As previous suggested by JBR, a 10% increase in the amount of subgrade required to produce a 1-foot thick layer on the regraded overburden was added to the cost estimates in this report.

5. *Slope Reconfiguration* - A suggestion was made by Simplot that the uniform lined slope was not feasible to build and potentially unstable. A revised slope configuration with benches every 100 vertical feet was recommended. This configuration has been incorporated in this report as the Stepped Lined Slope and the increased acreage for this slope configuration was used to calculate the costs in this report.

6. *Drainage System* - MFG recommended incorporation of a geocomposite drainage net over the entire infiltration barrier. We do not agree with this concept because the crushed chert layer will provide the necessary high permeability layer on top of the infiltration barriers. Crushed chert will have superior slope stability characteristics over using the geocomposite drainage net in contact with a plastic membrane (PVC or HDPE) or the geofabric cover of the GCL.

7. *Non-woven Geotextile* - MFG recommended installing a non-woven geotextile under the PVC and HDPE membrane infiltration barriers. We do not agree with this concept because the fine crushed overburden shale subgrade would be smooth rolled to provide support for these membranes so a geotextile is not required. In addition, placement of the geotextile would negatively affect the slope stability in contact with the overlying plastic membranes.

8. *Additional Fees and Contingencies* - MFG recommended a 30% contingency fee to allow for other unanticipated items and to cover design and construction management/administration costs. We think that the contingency fee should be 22% at this point in time. This includes a 7% design and permitting cost plus a 15% contingency.

6.0 Infiltration Barrier Comparisons and Conclusions

A comparison of the potentially applicable infiltration barriers is shown in Table 7.0-1. The soil-cement, asphalt paving and asphalt soil sealer infiltration barriers were not evaluated in detail because they would not be resistant to differential settlement. Clay-rich earth barriers may meet this design criteria but only for low amounts of settlement. If these infiltration barriers were to be considered for use at Smoky Canyon, the cost of mitigating the differential settlement would need to be added to the costs of the infiltration barriers themselves (see Section 3.2). Only the HDPE, PVC, GCL and spray-on membranes comply with the design criteria for low permeability and being resistant to differential settlement. Any of these membranes could be built on 2% slopes and could be built on the 3h:1v slopes with difficulty.

Based on the information contained in this feasibility review, the most feasible material for an infiltration barrier at the Smoky Canyon Mine B and C Panels appears to be a synthetic membrane consisting of HDPE, PVC, or GCL. The most feasible configuration appears to be the Crest Lined Slope. The water collected on top of this infiltration barrier would not be expected to be contaminated so it could either be recharged into the Wells Formation or discharged to the surface. The overall cost of including this infiltration barrier into the cap design is estimated to be approximately $33MM to $39MM for the Proposed Action and $22MM to $27MM for the Alternatives. If mitigation of differential settlement was required in addition to the use of these materials, the added cost for the compaction of the overburden would need to be added to the cost of the infiltration barriers themselves. Based on site-specific information on mining costs and productivity for the Smoky Canyon Mine operations, the BLM has determined that these infiltration barrier costs may be prohibitively expensive for the Smoky Canyon Mine B and C Panels.

The ranking of the per acre costs of the different infiltration barriers, for the Alternatives A & B, Crest Lined Slope configuration are:

Infiltration Barrier	Cost/Acre
Salt Lake Formation w/ 5% bentonite	$67,276
Crushed Overburden Shale w/ 5% bentonite	$53,982
Geosynthetic Clay Liner	$53,632
PVC membrane	$48,373
Spray-on Asphalt Membrane 6	$46,047
HDPE membrane	$45,452

The cost for the Salt Lake Formation material does not include any costs for acquisition of the borrow material.

Table 6.0-1 Comparison of Infiltration Barriers for Potential Applicability to the Smoky Canyon Mine

Comparison Factor	Overburden	Salt Lake Formation	GCL	PVC	HDPE	Spray-on Membrane 6
Permeability	2.7 - 7.9 E-6*	1 E-6*	E-9	E-11	E-13	E-11
Differential Settlement	Fractured when strain > 0.3-0.8%	Fractured when strain >0.3 - 0.8%	No fractures strain 10 - 15%	No fractures strain 200 %	No fractures strain 200 %	No fractures strain 600 %
Requires crushed shale subgrade	Yes on 3h:1v No on 2% slopes	Yes on 3h:1v No on 2% slopes	Yes	Yes	Yes	Yes
Requires crushed chert cushion	No	No	Yes	Yes	Yes	Yes
Requires crushed overburden for infiltration barrier	Yes	No	No	No	No	No
Off-site Borrow	No	Yes - Large Volume.	No	No	No	No
New Haul Road	No	Yes	No	No	No	No
Build on Slopes	Difficult on 3h:1v Yes on 2%	Difficult on 3h:1v Yes on 2%	Yes	Yes	Yes	No on 3h:1v Yes on 2%
Frost Damage	Yes	Yes	No	No	No	No
Build in Freezing Temperatures	No	No	Difficult	No	No	No
Build in Wet Weather	Yes	Yes	No	No	No	No
Stable Slopes	Yes on 3h:1v Yes on 2%	Yes on 3h:1v Yes on 2%	?? on 3h:1v Yes on 2%	?? on 3h:1v Yes on 2%	?? on 3h:1v Yes on 2%	?? on 3h:1v Yes on 2%
$/Ac Alt. Action (Crest Lined)	$53,982	$67,276	$53,632	$48,373	$45,452	$46,047

* The natural permeabilities shown would be reduced to E-8 to E-7 after addition of bentonite.

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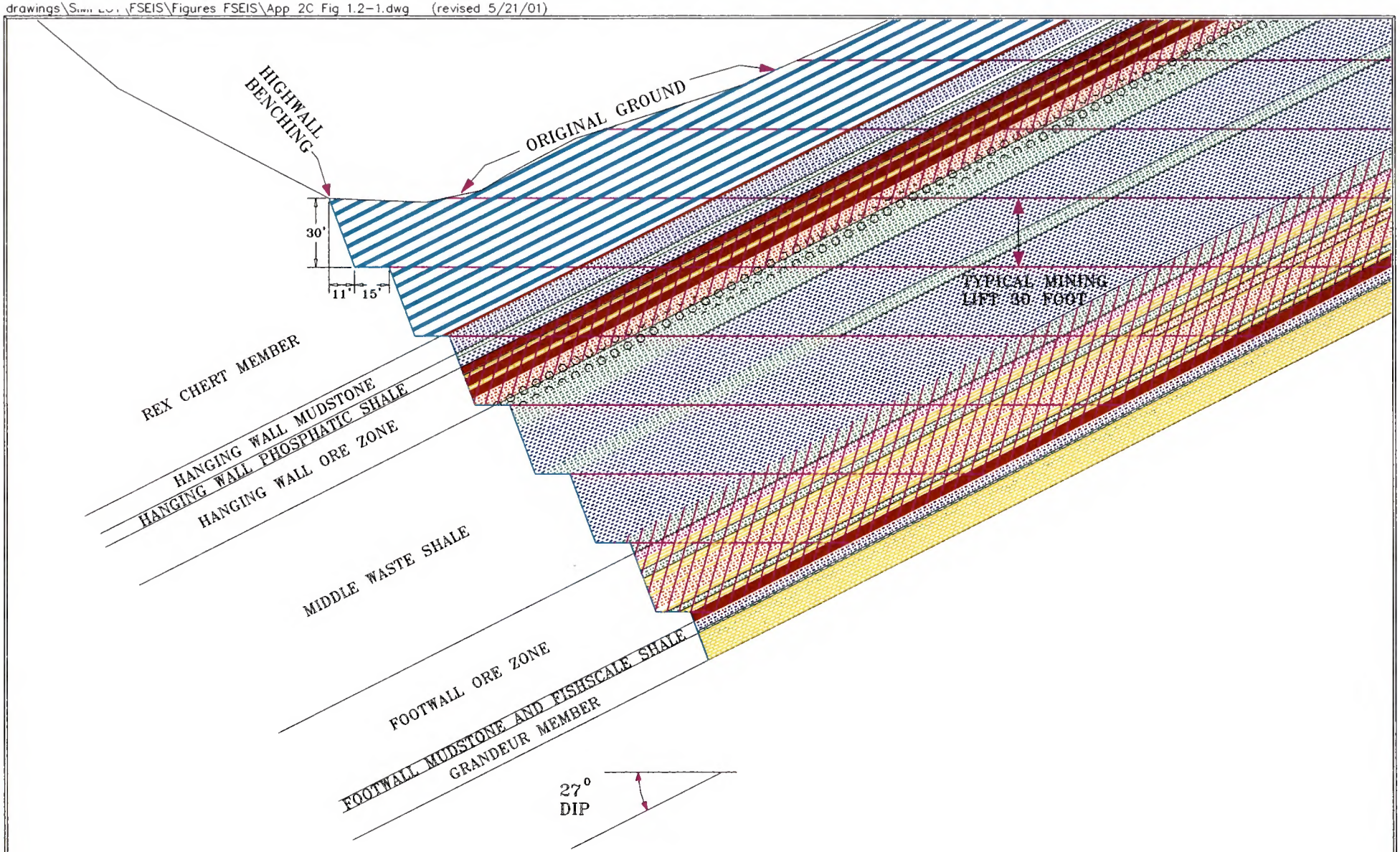

ADAPTED FROM J.R. SIMPLOT, SMOKY CANYON MINE, TYPICAL-CROSS SECTION, (LOOKING NORTH)

FIGURE 1.2-1
TYPICAL CROSS-SECTION PHOSPHORIA FM.
SIMPLOT SMOKY CANYON MINE PANELS B&C

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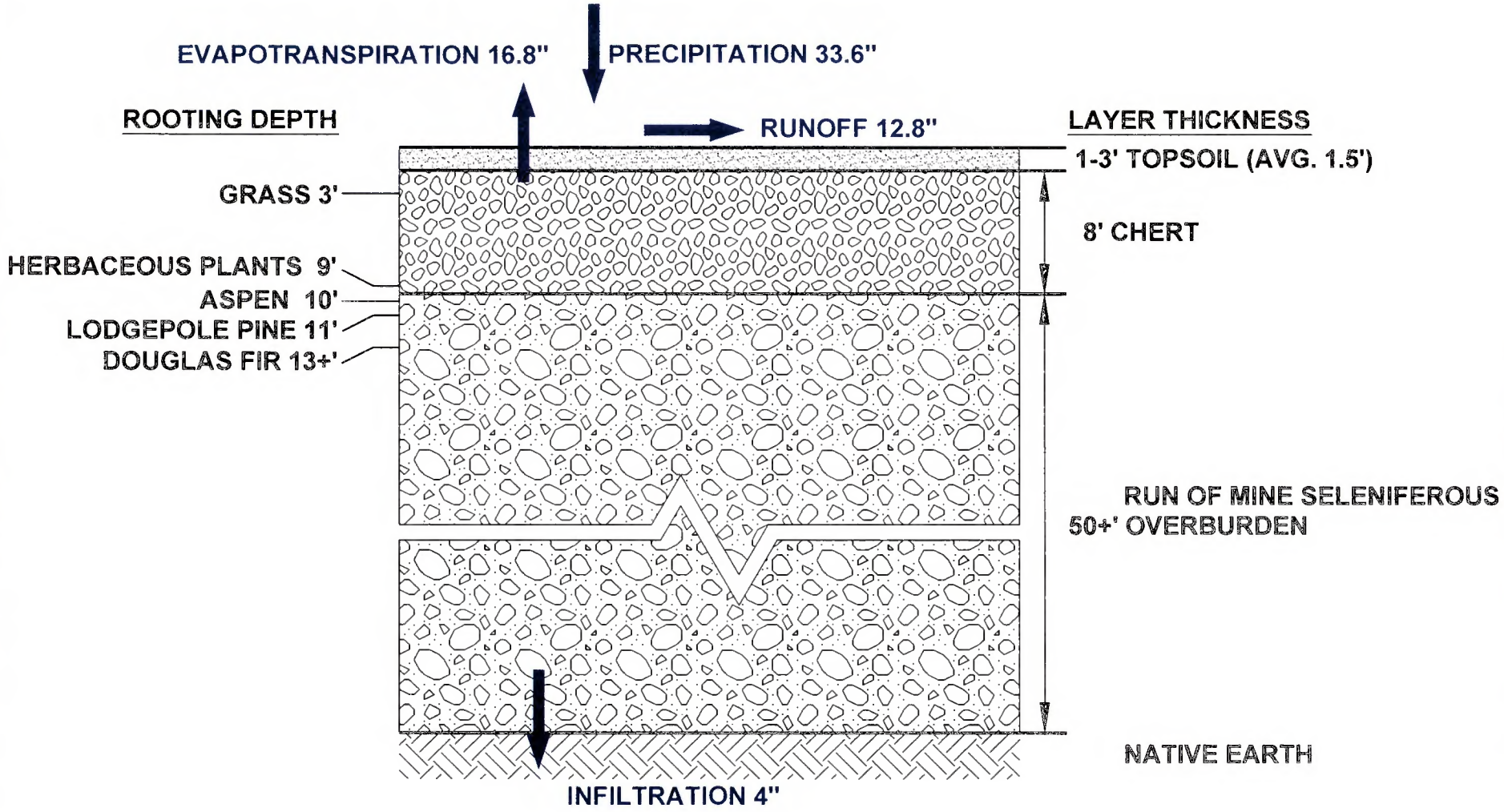

FIGURE 1.3-1
OVERBURDEN CAP DESIGN
SIMPLOT SMOKY CANYON MINE PANELS B&C

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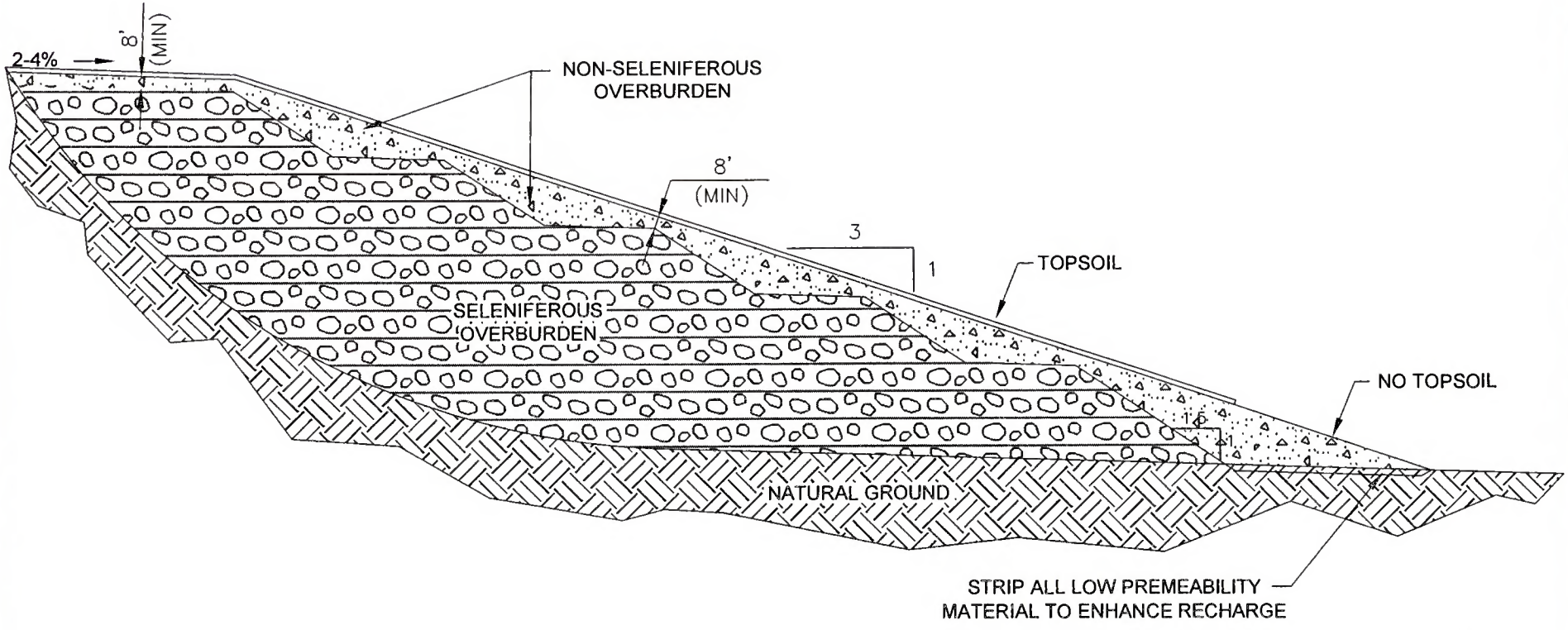

FIGURE 1.6-1
CURRENT SLOPE PLAN
SIMPLOT SMOKY CANYON MINE PANELS B&C

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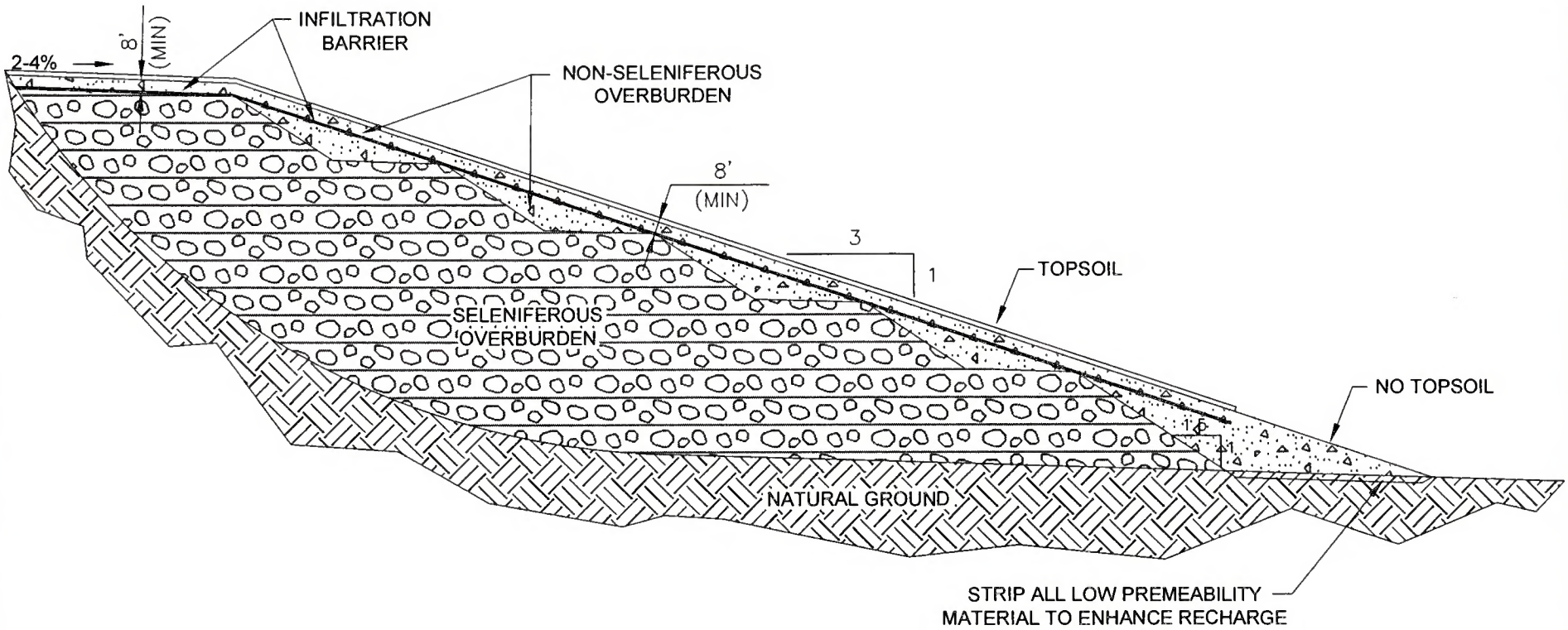

FIGURE 1.6-2
UNIFORM LINED SLOPE
SIMPLOT SMOKY CANYON MINE PANELS B&C

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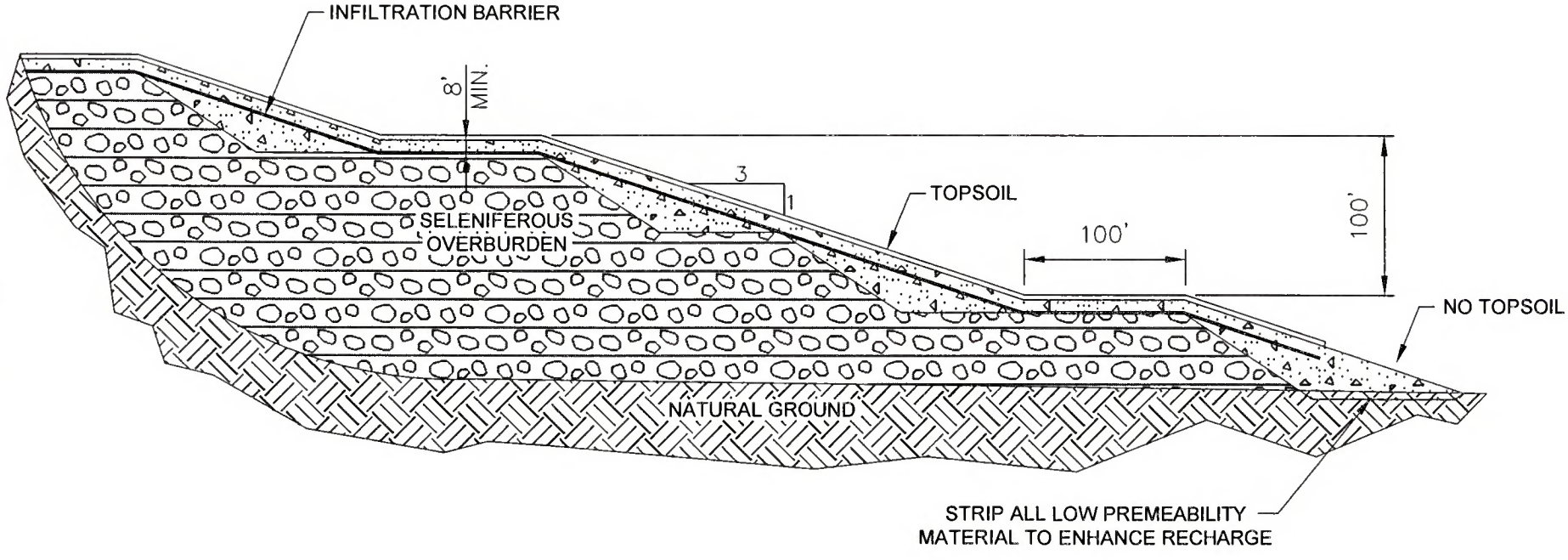

FIGURE 1.6-3
STEPPED LINED SLOPE
SIMPLOT SMOKY CANYON MINE PANELS B&C

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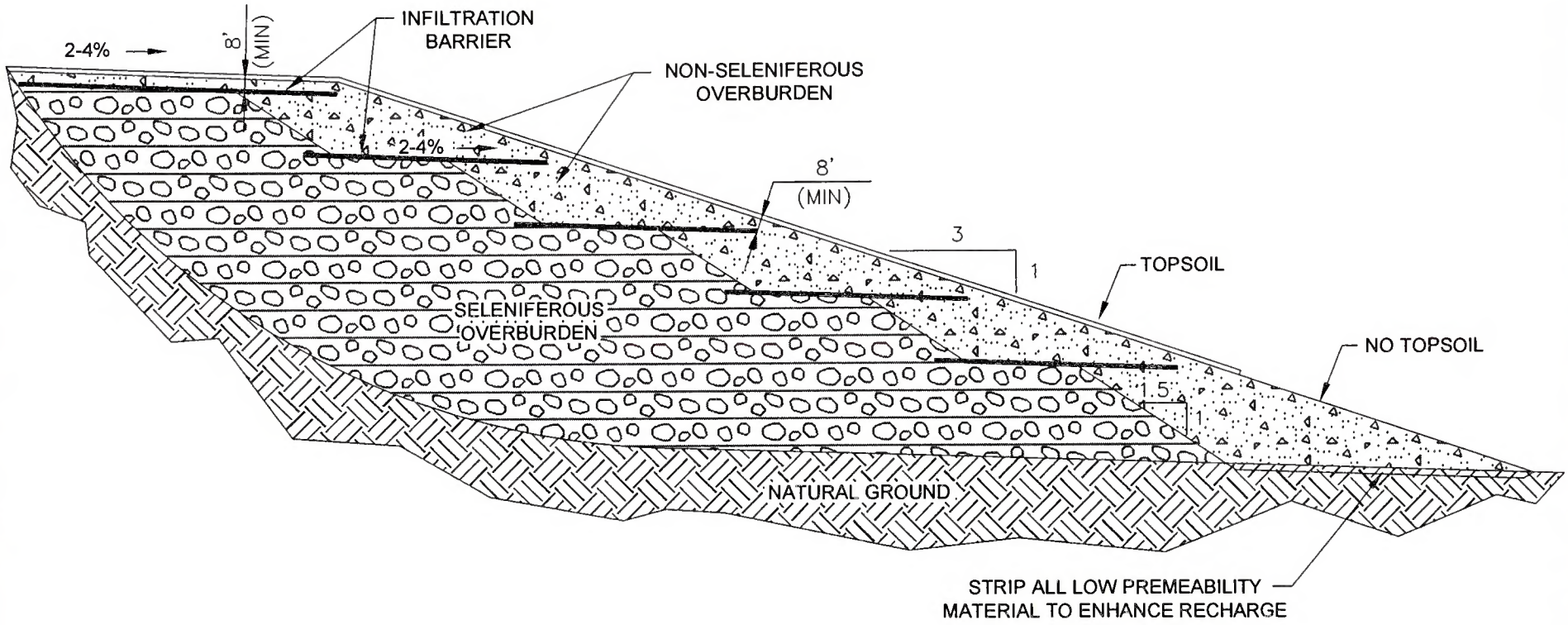

FIGURE 1.6-4
CREST LINED SLOPE
SIMPLOT SMOKY CANYON MINE PANELS B&C

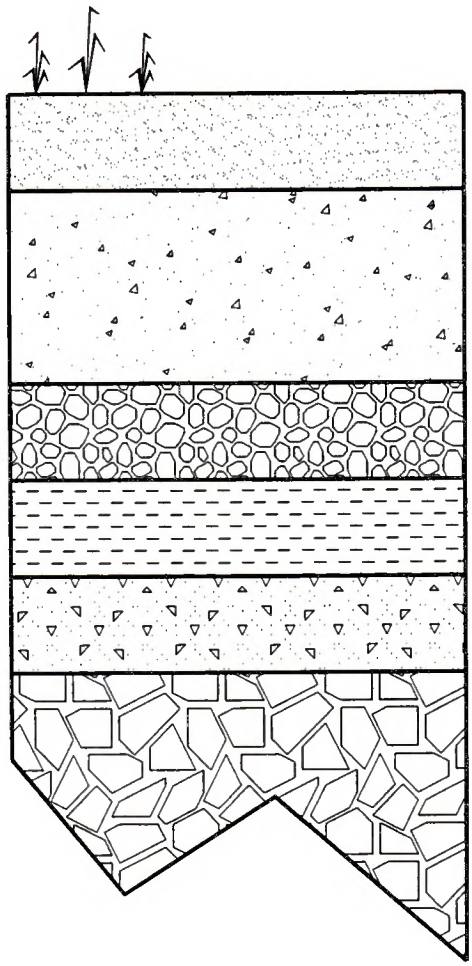

FIGURE 2.0-1
TYPICAL INFILTRATION BARRIER
SIMPLOT SMOKY CANYON MINE PANELS B&C

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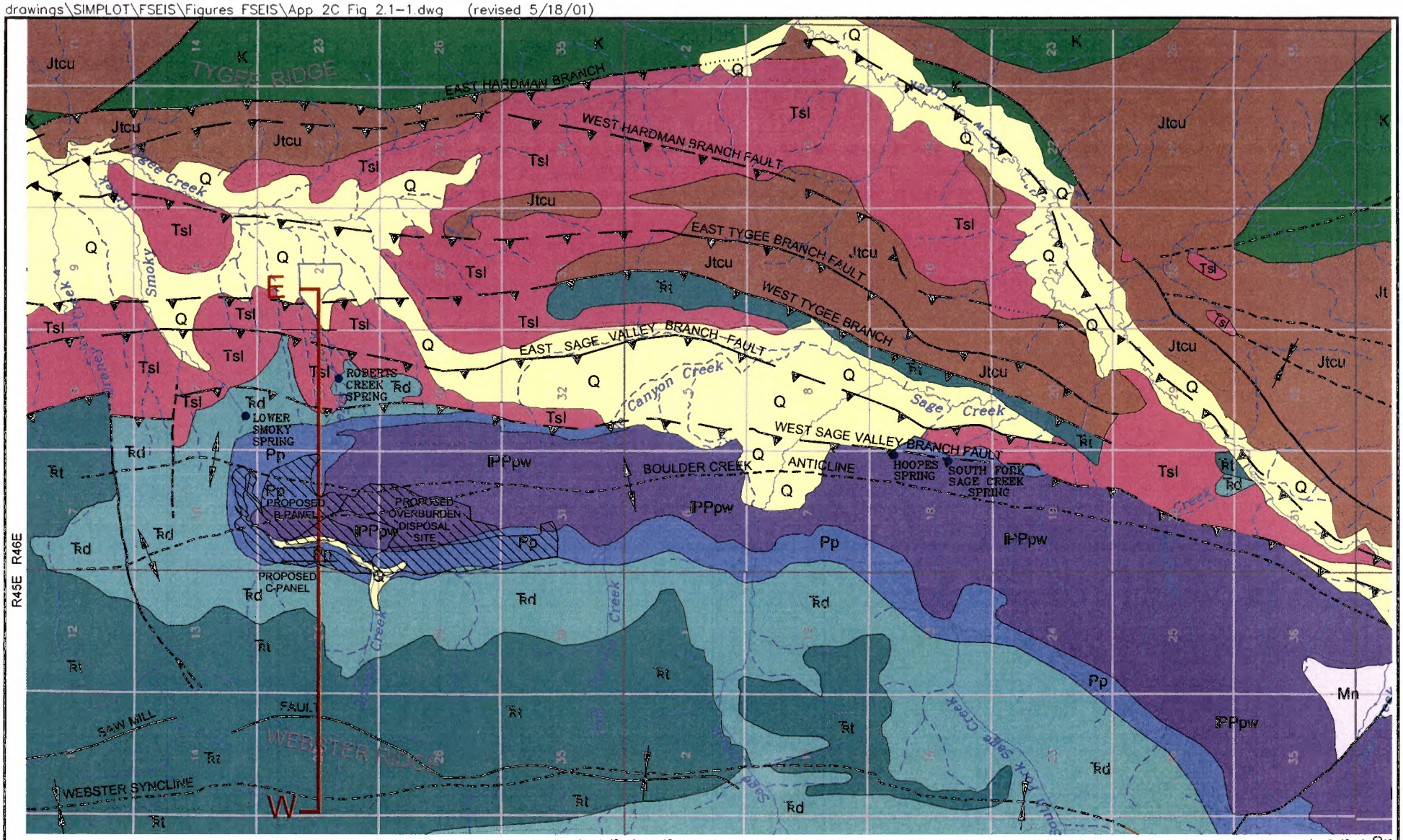

See Figure 3.1-2 for Cross Section

Q	QUATERNARY (ALLUVIUM, COLLUVIUM)
Tsl	TERTIARY (SALT LAKE FORMATION)
K	CRETACEOUS (GANNETT GROUP)
Jtcu	JURASSIC (TWIN CREEK LIMESTONE)
Rt	TRIASSIC (THAYNES, ANKAREH)
Rd	TRIASSIC (0INWOODY)
Pp	PERMIAN (PHOSPHORIA FORMATION)
IPPpwu	PENNSYLVANIAN/PERMIAN (WELLS FORMATION
Mn	MISSISSIPPIAN

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6000 0 6000 FEET

FIGURE 2.1-1
GENERAL GEOLOGIC MAP
SIMPLOT SMOKY CANYON MINE PANELS B&C

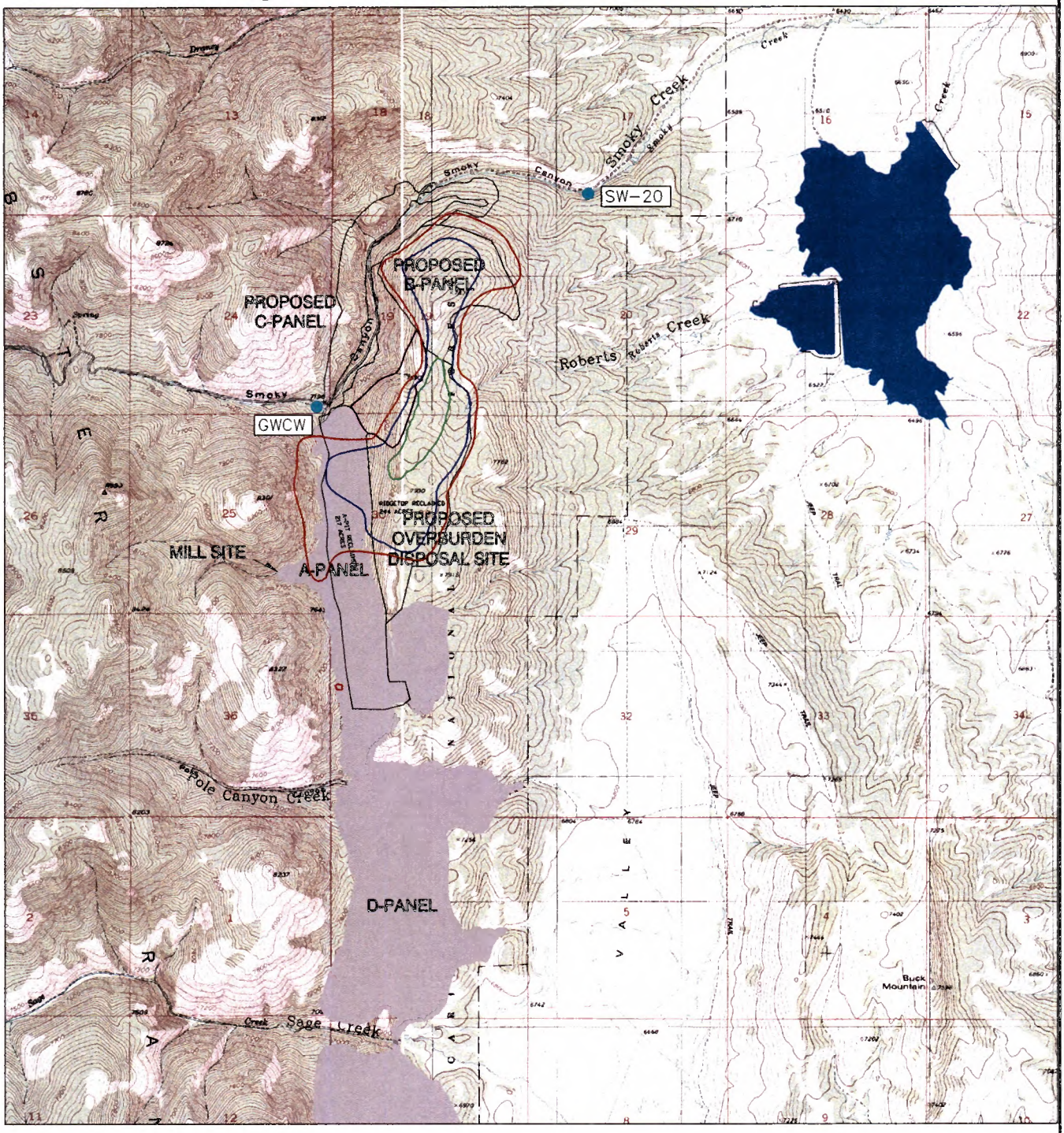

FIGURE 3.1-1
RECHARGE REDUCTION
GROUNDWATER MODEL RESULTS FOR
SELENIUM - PROPOSED ACTION
SIMPLOT SMOKY CANYON MINE PANELS B&C
SUPPLEMENTAL EIS

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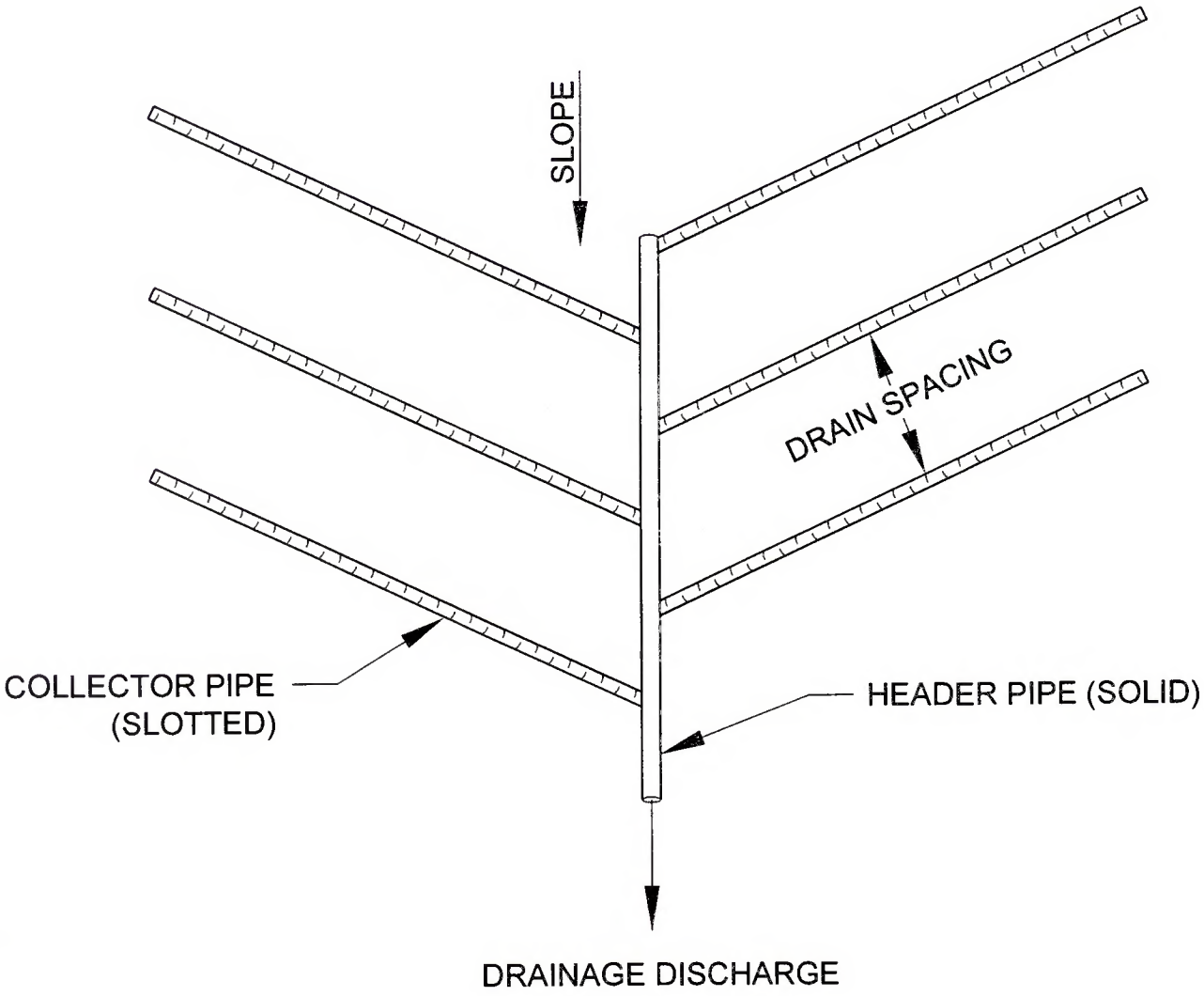

FIGURE 4.1-1
TYPICAL DRAINAGE NETWORK
SIMPLOT SMOKY CANYON MINE PANELS B&C

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APPENDIX A

Cost Estimates

SIMPLOT INFILTRATION BARRIER COST ESTIMATE - PROPOSED ACTION PLAN - UNIFORM LINED SLOPE

			SYNTHETIC LINER						Salt Lake Fm. (Tailings Dam area)				ASPHALT SPRAY-ON LINER		CRUSHED SHALE	
			GSE (HDPE) 40mIL		Watersavers (PVC)		CETCO (Bentomat)		minimum cost		maximum cost					
Item	units	unit type	$/unit	cost	$/unit	cost	$/unit	cost	$/unit	cost	$/unit	cost	$/unit	cost	$/unit	cost
1.0 Subgrade (12" Shale)																
1.1 loading to crusher	2,141	hours	258	552,378	258	552,378	258	552,378	258	552,378	258	552,378	258	552,378	258	552,378
1.2 crushing	1,824,309	tons	3.50	6,385,082	3.50	6,385,082	3.50	6,385,082	3.50	6,385,082	3.50	6,385,082	3.50	6,385,082	3.50	6,385,082
1.3 loading to trucks	1,589	hours	258	409,962	258	409,962	258	409,962	258	409,962	258	409,962	258	409,962	258	409,962
1.4 hauling	1,824,309	tons	1.40	2,554,033	1.40	2,554,033	1.40	2,554,033	1.40	2,554,033	1.40	2,554,033	1.40	2,554,033	1.40	2,554,033
1.5 Dozing	3,800	hours	161	611,800	161	611,800	161	611,800	161	611,800	161	611,800	161	611,800	161	611,800
1.6 Compacting	1,366	hours	100	136,600	100	136,600	100	136,600	100	136,600	100	136,600	100	136,600	100	136,600
1.7 Subgrade (Shale) Subtotal	1,436,464	LCY		10,649,854		10,649,854		10,649,854		10,649,854		10,649,855		10,649,855		10,649,854
2.0 Synthetic Liner																
2.1 Liner labor installation	36,464,076	sq ft	0.13	4,740,330	0.09	3,281,767	0.12	4,375,689	N/A	N/A	N/A	N/A	0.05	1,823,204		
2.2 Liner material	36,464,076	sq ft	0.18	6,563,534	0.27	9,845,301	0.33	12,033,145	N/A	N/A	N/A	N/A	0.3	10,939,223		
2.3 Synthetic Liner Subtotal	36,464,076	sq ft		11,303,864		13,127,067		16,408,834						12,762,427		
3.0 Cover (12" Chert)																
3.1 loading to crusher	2,141	hours	258	552,378	258	552,378	258	552,378	N/A	N/A	N/A	N/A	258	552,378		
3.2 crushing	1,824,309	tons	3.50	6,385,082	3.50	6,385,082	3.50	6,385,082	N/A	N/A	N/A	N/A	3.50	6,385,082		
3.3 loading to trucks	1,589	hours	258	409,962	258	409,962	258	409,962	N/A	N/A	N/A	N/A	258	409,962		
3.4 hauling	1,824,309	tons	1.40	2,554,033	1.40	2,554,033	1.40	2,554,033					1.40	2,554,033		
3.5 Dozing	3,800	hours	161	611,800	161	611,800	161	611,800	N/A	N/A	N/A	N/A	161	611,800		
3.6 Compacting	1,366	hours	100	136,600	100	136,600	100	136,600	N/A	N/A	N/A	N/A	100	136,600		
3.8 Cover (Chert) Subtotal	1,436,464	LCY		10,649,854		10,649,854		10,649,854						10,649,854		
4.0 Earth Liner (12" Earth)			N/A	N/A	N/A	N/A	N/A	N/A								
4.1 Loading	3,275	hours	N/A	N/A	N/A	N/A	N/A	N/A	130	425,750	130	425,750				
4.2 Hauling	1,385,053	LCY	N/A	N/A	N/A	N/A	N/A	N/A	5.50	7,817,782	9.37	12,977,947				
4.3 Dozing	3,664	hours	N/A	N/A	N/A	N/A	N/A	N/A	161	589,904	161	589,904				
4.4 Compacting	1,623	hours	N/A	N/A	N/A	N/A	N/A	N/A	100	162,300	100	162,300				
4.5 Cap (natural clay) Subtotal	1,385,053	LCY								8,795,746		14,155,901				
5.0 Other																
5.1 Dust Suppression										804,000		804,000				
5.2 Road Maintenance										1,340,000		1,340,000				
5.3 5% Bentonite addition	781	acres							30,260	23,027,860	30,260	23,027,860			30,260	23,027,860
5.4 10% subgrade addition				1,064,985		1,064,985		1,064,985		1,064,985		1,064,985		1,064,985		1,064,985
5.5 Haul Road										570,000		570,000				
5.8 Other Subtotal				1,064,985		1,064,985		1,064,985		26,806,845		26,806,845		1,064,985		24,092,845
6.0 PROJECT SUBTOTAL				33,668,557		35,491,761		38,773,527		46,252,445		51,812,600		35,127,120		45,392,553
7.0 Contingency (22%)				7,407,082		7,808,187		8,530,176		10,175,536		11,354,772		7,727,966		9,986,362
GRAND TOTAL				41,075,639		43,299,948		47,303,703		56,427,982		62,967,372		42,855,087		55,378,915

Overburden Infiltration Barrier				
	units	unit type	$/unit	cost
4.1 Loading to Crusher	2141	hours	258	552,378
4.2 Crushing	1,824,309	tons	3.50	6,385,082
4.3 Loading	1589	hours	258	409,962
4.4 Hauling	1,824,309	tons	1.40	2,554,033
4.5 Dozing	3400	hours	181	611,800
4.6 Compacting	1366	hours	100	136,600
4.5 crushed shale subtotal				10,649,854

SIMPLOT INFILTRATION BARRIER COST ESTIMATE - PROPOSED ACTION PLAN - CREST LINED SLOPE

			SYNTHETIC LINER						Salt Lake Fm. (Tailings Dam area)				ASPHALT SPRAY ON	
			GSE (HDPE) 40 Mil		Watersavers (PVC)		CETCO (Bentomat)		minimum cost		maximum cost			
Item	units	Unit Type	$/unit	cost	$/unit	cost	$/unit	cost	$/unit	cost	$/unit	cost	$/unit	cost
1.0 Subgrade (6" Shale)														
1.1 loading to crusher	1,071	hours	258	276,318	258	276,318	258	276,318	N/A	N/A	N/A	N/A	258	276,318
1.2 crushing	912,155	tons	3.50	3,192,543	3.50	3,192,543	3.50	3,192,543	N/A	N/A	N/A	N/A	3.50	3,192,543
1.3 loading to trucks	795	hours	258	205,110	258	205,110	258	205,110	N/A	N/A	N/A	N/A	258	205,110
1.4 hauling	912,155	tons	1.40	1,277,017	1.40	1,277,017	1.40	1,277,017	N/A	N/A	N/A	N/A	1.40	1,277,017
1.5 Dozing	1,900	hours	161	305,900	161	305,900	161	305,900	N/A	N/A	N/A	N/A	161	305,900
1.6 Compacting	663	hours	100	66,300	100	66,300	100	66,300	N/A	N/A	N/A	N/A	100	66,300
1.7 Subgrade (Shale) Subtotal				5,325,188		5,325,188		5,325,188						5,325,188
2.0 Synthetic Liner														
2.1 Liner labor installation	32,480,750	sq ft	0.13	4,222,498	0.09	2,923,268	0.12	3,897,690	N/A	N/A	N/A	N/A	0.05	1,624,038
2.2 Liner material	32,480,750	sq ft	0.16	5,846,535	0.27	8,769,803	0.33	10,716,646	N/A	N/A	N/A	N/A	0.3	9,744,225
2.3 Synthetic Liner Subtotal	32,480,750	sq ft		10,069,033		11,693,070		14,616,336						11,368,263
3.0 Cover (12" Chert)														
3.1 loading to crusher	2,141	hours	258	552,378	258	552,378	258	552,378	N/A	N/A	N/A	N/A	258	552,378
3.2 crushing	1,624,309	tons	3.50	6,385,082	3.50	6,385,082	3.50	6,385,082	N/A	N/A	N/A	N/A	3.50	6,385,082
3.3 loading to trucks	1,589	hours	258	409,962	258	409,962	258	409,962	N/A	N/A	N/A	N/A	258	409,962
3.4 hauling	1,624,309	tons	1.40	2,554,033	1.40	2,554,033	1.40	2,554,033	N/A	N/A	N/A	N/A	1.40	2,554,033
3.5 Dozing	3,800	hours	161	611,800	161	611,800	161	611,800	N/A	N/A	N/A	N/A	161	611,800
3.6 Compacting	1,366	hours	100	136,600	100	136,600	100	136,600	N/A	N/A	N/A	N/A	100	136,600
3.7 Cover (Chert) Subtotal	1,436,464	LCY		10,649,854		10,649,854		10,649,854						10,649,854
4.0 Earth Liner (12" Earth)														
4.1 Loading	3,210	hours	N/A	N/A	N/A	N/A	N/A	N/A	130	417,300	130	417,300	N/A	N/A
4.2 Hauling	1,357,720	LCY	N/A	N/A	N/A	N/A	N/A	N/A	5.50	7,467,460	9.37	12,721,836	N/A	N/A
4.3 Dozing	3,592	hours	N/A	N/A	N/A	N/A	N/A	N/A	161	578,312	161	578,312	N/A	N/A
4.4 Compacting	1,590	hours	N/A	N/A	N/A	N/A	N/A	N/A	100	159,000	100	159,000	N/A	N/A
4.5 Cap (natural clay) Subtotal	1,357,720	LCY								6,622,072		13,676,448		
5.0 Other														
5.1 Dust Suppression										804,000		804,000	N/A	N/A
5.2 Road Maintenance										1,340,000		1,340,000	N/A	N/A
5.3 5% Bentonite addition	746	acres							30,260	22,573,960	30,260	22,573,960	N/A	N/A
5.4 10% subgrade addition				1,064,985		1,064,985		1,064,985	N/A		N/A		N/A	N/A
5.5 Haul road										570,000		570,000	N/A	N/A
5.5 Subtotal				1,064,985		1,064,985		1,064,985		25,287,960		25,287,960		
6.0 PROJECT SUBTOTAL				27,109,059		28,733,097		31,656,364		33,910,032		39,164,408		27,343,304
7.0 Contingency (22%)				5,963,993		6,321,261		6,964,400		7,460,207		6,616,170		6,015,527
TOTALS				33,073,052		35,054,378		38,620,764		41,370,239		47,780,578		33,358,831

Overburden Infiltration Barrier					
		units	unit type	$/unit	cost
4.1 Loading to Crusher		2141	hours	258	552,376
4.2 Crushing		1,824,309	tons	3.50	6,385,082
4.3 Loading		1589	hours	258	409,962
4.4 Hauling		1,624,309	tons	1.40	2,554,033
4.4 Dozing		3800	hours	161	611,600
4.4 Compacting		1366	hours	100	136,600
4.5 crushed shale subtotal					10,649,854
30,260	22,573,960				
N/A					
	22,573,960				
	33,223,614				
	7,309,239				
	40,533,053				

SIMPLOT INFILTRATION BARRIER COST ESTIMATE - ALTERNATIVE PLAN A & B - STEPPED LINED SLOPE

			SYNTHETIC LINER						Salt Lake Fm. (Tailings Dam area)				ASPHALT SPRAY ON		CRUSHED SHALE	
			GSE (HDPE) 40 Mil		Watersavers (PVC)		CETCO (BentoMat)		minimum cost		maximum cost		LINER			
Item	units	Unit Type	$/unit	cost	$/unit	cost	$/unit	cost	$/unit	cost	$/unit	cost	$/unit	cost	$/unit	cost
1.0 Subgrade (12" Shale)																
1.1 loading to crusher	1,659	hours	258	426,022	258	426,022	258	426,022	258	426,022	258	426,022	258	426,022	258	426,022
1.2 crushing	1,413,612	tons	3.50	4,947,642	3.50	4,947,642	3.50	4,947,642	3.50	4,947,642	3.50	4,947,642	3.50	4,947,642	3.50	4,947,642
1.3 loading to trucks	1,232	hours	258	317,856	258	317,856	258	317,856	258	317,856	258	317,856	258	317,856	258	317,856
1.4 hauling	1,413,612	tons	1.40	1,979,057	1.40	1,979,057	1.40	1,979,057	1.40	1,979,057	1.40	1,979,057	1.40	1,979,057	1.40	1,979,057
1.5 Dozing	2,945	hours	161	474,145	161	474,145	161	474,145	161	474,145	161	474,145	161	474,145	161	474,145
1.6 Compacting	1,059	hours	100	105,900	100	105,900	100	105,900	100	105,900	100	105,900	100	105,900	100	105,900
1.7 Subgrade (Shale) Subtotal	1,113,080	LCY		6,252,622		6,252,622		6,252,622		6,252,622		6,252,622		6,252,622		6,252,622
2.0 Synthetic Liner																
2.1 Liner labor installation	28,255,107	sq ft	0.13	3,673,164	0.09	2,542,960	0.12	3,390,813	N/A	N/A	N/A	N/A	0.05	1,412,755		
2.2 Liner material	28,255,107	sq ft	0.16	5,085,919	0.27	7,628,879	0.33	9,324,185	N/A	N/A	N/A	N/A	0.3	8,476,532		
2.3 Synthetic Liner Subtotal	28,255,107	sq ft		6,759,083		10,171,839		12,714,798						9,889,287		
3.0 Cover (12" Chert)																
3.1 loading to crusher	1,659	hours	258	426,022	258	426,022	258	426,022	N/A	N/A	N/A	N/A	258	426,022		
3.2 crushing	1,413,612	tons	3.50	4,947,642	3.50	4,947,642	3.50	4,947,642	N/A	N/A	N/A	N/A	3.50	4,947,642		
3.3 loading to trucks	1,232	hours	258	317,856	258	317,856	258	317,856	N/A	N/A	N/A	N/A	258	317,856		
3.4 hauling	1,413,612	tons	1.40	1,979,057	1.40	1,979,057	1.40	1,979,057					1.40	1,979,057		
3.5 Dozing	2,945	hours	161	474,145	161	474,145	161	474,145	N/A	N/A	N/A	N/A	161	474,145		
3.6 Compacting	1059	hours	100	105,900	100	105,900	100	105,900	N/A	N/A	N/A	N/A	100	105,900		
3.7 Cover (Chert) Subtotal	1,113,080	LCY		6,252,622		6,252,622		6,252,622						6,252,622		
4.0 Earth Liner (12" Earth)																
4.1 Loading	2,536	hours	N/A	N/A	N/A	N/A	N/A	N/A	130	329,940	130	329,940				
4.2 Hauling	1,073,242	LCY	N/A	N/A	N/A	N/A	N/A	N/A	5.50	5,902,831	9.37	10,056,278				
4.3 Dozing	2,840	hours	N/A	N/A	N/A	N/A	N/A	N/A	161	457,240	161	457,240				
4.4 Compacting	1,257	hours	N/A	N/A	N/A	N/A	N/A	N/A	100	125,700	100	125,700				
4.5 Cap (natural clay) Subtotal	1,073,242	LCY								6,615,711		10,969,158				
5.0 Other																
5.1 Dust Suppression										804,000		804,000				
5.2 Road Maintenance										1,340,000		1,340,000				
5.3 5% Bentonite addition	590	acres							30260	17,853,400	30260	17,853,400			30260	17,853,400
5.4 10% subgrade addition				825,262		825,262		825,262		825,262		825,262		825,262		825,262
5.5 Haul Road										570,000		570,000				
5.5 Subtotal				825,262		825,262		825,262		21,392,662		20,622,662		825,262		18,678,662
6.0 PROJECT SUBTOTAL				26,089,569		27,502,344		30,045,304		36,480,995		40,044,441		27,219,793		35,183,906
7.0 Contingency (22%)				5,739,710		6,050,516		6,609,967		8,021,419		8,809,777		5,988,354		7,740,459
TOTALS				31,829,298		33,552,860		36,655,271		44,482,414		48,854,218		33,208,148		42,924,365

Overburden Infiltration Barrier				
	units	unit type	$/unit	cost
4.1 Loading to Crusher	1,659	hours	258	426,022
4.2 Crushing	1,413,612	tons	3.50	4,947,642
4.3 Loading	1,232	hours	258	317,856
4.4 hauling	1,413,612	tons	1.40	1,979,057
4.5 Dozing	2,945	hours	161	474,145
4.6 Compacting	1059	hours	100	105,900
4.7 crushed shale subtotal				6,252,622

APPENDIX B

MFG Memo

MEMORANDUM

TO: Alan Prouty - Simplot

FROM: Daryl Longwell and Kathy Tegtmeyer - MFG

DATE: October 9, 2001

SUBJECT: Evaluation of Conceptual Cost Estimate for Infiltration Barrier Smoky Canyon Mine Panels B & C

Pursuant to your request, MFG, Inc. has prepared a preliminary evaluation of the Draft Conceptual Cost Estimate for incorporation of an infiltration barrier in the overburden cap for the Smoky Canyon Mine Panels B & C, prepared by JBR Consultants. Information available for our review included the following:

- Memo dated July 31, 2001 - from Brian Buck to the Simplot SEIC I.D. Team – 'Draft Conceptual Design and Cost Estimate for Infiltration Barrier';
- Memo dated September 25, 2001 – From Brian Buck to Jeff Cundick – 'Simplot Infiltration Barrier, Additional Information';
- Cost Estimate Spreadsheet entitled 'Simplot Dump Liner Cost Estimate – Proposed Action Plan'; and
- An email from Larry Raymond, dated October 1, 2001.

The primary focus of our review was on identifying and quantifying potential costs associated with items that were not included in JBR's cost estimate. For each of the four capping alternatives evaluated by JBR (HDPE liner, PVC liner, GCL liner, and compacted clay liner) we created a spreadsheet which identifies and presents estimated costs for items which were not included in JBR's draft conceptual cost estimate. These spreadsheets are included in the attached Excel file (costestimate1.xls). These items are listed below, consistent with their numbering on the spreadsheets:

1. Haul Road Construction and Maintenance

   As identified in Brian Buck's September 25, 2001 memo, a separate haul road may be required to accommodate haul traffic necessary to transport clay from the borrow area near the tailing impoundments to the overburden dump sites. These costs are only applicable to the compacted clay cap alternative.

   a. Build & Reclaim Haul Road: Incorporated estimated costs to build and reclaim a separate haul road presented in Larry Raymond's 10/1/01 email ($570,000).

Colorado. In addition, line item 5b was added to incorporate costs for a non-woven geotextile to be placed beneath the geomembrane liner (HDPE or PVC) to act as a cushion layer. Estimated unit costs are based on actual costs including installation.

6. Additional Fees & Contingencies

   30% was added as a contingency to all of the estimates to allow for other unanticipated items and to cover design and construction management/administration costs. For a conceptual estimate such as this, a 30% allowance would probably be a minimum.

We did not perform a detailed evaluation of JBR's estimated unit rates or unit costs; however, we did a cursory review of these units. For the most part, JBR's estimates seem to be in the 'ball park' for the items they did include. The rates for the installation of the various geo-membrane liners appear to be on the low side based on actual bid prices we have received on recent projects (probably on the order of $0.05 to $0.10 per square foot). With respect to the costs for crushing and placing both the subgrade and chert layers, above and below the liner, it appears as though they did not include hauling costs related to transporting material either to the crusher and probably more significantly from the crusher to the placement location. If it was determined to be useful, we could take a harder look at JBR's estimated costs; however, at this time we have not undertaken this effort.

SELECTED OVERALL COMMENTS REGARDING COST ESTIMATE FOR SIMPLOT DUMP LINER COST ESTIMATE

No.	ITEM	Comment	Additional Cost	% of Cost Range (Cost Range = $17.3 to 32.6 million)
1	Liner Costs: HDPE, PVC, GCL	Cost appear to be low, for a 40 mil HDPE, need $0.40/sf min. compare to $0.31, $0.36, $0.45/sf Required Area: 36,464,076 sf appears cost may be delivered only without installation Addition of a geotextile for HDPE and PVC options at $0.25/sf	$3,500,000 $9,116,000	12 to 20 % 28 to 50%
2	Bentonite Addition to Clay	Assume $30,000/ac	$25,110,000	plus 77%
3	Additional Drainage Liner -GCL	Assume $20,500/ac	$17,200,000	plus 53%
	TOTAL OF 1, 2, and 3		$54,926,000	
	Contingency	Assume 30% of total cost for conceptual estimate Assume 15 - 20% of total cost for preliminary design estimate Range of cost original estimate: $17.3 to 32.6 million Use $72.3 million as estimate ($17.3 to $55)	$21,690,000	plus 66%

ALTERNATIVE: HDPE
SIMPLOT INFILTRATION BARRIER
ADDITIONAL CONCEPTUAL COSTS NOT INCLUDED IN ORIGINAL ESTIMATE

ITEM No.	ITEM	Quantity	Unit	Unit Cost	Unit	Total Cost ($)	Comments
1	HAUL ROAD						
1a	Upgrade and reclaim		LS		$		Not Applicable
1b	Dust suppression		LS		$		Not Applicable
1c	Road maintenance		LS		$		Not Applicable
	Total						
2	BENTONITE ADDITION TO CLAY						
2a	Bentonite delivered		ac		$/ac		Not Applicable
2b	Less volume of clay displaced		cy		$/cy		Not Applicable
	Total						
3	ADDITIONAL SUBGRADE REQUIREMENT	215,500	LCY	5.64	$/LCY	1,215,420	Assume 15% of original estimate
4	SLOPE RECONFIGURATION						
4a	Subgrade	88	ac	5.64	$/cy	800,730	Assume 1-foot thickness
4b	HDPE Liner	88	ac	0.31	$/sf	1,188,317	
4c	Chert layer	88	ac	5.64	$/cy	800,730	Assume 1-foot thickness
	Total					2,789,776	
5	DRAINAGE SYSTEM						
5a	Geocomposite Drain system	925	ac	0.65	$/sf	26,190,450	
5b	Additional layer of geotextile below HDPE	925	ac	0.17	$/sf	6,849,810	
	Total					33,040,260	
	Total of 1 thru 5					37,045,456	
	Total from Original Estimate					27,495,500	
	Revised Total					64,540,956	
6	ADDITIONAL FEES & CONTINGENCIES	19,362,287	LS			19,362,287	Assume 30%
	TOTAL REVISED COST (1 thru 6)					83,903,243	

Notes: 3 Assume 10 to 20% more subgrade required. Use 15% x 1,436,464 = 215,500 LCY @ $5.64/LCY
4 Cost of subgrade = $5.64/cy from JBR estimate
Cost of chert = $5.64/cy from JBR estimate.
Acreage for additional slope reconfiguration = 88 acres.
Liner estimate = $0.31/sf from JBR estimate.
5 Total acreage = 837 + 88 = 925 acres = 40,293,000 sf

ALTERNATIVE: GCL
SIMPLOT INFILTRATION BARRIER
ADDITIONAL CONCEPTUAL COSTS NOT INCLUDED IN ORIGINAL ESTIMATE

ITEM No.	ITEM	Quantity	Unit	Unit Cost	Unit	Total Cost ($)	Comments
1	HAUL ROAD						
1a	Upgrade and reclaim		LS		$		Not Applicable
1b	Dust suppression		LS		$		Not Applicable
1c	Road Maintenance		LS		$		Not Applicable
	Total						
2	BENTONITE ADDITION TO CLAY						
2a	Bentonite delivered		ac		$/ac		Not Applicable
2b	Less volume of clay displaced		cy		$/cy		Not Applicable
	Total						
3	ADDITIONAL SUBGRADE REQUIREMENT	215,500	LCY	5.64	$/LCY	1,215,420	Assume 15% of original estimate
4	SLOPE RECONFIGURATION						
4a	Subgrade	88	ac	5.64	$/cy	800,730	Assume 1-foot thickness
4b	GCL Liner	88	ac	0.47	$/sf	1,801,642	
4c	Chert layer	88	ac	5.64	$/cy	800,730	Assume 1-foot thickness
	Total					3,403,101	
5	DRAINAGE SYSTEM						
5a	Geocomposite Drain	925	sf	0.65	$/sf	26,190,450	
5b	Additional geotextile		sf		$/sf		Not Applicable
	Total					26,190,450	
	Total of 1 thru 5					30,808,971	
	Total from Original Estimate					32,600,477	
	Revised Total					63,409,448	
6	ADDITIONAL FEES & CONTINGENCIES	30%				19,022,834	
	TOTAL REVISED COST (1 thru 6)					82,432,282	

Notes: 3 Assume 10 to 20% more subgrade required. Use 15% x 1,436,464 = 215,500 LCY @ $5.64/LCY
4 Cost of subgrade = $5.64/cy from JBR estimate
Cost of chert = $5.64/cy from JBR estimate.
Acreage for additional slope reconfiguration = 88 acres.
GCL estimate = $0.47/sf from JBR estimate
Total acreage = 837 + 88 = 925 acres = 40,293,000 sf

Appendix 2D

Historic Mining Environmental Impact Investigation

HISTORIC MINING ENVIRONMENTAL IMPACT INVESTIGATION AT SMOKY CANYON MINE

MARCH 2002

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APPENDIX

1. Memorandum of Understanding (MOU) ..... Appendix A

2. Area Wide Administrative Order on Consent ..... Appendix B

ACRONYMS and ABBREVIATIONS

ACOE	U.S. Army Corps of Engineers
AOC	Administrative Order of Consent
ARAR	Applicable, or Relevant and Appropriate Requirements
AWQC	Ambient Water Quality Criterion
BDL	Below Detection Limit
BIA	U.S. Department of Interior, Bureau of Indian Affairs
BLM	U.S. Department of Interior, Bureau of Land Management
BMP	Best Management Practices
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CWA	Clean Water Act
EE/CA	Engineering Evaluation/Cost Analyses
EIS	Environmental Impact Statement
EO	Executive Order
EPA	U.S. Environmental Protection Agency
Forest Service	U.S. Department of Agriculture, Forest Service
IDAPA	Idaho Administrative Procedures Act
IDEQ	Idaho Department of Environmental Quality
IDL	Idaho Department of Lands
IDWR	Idaho Department of Water Resources
IMA	Idaho Mining Association
JBR	JBR Environmental Consultants, Inc.
MCL	Maximum Contaminant Level
Montgomery Watson	Montgomery Watson Consultants, Inc.

MOU	Memorandum of Understanding
NEPA	National Environmental Protection Act
NPDES	National Pollution Discharge Elimination System
Overview	Historic Mining Environmental Impact Investigation At Smoky Canyon Mine: An Overview
RAO	Remedial Action Objectives
RG	Remediation Goals
ROD	Record Of Decision
SAP	Sampling and Analysis Plan
SCM	Smoky Canyon Mine
SEIS	Supplemental Environmental Impact Statement
SI	Site Investigation
Simplot	J.R. Simplot Company
SRB	Sulfur/Selenium Reducing Bacteria
SWPPP	Storm Water Pollution Prevention Plan
U of I	University of Idaho
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
Working Group	Interagency/Phosphate Industry Selenium Working Group

Historic Mining Environmental Impact Investigation at Smoky Canyon Mine: An Overview

This document, the Historic Mining Environmental Impact Investigation at Smoky Canyon Mine: An Overview ("Overview") has been developed to provide a description of how Simplot is addressing environmental impacts from past mining at the Smoky Canyon Mine ("SCM"). This document is revised from the previous Selenium Mitigation Action Plan to address comments received from public and agency reviews. Simplot has committed to work in a cooperative manner, under the direction of federal and state authorities, to investigate current and potential impacts from selenium and other environmental contaminants as a result of past mining. Furthermore, Simplot will continue to work with the U.S. Department of Agriculture, Forest Service (Forest Service) and with the State of Idaho to address selenium releases, with the common goal of developing appropriate mitigation measures to deal with those impacts in harmony with federal and state regulatory programs.

This Overview describes activities that are now being undertaken to address impacts manifested from past mining. This Overview thus relates to activities that are separate from those under consideration in the Supplemental Environmental Impact Statement (SEIS) being developed through the National Environmental Policy Act (NEPA) process (BLM, 2000a). While the SEIS addresses mining scheduled for the near term at SCM (Panels B and C as approved by the Final Environmental Impact Statement, Smoky Canyon Phosphate Mine, March 1982), this Overview addresses impacts from past mining in A- and D- Panels and the current mining in E panel. The site-specific investigations described in the Overview will be carried out under an Administrative Order on Consent/Consent Order (AOC/CO) in a manner consistent with authorities provided to the Forest Service under Executive Order (EO) 12580.

1. INTRODUCTION

Simplot has been mining phosphate ore in southeast Idaho for approximately 50 years. The Company has operated the SCM on National Forest Service administered lands in the Caribou National Forest since 1983. The SCM is located approximately 26 miles east of Soda Springs, Idaho and 20 miles west of Afton, Wyoming (Figure 1).

The existing operation at SCM encompasses A-, D-, and E-Panels (Figure 2). Each panel consists of an open pit, backfilled portions of the open pit and associated external overburden disposal areas. The A-Panel Area extends from the Smoky Creek industrial well site south to Pole Canyon. The D-Panel Area is bordered by Pole Canyon on the north and by Sage Creek on the south. The E-Panel Area is the present active mining site and extends from Sage Creek south to South Sage Creek (Simplot, 2000). Phosphate ore removed from these locations is transported to a mill where it is crushed, mixed with water and concentrated by physical separation to form a high-grade slurry. The high-grade slurry is piped 87 miles to Pocatello, Idaho, for processing into phosphate fertilizer. The low-grade portion is disposed of, via a pipeline, in tailings ponds located east of the mine property on land owned by Simplot (Figure 3). The tailings water reclaim system returns water from the tailings pond back to the mill for reuse.

The south half of the A-Panel pit and most of the D-Panel pit have been backfilled with overburden. E-Panel backfill is currently occurring. Excess overburden is located in disposal sites east of the mine pits. The backfilled portions of the pits and inactive areas of the external overburden disposal sites have been reclaimed under the approved mine plan.

Simplot recently initiated the process to begin mining in a portion of the mine previously approved under a 1982 mine design; Simplot plans to develop the remaining B- and C-Panels (Figure 4) originally approved in the Record of Decision (ROD) for the 1982 Environmental Impact Statement (EIS) for SCM. The B-Panel Area is bordered on the south by A-Panel and on the north by Smoky Creek. C-Panel is located on the north side of the road beyond B-Panel.

In response to the proposal to develop Panels B and C, a SEIS is being developed by the Pocatello Field Office of the U.S. Department of Interior, Bureau of Land Management (BLM) with assistance from other agencies including the Forest Service, Caribou-Targhee National Forest Office to assess the impacts of newly-identified contaminant issues discovered since the 1982 ROD was signed. The SEIS addresses the impacts to the environment that may result from future mining in B- and C-Panels.

Simplot has participated in the regional efforts, described in more detail below, in order to do its part in comprehensively addressing the selenium issue. In addition, Simplot plans to voluntarily enter an AOC/CO specific to the SCM site in order to address selenium impacts from past mining. This AOC/CO will require a Site Investigation (SI) and Engineering Evaluation/Cost Analysis (EE/CA) that will be initiated to address the impacts on the environment from selenium. Based upon the findings of the site investigation and EE/CA, a group of potential actions aimed at addressing the impacts will be developed by the FS, and presented at a public forum before selection of the preferred actions(s).

2. REGULATORY BACKGROUND AND AUTHORITY

Federal, state, and local regulations govern the development, operation, and reclamation of phosphate mines. The existing and proposed mining operations are located on Federal Phosphate Leases No. I-012890, I-026843, I-027801, and I-30369. The Forest Service, Soda Springs Ranger District, administers the Federal land involved in the operation of the SCM, and the Pocatello Field Office of the BLM administers the Federal mineral leases under which the ore is recovered and the United States receives payment for it.

A programmatic EIS was completed in 1977 by the U.S. Geological Survey (USGS), Forest Service, BLM, and the operating phosphate mining companies to address phosphate mining in the area (Final Environmental Impact Statement: Development of Phosphate Resources in Southeastern Idaho, 1977). The EIS reported some of the ore contained seleniferous components, but it was thought that contaminants would not leach in amounts that would present a concern.

In addition, a site-specific EIS was developed in 1981 and 1982 to address phosphate mining/processing at SCM (Draft Environmental Impact Statement, Smoky Canyon Phosphate Mine, 1981 and Final Environmental Impact Statement, Smoky Canyon Phosphate Mine, 1982). A Record of Decision (ROD) allowing mining to occur at SCM was signed on January 6, 1983. Additional studies have shown that, as a result of past mining practices, selenium and other materials can become mobile in water and can be taken up in vegetation at concentrations that may be harmful to some animals and aquatic life.

2.1.1 Memorandum of Understanding

In response to the new information regarding selenium in the environment, federal and state governmental entities and the mining companies have agreed to investigate the selenium issue on a regional basis under a Memorandum of Understanding (MOU), a copy of which is attached as Appendix A. The MOU, effective July 15, 2000, between the Idaho Department of Environmental Quality (IDEQ), several federal entities (i.e., the Forest Service, U.S.

Environmental Protection Agency (EPA), U.S. Department of Interior, Bureau of Indian Affairs (BIA), U.S. Fish and Wildlife Service (USFWS), and BLM) and the Shoshone-Bannock Tribes, was developed to coordinate the investigation of and the responses to selenium and other potential contaminants associated with phosphate mining in southeast Idaho (IDEQ. 2000b).

The Statement of Purpose in the MOU outlines six purposes for which the MOU is intended to provide a framework: (1) ascertaining the overall extent of the contamination present in and around historic and ongoing phosphate mining operations; (2) defining specific sites for focused investigation and response action; (3) establishing overall priorities for the investigation and response action process in order to protect human health and the environment; (4) undertaking investigations and response actions in a manner that will allow the Parties to recover response costs; (5) promoting future mining practices that will safeguard the environment from future contamination; and (6) negotiating agreements or entering contracts consistent with the requirements of CERCLA under which the mining companies or contractors hired by one of the parties to the MOU will undertake appropriate investigation and response actions in connection with selenium and other contamination within the Mining Area. The MOU also provides that a committee of governmental agency representatives (from the Forest Service, BLM, BIA, USFWS, EPA, DOJ, IDEQ and the Shoshone Bannock Tribes) will undertake a variety of tasks, including defining the area-wide investigation, identifying specific sites for additional investigation or response action, selecting site-specific lead agencies, identifying support agencies, and otherwise implementing their commitment to work cooperatively.

Consistent with the MOU and subsequent agency discussion, the Forest Service was designated as the lead agency to coordinate the Smoky Canyon site-specific activities. The status of the AOC/CO specific to the SCM is discussed under section 2.1.3 below.

2.1.2 Area-Wide Investigation Consent Order / Administrative Order on Consent

Subsequent to the signing of the MOU, the same group of governmental agencies and the phosphate mining companies, including Simplot, entered an Area-Wide AOC (AWAOC) to complete the Area-Wide Investigation for selenium and other potential contaminants of concern, under the direction of the IDEQ. A copy of the AWAOC is attached as Appendix B. The statement of work under the AWAOC states that the primary objectives of the area-wide investigation are to: (1) establish area wide remedial action objectives (RAOs), remediation goals (RGs), and risk-based cleanup levels for selenium and other contaminants of concern that will be protective of human health and the environment; (2) develop a monitoring plan that will assess the effectiveness of future remedial activities within the Resource Area; (3) develop Best Available Technologies and Remediation Techniques for use, as appropriate, at sites in the Resource Area; and (4) provide information to support future agency-approved site investigations and remedial actions, and other land use activities on selenium-impacted lands within the resource area. The work being done under the AWAOC includes a general, area-wide risk assessment, and planning for general remedial action objectives (RAOs) and measures that are intended to be used to facilitate, expedite and provide consistency to all future site-specific work.

Paragraph 10 of the AWAOC addresses the coordination of the more general area-wide investigation with the site-specific investigations anticipated by both the MOU and the AWAOC. The AWAOC states in this paragraph that "The parties contemplate that various site-specific investigations, risk assessments and possible remedial actions will or may be performed in the future on all or some of the individual mining operations . . .pursuant to the terms of negotiated Consent Orders/Administrative Orders on Consent." This paragraph also provides that the Area-Wide Investigation is to be closely coordinated with the site-specific work, so that the

site-specific work will not be performed in a duplicative or inconsistent manner with the AWAOC work. However, under this same paragraph, "IDEQ, the Federal Agencies and the Tribes do not waive or limit any of their authorities with respect to determining the scope of or schedule for either the Area-Wide Investigations or site-specific work" (IDEQ, 2001). Simplot recognizes that site-specific sampling and similar site investigation work at SCM, as well as various interim protective measures such as grazing restrictions, may not be inconsistent or duplicative with this Area-Wide Investigation and may proceed at specific sites prior to completion of the Area-Wide Investigation

2.1.3 Site Specific Consent Order/Administrative Order on Consent

The J.R. Simplot Company is currently negotiating an Administrative Order on Consent/Consent Order (AOC/CO) with the Forest Service and the State of Idaho for the SCM. The AOC/CO provides for a site investigation (SI) and engineering evaluation/cost analysis (EE/CA) on the release of selenium and other potential contaminants of concern at the SCM from historic mining practices. This AOC/CO, specific to the J.R. Simplot Company at the SCM site, is the first in the series of consent orders that will be negotiated by the governmental entities under the MOU and AWAOC with the five different mining companies (also parties to the AWAOC) that mine (and/or have mined) phosphate rock southeast Idaho.

The general objective of the SI is to determine the scope of any release or possible threatened release of contaminants to the environment at or from SCM. The SI will include a site characterization, including data collection, data evaluation and validation, to define the nature and extent of impacts. This work will be in addition to work that has previously been conducted at SCM by Montgomery Watson, the University of Idaho and other on-going monitoring, under the AWAOC and other initiatives. The general objective of the EE/CA is to identify and evaluate action requirements. An alternative will be chosen that is designed to prevent, mitigate or otherwise respond to or remedy any release or threatened release of contaminants at SCM historic operations. The EE/CA will include: (1) an identification of removal action objectives; (2) an identification and comparative analysis of removal action alternatives, including an analysis of their effectiveness, cost, and ability to be implemented; and (3) a recommended action alternative. Several major documents will be produced under the AOC/CO and made available for public review – a SI Work Plan, EE/CA Work Plan, Field Sampling Plan (includes the Site Health and Safety Plan, Sampling and Analysis Plan, Quality Assurance Plan), SI Report, and EE/CA Report. The AOC/CO and Statement of Work will establish enforceable timeframes for each of these items. Currently, Simplot is actively negotiating both the AOC/CO and the Statement of Work with the Forest Service and the Idaho Department of Environmental Quality. Water quality sampling, not yet incorporated into the Statement of Work, is being developed for implementation in the spring 2002.

2.2 History of the Selenium Working Group

In 1996, horses pastured on lands downstream from the Maybe Canyon Mine were determined to have selenium poisoning, or selenosis, and were euthanized. In response, a voluntary working group was formed to study the source and extent of selenium releases from phosphate mining activities. The Idaho Mining Association (IMA) Selenium Subcommittee formed and consists of representatives from the five mining companies (Simplot, FMC, Nu-West Industries, Inc., Rhodia, and Monsanto) that are currently mining or who have recently mined phosphate ore in the fifteen (four active and eleven inactive) mines in southeast Idaho. The Interagency/Phosphate Industry Selenium Working Group (Working Group) also formed and was comprised of the IMA Selenium Subcommittee in cooperation with federal, state, local, and tribal agencies.

The Working Group began investigating the selenium issue at fifteen mines, associated lands, and potentially impacted waters throughout the Southeast Idaho Phosphate Resource Area. The Working Group initiated a Regional Investigation of the resource area, through Montgomery Watson Consultants, Inc. (Montgomery Watson) a third party consultant, funded by the members of the IMA's Se Subcommittee, to determine the extent of selenium impacts to soils, vegetation, surface waters, and ecological receptors (e.g., fish, elk, birds, livestock) (Montgomery Watson, 1998, 1999b, 1999c). Some aspects of this Regional Investigation are nearing completion, under IDEQ leadership, to fill critical data gaps. The intent of this investigation is to:

- Characterize the extent and magnitude of releases of target elements, including selenium, from phosphate mining in surface water and groundwater, sediment, surface soil, vegetation and select biota
- Characterize the threat of overburden chemical constituent impacts to human health and the environment
- Collect data that can be used to establish environmentally acceptable levels of selenium and other target elements for the purpose of developing region or site-specific mitigation goals to protect the environment.

2.2.1 Current State of Affairs

To date, the Working Group has completed Regional Investigation reports in 1997, 1998, 1999, and is currently completing the 2000 Report. Montgomery-Watson evaluated and interpreted data to support its preliminary human health risk assessment focused on selenium and a selected number of other associated metals. The remaining Area-Wide Investigation activities are being performed under the Area-Wide AOC. This AWAOC is attached as Appendix B. The IDEQ is serving as the lead agency for the Area-Wide Investigation. Members of the former Working Group Steering Committee, as well as other interested stakeholders, serve as an advisory group to the IDEQ. In accordance with the AWAOC, the IDEQ is working with a third party contractor, Tetra-Tech EM, Inc., to coordinate the area-wide investigation with the other Area-Wide AOC participants' active involvement.

In addition, lead agencies have been selected for each of the fifteen phosphate mines (4 active and 11 inactive) in southeast Idaho, and a schedule has been developed for site-specific investigations. The J.R. Simplot Company at the SCM will institute the first site-specific investigation under the AWAOC schedule. This investigation will be conducted in accordance with the provisions of the site-specific consent order discussed in more detail above.

2.3 Regional Investigation Sampling

One of the main objectives of the Regional Investigation was to determine the extent of elevated selenium levels and other potential contaminants of concern that are attributable to phosphate mining activities. To meet this objective, initial sampling was planned for water, soil, and vegetation in the vicinity of the phosphate mines (bird egg, fish, cattle, elk, and other studies were added to the investigation later). Complete sampling approach and methodologies for all media sampled are recorded in Montgomery Watson 1998, 1999b, 1999c and 2000.

2.3.1 Sampling Summary

In 1997 and 1998, an inventory of potential stream sampling stations and mine facilities (mine pits, overburden disposal areas, seeps, stock ponds, French drains, water supply wells, tailings ponds, storm water runoff control ponds and other miscellaneous facilities) was developed. From this inventory a sampling design was developed to facilitate sampling of a portion of those sites identified. Beginning with the 1998 sampling season, a random selection process was used to determine which facilities would be sampled. Selection was made from approximately 200 mine facilities identified by mine personnel and 225 potential stream sampling stations identified on USGS topographic maps. Over 2,000 samples have been taken from the inventory of potential sampling stations, and over 15,000 analyses have been performed. Three background locations were designated for the Regional Investigation. The background streams were defined as streams that cross an undeveloped portion of the Phosphoria Formation in a drainage, that was at the time, undisturbed by phosphate mining. At the time, the South Fork Sage Creek was designated as background for the Smoky Canyon area because no mining activity had been conducted in the watershed. Results from the sampling analyses performed as part of the Regional Investigation were compared with surface and groundwater regulatory criteria and background conditions to determine if concentrations of target elements exceeded regulatory criteria.

Sampling specific to the SCM that took place as part of the Regional Investigation is summarized in the following sub-sections. This limited sampling that took place at SCM as part of the Regional Investigation does not necessarily provide comprehensive characterization of the site. Subsequent site-specific sampling will take place to that end as part of the site-specific investigation for SCM. Results from the Regional Investigation prepared by Montgomery-Watson are part of a preliminary investigation. For information on statistical analyses, laboratory methods and detection limits, and data validation calculations for data presented in sections 2.3.1.1 and 2.3.1.2, refer to Montgomery Watson 1998, 1999b and 2000. Maps showing the location of the sampling stations are also included in the reports.

For 1999 and 2000, the focus of the Regional Investigation sampling program was shifted away from the mine to the Blackfoot River Watershed. Surface water, salmonid forage fish, sediment, submergent macrophytes, periphyton, benthic macroinvertebrates and riparian vegetation were sampled. For sample results, refer to Montgomery Watson 1999b and 2000.

The sampling design for 2001 was developed by IDEQ to fill data gaps in the Area-Wide Investigation. These data gaps are presented in the Draft Data Gap Technical Memorandum (TtEMI, 2001a). For this sampling event Montgomery Watson was tasked with sampling surface water and waste rock dump soil. The sampling that was specific to SCM included seeps DP-10 and DP-7 in addition to water accumulated in the A-pit. These results are included on Table 1.

2.3.1.1 Surface Water and Groundwater

In 1997, selenium only samples were taken as part of an interim survey at four stream stations and one of the tailings ponds at SCM (Table 1). Two of the stream stations and the tailings pond had concentrations of selenium above the cold water biota standard of 0.005mg/L (see Section 4.3). This criterion is based on values promulgated under the Clean Water Act (CWA). Background stream samples taken were below 0.001 mg/L selenium based on the method detection limit accepted for the laboratory protocols adopted for the southeast Idaho investigations for total selenium in water. In 1998, three ponds, one groundwater well, and seven stream stations were sampled at SCM for a wide range of potential contaminants of concern. The groundwater well concentration was below the drinking water standard of 0.05 mg/L selenium, but was elevated relative to other groundwater wells sampled as part of the

Regional Investigation. The ponds all contained elevated selenium, as did two of the seven streams. The background samples were within the same range as the 1997 samples (Table 1). Data collected during 2000 specific to SCM included surface water only with 4 of the 7 sample results being below the detection limit. The sampling for 2001 included the two seeps, of which selenium was detected at above the drinking water standard, as was as the water in the A-pit (Table 1).

Table 1. Regional Investigation Water Sampling at the Smoky Canyon Mine by Montgomery Watson.

Water Results (mg/L)															
	Sept-97 Filtered/ Unfiltered	May-98				Sep-98				May-00	Spring 01				
Station	Se	Se	Cd	Mn	Zn	Se	Cd	Mn	Zn	Se	Se	Cd	Mn	Zn	Mo
Seeps															
DS028 Seep D-P10											**0.53**	0.00094	0.012	0.045	BDL
DS029 Seep D-P7											**0.86**	**0.0088**	0.38	**0.23**	BDL
Streams															
65 Above Pole Canyon WD at FS station S-B&M-8	BDL/BDL														
66 Below Pole Canyon WD at FS Station S-B&M-9	**0.557-0.63/0.566-0.612***														
67/ST188 N Fork Sage Creek above Pole Cr[1]	0.00337/*0.00546*	BDL	0.00082			BDL	*0.0029*			BDL					
68/ST187 N Fork Sage Creek below Pole Cr[1]	0.00323/0.00371	*0.041*	*0.0023*			0.0019	*0.0016*			*0.0083*					
ST170 Smoky Creek, downstream of Tyhee Creek										BDL					
ST173 Smoky Creek downstream of SCM at FS Station		0.001	BDL	0.01	BDL	BDL	*0.0016*	0.074	BDL						
ST174 Smoky Creek downstream of Tailings Pond S B&M-5		BDL	BDL	0.024	BDL	BDL	BDL	0.074	BDL						
ST176 Smoky Creek upstream of Tailings Ponds S-B&M-4		BDL	*0.0032*	0.034	BDL	BDL	0.00084	0.023	BDL						
ST182 Sage Creek, downstream of North Fork Sage Creek										0.0033					
ST183 Sage Creek, downstream of Smoky Canyon Mine		BDL	0.00074	0.032	BDL	BDL	*0.0012*	0.026	BDL	BDL					
ST184 Sage Creek Upstream of Smoky Canyon Mine		BDL	BDL	0.019	BDL	BDL	0.00084	0.0074	BDL						
ST185 South Fork Sage Creek Downstream of P Formation Outcrop		BDL	BDL	0.018	BDL	BDL	BDL	BDL	BDL	BDL					
ST228 S Fork Sage Creek at Fish Sampling Reach			N/A	N/A	N/A	0.002	0.001	0.0051	BDL	0.0013					
Ponds															
SP054/MP032 Mine A Pit Pond		**0.064**	BDL	0.018	0.07	**0.097**	*0.0025*	0.0094	0.03		**0.09**	BDL	BDL	0.0033	BDL
TP004/70 Tailings Pond #1 near Roberts Creek	*0.0101-0.0105/0.0101**	*0.018*	*0.0016*	0.043	BDL	*0.017*	*0.0024*	0.047	BDL						
TP005 Tailings pond #2		*0.029*	*0.0046*	0.015	0.03	*0.03*	**0.0083**	0.026	0.055						
Wells															
PW017 SCM Potable Supply Well	N/A	*0.022*	*0.0019*	0.0086	0.087	*0.024*	*0.0045*	BDL	BDL						
PW018 SCM Industrial Supply Well		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A						

[1] Location names and station numbers defined in Montgomery Watson, 1998 and 1999b. (North Fork Sage Creek is not named on USGS maps. Currently there is no defined surface water confluence of Pole Creek with North Fork Sage Creek.)

*Where multiple samples were taken at a location the range of values is provided

Where no data is entered, this indicates no samples were taken at that station as part of the Regional Investigation for that sampling year.

Italicized values are above the cold water biota standard (EPA, 1996) Se 0.005 mg/L, Cd 0.0011 mg/L, Mn N/A, Mo N/A, Zn 0.11 mg/L.

Bold values are above the drinking water standard (EPA, 1996) Se 0.05 mg/L, Cd 0.005 mg/L, Mn N/A, Mo N/A, Zn N/A.

BDL = Below Detection Limit. The Method Detection Limit accepted for selenium in southeast Idaho investigations is 0.001 mg/L. Laboratory Method Detection Limit as set by EPA methods used: Cd .0005 mg/, Mn .005 mg/L, Mo 1.0 mg/L, Zn .02 mg/L

Soil and Vegetation

Surficial soils and vegetation were sampled in July of 1998 at three Smoky Canyon locations: Smoky Canyon Mine A Pit Backfill; Smoky Canyon Mine Waste Overburden Disposal Area A1; and Smoky Canyon Mine Pole Canyon Waste Overburden Disposal Area (Table 2). Five randomly selected 100 square foot quadrates were sampled on each overburden disposal area. The average concentration was 27.03-mg/kg total selenium (dry weight) for soils and 23.39-mg/kg total selenium (dry weight) for vegetation. Background samples were taken at South Fork Sage Creek. The average background concentrations were 1.01 mg/kg selenium (dry weight) and 0.04298-mg/kg selenium (dry weight), for soil and vegetation respectively. There are no promulgated standards for selenium in surface soil or vegetation, however, sample concentrations were elevated relative to background and may indicate impacts from phosphate-mining activities. As a reference, results from this sampling activity for cadmium is also included.

Table 2. Regional Investigation Selenium and Cadmium Soil and Vegetation Sampling at Smoky Canyon Mine by Montgomery Watson, 1998.

	1998 Selenium Concentration mg/kg (dry weight)		1998 Cadmium Concentration mg/kg (dry weight)	
Location	**Soil**	**Vegetation**	**Soil**	**Vegetation**
WD074 SCM A Pit Backfill				
Quadrant 1	8.1	5.5	38	3.2
Quadrant 2	120	24	43	1.1
Quadrant 3	18	2.4	91	3.8
Quadrant 4	56	17	47	2.1
Quadrant 5	8.2	3.7	55	8.4
WD075 SCM Waste Dump A1				
Quadrant 1	12	32	48	1.7
Quadrant 2	28	7.6	41	2
Quadrant 3	25	17	55	2.5
Quadrant 4	11	26	23	1.1
Quadrant 5	4.1	16	19	1
WD076 SCM Pole Canyon Waste Dump				
Quadrant 1	16	3.7	42	1.5
Quadrant 2	8.1	20	36	2.3
Quadrant 3	18	84	35	2.8
Quadrant 4	35	55	44	2
Quadrant 5	38	37	47	2.4
BB003 Background Sample, South Fork Sage Creek Outcrop				
Quadrant 1	0.64	0.14	5.7	0.1
Quadrant 2	0.61	BDL	9.2	0.15
Quadrant 3	1	0.0079	7.5	0.67
Quadrant 4	1.4	0.019	4.7	0.33
Quadrant 5	1.4	0.063	4.7	0.29

BDL = Below Detection Limit. The Method Detection Limit accepted for selenium in southeast Idaho investigations is 0.001 mg/L.

2.3.2 Smoky Canyon Mine Site-Specific Studies

Since the 1998 Regional Investigation sampling conducted by Montgomery Watson, site-specific sampling and studies have been undertaken at SCM as part of the SEIS development for B- and C-Panels. These additional studies were conducted to determine baseline levels and to document conditions prior to mining B&C panels. This work differs from the work to be accomplished under the site-specific AOC/CO. The baseline was not intended to, and did not, investigate previously mined areas. The investigation under the site-specific AOC/CO, now under discussion and referenced in section 2.1.3 above, will delineate impacts and mitigation measures due to *historic* or *past* mining practices.

As part of determining cumulative impacts related to mining in the SEIS, JBR Environmental Consultants, Inc. (JBR), (the third party consultant assisting the Forest Service and BLM in developing the SEIS,) completed a Data Report for Soil and Vegetation Sampling at the Smoky Canyon Mine in 2000. The study involved taking samples in reclaimed areas of A-, D-, and E-Panels and control samples from undisturbed areas near the mined panels. Variables included age of reclamation, type of overburden, and whether topsoil had been placed on top of the overburden during reclamation. Soil samples were analyzed as received (with minimal moisture content).

Total selenium in soil samples taken from the reclaimed locations ranged from 0.5-mg/kg total selenium to 63.6 mg/kg total selenium with an average value of 20.34-mg/kg total selenium. Extractable selenium from those samples ranged from 0.002 mg/kg extractable selenium to 0.23 mg/kg extractable selenium, with an average value of 0.03 mg/kg extractable selenium.

Total selenium in soil samples taken from background locations ranged from <0.2-mg/kg total selenium to 1.1 mg/kg total selenium with an average value of 0.6mg/kg total selenium. Extractable selenium from those samples ranged from 0.002 mg/kg extractable selenium to 0.008 mg/kg extractable selenium with an average value of 0.005 mg/kg extractable selenium.

Total selenium in vegetation samples taken from reclaimed locations ranged from <0.2-mg/kg selenium to 74.0 mg/kg selenium with an average value of 9.34 mg/kg selenium. The average value for the vegetation samples taken from background locations was 0.725-mg/kg selenium. Values reported for vegetation are on a dry weight basis.

In addition to the soil and vegetation study, JBR produced technical reports covering the following subjects; soils; wildlife; vegetation, geology; recreation; cultural resources; transportation; visual resources; watershed analysis; and a water resources report, which included a groundwater age dating study. Results of these studies can be reviewed in the SCM B&C Panel SEIS.

2.4 Selenium Chemistry and Standards

Phosphate ore is found underground between layers of shales. (A more in-depth geologic explanation of the region can be found in the Smoky Canyon Mine, Panels B& C SEIS, 3.1.1.) During the mining process, the phosphate ore is removed together with the overburden shale. The phosphate ore is selectively separated from the overburden shales and other overburden materials for processing. Testing has determined that the middle shale layer contains the highest concentrations of selenium. These overburden materials are placed in out-of-mine pit overburden disposal areas or are used as direct backfill into the pit. Historic mining operations often co-mingled the middle shales with the rest of overburden material in the overburden disposal areas (Montgomery Watson, 1999a).

2.4.1 Environmental Chemistry of Selenium

Selenium is present in overburden and becomes soluble when mined middle waste shale is exposed to the atmosphere and oxidation proceeds. When the middle shales are exposed to air and water, selenium is oxidized into more soluble forms that are increasingly mobile in the environment. As selenium minerals and compounds oxidize selenium forms the oxyanions, selenite and selenate. Selenite has an oxidation state of +4 and selenate has an oxidation state of +6. Selenate has greater solubility, increased bioavailability and is more difficult to treat.

While not demonstrated in long-term or full-scale studies, initial speciation studies indicate most of the selenium in the leachable (weathered) portions of the Pole Creek overburden disposal area at SCM is in the form of selenite, which rapidly increases oxidation state to selenate once it exits the overburden disposal area. Once selenium oxyanions are leached from the parent rock/soil, they can be absorbed into vegetation, transported through erosion of sediments, or carried into surface waters (Möller, G., 1998).

Soils found overlying undisturbed outcrops of the Phosphoria Formation are known to have total selenium values greater than other geological formations found in southeast Idaho. In general, elevated levels of selenium are associated with the following environmental media at phosphate operations in southeast Idaho (Montgomery Watson, 1999a):

- Ponds located in mine pits, which are constructed on or of overburden, or that receive runoff from overburden
- Water that flows through French drains associated with run-of-mine overburden disposal areas
- Seeps, springs, and shallow groundwater near seleniferous overburden disposal areas that are influenced by infiltration or surface water runoff
- Vegetation growing on seleniferous overburden disposal areas or downgradient from seleniferous overburden disposal areas (i.e., transported by water flowing from these areas)
- Surface water runoff from seleniferous overburden disposal areas, held in sediment retention ponds, and soluble selenium discharged off site from pond overflows should it occur
- Sediment eroded from seleniferous overburden disposal areas and transported by runoff

Theoretically, the formation of selenium oxyanions and their subsequent leaching (as well as parallel processes with respect to other contaminants of concern) can be controlled by producing a reducing environment. Alternately, selenium oxyanions that have already been produced may be controlled through chemical binding (e.g. use of chelating agents) (Möller, G., 1998). Further investigation is needed to test the effectiveness of these methods on a large scale. In addition, by fostering this reducing environment, it is anticipated that release of other potential contaminants of concern can be diminished.

2.4.2 Selenium Standards

Officially promulgated standards applicable to selenium in surface water include the EPA maximum contaminant level (MCL) of 0.05 mg/L total recoverable selenium for drinking water and the ambient water-quality criterion (AWQC) of 0.005 mg/L total recoverable selenium for surface water. The MCL represents the EPA Safe Drinking Water Act level and is the maximum permissible level of a contaminant in water supplied to any user of a public water system, whether supply is from ground or surface water. The State of Idaho applies this same numerical standard to all groundwaters of the State through their promulgation and adoption of the Ground Water Quality Rule (Idaho Administrative Procedures Act (IDAPA) 58.01.11).

The AWQC has been adopted by the State of Idaho as the freshwater aquatic life standard for chronic exposure for protection of aquatic biota. Additional surface water screening criteria for protection of aquatic biota are also available from various other sources (Table 3).

Table 3. Water Quality Criteria for Protection of Aquatic Life.

Selenium Concentration (mg/L)	Source
0.005	AWQC, CWA Criteria Continuous Concentration, chronic toxicity level, 40 CFR 131.36 (EPA. 1986. Quality Criteria for Water. Washington, D.C. U.S. Environmental Protection Agency. Office of Water Regulations and Standards).
0.0883	EPA Lowest Chronic Value (i.e., lowest freshwater chronic toxicity value reported for a chemical) (EPA. 1986. Quality Criteria for Water. Washington, D.C. U.S. Environmental Protection Agency. Office of Water Regulations and Standards).
0.020	EPA Criterion Maximum Concentrations, acute toxicity level, 40 CFR 131.36 (b)(1) (EPA. 1996). Proposed Selenium Criterion Maximum Concentration for the Water Quality Guidance for the Great Lakes System. Proposed Rule, 40 CFR Part 132. Washington, D.C. U.S. Environmental Protection Agency). This has been adopted by the State of Idaho per IDAPA 58.01.02.210.01, for protection of freshwater aquatic life.

Federal or State regulatory agencies have not developed standards for selenium in media other than water (e.g., soil, vegetation). The determination of such levels is a complex exercise that is dependent on many variables, such as the form (e.g., selenite, selenate) of selenium present, its availability (e.g., depth in the soil column, redox conditions, pH, clay and organic content) to potential receptors, its uptake by plants, the bioaccumulation factor for the specific species, etc.

3. MEDIA-SPECIFIC ISSUES

The following sections identify some of the agencies, participating in the MOU, with authority in specific media that may serve as support agencies for the site-specific investigations.

3.1 Surface Water

Elevated levels of selenium have been detected in surface water at Smoky Canyon Mine site. Surface water sampling will take place as part of the site-specific investigation in addition to being ongoing as a part of the water quality monitoring program. Anticipated areas of

focused investigation are expected to include Pole Creek through the cross-valley fill in Pole Canyon, and several overburden seeps at D and E panels. Simplot will work with the Forest Service, along with IDEQ, BLM, and other support agencies, to investigate and mitigate selenium or other contaminant releases to surface water as necessary.

3.2 Groundwater

Elevated selenium levels have been detected in groundwater at Smoky Canyon Mine site. Groundwater sampling and investigation are ongoing to determine the sources of these elevated levels of selenium. Under the jurisdiction of IDEQ, sampling of existing wells will continue, and new monitoring wells will be installed to aid in characterizing up- and down-gradient conditions. This information will aid Simplot and IDEQ in analyzing the sources of contamination, and In choosing effective remediation. In addition, Simplot currently is working with IDEQ on a consent order to assure compliance with the Idaho Groundwater Quality Rule for the future mining of B&C panels

3.3 Soil and Vegetation

Selenium in vegetation on overburden fills reclaimed under the direction of the Forest Service at SCM is elevated relative to background species levels. A number of vegetation studies already conducted under the area wide investigation have shown undisturbed existing soils at the mine sites to not contribute to elevated selenium in certain vegetation. Vegetation established in mid-shales has shown elevated selenium levels and risks associated with it will be identified in the Area Wide Risk Assessment expected to be released shortly. The Dry Valley ROD states that selenium in forage vegetation in the range of 5 to 15 mg/kg should not result in adverse effects when eaten on a long term basis (JBR, 2000 and BLM, 2000b). Reclamation and grazing criteria guidelines are goals of the area-wide and site-specific investigations and will be applied appropriately. Simplot will work with the Forest Service, and other agencies to develop appropriate remedies to mitigate potential impacts of elevated selenium levels in vegetation on reclaimed dumps.

3.4 Tailings Ponds

The SCM operations include two tailings ponds located approximately 3.2 miles northeast of the mill area. These ponds are categorized as a private industrial water storage facility in addition to providing disposal for mill tailings. As a result of the water's contact with the ore during the milling process, selenium has also been observed in the tailings pond water above the cold-water biota standard, but well below the drinking water standard. Since these ponds are on private land and the water is held for industrial reuse, water quality standards are not applicable for normal operations. Nevertheless, if a release were to occur during operation the IDEQ has authority to address the release.

The ponds are currently operated in compliance with a CWA Section 404 permit issued by the U.S. Army Corps of Engineers (ACOE). Issuance of the permit was made following comments, site visits, and consultation by the EPA, USFWS, Idaho Department of Lands (IDL), Idaho Department of Water Resources (IDWR), IDEQ and other interested parties. Mitigation and monitoring requirements were established and have been incorporated as required. A Conservation Easement was also issued by Caribou County with the purpose of yielding in perpetuity a significant public benefit by protecting the property from grazing.

In accordance with the ACOE 404 permit, Simplot currently monitors the tailings pond water, groundwater discharges at a toe drain sump located at the base of Tailings Pond #2 dam, and Tygee Creek. To date no release of selenium has been detected to groundwater or

surface water from the tailings pond facility. Three additional monitoring wells of varying depths were also installed to confirm in 2000 the integrity of the tailings pond facility to support the SEIS baseline studies. Again no release of tailings pond waters was detected.

Golder Associates Inc. prepared an "Abandonment Plan For Smoky Canyon Mine Tailings Pond #2" (June 1992) as part of the permitting process required by the IDWR. Closure under this plan includes the design of spillway control to accommodate a 100-year flood and minimize erosion. Tailings surfaces are required to be capped with topsoil and revegetated. After implementation of the closure design requirements, the spillway and discharge channel must be maintained, erosion channels must be inspected and repaired, periodic monitoring for seepage will be performed, and annual inspections will be conducted for dam movement.

However, Simplot recognizes that this abandonment plan was developed and approved prior to the discovery of the selenium issue. As a result, Simplot is committed to revisiting this plan based upon the data gathered during the SI and EE/CA process. The Idaho Department of Lands has specific authorities that pertain to the operation and reclamation of the tailings impoundment. As a result, Simplot has notified IDL and will work with the agency to modify this abandonment plan. At this point, it is premature to speculate concerning any specific changes concerning reclamation of the tailings impoundment. It is anticipated that the additional studies done at the tailings ponds through the SI and EE/CA process will help delineate the appropriate actions for protection of wildlife and the environment.

Based upon the biological assessment conducted for the DSEIS, current utilization of the tailings impoundment by threatened and endangered species does not pose a significant risk. The Biological Assessment prepared for the DSEIS for B & C panels documents that no listed endangered or candidate species use the tailings pond on a regular basis (Biological Assessment, JBR Consultants, March 2001).

4. SITE-SPECIFIC RESEARCH AND ACTIONS

The following presents existing information that will be considered during the SI/EECA process. As noted below, one of the goals of the EECA will be to evaluate the potential of small-scale research to a full-scale application.

In August 1997, the University of Idaho (U of I) and Simplot began a collaboration to address selenium releases from the SCM. Dr. Greg Möller from the U of I has been the lead for research on the characterization and abatement of selenium releases at Smoky Canyon. Preliminary characterization studies have been conducted on overburden, soil, and water samples from the Pole Creek area near the mine (Figure 5). Several studies were done using different soil amendments with the overall goal of reducing the amount of selenium potentially discharged from the mining overburden, as well as reducing amounts of other elements that may be discharged.

Several potentially useful and promising treatment methods have been identified, including use of organic amendments, co-precipitation, chemical reduction, adsorption, microbial reduction, and a combination of these methods. These methods were chosen based on the scale of the problem, cost-effectiveness, and the reliability of the control method. Initial laboratory studies have been conducted, followed by field tests and monitoring.

It is important to note the information presented in the following sections (4.1 and 4.2) is based on research that has not been reviewed by regulatory agencies. While the methods appear to reduce selenium concentrations based on preliminary data, the effectiveness and success of the treatment methods are yet to be demonstrated in large-scale, long-term field

studies. Any future work in this area not already approved at SCM will be subject to the conditions negotiated with the lead and support agencies for the site-specific AOC.

4.1 Treatment of Selenium in Soils

For soil, organic amendments such as potato waste, potato starch, and ferric thermal poly-aspartate have been found to stimulate natural, microbial activity, which may significantly reduce the amount of selenium available to be leached from soil. In laboratory tests, several soil amendments demonstrated the ability to decrease amounts of selenium in soil pore water, after both two and four week trials. The potato waste treatment performed best of any method tested, both in terms of time required and effectiveness. Iron was the second best amendment (Möller, G., 1998).

Treatment of selenium in the field has proven challenging because of the large scale associated with mining operations. Batch reactor studies were undertaken on the Pole Canyon overburden disposal area to evaluate if selected amendments that demonstrated potential in the laboratory were effective in the field (Möller, G., 2000b). A layer of iron metal granules combined with soil modified with potato processing waste enhanced control of selenium mobilization from snow melt and precipitation infiltration into the overburden disposal area. The data demonstrate that this type of barrier may potentially be effective at limiting subsurface selenium mobilization through the acceleration of chemical and microbial selenium stabilization processes (Möller, G., 2000b).

Future research at the Pole Canyon site will involve analyses of microbial populations to determine the role and identity of sulfur/selenium reducing bacteria (SRB). The analyses will include estimations of total bacterial abundance, including SRBs specifically, and a determination of the optimal growth parameters for selenium immobilization. A determination of the genera and/or species of bacteria that are native to the mining sediments and soils will also be completed. This knowledge will help in the formulation of nutrient amendments or condition alterations that may accelerate growth and activity.

4.2 Treatment of Selenium in Water

Past research indicates the most widely used technology for the removal of selenium from water has been chemical co-precipitation, which helps to create a stable precipitate. For example, the addition of a reducing zero-valent metal like iron has proven effective at removing selenium from water. Pond #10 in D-Panel (DP-10) was observed to have high levels of selenium, and was dosed by U of I in 2000 with colloidal iron to improve the selenium reducing capability of sediment in a standing surface water application. Samples of water and sediment will be taken to determine speciation, providing data on selenium cycling within the system in response to amendment dosing. Initial results show that iron added in late August lowered the selenium by approximately 60 percent (Möller, G., 2000c).

During the summer of 2000, additional field tests were initiated. An infiltration trench was installed at the Pole Canyon overburden disposal area. The 7-foot deep trench was constructed on the existing bench just above the emergence of lower Pole Creek from the French drain and follows the contours along the toe of the overburden disposal area. Cheese whey was applied to the trench to theoretically saturate the overburden to the level of the French drain thereby potentially creating a permeable biological treatment zone near the toe of the overburden disposal area. Fine granular iron may also be applied to the infiltration trench. Preliminary results show cheese whey treatment applied in August appeared to reduce the selenium concentration from the range of 290-900 µg/l selenate, measured earlier in the

summer, to about 50 µg/l selenite (Möller, G., 2000c). Monitoring will continue to be conducted by U of I, IDEQ, and Simplot at the emergence of lower Pole Creek.

Elevated levels of selenium were also observed at the seep associated with Pond #7 in D-Panel (DP-7) in early 2000. The U of I proposed to use this site to test the feasibility of a pilot scale *in situ* bioreactor "subsurface wetland" to minimize selenium leaching. The study will test the hypothesis that anaerobic conditions inside the bioreactor will allow microbial reduction of selenate to elemental selenium. The project will involve filling two tanks with a high surface area, biological growth support, packing material and dosed with granular iron and cheese whey. The bioreactor design will allow for sampling and additional dosing, primarily with fermented cheese whey. Selenium speciation data will be compared for the inlet and the outlet to determine the rates of selenium reduction and removal. This pilot test may help determine if the concept could be used effectively on a larger scale such as Pole Canyon. As stated previously, the long-term effectiveness or maintenance requirements of selenium control treatments are unknown at this time.

4.3 Additional Research

The USGS is conducting research in the mining area including the SCM. The USGS is working to establish background/baseline geologic, geochemical, and geophysical data for the area, including active and abandoned mines, reclaimed areas, unmined deposits, and areas without phosphate deposits. Their research involves the behavior and residence of selenium and other trace elements, including but not limited to mobilization, transport, fate, and impact.

The Forest Service is also conducting studies at the Rocky Mountain Research Station. These include: a potted plant study to determine degree of uptake by species grown in shale from one of the mines; a wetland attenuation study at Angus Creek; and a study to determine the relationship between soil and vegetation in terms of total versus extractable selenium. All information from these studies will be shared with the agencies and companies involved and incorporated by Simplot as applicable.

Dr. Ratti, avian ecologist from the University of Idaho, is conducting a study addressing selenium concentrations in bird eggs within the Southeast Idaho Phosphate Region. Dr. Hardy from the Hagerman Research Station is conducting a study on cutthroat trout to establish tolerance and mortality due to selenium ingestion.

Lastly, the U.S. Department of Health and Human Services, Agency for Toxic Substances and Disease Registry as part of a cooperative agreement with the Idaho Department of Health and Welfare, Division of Health Bureau of Environmental Health and Safety, conducted two health consultations. One health consultation addressed potential health risks from drinking or using groundwater in the Southeast Idaho phosphate resource area. The other health consultation analyzed risks associated with consumption of beef, elk, sheep and fish from the phosphate resource area. These health consultations indicated that there is no apparent public health hazard from drinking and/or using groundwater in this region. (ATSDR, June 2001) In addition, there is no conclusive evidence that consumption of beef, elk, sheep or fish from this region represents significant health risks; however, additional studies were recommended to further evaluate potential health effects. (ATSDR, June 2001)

5. NEW BMP'S

The Working Group developed a suite of site-specific BMPs. These BMPs have been compiled in a series of manuals to identify the potential measures for application at current, future, and historic mines for mitigating and preventing selenium releases (Existing BMPs at

Operating Mines, March 2000, and BMP Guidance Manual for Active and Future Phosphate Mines, November 2000). Several categories of BMPs have been identified, many of which are general to mining while others are selenium-specific. Many historical BMPs intended to manage sediment may have a positive effect on reducing selenium releases at the source even though they were not specifically designed to do so (Montgomery Watson, 1999a).

In addition to the passive treatment methods Simplot is testing in conjunction with U of I (Section 5), additional BMPs are being implemented at SCM that may reduce the potential for selenium releases. For example, caps for new overburden piles are being constructed with components of the overburden, such as chert, that are not high in selenium. Middle shales are now segregated and buried under a cap of chert, which should isolate them from the surface environment. The backfilling of middle shales into mine pits also reduces the need for external overburden disposal areas. In addition to reducing the potential for selenium in surface runoff, studies conducted for the SEIS have shown these practices will enhance revegetation and reduce the amount of selenium available for uptake by vegetation. Simplot proposes to cover all new areas of seleniferous overburden with at least 8 feet of chert and 1-3 feet of topsoil on top of the chert. The chert cap is resistant to weathering and erosion and will provide a separation of the vegetation roots from the seleniferous overburden thereby reducing the potential for uptake of selenium by vegetation. Simplot is also implementing BMPs to restrict wildlife and livestock grazing of reclamation vegetation. While the effectiveness of these practices is not fully established, they may prove to be successful in reducing selenium releases in the future.

Simplot is required by law to maintain National Pollution Discharge Elimination System (NPDES) General Industrial and Construction Storm Water permits administered by Region X EPA. Simplot has enhanced the storm water management system at Smoky Canyon as reflected in the SCM Storm Water Pollution Prevention Plan (SWPPP). Simplot believes that BMPs implemented to manage storm water may reduce the risk of any discharges of selenium and other potential contaminants to surface waters. Structural and non-structural controls are being used at Smoky Canyon to minimize storm water contact with potential pollutants and to prevent storm water from reaching surface water. The plan includes BMPs specified in the mine plan approvals such as settling ponds, culverts, ditches and sediment traps to minimize possible impacts from runoff and sediment releases. Storm water collection ponds at SMC are designed to contain a 100-year storm event and not overflow. Region X EPA officials, to ensure compliance with all applicable regulations, inspect the SWPPP and storm water pollution prevention measures in place at SCM regularly.

A secondary purpose of the SWPPP is to protect groundwater from impacts related to storm water. Based on evidence gathered as part of the SEIS, it appears that groundwater impacts will result primarily from historic overburden disposal areas. Simplot believes that minimizing the contact of water (storm water or surface water) to historic overburden disposal areas will reduce the opportunity for selenium to become mobilized, decreasing the likelihood that it will migrate into surface water or groundwater. Implementation of the BMPs listed in the SWPPP for control of storm water may help minimize storm water runon/runoff, and subsequently protect groundwater. Storm water settling ponds have been constructed at the SCM to minimize the impacts of any discharges. Additional practices include vegetative buffer strips, prevention of runoff flowing across disturbed areas, stabilization of disturbed soils as quickly as possible, and reseeding with appropriately selected vegetation (Simplot, 2000). Some of these BMPs have already demonstrated their effectiveness in the field.

6. CONCLUSION

Elevated selenium levels have been observed in several media at SCM. Activities are now being undertaken to address the impacts manifested from past mining; these efforts are separate from the SEIS effort to prospectively address future impacts from mining at Panels B and C. Information developed from both efforts, however, will insure the benefit of each

There are agencies with regulatory authority and jurisdiction over each type of environmental media presenting a concern at SCM. Under the MOU and the AWAOC, the Forest Service has been identified as the coordinating lead agency for the SCM site-specific investigation. Simplot currently is negotiating with the Forest Service and the State of Idaho to enter into an AOC/CO specific to the Smoky Canyon Mine that will provide for a Site Investigation and Engineering Evaluation/Cost Analysis.

The statement of work and workplans under this AOC/CO are now being developed. An EE/CA will be developed and implemented for past mine disturbances in cooperation with the Forest Service, IDEQ, and other agencies on the site-specific AOC track, which is separate from the SEIS track. These tracks eventually may at least partially converge, because the baseline studies and technical reports already developed in conjunction with the SEIS process, as well as information gained from the SI and other investigations, will be used for the EE/CA and also for any revisions to the tailings pond closure plan with IDL.

In addition to conducting sampling (which will be expanded based upon additional monitoring required by the SEIS and under the site-specific SOW) and implementing BMPs, Simplot will continue to be proactive in fostering the research of selenium control technologies. The use of organic reduction zones, such as the use of iron enriched materials on inflow/outflow streams and in high selenium soils, to minimize conversion of selenium to selenate and to facilitate conversion of selenate to less soluble species, has proven effective in preliminary tests. Laboratory research and additional field projects will continue to test their effectiveness in long-term, large-scale applications. Simplot believes the knowledge gained will be vital to long-term selenium control.

Through the development of this document, Simplot is demonstrating its commitment to fully cooperate in the AOC-guided site-specific investigation and remediation of existing impacts related to selenium and other contaminants released from the SCM site as a result of past mining activities. Simplot will work to develop appropriate mitigation measures in cooperation with the Forest Service, the State of Idaho, and the support agencies to protect human health and the environment.

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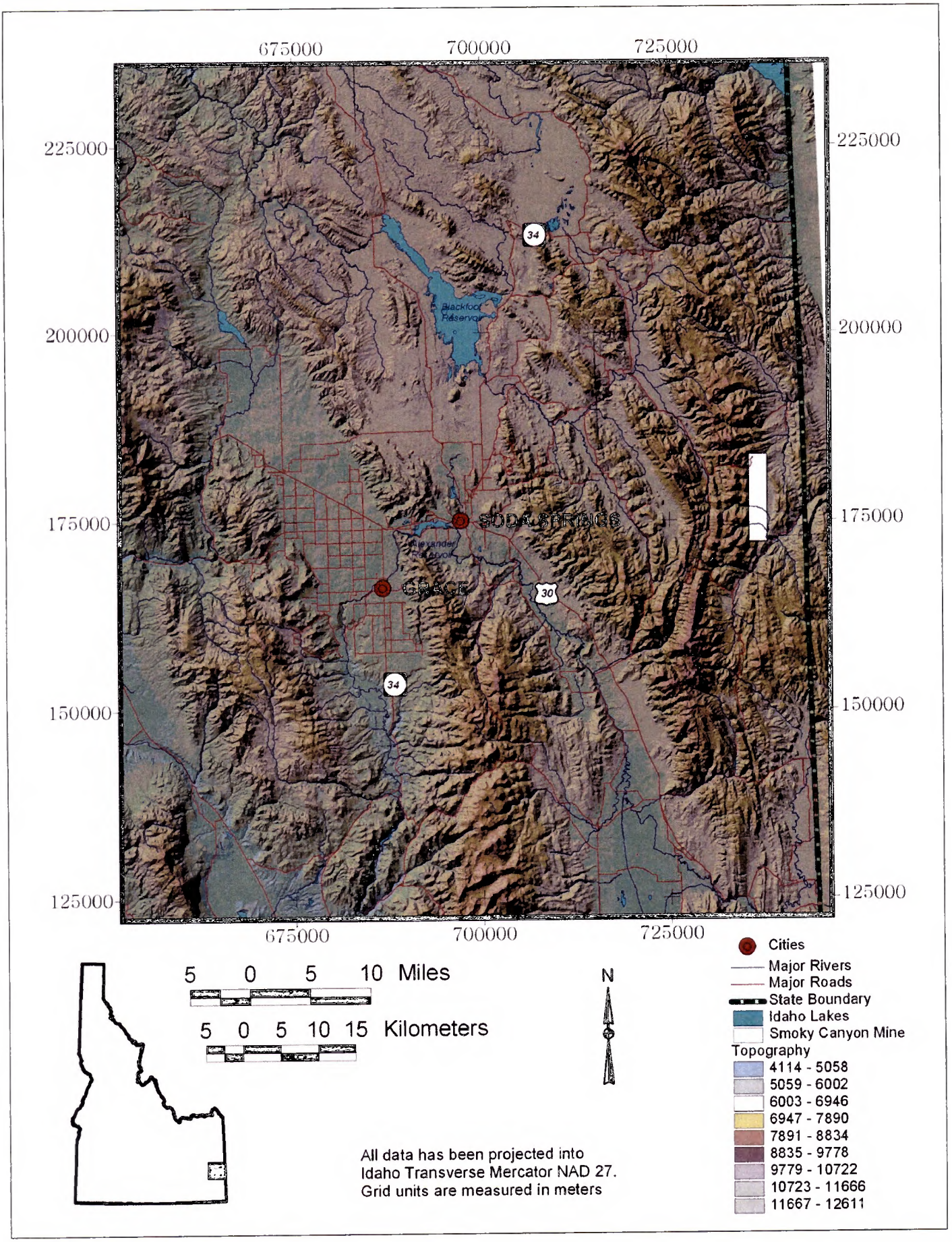


FIGURE 1. LOCATION OF SMOKY CANYON MINE

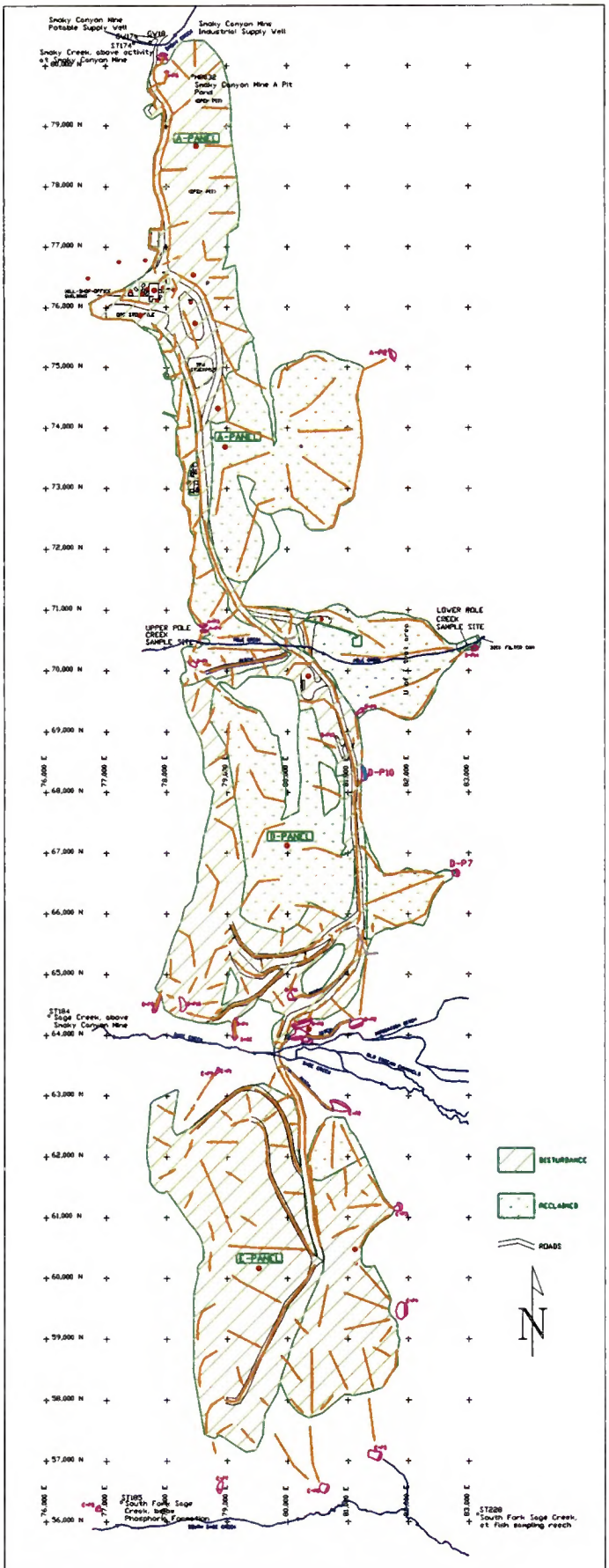
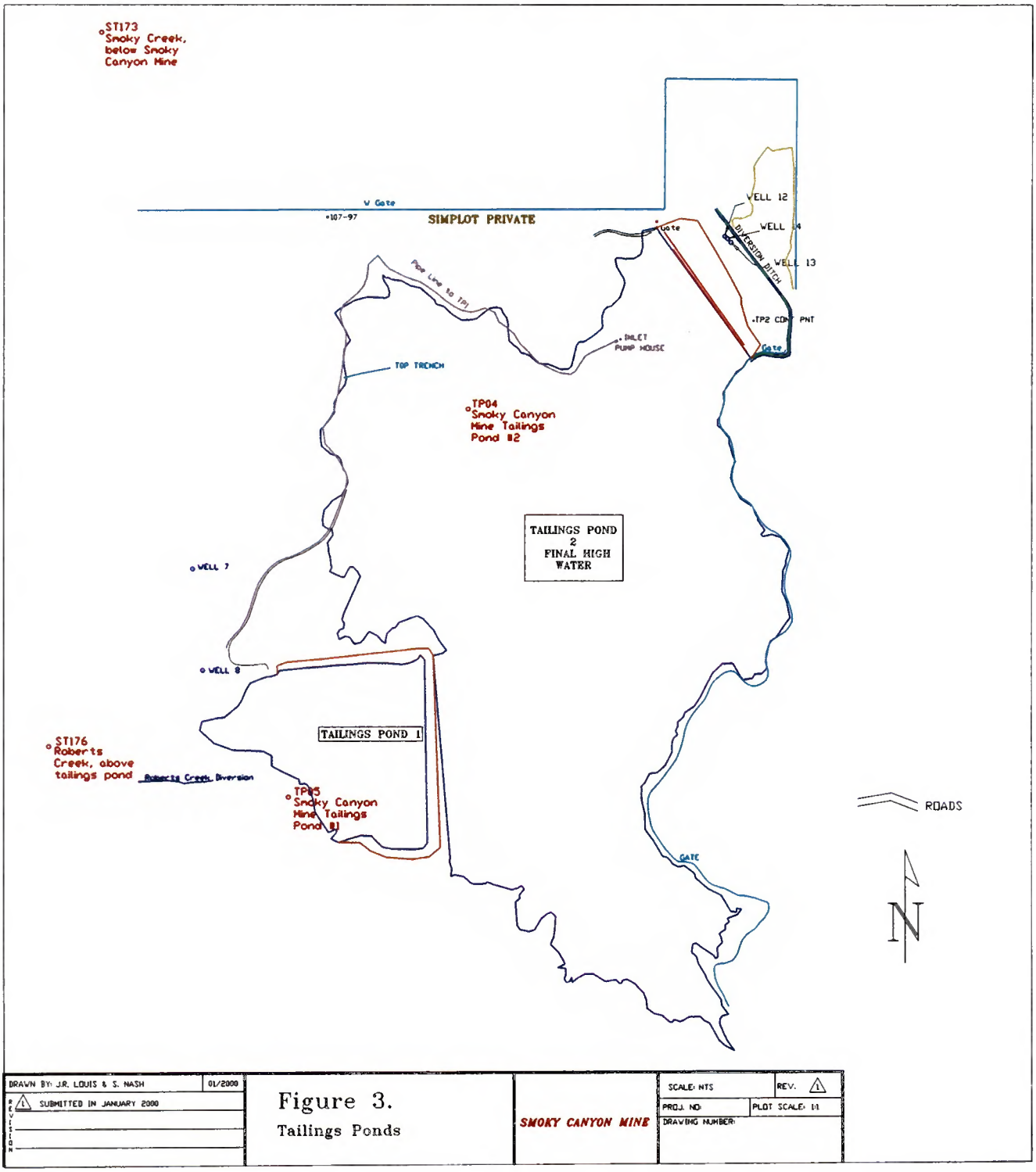
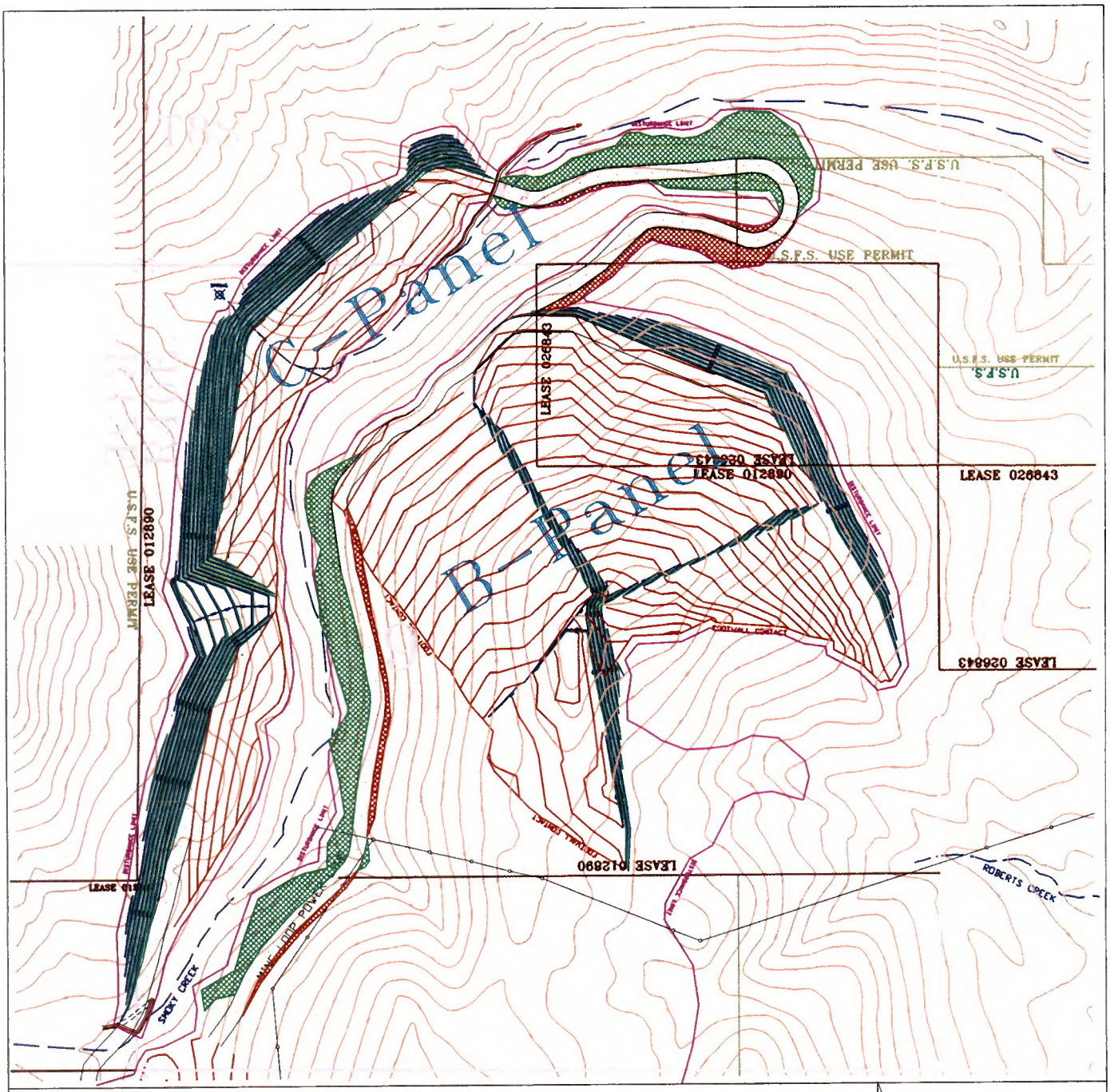


Figure 2.
Panels A, D, E, historic & current mine panels



DRAWN BY: J.R. LOUIS & S. NASH 01/2000 1 SUBMITTED IN JANUARY 2000	Figure 3. Tailings Ponds	SMOKY CANYON MINE	SCALE: NTS REV. 1 PROJ. NO: PLOT SCALE: 1:1 DRAWING NUMBER:	



LEGEND

B&C PANELS

SMOKY CANYON MINE
1927 NORTH AMERICAN DATUM
IDAHO EAST
PORTIONS OF T.8S., R.45E., SEC. 13, 24, 25 & 36
AND T.8.S, R.46E., SEC. 17, 18, 19, 20, 29, 30 & 31

- FOOTWALL
- LEASE BOUNDARY
- USFS BOUNDARY
- HAUL ROADS
- 50 FOOT CONTOUR INTERVAL
- BENCH TOE
- BENCH CREST
- DISTURBANCE LIMIT
- CUT
- FILL

N

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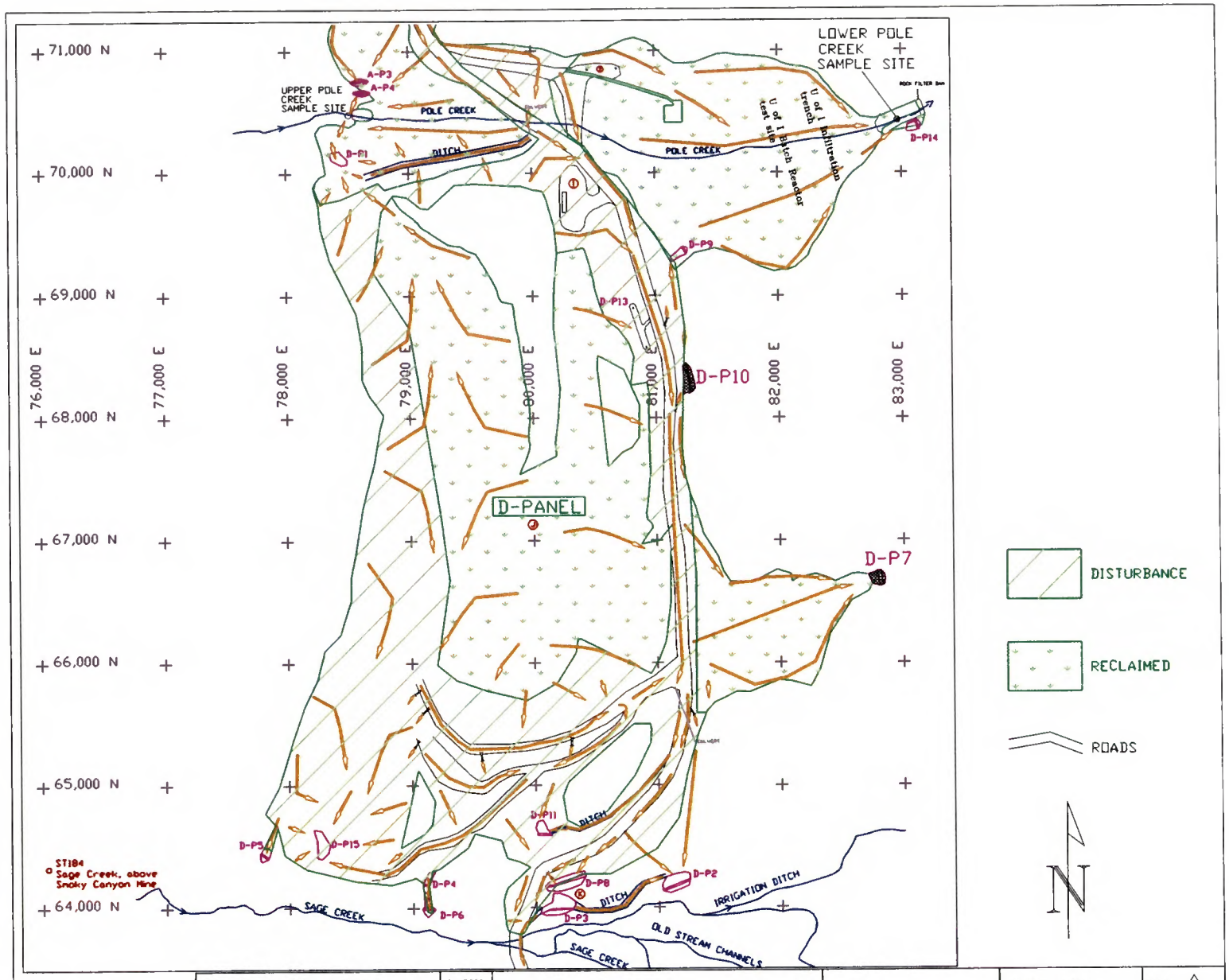
REVISIONS: 1 5-23-2001		Figure 4. Panels B & C; proposed mine panels	PROJ. NO: PLOT SCALE: 1:1
		SMOKY CANYON MINE	DRAWING NUMBER: 2000-PS-201



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REVISION 1 SUBMITTED IN JANUARY 2000		PROJ. NO:	PLOT SCALE: 1:1
		DRAWING NUMBER:	

Figure 5.
Panel D; locations of U of I research sites

SMOKY CANYON MINE

Appendix 2E

Environmental Monitoring Plan

Smoky Canyon Mine Panels B and C Environmental Monitoring Plan

1.0 Executive Summary

The Smoky Canyon Mine is a surface phosphate mine located in Caribou County, Idaho approximately 10 air miles west of Afton, Wyoming. The J.R. Simplot Company (Simplot) has been operating the mine since 1984. Monitoring of various environmental media in and around the Smoky Canyon Mine is, and will continue to be, an important component of mining activities. Future environmental monitoring will include three programs with different requirements or data collection needs, as follows: (1) ongoing environmental monitoring associated with existing mine plan and permits, (2) a planned Site Investigation performed by Simplot pursuant to a site-specific Administrative Order on Consent for the Smoky Canyon Mine and (3) monitoring associated with the Record of Decision for mining operations at Panels B and C that will also address compliance with the Idaho Ground Water Quality Rule.

The purpose of this document is to address the specific issues that were identified in the Supplemental Environmental Impact Statement (SEIS) for Panels B and C monitoring. This plan presents the Panels B and C monitoring objectives and preliminary approaches that will be used to meet those objectives. The document also summarizes other environmental monitoring programs currently being implemented by Simplot. The information provided herein will be used together with existing monitoring plans, the work plans prepared for the Site Investigation (SI) and Engineering Evaluation/Cost Analysis (EECA), the closure plan for Panels B and C and a water quality monitoring plan developed to demonstrate compliance with Idaho regulations to implement a comprehensive monitoring program for Panels B and C.

Simplot proposes to mine phosphate ore reserves in Panels B and C, and to use existing facilities to concentrate the ore, as part of continuing phased mining of the Smoky Canyon Mine as authorized by the Department of Interior in 1983. The proposed mining operations would consist of two open pits - Panels B and C, topsoil stockpiles, mine equipment parking areas, access and haul roads, a power line extension, an external overburden disposal area, pit backfills, and runoff/sediment control facilities. Overburden from the pits would be placed as backfill in the new open pits and the remaining portions of the Panel A pit that have not yet been reclaimed.

As a component of the existing mine operations, Simplot implements a number of monitoring programs to track environmental conditions at the site and meet various requirements associated with the permitted operations and related facilities. The existing monitoring program elements include: the surface water, aquatic habitat, species diversity, and monitoring associated with the original mine plan; storm water and drinking water monitoring; and various reclamation monitoring tasks to track soil-erosion and evaluate re-vegetation success.

The Panels B and C SEIS identified monitoring needs associated with long-term evaluation of Water Resources (Surface Water and Groundwater), Best Management Practices, Soils and Vegetation Selenium Levels, Wetlands Mitigation, Wildlife and Paleontological Resources and Cultural Sites. The monitoring approaches provided in this document will provide the data to address these needs when used along with data collected through the other monitoring programs implemented at this site.

2.0 Introduction

The Smoky Canyon Mine is a surface phosphate mine located in Caribou County, Idaho approximately 10 air miles west of Afton, Wyoming. The J.R. Simplot Company (Simplot) has been operating the mine since 1984. The existing operations are conducted in accordance with the 1982 Smoky Canyon Mine and Reclamation Plan approved by the U.S. Forest Service (USFS) and the Bureau of Land Management (BLM). USFS and BLM are currently evaluating Simplot's proposed development of the Panels B and C areas. Even though mining at Panels B and C is included in the original mine plan, the availability of new information since 1982 warranted preparation of a Supplemental Environmental Impact Statement (SEIS) to further evaluate the potential for environmental impacts related to the development of Panels B and C.

Monitoring of various environmental media in and around the Smoky Canyon phosphate mine is, and will continue to be, an important component of mining activities. Three different future data collection programs, each conducted to address different data needs, will include environmental monitoring elements, as follows:

1. Environmental monitoring programs are currently implemented to meet the requirements of the existing mine plan and associated permits for active operations. The ongoing environmental monitoring programs associated with existing operations at the Smoky Canyon Mine are described in this document to identify the types of data that are and will continue to be available for the mine site.

2. A Site Investigation (SI) and Engineering Evaluation/Cost Analysis (EECA) will be conducted in accordance with an Administrative Order on Consent (AOC) between Simplot and multiple state, tribal and federal agencies to evaluate environmental conditions resulting from historical mining operations. The Statement of Work (SOW) for the SI and EECA is currently being developed; it will focus the investigation on the areas of historic operations, and will also include long-term monitoring of conditions in and around the Smoky Canyon Mine.

3. A monitoring program will be developed for Panels B and C operations to address the monitoring requirements associated with these operations and the additional data needs identified through development of the SEIS, including the provisions for monitoring to address the Idaho Ground Water Quality Rule. A Consent Order agreement between Simplot and the Idaho Department of Environmental Quality is being developed to specifically address the groundwater monitoring needs associated with Panels B and C, and a water quality monitoring plan is being prepared in conjunction with that Consent Order. That plan will identify the monitoring tasks that will be used to demonstrate compliance with Idaho's Ground Water Quality Rule, including the specific monitoring locations, sample analyses and data analysis procedures. The Consent Order will also define the water quality conditions that require certain responses by Simplot and will document Simplot's commitment to implement those responses.

Given the various monitoring objectives and programs planned for the Smoky Canyon Mine, there is a need for a comprehensive plan that identifies all of the monitoring elements, allows for redundancies or data gaps to be identified and eliminated and provides consistent data collection procedures for use site wide. Such a plan cannot be developed at this time, however, because the monitoring elements associated with the SI and EECA and the final monitoring plan for the IDEQ Consent Order have not been fully scoped and the details of the closure plan for Panels B and C have not been finalized.

Therefore, the purpose of this document is to address the specific issues that were identified in the SEIS for Panels B and C monitoring. This plan presents the Panels B and C monitoring objectives and preliminary approaches that will be used to meet those objectives. This document also summarizes other environmental monitoring programs currently being implemented by Simplot. The information provided herein will be used together with existing monitoring plans, the work plans prepared for the SI and EECA,

the closure plan for Panels B and C and a water quality monitoring plan developed to demonstrate compliance with Idaho regulations to implement a comprehensive monitoring program for Panels B and C.

This document is organized as follows. Section 3.0 provides a summary of the existing and proposed mine operations. The existing monitoring programs are described in Section 4.0. The remaining monitoring needs and proposed new monitoring objectives and approaches associated with Panels B and C are detailed in Section 5.0. Section 5.0 also includes preliminary designs for the new monitoring elements, but these are subject to change for consistency with the final monitoring plans presented in the IDEQ Consent Order and closure plan for Panels B and C. The documentation procedures and reporting schedules for future monitoring data are presented in Section 6.0.

3.0 Summary of Mine Operations

The following section briefly summarizes the existing mine operations and describes the general plans proposed for mining at Panels B and C, to the extent that those plans are known at this time. Additional details regarding both existing and proposed mining operations are included in the Final SEIS.

3.1 Existing Mine Operations

The existing mine facilities include an access road, office/shop complex, mill, ore stockpile, open pits, backfilled pits, external overburden disposal sites, tailings ponds, power line, tailings pipeline, concentrate slurry pipeline, and ancillary facilities such as runoff control systems, field storage yards, and "Hot Start" (mine equipment fueling, fuel storage, and parking) areas. Most of these facilities, with the notable exception of the tailings ponds, are contained within 2,600 acres of federal phosphate mineral leases administered by the Pocatello Field Office of the BLM. The federal land surface is administered by the Caribou-Targhee National Forest, Soda Springs Ranger District. The tailings ponds are located on 1,680 acres of private land owned by Simplot.

Mining operations must comply with detailed mining and reclamation plans that have been approved by the USFS and BLM. These plans are typically submitted, approved, and implemented in a phased manner. Current operations at the mine include drilling, blasting, loading, and hauling of ore and overburden using a shovel and truck fleet. The sequential mining of pits along the strike length of the deposit facilitates backfilling open pits with overburden from subsequent pits. Some overburden is placed in external overburden disposal sites outside of the open pits. As of the summer of 2000, the total disturbed area of the existing operations at the Smoky Canyon Mine was 1,345 acres, of which 496 acres have been reclaimed.

The mine is operated 24-hours per day throughout the year. To expose the phosphate ore, hard overburden (chert or limestone) is blasted with explosives and softer overburden (shale) is blasted or ripped with dozers. Ore and overburden are loaded into haul trucks and delivered either to the mill ore stockpile, external overburden disposal areas, or previously mined pits as backfill.

Ore is ground and made into a slurry, then beneficiated to separate the material with the highest phosphate content (ore concentrate) from the low-grade material (tailings). The ore concentrate slurry is piped off-site. The tailings slurry passes through a tailings thickener before entering the tailings line and being piped to the tailings ponds. By design, there is no discharge of tailings solids or water from the tailings ponds. Reclaimed water from the tailings ponds is recycled to the mill for reuse.

Some of the shale overburden contains elevated concentrations of selenium, and recently implemented Best Management Practices (BMPs), including selective handling and capping, are currently being used to reduce environmental impacts due to exposure of this material. Older mine operations did not include

all of these BMPs with the result that seleniferous shale overburden is exposed at or near the surface of some reclaimed areas. This exposes the selenium in the material to weathering and wind or water erosion at the surface.

Road construction and maintenance, timber and other vegetation removal, surface runoff management, topsoil stripping, and reclamation activities are among the related ancillary activities currently occurring at the Smoky Canyon Mine.

3.2 Proposed Panels B and C Mining Operations

Simplot proposes to mine phosphate ore reserves in Panels B and C, and to use existing facilities to concentrate the ore, as part of continuing phased mining of the Smoky Canyon Mine as authorized by the USFS in 1983. The proposed mining operations would consist of two open pits - Panels B and C, topsoil stockpiles, mine equipment parking areas, access and haul roads, a power line extension, an external overburden disposal area, and runoff/sediment control facilities. Overburden from the pits would be placed as backfill in the new open pits and the remaining portions of the Panel A pit that have not yet been reclaimed.

General mining techniques and processes would be the same as for the existing operations. However, with the increased awareness of the selenium issues, additional BMPs for the control of releases of sediment and dissolved contaminants are planned as part of the mining operations. These BMPs are discussed in detail in the SEIS.

With the mining of Panels B and C (under the proposed plan), approximately 93.77 million tons (MMT) of ore and overburden would be removed during 4.6 years of active mine life. The disturbed area of the two open pits would be 274 acres. The additional disturbance caused by the new external overburden disposal area would be approximately 244 acres. Road and water management facilities would disturb 100 acres. The total new site disturbance would be 618 acres.

The configuration of the Panels B and C ore bodies necessitates the location of mining operations along either side of Smoky Creek, but with distances between 50 and 500 feet away from the stream. The open pits in Panels B and C would eventually be largely backfilled with overburden as part of the mining operation.

The ridge-top external overburden disposal site has been configured to reduce incursion into the ephemeral drainages and to maximize drier south and west aspects in order to reduce annual infiltration of snow melt into the overburden as well as the potential for overburden seeps at the edges of the overburden fill.

Selective handling of mine overburden would be practiced during the proposed operations. Waste overburden shales known to contain elevated concentrations of selenium (seleniferous shales) would be handled separately from other overburden. Low selenium content chert and limestone overburden (hereafter referred to as "chert") would also be handled separately. This low-selenium overburden would be spread over the seleniferous shales at a thickness of approximately eight feet at the external overburden disposal facility and the pit backfill areas. This thickness of chert cover is intended to prevent the underlying seleniferous overburden shales from erosion and prevent most root penetration. One to three feet of topsoil would be spread over the chert cover to complete the cap. The cap surface would then be revegetated.

The Panel B haul road fill would encroach on about 200 feet of the Smoky Creek channel upstream of the road crossing. This 200 feet of creek channel would be protected by a retaining wall to support the road fill along this reach. There would also be a culverted haul-road crossing over Smoky Creek.

4.0 Existing Environmental Monitoring Elements

As a component of the existing mine operations, Simplot implements a number of monitoring programs to track environmental conditions at the site and to meet various requirements associated with the permitted operations and related facilities. The existing monitoring program elements include: the surface water and aquatic habitat monitoring associated with the original mine plan; storm water and drinking water monitoring; and various reclamation monitoring tasks, including soil-erosion and vegetation monitoring. These monitoring elements are described in some detail below, including the locations and frequency used for sampling or other data collection and the sample analyses performed. These are all ongoing monitoring elements that will not change upon approval of the Panels B and C development. Expected additional data needs associated with Panels B and C and monitoring elements designed to address those needs are identified later in Section 5.0.

4.1 Surface Water Monitoring

Several types of monitoring related to surface waters are, and will continue to be, performed at the Smoky Canyon Mine to identify the potential for or actual impacts to water quality that may be related to mining activities. The surface water monitoring data can also be used to evaluate the effectiveness of BMPs implemented as part of the existing operations and to demonstrate that the applicable water quality standards for the beneficial uses of downstream receiving waters are being met. Further, routine and regular stream flow and water chemistry monitoring are used to track spatial and temporal trends and to describe variability in water quality conditions.

Routine surface water monitoring is performed as necessary to comply with the mine plan. The routine surface water monitoring program is generally described below. Other surface water monitoring that has been performed at the site includes the baseline characterization performed in support of the SEIS and additional characterization monitoring performed to support area-wide selenium investigations. The methods and results from those monitoring efforts are presented in the SEIS and the Regional Investigation Data Report (Montgomery Watson, 1999).

4.1.1 Water Quality Monitoring of Streams and Springs

TRC Mariah Associates Inc. (TRC Mariah) of Laramie, Wyoming conducts water quality monitoring for Simplot. They collect surface water samples at twelve (12) stream locations and one (1) spring. Water samples are submitted to ACZ Laboratories in Steamboat Springs, Colorado. Samples are analyzed for a variety of metals, as well as wet chemistry parameters, in accordance with the laboratories quality assurance plan. Surface water monitoring reports are provided annually to the BLM, USFS and Idaho Department of Environmental Quality (IDEQ).

Monitoring Program Objectives
This monitoring program was initiated in 1979 as part of an ongoing aquatic ecological monitoring program, with the stated goal of detecting changes, if any, from baseline conditions due to surface mining activities at the Smoky Canyon Mine (Mariah Associates, Inc., 1989). As part of this monitoring program, TRC Mariah also collects benthic samples (macro-invertebrates) to better understand the water quality, as further described in Section 4.3. As mining has progressed, new sites have been added to the program, generally several years before land-disturbing activities occur, in order to gather baseline environmental data with which to compare post-disturbance data.

Monitoring Locations
In general, two monitoring sites have been established on each stream that has the potential to be impacted by Simplot's mining activities. Currently, this includes sites on Smoky Creek, Roberts Creeks,

Pole Creek, Sage Creek, South Sage Creek, and Tygee Creek. Further, one spring is also monitored. These sites are shown on Figure 3.3-2 in the DSEIS and are listed in Table 4.1-1.

Table 4.1-1

Current TRC Mariah Water Quality Monitoring Sites

Location	Site Identification
Upper Smoky Creek above Mine	TRC-Usm
Lower Smoky Creek below Mine	TRC-LSm
Upper Pole Creek above Mine	TRC-UP
Lower Pole Creek below Mine	TRC-LP
Upper Tygee Creek above Mine	TRC-UT1
East Tygee Creek above Mine	TRC-ET
Lowest Tygee Creek below Mine	TRC-LT3
Upper Sage Creek above Mine	TRC-US
Lower Sage Creek below Mine	TRC-LS
Upper South Sage Creek above Mine	TRC-SS
Lower South Sage Creek below Mine	TRC-LSS
Hoopes Spring	TRC-HS

Parameters

In addition to flow rate, water quality parameters consist of metals, nutrients, common ions, and other parameters. The complete list of parameters assessed (from mine plan) is as follows:

Dissolved oxygen
Water temperature
Aluminum
Arsenic
Barium
Boron
Cadmium
Calcium
Chromium
Copper
Iron
Lead
Magnesium
Manganese
Mercury
Nickel
Potassium
Selenium
Silver
Sodium
Vanadium
Zinc
Bicarbonate
Carbonate
Alkalinity
Chloride
Fluoride
Hardness
Nitrate
Nitrogen Ammonia
pH
Phosphorus, ortho
Specific conductivity
Total dissolved solids
Total suspended solids
Sulfate
Turbidity
Flow rate

Monitoring Schedule
The majority of the parameters are monitored once in the spring and once the fall. However, Simplot also monitors flow rate, water temperature, dissolved oxygen, pH, specific conductivity, total suspended solids, and alkalinity monthly, or as winter weather conditions permit access to the monitoring locations.

Methods
Some of the data (monthly flow rate, temperature, dissolved oxygen, pH, specific conductivity, total suspended solids, total dissolved solids and alkalinity) associated with this monitoring plan is collected by Simplot personnel, but the majority is collected by TRC Mariah personnel. These data are then compiled and reported together by TRC Mariah in annual reports. The following descriptions of the methods used for these collection efforts are taken from one of these annual reports (TRC Mariah Associates, Inc., 2000).

Flow rates at some sites are measured by recording water depths at permanently installed Parshall flumes; a standard rating relationship between depth and flow rate is used to determine flow. At other sites, a float technique is used to estimate surface velocity, a factor is applied to estimate average velocity, a cross sectional area is estimated, and flow rate is then calculated based upon these velocity and area estimates.

Dissolved oxygen, conductivity, and water temperature are measured in the field using Yellow Springs Instruments (YSI) meant for those applications. pH is measured in the field.

Water samples for laboratory analysis are collected and preserved if necessary, and submitted to either Simplot's laboratory (for alkalinity, suspended solids, and dissolved solids) or a commercial laboratory (for all other parameters of interest). Currently, ACZ Laboratories, Inc., in Steamboat Springs, Colorado is the commercial laboratory analyzing the samples; they follow applicable procedures in *Standard Methods for the Examination of Water and Wastewater* (American Public Health Association, 1989) and *Methods for Chemical Analysis of Water and Waste* (U. S. Environmental Protection Agency (EPA), 1983).

Data Interpretation, Record Keeping and Reporting
TRC Mariah prepares annual reports that provide the sample results collected during the previous year, contain a summary of previous years' results, and qualitatively describe temporal trends and comparisons between stations. The annual reports are submitted to the BLM, USFS and IDEQ.

4.1.2 Storm Water Monitoring

Simplot prepared the Storm Water Pollution Prevention Plan (SWP3) (Simplot, 2000) to comply with the Multi-Sector General Permit for storm water discharges that was issued by EPA for the Smoky Canyon Mine. In accordance with that plan, Simplot collects samples from storm water catch basin outflows during storm events. These storm water catch basins are located throughout the mining area to collect, settle, infiltrate, and evaporate run-off water from land disturbed by the mining operation. The ponds are designed to contain runoff from the contributing watershed area that would be produced in a 100-year, 24-hour storm event, plus a concurrent snow melt event; they discharge only on an infrequent, irregular basis.
The objective of this monitoring is to document the effectiveness of the ponds in controlling sediment releases from areas where mining activities are taking place.

Permit requirements are to obtain quarterly samples from pond outflows during storm events of 0.1 inch or greater, if discharge occurs. In some quarters, no qualifying storms occur, or qualifying storm events may not result in discharge. However, when possible, samples are collected whenever ponds discharge. Two types of samples are collected, as described below:

First, a grab sample is collected and visually examined and described in regard to color, odor, clarity, floating solids, settled solids, suspended solids, foam, oil sheen and any other obvious indicators of storm water contamination. Quarterly Visual Sampling Forms are completed for each of these samples and are maintained at the mine. In addition to recording information on the above indicators, date, time, observer, location, and discharge nature are also noted.

Next, another grab sample is collected in a clean, sealable poly sample jar and submitted for analysis of total suspended solids concentration. Outflow quantities associated with the discharge are visually estimated. Discharge Monitoring Reports are kept on file at the mine, and submitted by Simplot to EPA as required.

4.1.3 Tailings Pond Monitoring

Water in Tailings Pond No. 2 and water discharging from the Toe Drain (Tailings Dam No. 2) are monitored. TRC Mariah samples Toe Drain water according to the same schedule, parameters, and protocol as for the stream sites they sample, as described in Section 4.1.1. Water from Tailings Pond No. 2 is sampled in accordance with the monitoring requirements associated with the Section 404 Permit for Tailings Pond No. 2.

4.2 Groundwater Monitoring

Two water supply wells, the Culinary well and the Industrial well, were installed in 1981 and 1983 respectively. One additional well (TW-4) was installed in another test hole along Lower Smoky Creek at the same time, but it has never been used as a water supply. An additional ten wells or piezometers were installed in 1999 and 2000 as part of the baseline site characterization performed in support of the Panels B and C SEIS. In 2000, Simplot monitored water levels and groundwater quality approximately quarterly at several locations for the baseline characterization study in support of the Panels B and C SEIS.

The Culinary well is a source of drinking water for mine employees, and routine sampling and analysis is performed to demonstrate compliance with the Idaho Department of Health's standards for public water supplies. Routine sampling and analysis of drinking water is performed in accordance with Public Water System monitoring requirements provided by the Idaho Department of Health. The following parameters are included: bacteria, nitrate, nitrite, inorganics including selenium, volatile organic compounds and lead and copper. The Industrial well supplies water for use in milling operations. Industrial well water quality is not routinely monitored. Neither the Culinary well nor the Industrial well can be used for water level measurements because there are permanent down-well pumps in place, which are routinely in operation.

Simplot currently monitors drinking water quality at the Culinary Well and has previously performed groundwater monitoring at groundwater wells installed at various times between 1981 and 2000 for specific monitoring purposes (refer to SEIS Technical Report 3.0 - Water Resources for summary of past groundwater monitoring activities). Simplot also routinely monitors water quality at one spring (Hoopes Spring), a surface expression of groundwater, as described above in Section 4.1.1. The groundwater monitoring programs conducted at the Smoky Canyon Mine – baseline study, tailings dam piezometer monitoring and Culinary well water-quality monitoring – are briefly summarized below.

4.2.2 SEIS Baseline Monitoring Program

The objectives of the baseline groundwater monitoring program were to describe:

- groundwater/surface water interactions in the bottom of Smoky Canyon (GW-5);
- depth of groundwater in relationship to the proposed Panel B and C pits (GW-6 and GW-9);
- groundwater quality upgradient of the tailings ponds (GW-7 and GW-8);

- infiltration characteristics of overburden (GW-10 and GW-11); and
- any interaction between the tailings water and downgradient groundwater (GW-12, GW-13, and GW-14).

Monitoring Locations
The wells used for the baseline monitoring study are shown on Figure 3.3-3 of the SEIS, and are listed in Table 4.2-1 below.

Table 4.2-1

Monitoring Well Information

Monitoring Well I.D.	General Location Description	Year Monitoring Began	Completion Information
GW-5	Between proposed C Panel and Smoky Creek	1999	Shallow (34') alluvium
GW-6	Between proposed B Panel and Smoky Creek	1999	Rex Chert, 169' deep
GW-7	West of tailings pond	1999	Salt Lake Formation, 90' deep
GW-8	West of tailings pond	1999	Salt Lake Formation, 43' deep
GW-9	Near proposed C Panel	2000	Wells Formation, 512' deep
GW-10	Panel A overburden site	2000	Backfill material, 154' deep
GW-11	Panel A pit backfill	2000	Backfill material, 134' deep
GW-12	Below Tailings Dam #2	2000	Alluvium, 35' deep
GW-13	Below Tailings Dam #2	2000	mid-Salt Lake Formation, 278' deep
GW-14	Below Tailings Dam#2	2000	basal-Salt Lake Formation, 335' deep

Parameters
In addition to water depth, the following water quality parameters were measured for baseline characterization of groundwater:

Aluminum
Ammonia
Antimony
Arsenic
Barium
Beryllium
Bicarbonate
Boron
Cadmium
Calcium
Carbonate
Chloride
Chromium
Copper
Fluoride
Hardness
Hydroxide
Iron
Lead
Manganese
Magnesium
Mercury
Nickel
Nitrate
Nitrite
Phosphorous
Potassium
Selenium
Silver
Sodium
Sulfate
Thallium
Vanadium
Zinc
Specific Conductivity
pH
Total dissolved solids
Total suspended solids
Turbidity

Schedule
The monitoring wells were monitored approximately quarterly during 2000 (four sampling events).

Methods
Sampling procedures generally followed the Selenium Subcommittee's Field Sampling Plan - 1998 Regional Investigation (Montgomery Watson, 1998). Wells were purged of approximately three casing volumes of groundwater after depth was measured and prior to sample collection. Disposable polyethylene bailers were used for sample collection. Samples were placed in laboratory-supplied bottles and refrigerated.

Quality Control and Data Verification
Quality assurance/quality control samples were taken during two of the quarterly monitoring events. As described in the data report (Maxim, 2001), data validation was done to determine accuracy, precision, completeness, and representativeness. This included such items as reviewing compliance with holding times, quality control sample results, etc.

Data Interpretation, Record Keeping and Reporting
A completion report for the four quarterly monitoring activities was prepared by Maxim (2001). That report describes the monitoring program methodology, summarizes the data, and includes field and laboratory results.

4.2.2 Tailings Dam Monitoring

The tailings dams were constructed using low-permeability materials, and the ponds themselves overlie low-permeability clays, so seepage of tailings water from this area should be prevented through these means. However, piezometers have been installed within the tailings dams in order to ensure that any seepage is detected and controlled before any surface discharge past the dam could occur. Tailings Dam No. 1 has nine (9) piezometers (three in the north line, three in the middle line, and three in the south line). Tailings Dam No. 2 has six (6) piezometers (three in the north line and three in the south line). The water levels in the piezometers are measured monthly by Simplot.

4.2.3 Culinary Water Supply Monitoring

Simplot collects water samples from the Culinary well in accordance with requirements of the Idaho Department of Health. This includes monthly sampling and analysis for coliform bacteria as well as analyses for other parameters, including some metals, at the frequencies required by the Idaho Department of Health (see Section 4.2 above). This water supply comes from a Culinary water well located about 3/4 miles north of the shop. In December 2000 the Southeastern Health Department completed a "Ground Water Under Direct Influence Study" and determined that water pumped from the Culinary well was not under the direct influence of surface water.

The Culinary well samples are obtained from the culinary well sampling tap and also at a water tap inside the laboratory at the mine.

4.3 Aquatic Habitat

TRC Mariah Associates Inc. (TRC Mariah) of Laramie, Wyoming conducts aquatic habitat monitoring along with the water quality monitoring for Simplot that was described in Section 4.1.1 above. This monitoring program was initiated in 1979 as part of an ongoing aquatic biology program, with the stated goal of detecting changes, if any, from baseline conditions due to surface mining activities at the Smoky

Canyon Mine (Mariah Associates, Inc., 1989). Fish monitoring was also originally conducted as part of this program but discontinued with agency approval shortly after mining was initiated. As mining has progressed, new sites have been added to the program, generally several years before land-disturbing activities occur in order to gather baseline environmental data for eventual comparison to post-disturbance data.

The aquatic habitat data are provided annually to the BLM, USFS and IDEQ.

4.3.1 Monitoring Locations and Schedule

The sample locations, data collection frequency and schedule, and data reporting are all the same as described in Section 4.1.1 for the water quality component of this monitoring program.

4.3.2 Methods

Three replicate macroinvertebrate samples are collected at each station using a modified Surber square-foot bottom sampler (TRC Mariah, 2000). Samples are preserved immediately upon collection with formalin. Collection jars are labeled with site location, date, project name, and replicate number. Processing occurs at TRC Mariah's lab, by hand sorting, preserving, and identifying to lowest practical taxon.

Benthic macroinvertebrate samples are submitted to ACZ Laboratories for analysis where they are analyzed in accordance with the laboratory's quality assurance plan.

Data analysis is done by computer to determine number of taxa, density, standard deviation, and relative abundance. Results are characterized using specialized indices including the Shannon-Wiener community diversity index and evenness values.

Stream substrate embeddedness is also measured at each location. Embeddedness is a guided visual rating system developed by the USFS to measure sedimentation in streambeds (TRC Mariah, 2000). One rating is given at each site during each station visit, and tabulated in the annual reports.

4.4 Reclamation Monitoring

Monitoring is performed to evaluate the success of reclamation efforts in disturbed areas of the mine. The soil and vegetation conditions in reclaimed areas are inspected upon completion of the reclamation in accordance with the mine plan and subsequent closure plan(s).

In addition, the baseline soil and vegetation conditions in the area of Panels B and C were investigated to support the SEIS (JBR, 2000). Data collected through the baseline characterization are presented and discussed in detail in the SEIS.

4.4.1 Soil

Current erosion monitoring is primarily done in concert with the storm water inspections described below in Section 4.6.1. This monitoring has been primarily accomplished through qualitative, visual observations of topsoil storage piles and reclaimed surfaces. Inspections of this nature have been sufficient to document erosion in a timely manner and trigger any needed mitigative efforts.

4.4.2 Vegetation

Vegetation monitoring is a necessary component of reclamation of mined lands because it provides a means of determining whether reclamation goals are being met. This includes assessment of noxious weeds, species diversity, and community structure. Monitoring also allows for the timely discovery and reporting of problems, and lets land managers adapt to problems and failures by modifying the reclamation plan if necessary. Disturbed areas must be reclaimed to meet the standards required by the Idaho Surface Mining Act and in the USFS-approved mine plan. Closure plans for reclaimed areas include monitoring requirements to confirm vegetation success.

4.5 Wildlife

The Smoky Canyon mine and reclamation plan specifies certain monitoring requirements that were previously performed in conjunction with the Idaho Department of Fish and Game to evaluate effects of the mine on local elk calving areas and sage grouse populations. There are no requirements for ongoing wildlife monitoring.

4.6 Facilities Monitoring

In addition to monitoring programs for environmental media, such as surface water, Simplot also monitors the performance of their various facilities. The goal of this type of monitoring is to ensure that these facilities are performing properly and thus do not contribute to water quality degradation. This type of monitoring is accomplished by conducting regular inspections.

4.6.1 Storm Water Pollution Inspections

As described fully in the Smoky Canyon SWP3 (Simplot, 2000), regular inspections (monthly and annually) occur at the mine site as part of the mine's storm water permit. The SWP3 follows requirements of EPA's National Pollutant Discharge Elimination System (NPDES) program and the associated Multi-Sector General Permit for Storm Water Discharges Associated with Industrial and Construction Activities, with the intent of minimizing the contribution of pollutants in storm water runoff.

On a biweekly basis (as weather permits) and after storm events greater than one-half inch (based on precipitation measured by rain gage at the mine), the storm water control systems, other structural and non-structural BMPs, and potential pollutant source areas are inspected visually by the Mine's Site Supervisor or other staff designated by the Pollution Prevention Team listed in the SWP. Storm water controls that are inspected include ditches, culverts, settling ponds, and sediment traps that are located throughout the disturbed area associated with the Smoky Canyon Mine. Other BMPs included in the inspection program are such things as vegetated slopes and graded areas, spill containment facilities, etc. Potential pollutant source areas that are inspected include material handling locations, etc. The inspections include: assessments of the integrity of the storm water diversions, conveyance systems, catch basins, check dams, sediment control and collection systems; functioning of vegetation and slope treatments in regard to erosion reduction; and examination of material handling and storage areas for pollutant discharge evidence. Following these inspections, any necessary maintenance or repair actions are reported to the mine management and filed in the SWP3 records. The mine superintendent then schedules timely completion of necessary actions and assures timely documentation of such. Written documentation of both the inspections and any follow-up activities is prepared and filed with the SWP3.

Further, a comprehensive site inspection is conducted annually by members of the Pollution Prevention Team to fully assess the site's compliance with the SWP3 and identify any needed changes in either the

plan or the site facilities and BMPs. These are visual inspections that are typically conducted in early summer. This annual inspection includes all of the items listed above which are inspected monthly, as well as ore stockpiles, reclaimed areas, haul roads and any other potential pollutant source areas. Written records are also kept of these inspections and stored with the SWP3. Any needed changes in the SWP3 are made within two weeks of the inspection. Any needed on-the-ground changes are made within 12 weeks if possible.

4.6.2 SPCC Inspections

Under the mine's Spill Prevention, Control and Countermeasure (SPCC) Plan, Simplot inspects petroleum storage facilities for leaks and spills, then follows the procedures in the plan to respond to any such incidents. The facilities that are monitored include above-ground storage tanks for anti-freeze, diesel fuel, and gasoline, as well as associated pipelines. These tanks are located south of the wash bay building and east of the mill, within lined containment berms.

Routine monitoring at these locations consists of a monthly visual inspection for leaks performed in conjunction with the storm water monitoring inspections. Results of the inspections are documented in written records that are stored at the mine site. These inspections are conducted in accordance the Clean Water Act (40 CFR Part 112) as administered by EPA.

5.0 Data Needs, Monitoring Objectives and New Monitoring Elements for Panels B and C

In addition to the ongoing monitoring programs described above, the following monitoring needs were identified in the Panels B and C SEIS:

- Water Resources (Surface Water and Groundwater)
- Best Management Practices
- Soils and Vegetation Selenium Levels
- Wetlands Mitigation
- Wildlife
- Paleontological Resources and Cultural Sites

This section presents more-specific monitoring objectives and identifies the approaches that will be used to address each of these monitoring needs. The monitoring plans that will ultimately be used to implement these various monitoring tasks are identified herein; some of those, such as the water-quality monitoring plan included in the IDEQ Consent Order, are still being developed but will be finalized before the Panels B and C development begins. A summary of the monitoring approach included in the IDEQ Consent Order is provided here, but IDEQ may request changes before the Consent Order is finalized to address their needs under the Consent Order and Idaho Ground Water Quality Rule.

5.1 Water Resources - Surface Water

With the approval to mine the B and C Panels, surface water monitoring will be expanded to address the following objectives:

- Track variations in flow and water quality in Smoky Creek and Roberts Creek downstream of Panels B and at both high-flow and low-flow conditions;
- Demonstrate compliance with applicable water quality standards downstream of Panels B and C and the associated overburden handling and disposal areas;

- Provide early detection of changes in water quality originating from operations at Panels B and C (and the associated overburden disposal areas); and
- Evaluate interaction of groundwater from Panels B and C and the associated overburden disposal areas and surface water in Smoky Creek.

5.1.1 Streams and Springs

Additional surface water monitoring locations will be needed to address these objectives. All of the ongoing monitoring, which was described in Section 4.1 will continue, although some monitoring frequencies at existing locations may be increased to meet the objectives stated above.

Several new monitoring points will be added to the existing surface water monitoring plan that is currently being implemented by TRC Mariah. These sites are listed below in Table 5.1-1.

Table 5.1-1

New Water Quality Monitoring Sites

Location	Site Identification
Mid Smoky Creek above Lower Smoky Spring	TRC-MSm
Lower Smoky Spring	TRC-LSmS
Roberts Creek	MX-SW-4

When Smoky Creek is running above Lower Smoky Spring, Lower Smoky Spring is not a discrete discharge that can be sampled independent of Smoky Creek. Therefore, under these conditions the Lower Smoky Spring sample will be collected from Smoky Creek immediately downstream of the mixing zone with spring discharge. When Smoky Creek is not running above the spring, Lower Smoky Spring will be sampled directly. Flow conditions at the time of sampling will always be noted.

The same locations will also be added to the list of sites where aquatic habitat monitoring is performed.

Monitoring Schedule
Monitoring would be increased from a semiannual (spring and fall) schedule to a quarterly schedule (controlled by accessibility) at the following locations:

TRC-MSm, TRC-LSmS, TRC-USm, TRC-LSm, TRC-LT3, TRC-UT1, MX-SW-4

Monitoring will be quarterly (or as accessible during the winter months).

The additional data will be used to describe seasonal variability in surface water quality and to allow for early detection of any changes in water quality potentially related to the Panels B and C operations.

Methods
In order to ensure that proper protocols are consistently applied with all types of water monitoring (both surface and groundwater), surface water samples will be collected in accordance with the methods currently used by TRC Mariah under the existing water quality monitoring program.

While most of the existing flow data collection methods appear to be adequate, the use of the float technique to measure stream flow rate will be discontinued. While this method may be accurate enough to assess general rates of flow, it is not sufficient for tracking gain/loss in stream reaches, nor is it adequate for determining constituent loads. Instead, appropriate methods may include volumetric, calibrated control sections, or stream gaging velocity-area methods. In the event that high spring runoff or other flow conditions make stream gaging unsafe, the float method may be used as a fall-back, with documentation in the field book and in data reports.

5.1.2 Gain/Loss Survey in Lower Smoky Creek

A one-time gain/loss survey will be conducted along Lower Smoky Creek from Lower Smoky Spring in Section 17 to monitoring site SW-2 in order to determine if groundwater discharges occur along this reach. If gains in stream flow from groundwater discharge are identified along lower Smoky Creek, one surface water sample will be collected from each of the gaining reaches and their flows measured individually. These samples will be analyzed for parameters that may be used to identify the source of water, such as the suite of major ions or isotopes such as carbon-14 or tritium.

5.1.3 Storm Water Monitoring

Storm water monitoring will be expanded to include the new catch basins that are constructed as mining progresses at Panels B and C. The details of this monitoring are contained in the mine's Storm Water Pollution Prevention Plan, which is a separate document that is subject to change as required upon approval of the Panels B and C development.

5.2 Water Resources - Groundwater

The SEIS for Panels B and C identified the potential for groundwater impacts and specified certain monitoring needs associated with planned mining activities at Panels B and C, as follows:

- Evaluate potential connection between the Wells Formation aquifer and Lower Smoky Creek and spring;
- Track changes in water levels and water quality in vicinity of Panels B and C;
- Perform routine inspections for early identification of surface seeps from overburden and subsequent sampling of overburden seeps; and
- Assess effectiveness of BMPs in protecting water resources.

In response to identification of the potential for environmental impacts resulting from the Panel B and C development, the IDEQ plans to enter into a Consent Order agreement with Simplot that will set forth Simplot's responsibilities for demonstrating compliance with Idaho's Ground Water Quality Rule. The Consent Order will identify specific monitoring needs and objectives related to groundwater quality at Panels B and C. The objectives identified to date are based in part on the needs presented in the SEIS (and listed above), as follows:

- Demonstrate compliance with Idaho's groundwater quality standards.
- Provide for early detection of potential impacts to water quality and demonstrate the effectiveness of BMPs or best practical methods (BPMs) in protecting water quality.
- Detect impacts to water quality within the active mineral extraction area by comparison to site-specific baseline conditions for Panels B and C.

- Distinguish the effects of leaching from Panels B and C overburden storage and/or disposal areas from those resulting from leaching from other sources at the Smoky Canyon Mine or variations in natural conditions.

This document summarizes the proposed monitoring approach for each of these objectives. However, the approach provided here is subject to modification for consistency with the Consent Order once that agreement has been finalized, and the Consent Order monitoring plan will be the final document describing groundwater monitoring requirements associated with Panels B and C.

5.2.1 Demonstrate Compliance with Idaho's Ground Water Quality Rule

In accordance with Idaho's Ground Water Quality Rule, the groundwater quality standards apply outside of the active mineral extraction area. Groundwater monitoring will be performed outside the active mineral extraction area to demonstrate that groundwater quality standards are not exceeded at any time during or following the period of active mining operations.

The aquifer potentially affected by transport of the parameters associated with leaching from seleniferous overburden (i.e., cadmium, manganese and selenium) is the Wells Formation. The Wells Formation is the only aquifer that could potentially transport leached constituents outside the active mineral extraction area via groundwater flow.

Location
A new monitoring location will be installed to allow for groundwater sampling from the Wells Formation outside and downgradient of the active mineral extraction area. The new well would be located between Panel B and Lower Smoky Spring, and drilling for the well will extend at least 200 feet below the elevation of Lower Smoky Spring. If the Wells Formation is encountered anywhere at this location, then a well would be installed across the upper portion of the aquifer.

Frequency and Duration of Monitoring
Water level and water quality monitoring will be semiannual, beginning with approval of active mining operations at Panels B and C and continuing for the term of the Consent Decree.

Parameters
Both water levels and water samples will be collected. Initially, water samples will be analyzed for the parameters regulated under Idaho's Ground Water Quality Rule to establish the baseline conditions and to confirm that groundwater quality standards are met at this location. Later, the parameter list may be reduced to a short list of "indicator" parameters for seleniferous overburden (e.g., cadmium, manganese, selenium and sulfate).

Data Uses
Initially, the data collected at the new location will be used to establish the baseline condition and to confirm that baseline water quality currently meets groundwater quality standards and characterize range of indicator parameter concentrations. If baseline meets groundwater quality standards, then subsequent data will be used to demonstrate ongoing compliance through comparison of monitoring data to the applicable groundwater quality standards.

Monitoring at this location will also provide useful data for evaluating the potential for a connection between the Wells Formation and Lower Smoky Spring below Panel C.

5.2.2 Detect Conditions with Potential to Impact Groundwater

Although the potential for impacts to groundwater underlying overburden handling and disposal areas was identified in the SEIS, the magnitude, extent and timing of those impacts were not predicted with certainty. Some of the sources of uncertainty in that analysis were:

- The leachate chemistry predicted for the combined mixture of overburden materials disposed together in the various overburden disposal areas at various points in time;
- The time frame for leachate generation within and migration from overburden disposal areas;
- The amount of leachate generated and potentially available for migration to the Wells Formation; and
- The chemistry of surface runoff water collected in infiltration basins for direct recharge to the Wells Formation.

Of particular concern is the time frame for vertical transport of overburden constituents from the handling and disposal areas to the Wells Formation. Given the vertical distance to groundwater in the Wells Formation (i.e., saturated conditions at depth) and the relatively low permeability of overburden materials and the underlying Phosphoria or Wells Formation rock units, the time for transport of the amount of leachate needed to produce detectable changes in groundwater quality may extend tens or even hundreds of years. For this reason, monitoring groundwater quality in the Wells Formation, even immediately below the overburden disposal areas, is not likely to provide data that is useful for the early detection of conditions that may result in violations of groundwater quality standards. Instead, groundwater and surface water monitoring in and around the overburden disposal areas will be needed to detect the conditions that may result in impacts to water quality or conditions indicating that water quality impacts may be greater than those predicted in the SEIS.

Two different monitoring approaches will provide the data needed to characterize conditions in the overburden disposal areas and identify those conditions, including any unexpected conditions, indicative of potential for impacts to groundwater quality.

1. Leachate Characterization
Monitoring wells will be installed in the overburden materials at their permanent disposal locations to provide a means to sample leachate generated within these materials and flowing under saturated conditions within the disposed materials. The wells will be designed so that they are screened at a depth interval where saturated conditions are the most likely to occur, such as overlying relatively low permeability materials (relative to surrounding overburden materials) within the disposal setting or topographic lows along the base of the backfilled pits. Water level measurements and water samples will be routinely collected (see below) to evaluate whether leachate is present under saturated conditions and to monitor the concentrations of indicator parameters in leachate from different portions of the disposal areas.

Locations
In order to provide adequate spatial coverage across each overburden disposal area (backfilled pits as well as any external areas) several monitoring wells will be installed within each disposal area ultimately used. The total number of monitoring wells will depend on the final footprint area of seleniferous overburden. In addition, any points of seepage observed on the surfaces of the disposal areas will also be sampled, as described below in Section 5.3.

Frequency and Duration of Monitoring
Water level measurements will be performed monthly following completion of permanent overburden disposal. This monitoring schedule will continue for five years. Leachate sampling will be scheduled quarterly and also during any unusually wet periods (e.g., saturated conditions or rising water observed in

waste materials) beginning with completion of the overburden cap and continuing for the term specified in the Consent Order.

Parameters
Water level data and water samples will be collected from leachate monitoring points. Any samples of leachate recovered will be analyzed for indicator parameters for leaching from seleniferous overburden (e.g., cadmium, manganese, selenium and sulfate) plus pH, total dissolved solids (TDS), oxidation-reduction potential (ORP) and phosphate.

Data Uses
These data will be used to characterize the range in the concentrations of indicator parameters and rates of change in those concentrations during and following permanent disposal of overburden to describe their expected concentrations in leachate potentially migrating to Wells Formation. These data may also be used to develop the "average leachate" concentration for each parameter in each disposal area for comparison to the input parameters used in the fate and transport model developed for and presented in the SEIS. If the concentrations of indicator parameters are significantly higher that those used for the SEIS impact analysis, as defined by the conditions set forth in the final Consent Order, then actions may be taken to mitigate overburden leaching within the disposal area(s).

2. Surface Runoff Monitoring
Leaching of overburden may occur during overburden handling prior to its permanent disposal in backfilled pits or external disposal areas. In order to assess the potential for constituent migration via surface runoff, samples of runoff from overburden will be collected during active overburden handling and disposal in the backfilled B and C pits, as well as in any other disposal areas associated with Panels B and C, until reclamation of these areas is complete.

In addition, surface runoff recharge areas that allow for infiltration of runoff directly into the Wells Formation without contacting seleniferous overburden have been proposed as a means to reduce the amount of selenium-bearing leachate generated and increase the amount of clean water available for recharge to the Wells Formation. Water samples will be collected from the runoff collection basins in order to confirm that the runoff collected by the basins contributes relatively clean water to the Wells Formation. This water sampling may be coordinated with storm water monitoring performed in accordance with the Storm Water Pollution Prevention Plan.

Locations
Runoff water in constructed runoff channels or runoff collection basins and from the surfaces of disposal piles will be collected for chemical analysis.

Frequency and Duration of Monitoring
Runoff samples will be collected during runoff events and until overburden capping is completed. Following completion of the cap, surface runoff will be collected from slopes draining to runoff recharge areas during precipitation events of sufficient duration and intensity to promote runoff. At least 4 runoff events will be sampled after the cap is in place

Parameters
The runoff samples will be analyzed for dissolved concentrations of the indicator parameters for leaching from seleniferous overburden (e.g., cadmium, manganese, selenium and sulfate) plus pH and total suspended solids.

Data Use
The concentrations of indicator parameters in runoff water and water in recharge areas will be used to confirm that the water supplying the recharge areas has not been in contact with seleniferous overburden.

5.2.3 Detect Impacts to Groundwater Within Active Mineral Extraction Area

Groundwater in the Wells Formation underlying the Panel B and C areas (i.e., within the active mineral extraction area) will be monitored to identify changes in water quality that can be attributed to Panels B and C mining activities. The baseline, or pre-mining, conditions in the Wells Formation relative to Panels B and C have been characterized through monitoring performed to support the SEIS. These are the relevant site conditions for comparison to future monitoring results to detect changes in water quality resulting from the Panels B and C operations. Therefore, data from groundwater samples collected after the start of mining operations will be compared to the baseline data set collected prior to that time to determine whether significant changes are taking place.

Locations
The Wells Formation monitoring point available for water quality sampling in the immediate vicinity of Panels B and C is the Culinary Well. The Culinary Well is adjacent to the south end of Panel C and within the area where impacts to groundwater have been predicted through the SEIS impact analysis. There are sufficient data available from this location to establish the baseline conditions for indicator parameters of overburden leachate, and this location will continue to be available for sampling once Panels B and C operations begin. Water levels cannot be measured in the Culinary Well because the well contains a permanent pump which routinely operates to supply drinking water at the mine.

Monitoring well GW-9 is also located within the active mineral extraction area, but is not usable for water sampling because it was never successfully developed and does not provide representative groundwater samples. GW-9 will be available for baseline water-level monitoring until mining begins at Panel C.

Frequency and Duration of Monitoring
Water level and water quality monitoring will be performed quarterly during active mining operations and semiannually thereafter, or as accessible during the winter months. This monitoring element will continue for the term of the Consent Order

Parameters
The groundwater samples from the Culinary well will be analyzed for the indicator parameters for leachate from seleniferous overburden (cadmium, manganese, selenium and sulfate) and also pH, TDS, ORP and phosphate.

Data Uses
The data collected during active mining operations will be compared to the range of baseline concentrations using appropriate statistical methods to indicate a significant change in parameter concentrations. The statistical test will have a specified confidence level (percent chance of error) for detecting an increase in an indicator parameter concentration above an upper percentile of the baseline data set. These data will also be used to confirm the conservatism of the model predictions presented in the SEIS for impacts to groundwater.

5.2.4 Distinguish Panels B and C Impacts From Other Sources Sitewide

In order to appropriately respond to any future groundwater or surface water impacts, it will be important to confirm that changes in groundwater or surface water quality detected through the Panels B and C monitoring plan do in fact originate from the Panels B and C mining operations and not from other source areas at the Smoky Canyon Mine or from variations in natural conditions. In order to make this distinction, water quality monitoring data collected for Panels B and C monitoring activities will be integrated with the monitoring data from other programs being implemented across the site for

interpretation. The mine plan will identify the data from other monitoring programs (e.g., ongoing environmental monitoring program, SI and EECA) that may be used to address this objective.

5.2.5 Groundwater Data Collection Methods

In order to ensure that proper protocols are consistently applied with all types of water monitoring (both surface and groundwater), a set of Standard Operating Procedures (SOPs) will be prepared to apply to all groundwater monitoring activities conducted at the Smoky Canyon Mine. Details regarding locations, frequency, parameters, and the SOPs will be provided in the water-quality monitoring plan prepared for inclusion with the IDEQ Consent Order agreement.

5.3 BMP Effectiveness Monitoring

Simplot has included a number of new BMPs in their Panels B and C mine plan (refer to SEIS) that are designed to prevent impacts to water resources. Monitoring to provide real-time information about the effectiveness of those BMPs in protecting groundwater resources is a component of the water quality monitoring plan associated with the IDEQ Consent Order on water quality for Panels B and C. That plan includes the evaluation criteria that will be used and the specific conditions that will require Simplot to take actions to improve or revise their BMPs, or other mine management practices, to ensure protection of groundwater resources.

In addition, evaluation of the effectiveness of BMPs would be an on-going function of the mine's Site Supervisor. This evaluation entails quality control during installation and application of the BMPs and periodic evaluation of performance using reports prepared to describe those activities. Determinations will be made to ensure the proper function and performance of the practice and any deficiencies would be corrected so the BMP functions at acceptable limits.

The inspections of storm water controls described in Section 5.1.3 and overburden leachate monitoring in Section 5.2.2 will provide the data needed for ongoing evaluation of the effectiveness of BMPs. In addition, regular inspections should be conducted along the outer toes and slopes of all overburden fills to look for indications of seeps or springs discharging from the overburden. Early warning of these conditions may be unusual patches of green vegetation compared to surrounding dry vegetation in the summer and fall. Water discharging from any such seeps or springs would be mapped and reported to the agencies, including USFS and BLM, following monthly field inspections. If measurable, flow quantity and analysis of the water would be done, along with efforts to prevent this water from impacting surface waters.

Inspection protocols and determination of acceptable limits for performance of BMPs, including effectiveness criteria, would be based on the monitoring methods presented in Best Management Practices for Mining in Idaho, Section 5 - Monitoring (IMA, 2000). Overall performance of the BMPs is assessed through consultation with the USFS and BLM. Data collected to assess the effectiveness of BMPs, including data collected under the Consent Order water quality monitoring plan, will be provided to the IDEQ, USFS and BLM on a routine basis for this purpose (see Section 6.2).

5.4 Soil and Vegetation in Reclamation Areas

A closure plan that includes criteria for reclamation success will be prepared for Panels B and C. The closure plan will identify the monitoring tasks to be performed to evaluate soil and vegetation conditions in reclaimed areas. All available data from previous studies at this mine, including the baseline studies, SI

and EECA, and data collected at other mines in the region will be considered when developing the closure plan and designing associated soil and vegetation monitoring programs.

5.4.1 Soil

Monitoring of soil resources has the following objectives: monitoring to document soil stability in regard to erosion and testing to assess selenium concentrations in soil.

Erosion Monitoring
With the implementation of the proposed Panel B and C mining activities, inspection-level erosion monitoring programs will be performed as part of the monthly storm water inspections, as described above for the existing monitoring elements.

Soil Chemistry Testing
Various studies have been conducted in the past to assess the selenium concentrations in various growth media located throughout the property. Most recently, studies were done of the baseline soils to be disturbed in the B and C Panel operation (Maxim, 2001) and of the growth medium used for reclamation in the existing disturbed areas (JBR, 2000).

The goals of soil chemistry testing for Panels B and C are: to confirm the effectiveness of the cap in preventing accumulation of selenium in the major rooting zone of the vegetation; provide soil data to correlate with vegetation analyses; and determine if topsoil selenium concentrations are stable following the disturbance of the in-situ soil profile.

This work will be performed in conjunction with either the Panels B and C reclamation plan or with the SI and EECA, depending on the relative timing of these activities (i.e., which ever comes first). Data collected through soil and vegetation monitoring will be considered usable for consideration in developing any subsequent reclamation plans and in developing and evaluating potential remedial actions in any areas of the mine.

Sampling and analysis of soil placed will be performed prior to soil placement in reclaimed areas, once during each of the two years following completion of reclamation and once 5 years later in the newly revegetated areas. Soil samples will be taken of the major rooting depth at the same locations where vegetation samples are taken from the transect for selenium analyses (see Section 5.4.2). By necessity, these exact locations would vary slightly from year to year but would be generally confined to a limited area of the transect. Parameters for analysis may include: extractable selenium, total selenium, cadmium, manganese, molybdenum, and zinc. Results will be correlated with vegetation sampling results and compared with previous years' results. Detailed procedures for soil sampling, analysis and testing will be provided in either the closure plan for Panels B and C or the SI work plan for the Smoky Canyon Mine.

5.4.2 Vegetation

Vegetation monitoring is a necessary component of reclamation of mined lands because it provides a means of determining whether reclamation goals are being met. This includes assessment of noxious weeds, species diversity, and community structure. Monitoring also allows for the timely discovery and reporting of problems, and lets land managers adapt to problems and failures by modifying the reclamation plan if necessary. At the Smoky Canyon Mine, selenium accumulation in vegetation is also a concern, and the selenium concentrations in vegetation on reclaimed areas also needs to be monitored.

Qualitative Vegetation Data Collection
In order to provide an overview of reclamation progress, and to identify problems as they occur, two types of qualitative data will be collected. Monitoring vegetation will be based on following changes over time in individual plots. In order to be meaningful, plots should be defined as areas that were seeded or planted at the same time. Photo points will be established in new revegetated areas each year at locations favorable for viewing a representative portion of the revegetated area. Photo points will be permanently marked and surveyed in the field (e.g., using GPS or other methods of comparable accuracy) so that they may be reliably located in the future. Color photos will be taken along specific compass bearings, as appropriate, at each photo point. The photos will be taken annually in mid-summer, permanently marked, and archived for future reference. Camera equipment and film used will be consistent from year to year to facilitate photo comparisons (e.g., lens, 35 mm print or slide film, or digital camera).

Newly revegetated areas (less than one year old) will be inspected once a month in the growing season to identify problems requiring a timely response. Examples of such problems are the appearance of pests, noxious weeds, excessive grazing and browsing, erosion, and other plant disturbances. In these cases, it is important to apply control measures promptly in order to minimize the costs of correcting the problem. Revegetated areas older than one year will be inspected in mid-summer of each year to identify any problems with weeds or erosion. The Mine Manager will contact the USFS mine inspectors annually to arrange for a weed specialist to inspect revegetated areas. Treatments will be developed and applied in a timely manner to control the weeds identified on site. Weed infestations will be accurately located on maps so that inspectors can later revisit treated sites to evaluate and monitor treatment success.

Quantitative Vegetation Data Collection
The establishment of vegetation on new reclaimed areas will be monitored each year for 7 years following completion of reclamation by identifying the plant species present and measuring plant cover by species. Where trees have been planted, survival of seedlings will also be measured. Samples of vegetation will also be taken for analysis of total selenium content. New revegetation areas, or plots, will be identified and mapped annually in reclaimed areas based on the date of seeding or planting the area. Quantitative vegetation monitoring of new revegetated areas will begin in mid-summer of the year following initial seeding or planting, and take place annually thereafter. Randomly located transects will be established in the plots. The transects will be surveyed, permanently marked, and mapped for use in future years.

The number of transects established in the plots will be sufficient to have an adequate sample size for statistical analysis. For each transect, ground cover by species (including area of bare ground) and species density will be measured. Data forms will be used in the field in order to standardize procedures and ensure complete sampling records. In plots where tree seedlings have been planted, randomly-located quadrants will be established and the number and description of surviving seedlings of each species per quadrate area will be measured.

Vegetation samples for measuring total selenium concentration will be taken annually the first two years and then once five years later from the transects in roughly the same location each year. Data for the vegetation ground cover and species density would not be collected at the same locations as the vegetation chemistry samples. Samples may also be analyzed for total cadmium, manganese, molybdenum, and zinc. Detailed procedures for vegetation monitoring, sampling and analysis will be provided in either the closure plan for Panels B and C or the SI Work Plan for the Smoky Canyon Mine.

5.5 Wetlands Mitigation

Operations proposed under the current SEIS would result in disturbance of riverine wetlands along Smoky Creek; these would also need to be reclaimed after the project is completed. The U.S. Army Corps of Engineers (COE), as part of the wetlands regulatory program, requires the preparation of a

wetland mitigation plan prior to wetlands disturbance. Wetland mitigation plans include a monitoring component to document the success of the mitigation activities and insure that a reestablished or created wetland is self-sustaining.

For the wetland areas associated with Panels B and C, detailed monitoring requirements will be established in concert with the COE. In general, however, the COE will require that created wetlands be monitored for a period of about five years or more. Specifically, the wetland's hydrology, soil, and vegetation are monitored on a regular basis (usually quarterly or semiannually) to determine if the wetland is functioning and providing value per the permit requirements. Specific success criteria (such as percent cover and species composition) are stipulated in the mitigation plan. These criteria are referred to as mitigation targets. In general, the created wetland must meet these mitigation targets and be shown to function as a self-sustaining wetland without artificial support, such as irrigation, before the COE will certify the mitigation as successful.

5.6 Wildlife

Any accidents or incidents involving harm to any wildlife will be reported by mine personnel to the Mine Environmental Manager to record the identification of the wildlife species and the description of the accident or incident. To address concerns relating to the possible presence of threatened or endangered species in the area around existing tailings ponds, Simplot is currently preparing a work plan to describe monitoring and risk assessment efforts that will be made specifically to evaluate potential risks to bald eagles. The SI will also include tasks that build on the baseline work performed in support of the original and supplemental environmental impact statements to continue to monitor for threatened and endangered species at the Smoky Canyon Mine. In addition, the SI and EECA will include specific tasks to evaluate risks to ecological receptors originating from existing site conditions (i.e., prior to development at Panels B and C). The information provided by the SI/EECA will be used to evaluate the need for risk-reduction actions to protect local wildlife.

5.7 Cultural and Paleontological Resources

The known prehistoric sites near Simplot's mining activities should continue to be avoided by current mining activities and will be visited annually by the Mine Environmental Manager to observe for possible impacts. Records of this monitoring will consist of observation notes and photographic documentation of site condition.

As described in Section 3.1.8 of the SEIS, various types of fossils are found in the Smoky Canyon Mine area. The large majority of these are invertebrate fossils that are not considered unique to the project area or to southeastern Idaho. Therefore, a monitoring program to track their occurrence is not deemed necessary.

However, a monitoring program to track the occurrence of any vertebrate fossils exposed during mining will be implemented. Equipment operators will be required to note the presence of such a fossil, and avoid further disturbance while the Mine Environmental Manager is notified.

6.0 Panels B and C Monitoring Records and Reporting

The results of environmental monitoring conducted by Simplot personnel will be reported to the Mine Environmental Manager and retained in the Mine environmental record files. Environmental monitoring

conducted by contractors will be reported to the Mine Environmental Manager. All records and reports will be completed in a timely manner.

6.1 Reporting

The environmental monitoring reports will highlight any observations of problems so that corrective measures may be taken promptly. Acute problems requiring rapid response will be reported by the Mine Environmental Manager as soon as reasonably possible to the appropriate mine managers with authority to respond to the problem with mitigation as necessary. Any problems noted that would indicate real or potential non-compliance with government-issued permits or approvals will be reported to the appropriate agencies according to the requirements of the regulations, permits and approvals.

6.2 Annual Reports

Environmental field monitoring results for any one year will be summarized in an annual report. The contents of these annual reports will generally include:

- Descriptions of the methods used including any necessary deviations from approved monitoring procedures or other anomalies,
- Presentation of the data for the year,
- Analysis of any trends or year-to-year comparisons,
- Discussion of any problems requiring potential response, any corrective measures taken to respond to problems, and
- Recommendations for any modifications to future monitoring indicated by the results.

The annual reports will be reviewed by the Mine Environmental Manager who will summarize the reports for the Mine General Manager. The annual reports required by permitting agencies will be submitted to the agencies in a timely manner by the Mine Environmental Manager along with other information required for the Annual Operations meetings.

7.0 Contingency Plan

The mitigation measures described in the SEIS for the B and C Panels, including BMPs for overburden handling and disposal, were designed and will be implemented to prevent or reduce potential impacts to environmental resources by the B and C Panels operations. Although the SEIS provides an analysis of the potential project-related impacts, it is not possible to predict every scenario that may result in an environmental impact. In order to address concerns regarding the potential for impacts to water quality, particularly groundwater quality, Simplot is currently working toward a Consent Order agreement with IDEQ that will describe the water quality monitoring programs that Simplot will commit to implementing to allow for ongoing evaluation of the performance of these mitigation measures and early identification of any unforeseen impacts. That Consent Order will also include the contingency plan, or the actions required by Simplot contingent on results of the monitoring program, should impacts to water quality be indicated in the future.

This section describes the contingency plans related to other elements of the Panels B and C environmental monitoring plan, including monitoring of BMPs, aquatic habitat, soil, vegetation, wildlife and cultural resources.

There are no contingency plans provided here for monitoring related to ongoing or past mining operations at the Smoky Canyon Mine. Those monitoring data will be compiled for use in the SI and EECA, and they will be fully considered in identification of the areas where remedial actions are needed and development of appropriate remedies for those areas.

7.1 Best Management Practices (BMP)

Simplot has included a number of new BMPs in their Panels B and C mine plan (refer to SEIS) that are designed to prevent impacts to water resources. Monitoring to provide real-time information about the effectiveness of those BMPs in protecting groundwater resources is a component of the water quality monitoring plan associated with the IDEQ Consent Order on water quality for Panels B and C. That plan includes the evaluation criteria that will be used and the specific conditions that will require Simplot to take actions to improve or revise their BMPs, or other mine management practices, to ensure protection of groundwater resources. Monitoring reports prepared for IDEQ under the Consent Order will also be provided to USFS and IDEQ.

In addition, in the event that BMP monitoring indicates that an effectiveness criterion for a BMP, as provided by the area-wide BMPs manual (IMA, 2000), is not being met, Simplot will initiate the following actions:

1. Verify monitoring results by revisiting the site along with another observer to make an independent evaluation of compliance and any observable damages that have resulted from the incident.

2. Notify the BLM and USFS in writing within 10 calendar days of discovering that an effectiveness criterion is apparently not being met. This written notification will include a description of: the issue, any known environmental damage that occurred, mitigation measures that have already been implemented, preliminary plans for any further studies, and the proposed schedule for future efforts, as listed in items 3. to 7. below.

3. Identify possible reasons for the deviation from the original design specifications or expected performance.

4. Determine key engineering and/or operating causes.

5. Identify a range of possible mitigating solutions.

6. Analyze feasibility and effectiveness of possible solutions and select a preferred solution.

7. Prepare a report on items 3. to 6. above and present to the BLM and USFS for concurrence or approval.

8. Implement the preferred solution after input from the agencies.

9. Verify the effectiveness of the solution through continued monitoring.

The specific actions taken in response to any particular unforeseen impact may vary from the actions outlined above. However, Simplot is committed to ensuring that unforeseen impacts that are detected by the BMP monitoring programs are confirmed, understood, and resolved in a timely manner.

7.2 Aquatic Habitat

Benthic macroinvertebrate and stream substrate embeddedness monitoring data are indirect indicators of potential impacts to surface streams downgradient of the mining activities. There are no regulatory compliance thresholds applicable to these results. If significant changes in these data occur in any one year compared to previous years, which indicate potential aquatic habitat degradation, Simplot will conduct the following:

1. Verify results with the laboratory;
2. Describe apparent increases or decreases compared to previous results and evaluate their significance;
3. If there is a change in conditions with the potential to degrade aquatic habitat, contact USFS and coordinate to conduct additional sampling in the field at the locations where the initial samples were taken and analyze these samples (USFS may elect to have field representatives present during any resampling); and
4. Review all the results with the BLM and USFS and determine what supplemental studies or mitigation may be required.

7.3 Soil

If soils monitoring in newly reclaimed areas indicates that concentrations of selenium within soil used for reclamation are greater than allowable concentrations identified in the Interim Selenium Soil/Vegetation Guidelines and Standards or approved site-specific guidelines, the following actions will be taken:

1. Verify analytical results with the laboratory;
2. If the reported levels are significantly above the applicable guidelines, conduct additional sampling in the field near the original samples that were over the guideline in a timely manner and analyze these samples; and
3. Review all the laboratory results with the BLM and USFS and determine what supplemental studies or mitigation may be required.

7.4 Vegetation

If monitoring of reclamation vegetation indicates that concentrations of selenium within the vegetation are above the Interim Selenium Soil/Vegetation Guidelines and Standards, or approved site-specific standards, the following actions will be taken:

1. Verify analytical results with the laboratory;
2. If the reported concentration is significantly above the applicable standard, conduct additional vegetation sampling near the initial samples that were over the standard in a timely manner and analyze these samples; and
3. Review all the laboratory results with the BLM and USFS and determine what supplemental studies or mitigation may be required.

7.5 Wildlife

Any mortalities or any accidents or incidents at the mine site involving obvious harm to any listed/sensitive and/or protected wildlife will be verbally reported by Simplot to the Idaho Department of Fish and Game and the U.S. Fish and Wildlife Service in within 24 hours of discovery. The USFS and BLM would also be notified of impacts or incidents involving wildlife. These notifications will include the following information:

1. Species and numbers of individuals involved in the incident.
2. Description of obvious harm or injury to the wildlife.
3. Description of the cause(s) of the harm, if known.
4. Within 10 calendar days of the verbal notification, a written summary of the same information, and any additional pertinent information, will be submitted to the Idaho Department of Fish and Game and the U.S. Fish and Wildlife Service.

Simplot will cooperate with any investigations commenced by the State and Federal agencies related to studying the potential causes of mortality or harm to listed/sensitive and/or protected wildlife at the Simplot facilities. This cooperation will also extend to development of appropriate supplemental mitigation required to reduce or eliminate the causes of such harm.

7.6 Cultural Resources

If monitoring of known cultural resources sites by Simplot discovers any physical disturbance of the sites, Simplot will report the description of the disturbance in writing to the USFS archeologist within 10 calendar days of discovery. Simplot will also determine if its activities have resulted in the disturbance and curtail such activities until an agency archeologist has visited the site and determined the appropriate mitigative actions that should be implemented.

8.0 References

Idaho Mining Association (IMA). 2000. Manual of Best Management Practices for Mining in SE Idaho, prepared for IMA by Montgomery Watson.

JBR Environmental Consultants, Inc. 2000. Soil and Vegetation Sampling at the Smoky Canyon Mine. 2000. Prepared for J. R. Simplot Company, Pocatello, Idaho.

Mariah Associates, Inc. 1989. Aquatic Monitoring Program for the Smoky Canyon Mine, Southeast Idaho, 1988 Results. Prepared for J. R. Simplot Company, Pocatello, Idaho.

Mariah Associates, Inc. 1990. Environmental Assessment Phosphate Tailings Disposal Project, Caribou County, Idaho. Prepared for J. R. Simplot Company the U.S. Army Corps of Engineers.

Maxim Technologies, Inc., 2001. Revised Draft Baseline Study for Smoky Canyon Mine Panels B&C Soil Resources, Prepared for J.R. Simplot Company, March.

Maxim Technologies, Inc., 2001. Water Resources Baseline Technical Report for the Smoky Canyon Mine Panels B and C. First, Second and Third Quarters 2000.

Montgomery Watson, 1998. Southeast Idaho Phosphate Resource Area Selenium Project - Sampling and Analysis Plan, prepared for Idaho Mining Association.

Montgomery Watson. 1999, Regional Investigation Data Report, Southeast Idaho Phosphate Resource Area, prepared for Idaho Mining Association, Selenium Subcommittee, December 1999.

J.R. Simplot Company (Simplot). 2000. Storm Water Pollution Prevention Plan for Smoky Canyon Mine (Phosphate) Caribou County, Idaho.

TRC Mariah Associates, Inc. 2000. Aquatic Monitoring Program for the Smoky Canyon Mine, Southeast Idaho, 1999 Results. Prepared for J. R. Simplot Company, Pocatello, Idaho.

APPENDIX A

MEMORANDUM OF UNDERSTANDING

HISTORIC MINING ENVIRONMENTAL IMPACT
INVESTIGATION AT SMOKY CANYON MINE

MEMORANDUM OF UNDERSTANDING
between
USDA-FOREST SERVICE REGION 4,
ENVIRONMENTAL PROTECTION AGENCY REGION 10,
USDOI (BUREAU OF LAND MANAGEMENT,
BUREAU OF INDIAN AFFAIRS, AND FISH AND WILDLIFE SERVICE),
THE SHOSHONE-BANNOCK TRIBES, and
STATE OF IDAHO DIVISION OF ENVIRONMENTAL QUALITY
concerning
CONTAMINATION FROM PHOSPHATE MINING OPERATIONS
IN SOUTHEASTERN IDAHO

PARTIES:

This Memorandum of Understanding (MOU) is entered into by and between the following governmental entities (Parties):

- The United States Department of Agriculture, Forest Service (Forest Service)
- The United States Environmental Protection Agency (EPA)
- The United States Department of Interior, Bureau of Land Management (BLM)
- The United States Department of Interior, Bureau of Indian Affairs (BIA)
- The United States Department of Interior, Fish and Wildlife Service (USFWS)
- The State of Idaho, Department of Health and Welfare, Division of Environmental Quality (IDEQ)
- The Shoshone-Bannock Tribes (Tribes)

The FS and BLM are hereafter collectively referred to as the "Federal Land Management Agencies:" The FS, EPA, BLM, BIA and USFWS are hereafter collectively referred to as the "Federal Agencies."

For purposes of this MOU the Parties designate the individuals identified in Appendix A or their successors as general contacts for issues relating to this MOU

RECITALS

A. Elevated concentrations of selenium and other hazardous substances, pollutants and contaminants have been identified in water, soil, and vegetation associated with current or former phosphate mining operations in southeastern Idaho.

B. The approximate extent of currently known past and present phosphate mining operations is indicated on the map attached hereto as Exhibit 1 (the "Mining Area"), and includes areas located variously on federal land, tribal land, private land, state land, or a mixture of these types of ownership or jurisdictional areas. Individual phosphate mining operations located within the Mining Area are listed in ~~the Addendum to~~ Exhibit 1. The Parties reserve the right to amend Exhibit 1 as necessary upon mutual agreement in light of information received or developed pursuant to this MOU.

C. A number of the Federal Agencies already have incurred and will incur costs in responding to the release and threat of release of hazardous substances in the Mining Area. It is anticipated that all the Parties eventually will incur such costs during the pendency of this MOU.

D. The Federal Agencies have referred matters subject to this MOU to the U.S. Department of Justice ("DOJ") Environmental Enforcement Division for possible litigation and/or concurrences that may be required by Executive Order 12580, as well as for assistance in negotiations.

E. Phosphate Mine Owners and Operators in the Mining Area ("Companies") may be liable for performing response actions and/or for response costs incurred and to be incurred by the "Parties" in responding to releases or threatened releases of hazardous substances within the Mining Area, and/or for natural resource damages.

F. In July 1998, the Forest Service negotiated an Administrative Order on Consent ("AOC") with one of the Companies for completion of a Site Investigation ("SI") and an engineering evaluation/cost analysis (EE/CA) at South Maybe Canyon.

STATEMENT OF PURPOSE:

G. The Parties acknowledge their overlapping authorities and interests in this matter and the complexity of mixed-ownership and jurisdictional issues in the Mining Area. The Parties intend in this MOU to provide a framework for the coordination of their actions and authorities to:

1) Ascertain the overall extent of the contamination present in and around historic and ongoing phosphate mining operations in the Mining Area;

2) Define specific sites for focused investigation and response action;

3) Establish overall priorities for the investigation and response action process in order to protect human health and the environment;

4) Undertake investigations and response actions in a manner that will allow the Parties to recover response costs.

5) Promote future mining operating practices that will safeguard the environment from future contamination; and

6) Negotiate agreements or enter into contracts consistent with the requirements of the Comprehensive Environmental Response, Compensation, and Liability Act ("CERCLA"), 42 U.S.C. § 9601 et seq., and the National Oil and Hazardous Substances Pollution Contingency Plan ("NCP"), 40 C.F.R. Part 300, under which the Companies or contractors hired by one of the parties to this MOU will undertake appropriate investigation and response actions in connection with selenium and other contamination within the Mining Area ("Agreements").

H. The Parties agree that they will work together to integrate procedures and substantive requirements for these various tasks under their respective asserted authorities, and to resolve any conflicts among them, in order to minimize duplication of efforts and assure effective and efficient response actions.

I. The Parties also will work together in the exercise of their respective authorities in the Mining Area, to ensure compliance with applicable federal, state, local and tribal laws, including but not limited to the legal authorities listed for each Party in Appendix B hereto.

J. The Parties similarly will work together in the exercise of their respective authorities in the Mining Area, and in accordance with the provisions of CERCLA and the NCP, to preserve their respective rights and interests concerning potential natural resource damage claims arising from injuries to natural resources in the Mining Area.

K. The Parties also agree that it is important to communicate a single set of instructions to the Companies following consultation among themselves, and it is important to develop and adhere to an agreed-upon communications plan in connection with their efforts under this MOU.

L. This MOU is an agreement between the Federal Agencies, the State and the Tribes, and is not intended to control the relationship among the Federal Agencies.

AUTHORITIES:

M. Each party asserts it has authority to enter into this Agreement and to respond to releases of hazardous substances within the Mining Area, as set forth in the Statement of Legal Authority attached hereto as Appendix B and incorporated as part of this MOU. By entering into this MOU, the Parties do not waive any of their respective authorities or concede authorities or jurisdiction asserted by other Parties. Nothing in this MOU shall be construed to restrict, enlarge, or otherwise determine the rights, interests, and jurisdiction of the United States, the State of Idaho, or the Tribes, or any of their respective departments or agencies.

AGREEMENTS:

A. Task Identification

1. The Parties agree to work together to establish criteria for defining the scope of an area-wide investigation, selecting specific sites for additional investigation or for response actions, and selecting a lead agency to oversee the site-specific response actions under Agreements with the Companies.

2. The Parties agree that an area-wide investigation should be conducted either by iDEQ or under an Agreement with one or more of the Companies. ~~under an Agreement entered into by all the Parties with one or more of the Companies~~.

3. The Parties agree that decisions concerning the particulars of how they should define the area-wide investigation, identify specific sites for additional investigation or response action, select a site-specific lead agency, identify support agencies, or otherwise implement their commitment to work together under this MOU will be made by a committee consisting of those persons identified in Appendix A, or their designee.

B. Identification of Lead and Support Agencies

4. For the area-wide investigation and for each specific site identified by the Parties for additional investigation or response action ("Site"), the Parties will cooperatively identify a Lead and any Support Agencies having an interest at the Site. The designation of an agency as Lead Agency shall not exempt that agency from any access or regulatory requirements applicable to land under the jurisdiction, custody, or control of another Party.

5. IDEQ has been designated the Lead Agency with respect to the area-wide investigation.

6. The Parties agree that the existing AOC for South Maybe Canyon is not affected by or subject to this MOU, with the exception of Paragraph 11 hereof. With respect to any additional Agreements that may be entered into concerning South Maybe Canyon, the Forest Service will remain the Lead Agency. Other Parties may act as Support Agencies pursuant to the terms of this MOU for such subsequent Agreements.

7. The Lead Agency and Support Agencies identified for a Site will negotiate one or more Agreements with the Company or Companies having responsibility for the Site. It is contemplated that Lead and Support Agencies for a Site will mutually determine an approach regarding Agreements appropriate for a particular site. Examples of alternative approaches include:

a. A single Agreement with a Company, signed by the Lead and Support Agencies;

b. The Lead Agency and a Support Agency entering into separate Agreements

with a Company, with the work undertaken based on a single mutually agreed statement of work (SOW); or

c. Only the Lead Agency entering into an Agreement with the Company.

In all cases agency coordination would continue, as provided in this MOU.

C. Information Sharing and Coordination

8. The State shall supply an On-Scene Coordinator ("OSC") or Remedial Project Manager ("RPM"), who will have the duties described in the NCP, to oversee the area-wide investigation and the main point of contact for the Federal Agencies and the Companies.

9. The Lead Agency for each Site will supply an OSC/RPM to oversee the implementation of any investigations or response actions undertaken pursuant to any Agreements between the Lead and Support Agencies and the Companies, and the main contact point for the Support Agencies and the Company or Companies involved.

10. For both the area-wide investigation and for each site-specific investigation and response action, each Support Agency will designate a Project Manager ("Project Manager").

11. The OSC/RPM will share information and coordinate with the Project Manager(s) during both the area-wide investigation and all site-specific investigations and response actions, as follows:

a. The OSC/RPM will provide the following to the Project Manager(s):

i. Copies of documents related to the investigation, analysis of alternatives, and response action design and implementation, including drafts of documents identified in Paragraphs 14 and 15 of this MOU.

ii. Reasonable prior notice of, and an opportunity to participate in, any meetings, conference calls, or other scheduled contacts with the Companies.

iii. Reasonable prior notice of activities to take place in connection with the area-wide investigation or at a specific Site.

b. The OSC/RPM and the Project Manager(s) will communicate regularly, by phone, correspondence, and meetings, to review the work status and to address any existing or anticipated technical issues.

c. The Project Manager(s) will advise the OSC/RPM regarding any issues and concerns of special interest to the Project Manager(s), in addition to those described in this MOU, so that the OSC/RPM can communicate or provide requested information to the Project Manager(s).

12. The Project Manager(s) will use best efforts to provide comments to the OSC/RPM within 21 days of the Project Manager's receipt of a deliverable from the Companies or a request for concurrence pursuant to Paragraphs 14 and 15 of this MOU. If a Project Manager determines that additional time is required to provide comments, the Project Manager will discuss the need for a reasonable amount of additional time (normally 15 days, or less) with the OSC/RPM, as soon as that need is identified.

13. The OSC/RPM will communicate the joint responses of the Parties to the Company(ies).

D. Concurrences

14. With respect to the area-wide investigation, the State, as the Lead Agency, will request concurrence from each Support Agency on a set of decision points to be established by the Signatory Committee or their designees, including but not limited to the following documents or their equivalents:

annual work plans
overall investigation plan
study identification
sampling and analysis plans
study completion reports
changes to statement of work
quality assurance plan
health and safety plan
risk assessment work plan
draft risk assessment
final risk assessment

15. With respect to site-specific work, the Lead Agency will request concurrence from each Support Agency on the following decision points:

a. The Work Plan for the Site investigation and analysis of alternatives. Under CERCLA the analysis of alternatives would be contained within an EE/CA or a Remedial Investigation/Feasibility Study ("RI/FS");

b. The Health and Safety Plan;

c. The Community Relations/Public Involvement Plan;

d. Decisions concerning the need for additional data collection and/or any

decision to cease data collection;

e. The final site investigation report;

f. The final human health and/or ecological risk assessments;

g. The final analysis of alternatives;

h. Each proposed or final response action decision, such as a draft or final action memorandum or a Proposed Plan or Record of Decision ("ROD");

i. Deliverables from a Company under an Agreement to implement any response action; and

j. Any decisions pertaining to potential injury to natural resources.

E. Dispute Resolution

16. Resolution of and communication regarding legal issues will be coordinated among appropriate counsel for the Parties and, as appropriate, DOJ attorneys. The legal contacts for the Parties are as follows:

USDA - Attorney, United States Department of Agriculture, Office of General Counsel, James Alexander (or successor or designee)

DOI/BLM/BIA/FWS - Primary Contact: Attorney-Advisor Office of Solicitor, Branch of Federal Facilities Compliance John Seymour; , Supporting Contacts: Attorney- Advisor, Division of Mineral Resources Harvey Blank; Attorney-Advisor, Division of Indian Affairs Jean Rice; Attorney-Advisor, Division of Parks and Wildlife John Carlucci; or Attorney-Advisor from DOI Regional or Field Solicitor's Office (or their respective successors or designees)

EPA - Assistant Regional Counsel, EPA Region 10, Elizabeth McKenna (or successor or designee)

DOJ - Senior Attorney Region 10, Environmental Enforcement Section, Deborah M. Reyher, Ben Franklin Station, P.O. Box 7611, Washington; D.C. 20044, (202) 514-4113 (or successor or designee)

Idaho - Administrator, Waste Management & Remediation Division, Idaho Department of Environmental Quality. (or successor or designee)

Tribes - Special Counsel, Attorney's Office, Shoshone-Bannock Tribes, Jeanette Wolfley (or successor or designee)

17. With respect to both the area-wide investigation and the site-specific investigations and response actions, the Parties will use their best efforts

to resolve technical disagreements informally among the OSC/RPM and the Project Manager(s).

18. If the OSC/RPM and the Project Manager(s) do not reach agreement through informal means, the Parties will use the following dispute resolution process:

a. Project Manager(s) and the OSC/RPM for the agencies involved at the site will quickly elevate any unresolved dispute, first to the persons identified in Appendix A, and up through the following management personnel (or their designees):

Forest Service Region 4 Deputy Regional Forester

The BLM Idaho State Office Director

EPA Region 10 Unit Manager of the Office of Environmental Cleanup, Ann Williamson

Program Administrator, Solid Waste Management Program, Idaho Department of Environmental Quality

USFWS - Regional Director

Chairman , Shoshone-Bannock Tribes' Land Use Commission

BIA - Deputy Commissioner

b. If the Parties continue to disagree, the Lead Agency will prepare a proposed written decision which fully evaluates and addresses the expressed concerns of the Support Agencies, and the matter will be elevated to a committee consisting of the signatories to this MOU, or their successors or designees (the "Signatory Committee").

c. If the Signatory Committee cannot reach agreement then the Supporting Agencies may: 1) accept the proposed decision of the Lead Agency; 2) seek mediation or further elevation through a process agreed upon by the disagreeing Agencies; or 3) rely on their respective rights and authorities under Paragraphs 4, 22-27 of this MOU. An unresolved disagreement at one site or on one issue does not require the withdrawal of a Party or termination of the entire MOU. If a disagreement is confined to one site or issue, coordination actions at other sites and on other issues will continue as specified in this MOU. Likewise, disagreement at one site or on one issue will not affect previous agreements reached at other sites or on other issues or prevent the enforcement of agreements at the subject site that became effective before the time of disagreement.

d. To avoid impeding work, the time for resolving disputes among the Parties must be short. When informal dispute resolution between the OSC/RPM and Project Manager(s) does not rapidly resolve a dispute, the OSC/RPM and the Project Manager(s) should elevate the dispute through management within 10 days. The Parties should resolve disputes or issue a decision within 21 days of elevation. In exigent circumstances, any Party may immediately elevate a dispute directly to the Signatory Committee.

19. Work will continue during dispute resolution, except for work that is the subject of or dependent upon the outcome of the pending dispute and that may be delayed without posing an imminent and substantial endangerment to human health, welfare, or the environment.

20. The dispute resolution process described in Section E of this MOU is separate from any dispute resolution process that may be described in an Agreement with a Company or Companies. If applicable, the Parties shall implement the dispute resolution process under such Agreements as follows:

a. The Lead Agency will propose an initial response to disputes raised by the Company, for concurrence by the Support Agencies.

b. If the Lead Agency and one or more of the Support Agencies cannot reach agreement as to how to respond to the dispute raised by the Company, a Support Agency may invoke the dispute resolution process under Section E of this MOU, unless the issue has already been disputed separately under this MOU. If the two dispute resolution processes are proceeding simultaneously, the dispute resolution process with the Company may not reach a final decision in a manner inconsistent with the MOU dispute resolution process.

F. CONFIDENTIALITY

21. The Parties recognize that to effectively and efficiently exercise their authorities concerning the Mining Area, their counsel, employees, and consultants may exchange documents and information subject to attorney-client privilege, attorney work product and other forms of privilege. The Parties, therefore, agree to protect these privileges, to the full extent provided by law. This provision shall remain in effect after this MOU terminates.

G. RESERVATION OF RIGHTS

22. The Federal Agencies reserve the right to exercise their rights and authorities under applicable law, including but not limited to, CERCLA, the NCP, and applicable Executive Orders, including Executive Order 12580, as amended and the Mineral Leasing Act, 30 U.S.C. sec. 181 et seq., including but not limited to, 30 U.S.C. § 211, and the Federal Land Policy and Management Act of 1976, 43

U.S.C. § 1701 et seq.

23. IDEQ reserves the right to exercise its rights and authorities under applicable law, including but not limited to, CERCLA, the NCP, the Idaho Environmental Protection and Health Act ("EPHA"), Idaho Code §§ 39-101 to 39-130, and the Hazardous Waste Management Act of 1983 ("HWMA"), Idaho Code §§ 39-4401 to 39-4432.

24. The Tribes reserve the right to exercise their rights and authorities under applicable law, including but not limited to, CERCLA, their inherent sovereign powers, the Fort Bridger Treaty, the Constitution and Bylaws of 1936, and various provisions of the Land Use Policy Ordinance, the Law and Order Code of 1982, and the 1994 Fort Hall Water Rights Agreement.

25. This MOU is not intended to affect, and the Parties hereby expressly reserve, any and all claims or potential claims each may have arising from injuries to natural resources in the Mining Area.

26. No statements made in the course of negotiations among the Parties or in this MOU may be construed to represent an admission, determination, settlement, or adjudication of any legal or factual dispute relating to any Party's rights, privileges or interests.

27. Each Party expressly reserves the right to assert any and all defenses it may have to any claim that may be asserted by the other Parties or by any other person under federal, state, or tribal law.

28. Nothing in this MOU is intended either to create any rights in or grant any cause of action to any person not a party to this MOU or to release or waive any claim, cause of action, demand, or defense in law or equity that any of the Parties to this MOU may have against any person(s) or entity not a party to this MOU.

29. This MOU is not a fund obligating document. Any reimbursement or contribution of funds between the Federal Agencies that have signed this MOU will be handled in accordance with applicable law and procedures. Such reimbursement or contribution shall be authorized in separate written agreements signed and approved by the appropriate agency officers or representatives pursuant to appropriate statutory authority. No provision of this MOU shall be interpreted or construed as a commitment or requirement that any of the Federal Agencies obligate or pay funds in contravention of the Anti-Deficiency Act, 31 U.S.C. § 1341, or any other applicable provision of law, in any fiscal year for actions subject to this agreement.

H. GENERAL PROVISIONS

30. This MOU is effective upon the date signed by the last of the Parties.

31. This MOU terminates 10 years after its effective date. Prior to that, this MOU may be terminated, modified, or extended upon the written agreement of the Signatory Committee. A Party may terminate its participation in this MOU upon 14 days written notice to all Parties.

MEMORANDUM OF UNDERSTANDING
concerning
SELENIUM CONTAMINATION IN SOUTHEASTERN IDAHO

UNITED STATES DEPARTMENT OF AGRICULTURE
FOREST SERVICE

By: _____
Jack A. Blackwell
Regional Forester
U.S.D.A. Forest Service, Region 4

_____
DATE

APPENDIX A

MEMORANDUM OF UNDERSTANDING
concerning
SELENIUM CONTAMINATION IN SOUTHEASTERN IDAHO

For the purpose of this MOU The Parties designate the following persons, or their successors or designees, as general contacts for issues relating to this MOU:

USDA/Forest Service - Forest Supervisor of the Caribou-Targhee National Forest (currently Jerry Reese , 420 North Bridge Street, St. Anthony, ID 83445, (208) 624- 3151)

DOI/BLM - District Manager, Upper Snake River District (currently Jim May1405 Hollipark Driver, Idaho Falls, ID 83401, (208)524-7500.

BIA - Land Manager (currently Jeffery Loman [add address and phone])

USFWS - Supervisor, Eastern Idaho Field Office (currently Michael J. Donahoo, 4425 Burley Dr., Suite A. Chubbuck, ID 83202)

EPA - Nick Ceto, 1200 Sixth Avenue, ECL 116, Seattle, WA 98101, (206) 553-1816

DOJ - Senior Attorney Region X, Environmental Enforcement Section (currently Deborah Reyher), Ben Franklin Station, P.O. Box 7611, Washington, D.C. 20044, (202) 514-4113)

IDEQ - Katherine Kelly, Administrator, Waste Management & Remediation Division, 1410 N. Hilton, Boise, ID 83706, 208-373-0445

TRIBES - Jeanette Wolfley, Tribal Attorney, Shoshone-Bannock Tribes, P.O. Box 306, Fort Hall, ID 83203, (208) 232-1922

EXHIBIT 1

MEMORANDUM OF UNDERSTANDING
concerning
SELENIUM CONTAMINATION IN SOUTHEASTERN IDAHO

APPENDIX B

MEMORANDUM OF UNDERSTANDING
concerning
SELENIUM CONTAMINATION IN SOUTHEASTERN IDAHO

STATEMENT OF AUTHORITY[1/]

1. Pursuant to CERCLA, the President is responsible for responding to releases of hazardous substances, or pollutants and contaminants, to protect the public health or welfare or the environment. The President's CERCLA response authority is generally delegated to EPA. 42 U.S.C. 9601 et seq.; Executive Order 12580, §§ (2)(g) & 4(d)(1)&(2).

2. Pursuant to Executive Order 12580, as amended by Executive Order 13016, the President delegated the authority to conduct various activities under CERCLA, including investigations and response activities (42 U.S.C. § 9604), cost recovery (42 U.S.C. § 9607), issuing such orders as may be necessary to protect public health or welfare or the environment (42 U.S.C. § 9606(a)), and entering agreements with a potentially responsible party ("PRP") for the PRP to perform investigations (42 U.S.C. § 9622(d)(3)) to several executive departments and agencies, including the Environmental Protection Agency ("EPA"), the United States Department of Agriculture ("USDA"), and the United States Department of the Interior ("DOI").

3. USDA is generally delegated the President's CERCLA authority where a release of a hazardous substance is on, or the sole source of the release is from, a facility under the jurisdiction, custody or control of an agency within the USDA. Executive Order 12580, §§ 2(e)(1) and 4(b)(1). The Forest Service administers National Forest System land on behalf of the public. With certain limitations, USDA delegated its CERCLA authority to the Forest Service where a release of a hazardous substance is on, or the sole source of the release is from, a facility under the jurisdiction, custody or control of the Forest Service. Executive Order 12580, §§ 2(e)(1) and 4(b)(1); 7 C.F.R. § 2.60(a)(39). Executive Order 13016 amends EO 12580 to authorize USDA's use of CERCLA Section 106 authority to address releases or threats of releases of hazardous substances affecting lands and natural resources under the Forest Service's trusteeship, jurisdiction, custody or control, subject to the concurrence of the Administrator of EPA. The CERCLA roles of USDA and the Forest Service are also recognized in various provisions of the NCP. 40 C.F.R. Part 300.

4. DOI is generally delegated the President's CERCLA authority where a release of a hazardous substance is on, or the sole source of the release is from, a facility under the jurisdiction, custody or control of an agency within DOI. Executive Order 12580, §§ 2(e)(1) and 4(b)(1). The CERCLA roles of DOI are also

recognized in various provisions of the NCP. 40 C.F.R. Part 300. DOI has re-delegated its authorities under Executive Order 12580 to the Bureau Directors with respect to land, resources, and facilities within the jurisdiction, custody, or control of the Bureaus including BLM and BIA. Executive Order 13016 amends EO 12580 to authorize DOI's use of CERCLA Section 106 authority to address releases or threats of releases of hazardous substances affecting lands and natural resources under DOI's trusteeship, jurisdiction, custody or control, subject to the concurrence of the Administrator of EPA. The Secretary of the Interior also has authority to lease phosphate deposits of the United States and lands containing such deposits pursuant to the Mineral Leasing Act, 30 U.S.C. sec. 181 et seq. and to manage public lands pursuant to the Federal land Policy and management Act of 1976, 43 U.S.C. § 1701 et seq. These authorities have been implemented by BLM, on behalf of the Secretary, through regulations contained in 43 C.F.R. Parts 3500 and 3590. DOI is also a trustee for natural resources, and USFWS is responsible for the protection and restoration of trust resources injured by uncontrolled releases of hazardous materials. USFWS also is responsible for conducting assessments to establish injury and the dollar equivalent of that injury for collection of damages from parties responsible for releasing hazardous materials. In addition to the authorities stated in Paragraphs 1 and 2, supra, USFWS participates in this MOU based on the following authorities: CERCLA Section 122(j), 42 U.S.C. § 9622(j); the Endangered S pecies Act of 1973, 16 U.S.C. §§1531-1544; the Migratory Bird Treaty Act of 1918, 16 U.S.C. §§ 703-712; the Bald Eagle Protection Act of 1940, 16 U.S.C. §§ 668-668d; the Fish and Wildlife Coordination Act, 16 U.S.C. §§ 661-667e; and the National Wildlife Refuge System Administration Act of 1966, 16 U.S.C. §§ 668dd-668ee.

5. IDEQ is the Idaho State agency that generally has authority over the identification, investigation and clean-up of facilities where hazardous substances have come to be located in the State of Idaho. IDEQ exercises this authority pursuant to the Idaho Environmental Protection and Health Act ("EPHA"), Idaho Code §§ 39-101 to 39-130, and the Hazardous Waste Management Act of 1983 ("HWMA"), Idaho Code §§ 39- 4401 to 39-4432. IDEQ is also the Idaho State agency with the authority to participate in the initiation and development of CERCLA response actions to be undertaken in the State of Idaho.

6. The Shoshone-Bannock Tribes ("Tribes") are federally recognized Indian tribes with a governing body known as the Fort Hall Business Council, which has authority to enter into this MOU on behalf of the Tribes. The Tribes, on July 3, 1868, concluded the Second Treaty of Fort Bridger with the United States, which was ratified by the United States Senate on February 24, 1869. 15 Stat. 673. Article 4 of the Fort Bridger Treaty reserved the Fort Hall Indian Reservation ("Reservation") as a "permanent home" for the signatory Tribes. Article 4 reserved off-Reservation hunting, fishing and gathering rights to the Tribes; these Treaty-guaranteed rights are exercised on public lands throughout the State of Idaho. The Tribes are obligated to protect both the individual and communal interests of the successors-in-interest of Indian signatories to the Treaty, and are

responsible to protect the health, welfare and safety of Tribal members, and the environment of the Tribes. The Tribes have authority over the identification, investigation, and cleanup of hazardous substances found within Indian Country, including on the Reservation, and retain protectable Treaty interests in public lands and water located off-Reservation that may be affected by hazardous substances or pollutant and contaminants. The Tribes exercise their authority pursuant to, among other authorities, CERCLA, their inherent sovereign powers, the Fort Bridger Treaty, the Constitution and Bylaws of 1936, and various provisions of the Land Use Policy Ordinance, the Law and Order Code of 1982, and the 1994 Fort Hall Water Rights Agreement. The Tribes anticipate finalizing a Hazardous Waste Management Act in 2000.

1/ Each of the Parties to the Memorandum of Understanding concerning Se. Contamination in Southeastern Idaho dated _____, 2000 (MOU) has subm Statement of Authority as set forth herein pursuant to Paragraph M of t Appendix to the MOU does not constitute an agreement among the parties no legal significance separate and apart from its incorporation by referen No statements or assertions contained herein shall be construed to restr otherwise determine the rights, interests and jurisdiction of the United of Idaho, or the Shoshone-Bannock Tribes, or any of their respective agencies or members. Nor shall any statements made herein be construed t an admission, determination, settlement or adjudication of any legal or relating to any Party's rights, privileges, interests, authority or juris

APPENDIX B

AREA WIDE ADMINISTRATIVE ORDER ON CONSENT

HISTORIC MINING ENVIRONMENTAL IMPACT
INVESTIGATION AT SMOKY CANYON MINE

In the matter of:	)	
	)	
	)	CONSENT ORDER/
Area-Wide Investigation of	)	ADMINISTRATIVE ORDER
Contamination from	)	ON CONSENT
Phosphate Mining in	)	
Southeastern Idaho	)	

I.
PARTIES

The Idaho Department of Environmental Quality ("IDEQ"), the United States Environmental Protection Agency ("EPA"), the United States Department of Agriculture ("USDA"), U.S. Forest Service ("USFS"), and the United States Department of Interior ("USDOI"), Bureau of Land Management ("BLM"), U.S. Fish and Wildlife Service ("USFWS"), Bureau of Indian Affairs ("BIA") and the Shoshone-Bannock Indian Tribes, (collectively referred to as the "Agencies") hereby enter into this Consent Order/Administrative Order on Consent ("CO/AOC") with J.R. Simplot Company, Nu-West Industries, Inc., Rhodia, Inc., FMC Corporation, P4 Production, L.L.C., (collectively referred to as the "Companies").

II.
PURPOSE AND SCOPE OF AGREEMENT

The purpose and scope of this CO/AOC is to identify procedures to be used to ensure the recovery of costs incurred by the IDEQ's performance or oversight and review, and EPA's[1], USFWS's and the Tribes' oversight and review of an Area-Wide Investigation into contamination from phosphate mining operations in Southeast Idaho. The activities for which performance or oversight costs are to be recovered are more particularly set forth in the Scope of Work ("SOW") attached hereto as Exhibit "A," which is incorporated herein by reference.

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1 Included as part of EPA's costs will be costs associated with the Agency for Toxic Substances and Disease Registry's (ATSDR's) activities under the CO/AOC.

COPY

III.
LIMITATION OF SCOPE

Nothing herein shall be deemed to affect or govern any of the parties' rights, duties or obligations with respect to the identification, remediation, or clean up of any specific site. Each and every Party hereto reserves all claims, rights, causes of action and defenses with respect to any and all specific sites.

IV.
AUTHORITIES

The Statements of Authority set forth below shall not be construed to restrict, enlarge, or otherwise determine the rights, interests and jurisdiction of the United States, the State of Idaho, or the Shoshone-Bannock Tribes, or any of their respective departments, agencies or members. Nor shall any statements made herein be construed to represent an admission, determination, settlement or adjudication of any legal or factual dispute relating to any Party's rights, privileges, interests, authority or jurisdiction. Each and every Party hereto reserves all claims, rights, causes of action and defenses with respect to any claim of jurisdiction expressed herein.

1. FEDERAL AUTHORITY. Pursuant to Executive Order 12580, as amended by Executive Order 13016, the President delegated the authority to conduct various activities and recover costs under the Comprehensive Environmental Response, Compensation, and Liability Act ("CERCLA") to several executive departments and agencies, including EPA, USDA, and DOI. Such response activities include investigations and response activities (42 U.S.C. § 9604), cost recovery (42 U.S.C. § 9607), issuing such orders as may be necessary to protect public health or welfare or the environment (42 U.S.C. § 9606(a)), and entering into agreements with a potentially responsible Party ("PRP") for the PRP to perform investigations (42 U.S.C. § 9622(d)(3)).

2. STATE AUTHORITY. IDEQ is the Idaho state agency that generally has authority over the identification, investigation and clean-up of facilities where hazardous substances have come to be located in the State of Idaho. IDEQ exercises this authority pursuant to the Idaho Environmental Protection and Health Act ("EPHA"), Idaho Code §§ 39-101 to 39-130, and the Hazardous Waste Management Act of 1983 ("HWMA"), Idaho Code §§ 39-4401 to 39-4432. IDEQ is the Idaho state agency with the authority to participate in the initiation and development of CERCLA response actions to be undertaken in the State of Idaho. Pursuant to Idaho Code § 39-108(b) and § 39-4414(2), IDEQ is entitled to recover from liable parties its reasonable costs associated with any violation of any permit, standard or regulation, including the costs of any non-routine investigation.

3. TRIBAL AUTHORITIES. The Shoshone-Bannock Tribes ("Tribes") are federally recognized Indian tribes with a governing body known as the Fort Hall Business Council, which has authority to enter into this CO/AOC on behalf of the Tribes. The Tribes have authority over the identification, investigation, and cleanup of hazardous substances found within Indian Country, including on the Reservation. The Tribes exercise their authority pursuant to, among other authorities, CERCLA, their inherent sovereign powers, the Fort Bridger Treaty, the Constitution and Bylaws of 1936, and various provisions of the Land Use Policy Ordinance, the Law and Order Code of 1982, and the 1994 Fort Hall Water Rights Agreement. Pursuant to CERCLA the Tribes can recover from liable parties all costs incurred for actions taken in response to the release or threatened release of hazardous substances that are not inconsistent with the National Contingency Plan ("NCP").

V.
FACTUAL BACKGROUND

Elevated concentrations of selenium and other hazardous substances, pollutants and contaminants have been identified in water, soil, vegetation and wildlife associated with current or former phosphate mining operations in southeastern Idaho. The IDEQ has determined that these elevated levels of selenium, and other hazardous substances, pollutants and contaminants are a violation of the standards, rules and regulations established pursuant to Idaho Code §§ 39-101 et seq. and 39-4401 et seq. The Companies dispute this assertion.

The approximate extent of currently known past and present phosphate mining operations in this region (the "Mining Area") is indicated on the map attached hereto for informational purposes as Exhibit B, and includes areas located variously on federal land, tribal land, private land, state land, or a mixture of these types of ownership or jurisdictional areas. Individual phosphate mining operations located within the Mining Area also are listed in Exhibit B.

The Agencies and the Companies have incurred and will continue to incur costs in responding to the release and threat of release of hazardous substances in the Mining Area. The Companies and other entities may be liable for some or all of those response costs.

Effective July 15, 2000, the Agencies entered into a Memorandum of Understanding ("MOU"). The MOU provides a framework for the coordination of the actions and authorities of the parties to the MOU. Under the terms of the MOU, IDEQ is designated the lead agency with respect to the Area-Wide Investigation; coordination with the other parties to the MOU is expected to occur pursuant to the terms of the MOU. The scope of the Area-Wide Investigation is set forth in the SOW.

VI.
AGREEMENT TO REIMBURSE COSTS ASSOCIATED WITH AREA-WIDE INVESTIGATION

1. Without admitting any liability and expressly reserving all claims and defenses except as specifically waived herein, the parties hereto mutually agree as follows:

2. The parties hereby mutually waive any and all claims for past costs incurred by them in connection with the Area-Wide Investigation conducted by the Selenium Working Group of the Idaho Mining Association ("Working Group") regarding the release of selenium or other contaminants as a result of phosphate mining in the Mining Area. The term "past costs" as used herein shall mean such Working Group costs incurred prior to August 1, 2000. Past costs do not include costs incurred by any of the parties for work conducted outside the Working Group relating to the release of selenium or other contaminants as a result of phosphate mining in the Mining Area, or the costs described in Paragraph 3, below.

3. The Parties and the United States Department of Justice ("DOJ"), on behalf of all the Federal Agencies and the Tribes, hereby reserve all claims for response costs, both past and future, associated with site-specific investigations or incurred in connection with the Area-Wide Investigation and not reimbursed or waived pursuant to the terms of this CO/AOC. Site-specific past costs include, but are not limited to, costs attributable to the South Maybe Canyon Mine Site, which is the subject of a June 8, 1998 Administrative Order on Consent between the Forest Service and Nu-West Industries, Inc. and Nu-West Mining, Inc. and costs incurred in connection with preliminary assessments and PRP searches for specific phosphate mining sites.

4. The Mining Companies assert that claims for cost recovery by certain Federal Agencies may be barred or diminished pursuant to Section 113 and/or Section 120 of CERCLA (42 USC § 9613, 9620). The Federal Agencies and Tribes dispute this assertion. The Mining Companies expressly reserve any and all claims and/or defenses based on these provisions.

5. IDEQ Cost Recovery Procedures: Subject to the funding commitments set forth below, the Companies hereby agree to reimburse IDEQ for its reasonable costs incurred by IDEQ in connection with performance, oversight and review of the items set forth and described in the SOW as provided herein.

a. Funding Commitment: The Companies hereby agree to commit the sum of up to five million dollars ($5,000,000.00) over a ten (10) year period commencing on the date following signature of this agreement for the purpose of reimbursing IDEQ for all of its reasonable costs incurred in the performance of the work identified in the SOW. Said funds shall be made available to IDEQ as follows:

1. Year One: Up to one million dollars ($1,000,000.00)

2. Year Two: Up to one million dollars ($1,000,000.00)

3. Years Three through Ten: Up to Three Hundred Seventy Five Thousand dollars ($375,000.00) per year.

b. If any of the amounts of funding set forth in paragraph 5.a. of this section are not utilized in a given fiscal year, such surplus funding shall be made available in subsequent fiscal years within the ten (10) year project life set forth above.

c. The funding commitments set forth above shall not be deemed to constitute a waiver by the State of Idaho, or IDEQ of any claim or right or cause of action to recover amounts in addition to the amounts set forth above and IDEQ hereby expressly reserves the right to recover amounts which exceed the funding commitments set forth above in accordance with the procedure set forth in paragraph 5.d. of this section.

d. If during any fiscal year the amount sought by IDEQ under this CO exceeds the annual or decennial funding commitments of the Companies expressed herein, the IDEQ shall submit a supplemental request for payment to the Companies setting forth the amounts sought in excess of the funding commitments set forth above and a detailed explanation of the reasons for such exceedence. Within thirty (30) days of receipt of the Supplemental Request the Companies must either agree to payment of the Supplemental Request for payment, or deny the supplemental request for payment. Any denial, must set forth a detailed explanation upon which the Companies predicate denial. Any denial of a request for supplemental payment is subject to the informal dispute resolution provisions contained herein but not formal dispute resolution. Any such supplemental request for payment shall not obligate the Companies to make payment. IDEQ reserves the right to institute a civil action for the recovery of these costs pursuant to Idaho Code § 39-108(b) and § 39-4414(2).

e. Budget, Billing and Payment Procedures: Not later than June 30 of each year, IDEQ shall submit to the Companies estimated annual budgets (Annual Budget Estimate) for the costs and expenditures associated with performance, oversight and review of the work outlined in the SOW expected to be incurred by IDEQ in the following fiscal year. The Companies shall have 30 days after receipt of the Annual Budget Estimate within which to submit comments or object to items contained in the Annual Budget Estimate.

f. The Annual Budget Estimate shall not be binding upon any Party. The Annual Budget Estimate shall serve solely as an estimate of reasonably foreseeable costs and expenditures. IDEQ shall not be limited by any amount set forth in the Annual Budget Estimate, and shall not be required to expend the specific amounts set forth therein.

g. Within thirty (30) days after the end of each fiscal quarter, IDEQ shall provide the Companies with detailed statements of expenditures made during the fiscal quarter. Such expenditures shall be in accordance with the authorities of IDEQ as set forth in paragraph IV herein. Subject to the limitations on amounts set forth above the Companies shall remit payment for these expenditures to IDEQ within thirty (30) days of receipt of IDEQ's statement of expenditures.

h. If the Companies dispute any amounts set forth in the statement of expenditures, the Companies shall remit payment for all sums not in dispute. Thereafter, any disputes concerning an amount owed by the Companies shall be resolved through the dispute resolution process set forth in Section XII of this CO/AOC. If resolution of a dispute results in any portion of the disputed sum being awarded to IDEQ, the Companies shall within fifteen (15) days after receipt of the final decision: (i) remit the amount awarded plus interest accruing at the statutory rate for interest on judgments from the date originally due; or (ii) proceed with other legal remedies in accordance with Section XII herein.

6. Federal Costs: The Companies hereby agree to reimburse the EPA and USFWS for their "Oversight Costs" as defined herein.

a. Definition of Oversight Costs. "Oversight Costs" shall mean all direct and indirect costs incurred by the EPA, USFWS in connection with their oversight and review of the Work performed by or on behalf of IDEQ under this CO/AOC after its effective date as set forth and described in the SOW, including, but not limited to, time and travel costs of EPA and USFWS personnel associated with oversight of the work performed under the SOW; contractor costs; federal inter-agency agreement costs; compliance monitoring, including the collection and analysis of split samples; site visits; discussions regarding disputes that may arise under this CO/AOC; review and approval or disapproval of reports; and any other costs directly incurred in overseeing this CO/AOC.

b. Federal Payment Procedure. EPA and USFWS each will submit to the Companies annual bills and supporting cost summaries for Oversight Costs incurred during the billing period. The first bills for Oversight Costs shall be issued no sooner than ninety (90) days after the effective date of this CO/AOC. The Companies shall remit payment for these expenditures to the billing entity (EPA or USFWS) within thirty (30) days of receipt of the BILL. Payments to EPA shall be made by certified or cashier's check made payable to EPA Hazardous Substance Superfund. Each check shall reference the name and address of the Party making payment, the Area-Wide Investigation, the EPA Region 10 number (106R), and shall be sent to:

EPA Superfund
Region 10
1200 Sixth Avenue, DMP-146
Seattle, WA 98101.

The Companies shall simultaneously transmit a copy of the check to:

Financial Management Officer
Region 10
1200 Sixth Avenue, OMP-146
Seattle, WA 98101

Payments to USFWS shall be made by certified or cashier's check made payable to the United States Fish and Wildlife Service and mailed to:

U.S. Fish & Wildlife Service
ATTN: Debra Freeman
911 N.E. 11th Avenue
Portland, OR 97232-4181

If the Companies dispute any amounts set forth in a statement of expenditures, the Companies shall remit payment for all sums not in dispute. Thereafter, any disputes concerning an amount owed by the Companies shall be resolved through the dispute resolution process set forth in Section XII of this CO/AOC. If resolution of a dispute results in any portion of the disputed sum being awarded to EPA, USFWS, the Companies shall within fifteen (15) days after receipt of the final decision: (i) remit the amount awarded plus interest accruing at the statutory rate for interest on judgments from the date originally due; or (ii) proceed with other legal remedies in accordance with Section XII herein.

c. Interest. In the event that any payment required by paragraph 6(a) is not made when due, interest shall accrue on the unpaid balance. Interest shall continue to accrue on the unpaid balance through the date of payment. "Interest" shall mean interest at the current rate specified for interest on investments of the Hazardous Substance Superfund established by 26 USC 9507, compounded annually on October 1 of each year, in accordance with 42 USC § 9607(a). Payments of interest shall be in addition to such other remedies or sanctions available to the Federal Agencies by virtue of the Companies' failure to make timely payments under this section. Payments required by this paragraph shall be made in the same manner described in paragraph 6(b) above.

7. Tribal Costs: The Companies hereby agree to commit to the sum of up to Sixty-Five Thousand Dollars ($65,000) per year for a three (3) year period commencing on the date

following complete execution of this agreement for the purpose of providing support for a full time position for a Selenium Project Manager, including fringe benefits and said Manager's reasonable costs and expenditures, to perform the oversight, investigation and review of work in the area-wide scope of work and site specific work. If the annual funding amount is not utilized in a given fiscal year, such surplus funding shall be made available in subsequent fiscal years during the three (3) year period referenced above. Unless terminated by the Companies, this agreement shall automatically renew upon expiration of the three year term for an additional three (3) year term under the same terms and conditions set forth herein.

a. Budget, Billing and Payment Procedures: Not later than July 30th of each year, the Tribes shall submit to the Companies an estimated annual budget for the salary and costs associated with the Selenium Project Manager which shall not exceed Sixty-Five Thousand Dollars ($65,000). The annual estimates shall not be binding on any Party. The annual estimates for costs and expenditures shall serve solely as an estimate of reasonably foreseeable costs and expenditures. The Tribes shall not be limited by the estimates of costs and expenditures, and shall not be required to expend the specific amounts set forth in the annual budget provided to the Companies. The Companies shall have 30 days after receipt of the Tribes' estimated annual budget within which to submit comments or object to items contained in the annual budget. If there are objections by the Companies, the parties shall proceed in accordance with paragraph 7.b. herein. If there are no objections by the Companies, the Companies shall remit payment of the annual salary, and within thirty (30) days after the end of each fiscal quarter, the Tribes shall provide the Companies with statements of expenditures made during the fiscal quarter. Such expenditures shall be in accordance with the authorities of the Tribes as set forth in Section IV herein. Subject to the limitations on amounts set forth above, the Companies shall remit payment for these expenditures to the Tribes within thirty (30) days of receipt of the Tribes' statement of expenditures.

b. Dispute of any amount: If the Companies dispute any amounts set forth in the statements of expenditures, the Companies shall remit payment for all sums not in dispute. Any disputes concerning an amount owed by the Companies to the Tribes shall be resolved through the dispute resolution process set forth in Section XII of this CO/AOC. If resolution of a dispute results in any portion of the disputed sum being awarded to the Tribes, the Companies shall within fifteen (15) days after receipt of the final decision: (i) remit the amount awarded plus interest accruing at the statutory rate for interest on judgments from the date originally due; or (ii) proceed with other legal remedies in accordance with Section XII herein.

c. Interest: In the event that any payment required in paragraph 7.b. is not made when due, interest shall accrue on the unpaid balance. Interest shall continue to accrue on the unpaid balance through the date of payment. "Interest" shall mean interest at the current rate specified for interest on investments of the Hazardous Substance Superfund established by 26 U.S.C. § 9507, compounded annually on October 1 of each year, in accordance with 42 U.S.C. §

9607(a). Payments of interest shall be in addition to such other remedies or sanctions available to the Tribes by virtue of the Companies' failure to make timely payments under this section.

VII.
DELEGATION AND ASSIGNMENT OF RESPONSIBILITY

It is the purpose and intent of IDEQ as lead agency to utilize cost efficient and expedient measures in performance of this CO/AOC and the attached SOW. IDEQ, or its designated contractor, shall have the primary responsibility for performing the tasks and subtasks described in the attached SOW. The IDEQ shall determine, in consultation with the Federal Agencies and the Tribes, appropriate resources for the performance of the tasks and subtasks described in the attached SOW. This may include assignment of tasks to the Mining Companies and their selected contractors, where appropriate, based upon consideration of efficiency and available resources. The Federal Agencies and the Tribes shall participate in decisions regarding such assignments and oversee such work as provided in the Memorandum of Understanding described in Section V above. All work assigned to the Mining Companies will be performed pursuant to enforceable agreements that will be separately executed and made subject to this CO/AOC. Nothing in this section or in the Scope of Work shall, in any way, limit the authority or the ability of the IDEQ to collect samples or take any actions necessary for completion of the Area-Wide Investigation, the provisions of the CO/AOC or the Scope of Work, which the IDEQ, in its discretion, determines are necessary and appropriate.

VIII.
CONSISTENCY WITH NATIONAL CONTINGENCY PLAN

All work implemented or required under this CO/AOC and the SOW shall be conducted in a manner which is not inconsistent with the National Oil and Hazardous Substances Pollution Contingency Plan ("NCP"), 40 C.F.R. Part 300, including without limitation 40 C.F.R. Subpart H. (40 C.F.R. § 300.415, and § 300.700).

IX.
COMPLIANCE WITH OTHER LAWS

Except as set forth herein, this CO/AOC shall not relieve the Companies from their obligations to comply with any of the applicable provisions of and the Parties hereto specifically reserve all other rights under the EPHA; the HWMA; the Idaho Water Quality Standards and Wastewater Treatment Requirements, IDAPA 16.01.02.001 to 16.01.02.999; the Rules and Standards for Hazardous Waste, IDAPA 16.01.05.001 to 16.01.05.999; the Ground Water Quality Rule, IDAPA 16.01.11.001-16.01.11.999, CERCLA, 42 U.S.C. 9601- 9675 and any other applicable local, state, tribal or federal law.

X.
COORDINATION WITH SITE-SPECIFIC REMEDIAL ACTIONS

The parties contemplate that various site-specific investigations, risk assessments and possible remedial actions will or may be performed in the future on all or some of the individual mining operations listed in Exhibit B pursuant to the terms of negotiated Consent Orders/Administrative Orders on Consent. Because this Area-Wide investigation includes a general, region-wide risk assessment and planning for general remedial action objectives and measures that are intended to be used to facilitate, expedite and provide consistency for future site-specific work, the parties generally contemplate and intend that this Area-Wide Investigation will be closely coordinated and not performed in a duplicative or inconsistent manner with any site-specific work. By stating this general goal, however, IDEQ, the Federal Agencies and the Tribes do not waive or limit any of their authorities with respect to determining the scope of or schedule for either the Area-Wide Investigation or any site-specific work.

XI.
GENERAL PROVISIONS

1. Conflict Between Consent Order and Exhibits. To the extent of any conflict between the meaning of the terms and provisions in this CO/AOC and the Exhibits, the meaning in this CO/AOC shall control.

2. Modifications. This CO/AOC may be modified by the Parties' mutual agreement. Agreed modifications to the CO/AOC must be in writing signed by an authorized representative of each party.

IDEQ, the Federal Agencies and the Tribes reserve the right to modify the SOW pursuant to the Memorandum of Understanding among them, but the Mining Companies will not be obligated under this CO/AOC to pay for any increase in costs incurred by IDEQ, the Federal Agencies or the Tribes as a result of such modification, unless they agree to pay such increased costs in writing. IDEQ, the Federal Agencies and the Tribes nonetheless reserve the right to seek recovery of such increased costs from the Companies.

3. Notice. All communications required by this CO/AOC shall be addressed to:

IDEQ – Orville Greene, Administrator, Waste Management & Remediation Division, Idaho Department of Environmental Quality, 1410 N. Hilton, Boise, ID 83706, 208-373-0445

EPA - Nick Ceto, U.S. Environmental Protection Agency, 1200 Sixth Avenue, ECL 116, Seattle, WA 98101, (206) 553-1816

USDA/Forest Service - Forest Supervisor of the Caribou-Targhee National Forest (currently Jerry Reese, 1405 Hollipark Dr., Idaho Falls, ID, 83401, (208) 557-5760)

BIA - Land Manager (currently Allen Sedik, CERCLA Coordinator, U.S. Department of the Interior, Bureau of Indian Affairs, 1849 C St., NW, MS 4513, Washington, DC, 20240, (202) 208-5474)

USFWS – Contaminants Specialist, Snake River Basin Office (currently Susan Burch, 1387 S. Vinnell Way, Room 368, Boise, ID 83709, (208) 378-5243)

TRIBES - Jeanette Wolfley, Tribal Attorney, Shoshone-Bannock Tribes, P.O. Box 306, Fort Hall, ID 83203, (208) 232-1922

DOI/BLM - District Manager, Upper Snake River District (currently Jim May 1405 Hollipark Drive, Idaho Falls, ID 83401, (208) 524-7500.

J. R. Simplot Company – Bruce Winegar, Frontier Bldg., 1130 W. Hwy. 30, Pocatello, ID 83204, (208) 235-5675.

Nu-West Industries, Inc. – Scott Sprague, Agrium U.S., Inc., 3010 Conda Rd., Soda Springs, ID 83276, (208) 543-4387.

Rhodia, Inc. – Dan Bersanti, Rhodia, Inc., P.O. Box 3146, Butte, MT, 59702, (406) 782-1215.

FMC Corporation – Rob Hartman, P.O. Box 4111, Pocatello, ID 83202, (208) 236-8658

P4 Production, L.L.C. – Robert Geddes, P.O. Box 816, Soda Springs Plant Highway 34 N., Soda Springs, ID 83276, (208) 547-4300.

4. Effect on Successors and Assigns. This CO/AOC shall bind the parties and their respective successors, agents, and assigns until such time as the terms of this CO/AOC are fully met.

5. Reservation of Natural Resource Damage Claims. Nothing herein shall be deemed to waive or compromise any claims, known or unknown, existing or potential for damages to natural resources whether in existence at the time of this CO/AOC or arising in the future.

6. State Tolling Agreement. The State of Idaho and the Companies expressly stipulate and agree that any statute of limitations applicable to any claims under CERCLA, EPHA, HWMA or any

other applicable law, for natural resource damages or other damages to the environment, is hereby tolled as of the effective date hereof, until such time as this CO/AOC is terminated. IDEQ and Companies further stipulate and agree that this tolling provision is not intended to restrict IDEQ and Companies from enforcing their rights under this CO/AOC, or to limit the time within which IDEQ and Companies may enforce such rights as provided in Idaho Code § 29-110. IDEQ and Companies further stipulate and agree that the IDEQ's right to pursue a claim for natural resource damages and the Companies' right to raise any defense to a natural resource damage claim are not rights created by or enforceable under this CO/AOC and, therefore, the tolling provision set forth herein is not prohibited by Idaho Code § 29-110.

7. Federal Tolling Agreement. The Companies and the Federal Agencies shall enter into a separate tolling agreement.

8. Tribal Tolling Agreement. The Companies and the Tribes shall enter into a separate tolling agreement.

9. Third Person's Rights Unaffected. Except as expressly provided herein, nothing in this CO/AOC shall be construed to create any rights in, or grant any cause of action to, the Parties or any person not a Party to this CO/AOC.

10. Effective Date. The effective date of this CO/AOC shall be the date of signature by the last of the Parties.

11. Authority. Each undersigned representative certifies that he or she is fully authorized to enter into the terms and conditions of this CO/AOC, and to execute and legally bind such Party to this document.

XII.
DISPUTE RESOLUTION

Informal Resolution: It is understood that disputes may arise between the Companies and either a single agency participant or multiple agency participants regarding cost recovery items governed by this CO/AOC. The Companies and the Agency (or Agencies) shall attempt to resolve expeditiously and informally disputes that arise under this CO/AOC. An agreement to informally resolve a dispute reached by the Parties pursuant to this section shall be memorialized in writing, signed by both Parties, and shall, upon the signature of both parties, be incorporated into and become an enforceable element of this CO/AOC.

Formal Resolution: If, after consultation, the Companies and the Agency(ies) still cannot agree on disputed matters, the Companies and the Agency(ies) may initiate a Dispute Resolution Process by written request directed to each Party's representative identified in Section XI, Paragraph 3 above. This dispute resolution process shall apply only to disputes involving

accounting errors in the calculation of amounts due, claims that costs billed are not within the categories of costs covered by this CO/AOC and/or alleged inconsistencies of response actions with the NCP.

The request for dispute resolution shall set forth the position of the requesting Party regarding the disputed matter, and include supporting data. The affected agency shall designate a Dispute Reviewer who shall issue a decision regarding the disputed matter. The decision of the Dispute Reviewer shall be incorporated into and become an enforceable element of this CO/AOC upon the parties' receipt of the decision regarding the dispute.

Nothing in this Order precludes the parties from agreeing to use other forms of alternative dispute resolution.

Review of IDEQ Disputes: With respect to disputes involving IDEQ's costs, either Party may seek review of the Dispute Reviewer's decision in accordance with applicable law including initiation of a contested case pursuant to the Hazardous Waste Management Act and Rules for Contested Cases before the Idaho Department of Environmental Quality, IDAPA 58.05.03, et seq.

Review of Federal and Tribal Disputes: With respect to disputes involving costs billed by any Federal Agency or the Tribes, the Dispute Reviewer's decision shall be final, but shall not constitute final agency action for purposes of initiating judicial review unless and until such Federal Agency or Tribes initiate a judicial action to enforce this CO/AOC.

Effect on other Matters: If the Dispute Resolution Process is invoked with respect to a particular matter, all other matters not directly affected thereby shall proceed according to the requirements of this CO/AOC.

XIII.
TERMINATION

This CO/AOC shall be terminated in writing by the Parties hereto upon completion of the items set forth in the attached SOW and final payment of all oversight costs and obligations under Section VI of this CO/AOC.

XIV.
SIGNATURE IN COUNTERPARTS

This CO/AOC may be signed in counterparts. Upon signature the original signature pages will be forwarded to the Department of Environmental Quality which shall maintain an original copy of the CO/AOC and all original signatures thereto. Copies shall be provided to all parties.

Appendix 3A

Maxim 2000 Water Quality Data

Summary of Year 2000 Surface Water Data
Analysis for Total Metals
Smoky Canyon Mine
Baseline Study

Site		Date	Aluminum (mg/L)	Antimony (mg/L)	Arsenic (mg/L)	Barium (mg/L)	Beryllium (mg/L)	Boron (mg/L)	Cadmium (mg/L)	Chromium (mg/L)	Copper (mg/L)	Iron (mg/L)	Lead (mg/L)	Manganese (mg/L)	Mercury (mg/L)	Nickel (mg/L)	Selenium (mg/L)	Silver (mg/L)	Thallium (mg/L)	Vanadium (mg/L)	Zinc (mg/L)
SC-SW-01	N	03/13/2000	<0.1	<0.001	<0.001	<0.1	<0.001	<0.1	<0.0001	<0.01	<0.01	<0.05	<0.001	<0.02	<0.0002	<0.02	--	<0.001	<0.002	<0.005	<0.02
	N	06/21/2000	0.1	0.001	0.001	0.1	0.001	0.04	0.0001	0.01	0.01	0.06	0.001	0.02	0.0002	0.02	0.001	0.001	0.002	0.005	0.02
	N	09/25/2000	0.1	<0.001	<0.001	<0.1	<0.001	0.01	<0.0001	<0.01	<0.01	0.08	<0.001	<0.02	<0.0002	<0.02	<0.001	<0.001	<0.002	<0.005	<0.02
	N	12/19/2000	0.1	<0.001	<0.001	<0.1	<0.001	0.04	<0.0001	<0.01	<0.01	0.21	<0.001	<0.02	<0.0002	<0.02	<0.001	<0.001	<0.002	<0.005	<0.02
SC-SW-02	N	03/13/2000	1.3	<0.001	<0.001	<0.1	<0.001	<0.1	0.0003	<0.01	<0.01	1.66	0.002	0.15	<0.0002	<0.02	<0.001	<0.001	<0.002	<0.005	<0.02
	N	06/20/2000	0.3	0.001	0.001	0.1	0.001	0.04	0.0002	0.01	0.01	0.59	0.001	0.07	0.0002	0.02	0.001	0.001	0.002	0.005	0.02
	N	09/25/2000	0.2	<0.001	<0.001	<0.1	<0.001	0.01	<0.0001	<0.01	<0.01	0.28	<0.001	0.06	<0.0002	<0.02	0.003	<0.001	<0.002	<0.005	<0.02
	N	12/19/2000	0.4	<0.001	<0.001	<0.1	<0.001	0.03	0.0001	<0.01	<0.01	1.31	0.001	0.12	<0.0002	<0.02	<0.001	<0.001	<0.002	<0.005	<0.02
SC-SW-03	N	06/20/2000	0.1	<0.001	<0.001	<0.1	<0.001	0.04	0.0002	<0.01	<0.01	0.26	<0.001	0.06	<0.0002	<0.02	<0.001	<0.001	<0.002	<0.005	<0.02
	N	12/20/2000	0.4	<0.001	<0.001	<0.1	<0.001	0.04	<0.0001	<0.01	<0.01	0.67	<0.001	0.12	<0.0002	<0.02	<0.001	<0.001	<0.002	<0.005	0.04
SC-SW-04	N	06/21/2000	0.1	0.001	0.001	0.1	0.001	0.06	0.0001	0.01	0.01	0.2	0.001	0.05	0.0002	0.02	0.001	0.001	0.002	0.005	0.02
	N	09/25/2000	<0.1	<0.001	<0.001	<0.1	<0.001	0.05	<0.0001	<0.01	<0.01	0.09	<0.001	<0.02	<0.0002	<0.02	<0.001	<0.001	<0.002	<0.005	<0.02
	N	12/20/2000	<0.1	<0.001	<0.001	<0.1	<0.001	0.07	<0.0001	<0.01	<0.01	0.09	<0.001	<0.02	<0.0002	<0.02	<0.001	<0.001	<0.002	<0.005	<0.02
SC-SW-05	N	03/15/2000	<0.1	<0.001	0.001	0.2	<0.001	<0.1	<0.0001	<0.01	<0.01	0.06	0.001	0.07	<0.0002	<0.02	0.001	<0.001	<0.002	<0.005	<0.02
	N	06/20/2000	0.3	0.001	0.001	0.1	0.001	0.05	0.0002	0.01	0.01	0.4	0.001	0.05	0.0002	0.02	0.001	0.001	0.002	0.005	0.02
	N	09/25/2000	0.3	<0.001	0.003	<0.1	<0.001	0.01	<0.0001	<0.01	<0.01	0.28	<0.001	0.06	<0.0002	<0.02	<0.001	<0.001	<0.002	<0.005	<0.02
	N	12/19/2000	<0.1	<0.001	<0.001	0.1	<0.001	0.05	<0.0001	<0.01	<0.01	<0.05	<0.001	0.04	<0.0002	<0.02	<0.001	<0.001	<0.002	<0.005	<0.02
SC-SW-06	N	03/14/2000	0.7	<0.001	0.002	0.2	<0.001	<0.1	0.0001	<0.01	<0.01	0.64	0.001	0.12	<0.0002	<0.02	--	<0.001	<0.002	<0.005	<0.02
	N	06/20/2000	1.1	0.001	0.002	0.1	0.001	0.05	0.0002	0.01	0.01	1.26	0.001	0.12	0.0002	0.02	0.001	0.001	0.002	0.005	0.02
	N	09/25/2000	0.8	<0.001	<0.001	0.4	<0.001	0.01	<0.0001	<0.01	0.02	0.66	0.004	0.2	<0.0002	<0.02	0.004	<0.001	<0.002	0.013	<0.02
	N	12/19/2000	0.4	<0.001	<0.001	<0.1	<0.001	0.03	<0.0001	<0.01	<0.01	0.52	<0.001	0.03	<0.0002	<0.02	<0.001	<0.001	<0.002	<0.005	<0.02
SC-SW-07	N	03/14/2000	1.9	<0.001	0.001	0.3	<0.001	<0.1	<0.0001	<0.01	<0.01	1.29	0.001	0.09	<0.0002	<0.02	--	<0.001	<0.002	<0.005	<0.02
	N	06/20/2000	3.4	<0.001	0.002	0.4	<0.001	0.07	0.0005	<0.01	<0.01	2.56	0.003	0.16	<0.0002	<0.02	<0.001	<0.001	<0.002	0.008	<0.02

Notes:

- < Indicates analyte not detected above laboratory practical quantification limit (PQL)
- -- Field data or laboratory samples were not collected or analyzed
- (mg/L) Milligrams per liter
- N Naturel sample
- D Field duplicate sample

Summary of Year 2000 Surface Water Data
Analysis for Total Metals
Smoky Canyon Mine
Baseline Study

Site		Date	Aluminum (mg/L)	Antimony (mg/L)	Arsenic (mg/L)	Barium (mg/L)	Beryllium (mg/L)	Boron (mg/L)	Cadmium (mg/L)	Chromium (mg/L)	Copper (mg/L)	Iron (mg/L)	Lead (mg/L)	Manganese (mg/L)	Mercury (mg/L)	Nickel (mg/L)	Selenium (mg/L)	Silver (mg/L)	Thallium (mg/L)	Vanadium (mg/L)	Zinc (mg/L)
SC-SW-07	N	09/25/2000	5.3	<0.001	0.002	0.3	<0.001	0.03	<0.0001	<0.01	<0.01	4.1	0.002	0.16	<0.0002	<0.02	<0.001	<0.001	<0.002	0.008	<0.02
	N	12/19/2000	0.6	<0.001	0.001	0.3	<0.001	0.06	<0.0001	<0.01	<0.01	0.66	<0.001	0.04	<0.0002	<0.02	0.001	<0.001	<0.002	<0.005	<0.02
SC-SW-08	N	06/21/2000	0.1	0.001	0.001	0.1	0.001	0.06	0.0001	0.01	0.01	0.15	0.001	0.04	0.0002	0.02	0.001	0.001	0.002	0.005	0.02
	D	06/21/2000	0.2	0.001	0.001	0.1	0.001	0.06	0.0001	0.01	0.01	0.24	0.001	0.04	0.0002	0.02	0.001	0.001	0.002	0.005	0.02
	N	09/25/2000	<0.1	<0.001	0.003	<0.1	<0.001	0.05	0.0009	<0.01	<0.01	0.05	<0.001	<0.02	<0.0002	<0.02	0.019	<0.001	<0.002	0.076	<0.02
	N	12/20/2000	<0.1	<0.001	0.004	<0.1	<0.001	0.06	0.0057	<0.01	<0.01	0.09	<0.001	0.08	<0.0002	<0.02	0.016	<0.001	<0.002	0.054	0.03
SC-SW-09	N	06/20/2000	0.2	<0.001	0.006	<0.1	<0.001	0.07	0.0033	<0.01	<0.01	0.39	<0.001	<0.02	<0.0002	<0.02	0.041	<0.001	<0.002	0.13	<0.02
	N	09/25/2000	0.2	<0.001	0.004	<0.1	<0.001	0.05	0.004	<0.01	<0.01	0.26	<0.001	<0.02	<0.0002	<0.02	0.023	<0.001	<0.002	0.102	<0.02
	N	12/20/2000	1.8	<0.001	0.005	<0.1	<0.001	0.06	0.003	<0.01	<0.01	2.68	0.001	1.1	<0.0002	<0.02	0.018	<0.001	<0.002	0.053	0.04
SC-SW-10	N	06/20/2000	<0.1	<0.001	0.001	<0.1	<0.001	0.06	0.0003	<0.01	<0.01	0.05	<0.001	<0.02	<0.0002	<0.02	0.002	<0.001	<0.002	<0.005	<0.02
	N	09/25/2000	<0.1	<0.001	<0.001	0.1	<0.001	0.05	<0.0001	<0.01	<0.01	0.05	<0.001	<0.02	<0.0002	<0.02	0.001	<0.001	<0.002	<0.005	<0.02
	N	12/19/2000	<0.1	<0.001	<0.001	0.1	<0.001	0.07	<0.0001	<0.01	<0.01	<0.05	<0.001	<0.02	<0.0002	<0.02	0.002	<0.001	<0.002	<0.005	<0.02
SC-SW-11	N	06/22/2000	<0.1	<0.001	<0.001	<0.1	<0.001	0.04	0.0002	<0.01	<0.01	0.13	<0.001	<0.02	<0.0002	<0.02	<0.001	<0.001	<0.002	<0.005	<0.02
SC-SW-12	N	06/22/2000	<0.1	<0.001	<0.001	<0.1	<0.001	0.03	0.0003	<0.01	<0.01	<0.05	<0.001	<0.02	<0.0002	<0.02	0.002	<0.001	<0.002	<0.005	<0.02
	N	09/26/2000	<0.1	<0.001	<0.001	<0.1	<0.001	<0.01	<0.0001	<0.01	<0.01	0.05	<0.001	<0.02	<0.0002	<0.02	<0.001	<0.001	<0.002	<0.005	<0.02
SC-SW-13	N	06/22/2000	<0.1	<0.001	<0.001	<0.1	<0.001	0.04	0.0002	<0.01	<0.01	0.06	<0.001	<0.02	<0.0002	<0.02	<0.001	<0.001	<0.002	<0.005	<0.02
	N	09/26/2000	<0.1	<0.001	<0.001	<0.1	<0.001	0.01	<0.0001	<0.01	<0.01	0.08	<0.001	<0.02	<0.0002	<0.02	<0.001	<0.001	<0.002	<0.005	<0.02
SC-SW-14	N	06/21/2000	0.1	<0.001	<0.001	<0.1	<0.001	0.03	0.0004	<0.01	<0.01	0.12	0.003	<0.02	<0.0002	<0.02	<0.001	<0.001	<0.002	<0.005	<0.02
	N	09/26/2000	0.2	<0.001	<0.001	<0.1	<0.001	<0.01	<0.0001	<0.01	<0.01	0.2	<0.001	0.04	<0.0002	<0.02	0.003	<0.001	<0.002	<0.005	<0.02
SC-SW-15	N	06/22/2000	<0.1	<0.001	<0.001	<0.1	<0.001	0.03	0.0002	<0.01	<0.01	0.33	<0.001	<0.02	<0.0002	<0.02	<0.001	<0.001	<0.002	<0.005	<0.02
	N	09/26/2000	0.1	<0.001	<0.001	<0.1	<0.001	0.02	<0.0001	<0.01	<0.01	0.07	<0.001	<0.02	<0.0002	<0.02	<0.001	<0.001	<0.002	<0.005	<0.02
SC-SW-16	N	06/22/2000	<0.1	<0.001	0.033	<0.1	<0.001	0.04	0.0077	<0.01	<0.01	<0.05	<0.001	<0.02	<0.0002	<0.02	<0.001	<0.001	<0.002	<0.005	<0.02
SC-SW-17	N	06/22/2000	<0.1	<0.001	0.001	<0.1	<0.001	0.04	0.0003	<0.01	<0.01	<0.05	<0.001	<0.02	<0.0002	<0.02	0.009	<0.001	<0.002	<0.005	<0.02

Notes:

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- (mg/L) Milligrams per liter
- N Natural sample
- D Field duplicate sample

Summary of Year 2000 Surface Water Data
Analysis for Total Metals
Smoky Canyon Mine
Baseline Study

Site	Date	Aluminum (mg/L)	Antimony (mg/L)	Arsenic (mg/L)	Barium (mg/L)	Beryllium (mg/L)	Boron (mg/L)	Cadmium (mg/L)	Chromium (mg/L)	Copper (mg/L)	Iron (mg/L)	Lead (mg/L)	Manganese (mg/L)	Mercury (mg/L)	Nickel (mg/L)	Selenium (mg/L)	Silver (mg/L)	Thallium (mg/L)	Vanadium (mg/L)	Zinc (mg/L)
SC-SW-17 N	09/26/2000	<0.1	<0.001	<0.001	<0.1	<0.001	<0.01	<0.0001	<0.01	<0.01	0.05	<0.001	<0.02	<0.0002	<0.02	0.006	<0.001	<0.002	<0.005	<0.02
SC-SW-18 N	03/15/2000	0.2	<0.001	0.001	0.1	<0.001	<0.1	0.0001	<0.01	<0.01	0.32	<0.001	0.06	<0.0002	<0.02	<0.001	<0.001	<0.002	<0.005	<0.02
N	09/25/2000	0.2	0.001	<0.001	<0.1	<0.001	0.02	<0.0001	<0.01	<0.01	0.23	<0.001	0.11	<0.0002	<0.02	<0.001	<0.001	<0.002	<0.005	<0.02
SC-SW-19 N	09/07/2000	0.2	<0.001	<0.001	<0.1	<0.001	<0.01	<0.0001	<0.01	<0.01	0.16	<0.001	0.02	<0.0002	<0.02	<0.001	<0.001	<0.001	<0.005	0.02
N	09/26/2000	<0.1	<0.001	<0.001	<0.1	<0.001	0.03	<0.0001	<0.01	<0.01	0.05	<0.001	<0.02	<0.0002	<0.02	0.002	<0.001	<0.002	<0.005	<0.02
N	12/20/2000	0.1	<0.001	<0.001	<0.1	<0.001	0.05	<0.0001	<0.01	<0.01	0.32	<0.001	0.06	<0.0002	<0.02	<0.001	<0.001	<0.002	<0.005	<0.02
SC-SW-20 N	12/20/2000	0.1	<0.001	<0.001	<0.1	<0.001	0.04	<0.0001	<0.01	<0.01	0.29	<0.001	0.03	<0.0002	<0.02	<0.001	<0.001	<0.002	<0.005	<0.02

Notes:

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- (mg/L) Milligrams per liter
- N Natural sample
- D Field duplicate sample

Summary of Year 2000 Surface Water Data
Analysis for Dissolved Metals
Smoky Canyon Mine
Baseline Study

Site		Date	Aluminum (mg/L)	Antimony (mg/L)	Arsenic (mg/L)	Barium (mg/L)	Beryllium (mg/L)	Boron (mg/L)	Cadmium (mg/L)	Chromium (mg/L)	Copper (mg/L)	Iron (mg/L)	Lead (mg/L)	Manganese (mg/L)	Mercury (mg/L)	Nickel (mg/L)	Selenium (mg/L)	Silver (mg/L)	Thallium (mg/L)	Vanadium (mg/L)	Zinc (mg/L)
SC-SW-01	N	03/13/2000	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
	N	06/21/2000	0.1	0.001	0.001	0.1	0.001	0.04	0.0001	0.01	0.01	0.05	0.001	0.02	0.0002	0.02	0.001	0.001	0.002	0.005	0.02
	N	09/25/2000	<0.1	<0.001	<0.001	<0.1	<0.001	<0.01	<0.0001	<0.01	<0.01	<0.05	<0.001	<0.02	<0.0002	<0.02	<0.001	<0.001	<0.002	<0.005	<0.02
	N	12/19/2000	<0.1	<0.001	<0.001	<0.1	<0.001	0.04	<0.0001	<0.01	<0.01	<0.05	<0.001	<0.02	<0.0002	<0.02	<0.001	<0.001	<0.002	<0.005	<0.02
SC-SW-02	N	03/13/2000	<0.1	<0.001	<0.001	<0.1	<0.001	<0.1	<0.0001	<0.01	<0.01	<0.05	<0.001	0.02	<0.0002	<0.02	<0.001	<0.001	<0.002	<0.005	<0.02
	N	06/20/2000	<0.1	0.001	0.001	0.1	0.001	0.05	0.0001	0.01	0.01	0.05	0.001	0.03	0.0002	0.02	0.001	0.001	0.002	0.005	0.02
	N	09/25/2000	<0.1	<0.001	<0.001	<0.1	<0.001	0.01	<0.0001	<0.01	<0.01	<0.05	<0.001	0.04	<0.0002	<0.02	0.003	<0.001	<0.002	<0.005	<0.02
	N	12/19/2000	<0.1	<0.001	<0.001	<0.1	<0.001	0.04	<0.0001	<0.01	<0.01	<0.05	<0.001	0.05	<0.0002	<0.02	<0.001	<0.001	<0.002	<0.005	<0.02
SC-SW-03	N	06/20/2000	<0.1	<0.001	<0.001	<0.1	<0.001	0.04	<0.0001	<0.01	<0.01	<0.05	<0.001	0.03	<0.0002	<0.02	<0.001	<0.001	<0.002	<0.005	<0.02
	N	12/20/2000	<0.1	<0.001	<0.001	<0.1	<0.001	0.04	<0.0001	<0.01	<0.01	<0.05	<0.001	0.05	<0.0002	<0.02	<0.001	<0.001	<0.002	<0.005	<0.02
SC-SW-04	N	06/21/2000	0.1	0.001	0.001	0.1	0.001	0.07	0.0001	0.01	0.01	0.05	0.001	0.02	0.0002	0.02	0.001	0.001	0.002	0.005	0.02
	N	09/25/2000	<0.1	<0.001	<0.001	<0.1	<0.001	0.04	0.0004	<0.01	<0.01	<0.05	<0.001	<0.02	<0.0002	<0.02	<0.001	<0.001	<0.002	<0.005	<0.02
	N	12/20/2000	<0.1	<0.001	<0.001	<0.1	<0.001	0.06	<0.0001	<0.01	<0.01	<0.05	<0.001	<0.02	<0.0002	<0.02	<0.001	<0.001	<0.002	<0.005	<0.02
SC-SW-05	N	03/15/2000	<0.1	0.001	<0.001	0.1	<0.001	<0.1	<0.0001	<0.01	<0.01	<0.05	<0.001	0.05	<0.0002	<0.02	0.001	<0.001	<0.002	<0.005	<0.02
	N	06/20/2000	0.1	0.001	0.001	0.1	0.001	0.05	0.0001	0.01	0.01	0.05	0.001	0.02	0.0002	0.02	0.001	0.001	0.002	0.005	0.02
	N	09/25/2000	<0.1	<0.001	<0.001	<0.1	<0.001	<0.01	<0.0001	<0.01	<0.01	<0.05	<0.001	<0.02	<0.0002	<0.02	<0.001	<0.001	<0.002	<0.005	<0.02
	N	12/19/2000	<0.1	<0.001	<0.001	0.1	<0.001	0.05	<0.0001	<0.01	<0.01	<0.05	<0.001	0.04	<0.0002	<0.02	<0.001	<0.001	<0.002	<0.005	<0.02
SC-SW-06	N	03/14/2000	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
	N	06/20/2000	0.1	0.001	0.001	0.1	0.001	0.05	0.0001	0.01	0.01	0.05	0.001	0.02	0.0002	0.02	0.001	0.001	0.002	0.005	0.02
	N	09/25/2000	<0.1	<0.001	0.001	<0.1	<0.001	<0.01	<0.0001	<0.01	<0.01	<0.05	<0.001	<0.02	<0.0002	<0.02	0.004	<0.001	<0.002	<0.005	<0.02
	N	12/19/2000	<0.1	<0.001	<0.001	<0.1	<0.001	0.04	<0.0001	<0.01	<0.01	<0.05	<0.001	<0.02	<0.0002	<0.02	<0.001	<0.001	<0.002	<0.005	<0.02
SC-SW-07	N	03/14/2000	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
	N	06/20/2000	<0.1	<0.001	0.002	0.3	<0.001	0.06	<0.0001	<0.01	<0.01	<0.05	<0.001	<0.02	<0.0002	<0.02	<0.001	<0.001	<0.002	<0.005	<0.02

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Summary of Year 2000 Surface Water Data
Analysis for Dissolved Metals
Smoky Canyon Mine
Baseline Study

Site		Date	Aluminum (mg/L)	Antimony (mg/L)	Arsenic (mg/L)	Barium (mg/L)	Beryllium (mg/L)	Boron (mg/L)	Cadmium (mg/L)	Chromium (mg/L)	Copper (mg/L)	Iron (mg/L)	Lead (mg/L)	Manganese (mg/L)	Mercury (mg/L)	Nickel (mg/L)	Selenium (mg/L)	Silver (mg/L)	Thallium (mg/L)	Vanadium (mg/L)	Zinc (mg/L)
SC-SW-07	N	09/25/2000	<0.1	<0.001	0.001	0.2	<0.001	0.02	<0.0001	<0.01	<0.01	<0.05	<0.001	<0.02	<0.0002	<0.02	<0.001	<0.001	<0.002	<0.005	<0.02
	N	12/19/2000	<0.1	<0.001	<0.001	0.2	<0.001	0.05	<0.0001	<0.01	<0.01	<0.05	<0.001	<0.02	<0.0002	<0.02	0.001	<0.001	<0.002	<0.005	<0.02
SC-SW-08	N	06/21/2000	0.1	0.001	0.001	0.1	0.001	0.06	0.0001	0.01	0.01	0.05	0.001	0.03	0.0002	0.02	0.001	0.001	0.002	0.005	0.02
	D	06/21/2000	0.1	0.001	0.001	0.1	0.001	0.07	0.0001	0.01	0.01	0.05	0.001	0.03	0.0002	0.02	0.001	0.001	0.002	0.005	0.02
	N	09/25/2000	<0.1	0.002	0.005	<0.1	<0.001	0.04	0.0008	<0.01	<0.01	<0.05	<0.001	<0.02	<0.0002	<0.02	0.019	<0.001	<0.002	<0.005	<0.02
	N	12/20/2000	<0.1	<0.001	0.004	<0.1	<0.001	0.06	0.0052	<0.01	<0.01	<0.05	<0.001	0.08	<0.0002	<0.02	0.016	<0.001	<0.002	0.053	0.03
SC-SW-09	N	06/20/2000	<0.1	<0.001	0.006	<0.1	<0.001	0.07	0.0028	<0.01	<0.01	<0.05	<0.001	<0.02	<0.0002	<0.02	0.041	<0.001	<0.002	0.13	<0.02
	N	09/25/2000	<0.1	0.002	0.004	<0.1	<0.001	0.04	0.003	<0.01	<0.01	<0.05	<0.001	<0.02	<0.0002	<0.02	0.023	<0.001	<0.002	0.077	<0.02
	N	12/20/2000	<0.1	<0.001	0.005	<0.1	<0.001	0.06	0.0025	<0.01	<0.01	<0.05	<0.001	1.07	<0.0002	<0.02	0.018	<0.001	<0.002	0.05	0.02
SC-SW-10	N	06/20/2000	<0.1	<0.001	<0.001	<0.1	<0.001	0.06	<0.0001	<0.01	<0.01	<0.05	<0.001	<0.02	<0.0002	<0.02	0.002	<0.001	<0.002	<0.005	<0.02
	N	09/25/2000	<0.1	0.001	0.001	0.1	<0.001	0.02	<0.0001	<0.01	<0.01	<0.05	<0.001	<0.02	<0.0002	<0.02	0.001	<0.001	<0.002	<0.005	<0.02
	N	12/19/2000	<0.1	<0.001	<0.001	<0.1	<0.001	0.06	<0.0001	<0.01	<0.01	<0.05	<0.001	<0.02	<0.0002	<0.02	0.002	<0.001	<0.002	<0.005	<0.02
SC-SW-11	N	06/22/2000	<0.1	<0.001	<0.001	0.1	<0.001	0.07	<0.0001	<0.01	<0.01	<0.05	<0.001	<0.02	<0.0002	<0.02	<0.001	<0.001	<0.002	<0.005	0.03
SC-SW-12	N	06/22/2000	<0.1	<0.001	<0.001	<0.1	<0.001	0.03	<0.0001	<0.01	<0.01	<0.05	<0.001	<0.02	<0.0002	<0.02	0.002	<0.001	<0.002	<0.005	<0.02
	N	09/26/2000	<0.1	<0.001	<0.001	<0.1	<0.001	<0.01	<0.0001	<0.01	<0.01	<0.05	<0.001	<0.02	<0.0002	<0.02	<0.001	<0.001	<0.002	<0.005	<0.02
SC-SW-13	N	06/22/2000	<0.1	<0.001	<0.001	<0.1	<0.001	0.04	<0.0001	<0.01	<0.01	<0.05	<0.001	<0.02	<0.0002	<0.02	<0.001	<0.001	<0.002	<0.005	<0.02
	N	09/26/2000	<0.1	<0.001	<0.001	<0.1	<0.001	<0.01	<0.0001	<0.01	<0.01	<0.05	<0.001	<0.02	<0.0002	<0.02	<0.001	<0.001	<0.002	<0.005	<0.02
SC-SW-14	N	06/21/2000	<0.1	<0.001	<0.001	<0.1	<0.001	0.04	<0.0001	<0.01	<0.01	<0.05	<0.001	<0.02	<0.0002	<0.02	<0.001	<0.001	<0.002	<0.005	<0.02
	N	09/26/2000	<0.1	<0.001	<0.001	<0.1	<0.001	<0.01	<0.0001	<0.01	<0.01	<0.05	<0.001	<0.02	<0.0002	<0.02	<0.001	<0.001	<0.002	<0.005	<0.02
SC-SW-15	N	06/22/2000	<0.1	<0.001	<0.001	<0.1	<0.001	0.04	<0.0001	<0.01	<0.01	<0.05	<0.001	0.03	<0.0002	<0.02	0.003	<0.001	<0.002	<0.005	<0.02
	N	09/26/2000	<0.1	<0.001	<0.001	<0.1	<0.001	<0.01	<0.0001	<0.01	<0.01	<0.05	<0.001	<0.02	<0.0002	<0.02	<0.001	<0.001	<0.002	<0.005	<0.02
SC-SW-16	N	06/22/2000	<0.1	<0.001	0.035	<0.1	<0.001	0.04	0.0078	<0.01	<0.01	<0.05	<0.001	<0.02	<0.0002	0.1	0.5	<0.001	<0.002	<0.005	0.32
SC-SW-17	N	06/22/2000	<0.1	<0.001	<0.001	<0.1	<0.001	0.04	<0.0001	<0.01	<0.01	<0.05	<0.001	<0.02	<0.0002	<0.02	0.009	<0.001	<0.002	<0.005	<0.02

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Summary of Year 2000 Surface Water Data
Analysis for Dissolved Metals
Smoky Canyon Mine
Baseline Study

Site	Date	Aluminum (mg/L)	Antimony (mg/L)	Arsenic (mg/L)	Barium (mg/L)	Beryllium (mg/L)	Boron (mg/L)	Cadmium (mg/L)	Chromium (mg/L)	Copper (mg/L)	Iron (mg/L)	Lead (mg/L)	Manganese (mg/L)	Mercury (mg/L)	Nickel (mg/L)	Selenium (mg/L)	Silver (mg/L)	Thallium (mg/L)	Vanadium (mg/L)	Zinc (mg/L)
SC-SW-17 N	09/26/2000	<0.1	<0.001	<0.001	<0.1	<0.001	0.01	<0.0001	<0.01	<0.01	<0.05	<0.001	<0.02	<0.0002	<0.02	0.006	<0.001	<0.002	<0.005	<0.02
SC-SW-18 N	03/15/2000	<0.1	<0.001	<0.001	<0.1	<0.001	<0.1	<0.0001	<0.01	<0.01	<0.05	<0.001	0.03	<0.0002	<0.02	<0.001	<0.001	<0.002	<0.005	<0.02
N	09/25/2000	<0.1	0.001	<0.001	<0.1	<0.001	<0.01	<0.0001	<0.01	<0.01	<0.05	<0.001	0.08	<0.0002	<0.02	<0.001	<0.001	<0.002	<0.005	<0.02
SC-SW-19 N	09/07/2000	<0.1	0.002	<0.001	<0.1	<0.001	<0.01	<0.0001	<0.01	<0.01	<0.05	<0.001	<0.02	<0.0002	<0.02	<0.001	<0.001	<0.001	<0.005	<0.02
N	09/26/2000	<0.1	<0.001	<0.001	<0.1	<0.001	0.02	<0.0001	<0.01	<0.01	<0.05	<0.001	<0.02	<0.0002	<0.02	0.002	<0.001	<0.002	<0.005	<0.02
N	12/20/2000	<0.1	<0.001	<0.001	<0.1	<0.001	0.04	<0.0001	<0.01	<0.01	<0.05	<0.001	0.03	<0.0002	<0.02	<0.001	<0.001	<0.002	<0.005	<0.02
SC-SW-20 N	12/20/2000	<0.1	<0.001	<0.001	<0.1	<0.001	0.04	<0.0001	<0.01	<0.01	<0.05	<0.001	<0.02	<0.0002	<0.02	<0.001	<0.001	<0.002	<0.005	<0.02

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Summary of Year 2000 Surface Water Data
Analysis for Other Parameters
Smoky Canyon Mine
Baseline Study

Site		Date	Electrical Conductivity (umhos/cm)	pH	Sodium Adsorption Ratio	Total Dissolved Solids (mg/L)	Total Suspended Solids (mg/L)	Turbidity (NTU)
SC-SW-01	N	03/13/2000	360	8	0.12	223	2	0.24
	N	06/21/2000	338	8.4	0.12	231	5	1
	N	09/25/2000	401	8.1	0.12	244	<1	1.1
	N	12/19/2000	382	8.3	0.14	230	7	1.7
SC-SW-02	N	03/13/2000	384	8.2	0.14	24	30	16
	N	06/20/2000	379	8.4	0.17	247	16	6.7
	N	09/25/2000	439	8.2	0.18	231	8	1.1
	N	12/19/2000	405	8.2	0.17	246	44	16
SC-SW-03	N	06/20/2000	447	8.5	0.19	279	9	3.2
	N	12/20/2000	500	8.4	0.61	288	28	16
SC-SW-04	N	06/21/2000	644	8.2	0.93	415	9	2.6
	N	09/25/2000	759	8	0.98	493	5	0.29
	N	12/20/2000	690	8.3	0.94	430	4	4.5
SC-SW-05	N	03/15/2000	537	8.1	0.60	332	4	2.7
	N	06/20/2000	378	8.6	0.49	250	21	9.7
	N	09/25/2000	438	8.5	0.61	265	10	2.8
	N	12/19/2000	587	8.3	0.73	356	3	1.3
SC-SW-06	N	03/14/2000	479	8.3	0.54	286	37	23
	N	06/20/2000	467	8.6	0.60	287	73	20
	N	09/25/2000	485	8.4	0.72	289	33	14
	N	12/19/2000	487	8.4	0.60	287	26	8

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N	Natural sample
D	Field duplicate sample
(umhos/cm)	Micromhos per centimeter
(NTU)	Nephelometric Turbidity Unit

Summary of Year 2000 Surface Water Data
Analysis for Other Parameters
Smoky Canyon Mine
Baseline Study

Site		Date	Electrical Conductivity (umhos/cm)	pH	Sodium Adsorption Ratio	Total Dissolved Solids (mg/L)	Total Suspended Solids (mg/L)	Turbidity (NTU)
SC-SW-07	N	03/14/2000	500	8.2	0.23	274	64	60
	N	06/20/2000	464	8.5	0.24	300	142	60
	N	09/25/2000	511	8.3	0.25	320	159	100
	N	12/19/2000	552	8.3	0.27	317	22	16
SC-SW-08	N	06/21/2000	569	8.2	0.95	445	7	3.9
	D	06/21/2000	578	8.2	0.95	403	89	1
	N	09/25/2000	488	8.9	0.70	323	2	0.55
	N	12/20/2000	548	8.3	0.60	349	5	9
SC-SW-09	N	06/20/2000	517	8	0.60	374	9	6.4
	N	09/25/2000	546	8.3	0.56	353	12	13
	N	12/20/2000	700	8.1	0.55	424	70	31
SC-SW-10	N	06/20/2000	641	7.5	0.80	407	<2	1.3
	N	09/25/2000	690	7.3	0.82	416	2	0.1
	N	12/19/2000	683	8.3	0.98	422	<2	0.98
SC-SW-11	N	06/22/2000	301	8.5	0.10	204	5	3.6
SC-SW-12	N	06/22/2000	356	7.9	0.12	234	2	0.25
	N	09/26/2000	398	7.8	0.14	236	<2	0.1
SC-SW-13	N	06/22/2000	310	8.5	0.10	213	<2	1.1
	N	09/26/2000	370	8.1	0.09	208	<2	0.81
SC-SW-14	N	06/21/2000	304	8.6	0.10	206	14	3.9
	N	09/26/2000	377	8	0.09	238	2	1.4

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N	Natural sample
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(umhos/cm)	Micromhos per centimeter
(NTU)	Nephelometric Turbidity Unit

Summary of Year 2000 Surface Water Data
Analysis for Other Parameters
Smoky Canyon Mine
Baseline Study

Site		Date	Electrical Conductivity (umhos/cm)	pH	Sodium Adsorption Ratio	Total Dissolved Solids (mg/L)	Total Suspended Solids (mg/L)	Turbidity (NTU)
SC-SW-15	N	06/22/2000	303	8.5	0.10	204	9	4.5
	N	09/26/2000	355	8.1	0.10	215	<1	1.1
SC-SW-16	N	06/22/2000	680	8	0.09	501	3	2.3
SC-SW-17	N	06/22/2000	452	7.9	0.23	293	<2	0.16
	N	09/26/2000	465	7.5	0.20	272	<1	0.1
SC-SW-18	N	03/15/2000	524	8.2	0.66	302	11	7.4
	N	09/25/2000	456	8.1	0.09	271	5	1.7
SC-SW-19	N	09/07/2000	491	7.7	0.13	285	<3	1
	N	09/26/2000	506	7.5	0.13	292	<1	0.1
	N	12/20/2000	471	8.4	0.17	258	26	7.3
SC-SW-20	N	12/20/2000	395	8.3	0.17	239	6	2.7

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(mg/L)	Milligrams per liter
N	Natural sample
D	Field duplicate sample
(umhos/cm)	Micromhos per centimeter
(NTU)	Nephelometric Turbidity Unit

Summary of Year 2000 Surface Water Data

Analysis for Major Ions and Nutrients

Smoky Canyon Mine

Baseline Study

Site		Date	Acidity (mg/L)	Alkalinity Bicarbonate (mg/L)	Alkalinity Carbonate (mg/L)	Alkalinity Hydroxide (mg/L)	Alkalinity Total (mg/L)	Ammonia Undistilled (mg/L)	Calcium (mg/L)	Chloride (mg/L)	Fluoride Undistilled (mg/L)	Hardness (mg/L)	Magnesium (mg/L)	Nitrate and Nitrite (mg/L)	Nitrate (mg/L)	Nitrite (mg/L)	Phosphorous Ortho (mg/L)	Phosphorous Total (mg/L)	Potassium (mg/L)	Sodium (mg/L)	Sulfate (mg/L)
SC-SW-01	N	03/13/2000	<2	245	0	0	201	<0.05	58	<1	0.12	211	18	0.07	0.07	<0.05	0.01	0.03	<5	4	17
	N	06/21/2000	2	232	0	0	190	0.05	61	1	0.09	216	18	0.05	0.05	0.05	0.02	0.03	1	4	18
	N	09/25/2000	<2	221	0	0	181	<0.05	54	2	0.1	201	16	<0.05	<0.05	<0.05	0.03	0.04	<1	4	17
	N	12/18/2000	<2	221	0	0	181	<0.05	64	9	0.11	234	18	0.06	0.06	<0.05	0.019	0.04	<1	5	24
SC-SW-02	N	03/13/2000	<2	245	0	0	201	<0.05	65	8	0.12	228	18	0.08	0.08	<0.05	0.02	0.12	<5	5	16
	N	06/20/2000	<2	251	0	0	206	<0.05	64	7	0.11	233	18	0.05	0.05	0.05	0.05	0.15	1	6	17
	N	09/25/2000	<2	226	0	0	185	0.13	59	6	0.12	213	16	0.06	0.06	<0.05	0.06	0.08	<1	6	19
	N	12/18/2000	<2	221	0	0	181	<0.05	68	9	0.12	240	17	0.3	0.3	<0.05	0.037	0.23	<1	6	66
SC-SW-03	N	06/20/2000	<2	265	0	0	217	<0.05	72	9	0.13	258	19	<0.05	<0.05	<0.05	0.06	0.1	1	7	18
	N	12/20/2000	<2	226	0	0	185	<0.05	71	33	0.13	247	17	1.01	1.01	<0.05	0.061	0.09	<1	22	27
SC-SW-04	N	06/21/2000	2	225	0	0	184	0.05	84	64	0.14	317	26	0.05	0.05	0.05	0.02	0.05	1	38	65
	N	09/25/2000	<2	201	0	0	165	<0.05	70	71	0.13	282	26	0.11	0.11	<0.05	0.03	0.06	1	38	101
	N	12/20/2000	<2	201	0	0	165	<0.05	82	73	0.16	312	26	0.09	0.09	<0.05	0.025	0.04	1	39	81
SC-SW-05	N	03/15/2000	<2	284	0	0	233	<0.05	62	17	0.14	258	13	0.07	0.07	<0.05	0.04	0.07	<5	22	27
	N	06/20/2000	2	211	0	0	173	0.05	57	19	0.18	184	14	0.05	0.05	0.05	0.03	0.06	1	16	17
	N	09/25/2000	<2	187	0	0	153	<0.05	45	24	0.22	162	12	<0.05	<0.05	<0.05	0.04	0.07	1	18	23
	N	12/19/2000	<2	250	0	0	205	<0.05	67	44	0.18	279	15	0.07	0.07	<0.05	0.047	0.06	2	28	45
SC-SW-06	N	03/14/2000	<2	284	0	0	233	<0.05	71	23	0.13	235	14	0.13	0.13	<0.05	0.04	0.11	<5	19	7
	N	06/20/2000	2	271	0	0	222	0.05	68	23	0.18	232	15	0.05	0.05	0.05	0.06	0.14	1	21	7
	N	09/25/2000	<2	221	0	0	181	<0.05	59	24	0.14	205	14	<0.05	<0.05	<0.05	0.07	0.1	1	18	9
	N	12/19/2000	<2	236	0	0	193	<0.05	72	29	0.14	237	14	0.26	0.26	<0.05	0.045	0.11	<1	21	17
SC-SW-07	N	03/14/2000	<2	311	0	0	255	<0.05	80	8	0.14	282	20	0.13	0.13	<0.05	0.04	0.13	<5	9	25
	N	06/20/2000	<2	290	0	0	238	0.15	69	8	0.2	267	23	<0.05	<0.05	<0.05	0.06	0.13	1	8	20
	N	09/25/2000	<2	245	0	0	201	0.08	61	9	0.18	261	24	0.06	0.06	<0.05	0.18	0.35	2	9	41
	N	12/19/2000	<2	279	0	0	229	<0.05	66	17	0.18	309	23	0.12	0.12	<0.05	0.067	0.09	2	11	44
SC-SW-08	N	06/21/2000	2	186	0	0	152	0.05	64	56	0.14	258	24	0.05	0.05	0.05	0.007	0.07	1	35	78
	D	06/21/2000	2	178	0	0	146	0.05	64	56	0.14	265	24	0.05	0.05	0.05	0.008	0.03	1	35	80
	N	09/25/2000	<2	66	33	0	70	<0.05	47	36	1.2	187	12	<0.05	<0.05	<0.05	0.02	0.05	3	21	106
	N	12/20/2000	<2	138	0	0	113	<0.05	79	43	0.94	255	14	0.05	0.05	<0.05	0.35	0.46	3	22	107
SC-SW-09	N	06/20/2000	<2	159	0	0	130	0.07	73	32	1.47	232	12	<0.05	<0.05	<0.05	0.04	0.28	3	21	93
	N	09/25/2000	<2	128	0	0	105	0.06	67	31	1.28	213	11	0.07	0.07	<0.05	0.46	0.59	3	19	110
	N	12/20/2000	<2	172	0	0	141	<0.05	106	76	0.87	331	15	0.17	0.17	<0.05	0.18	0.26	4	23	92
SC-SW-10	N	06/20/2000	<2	278	0	0	228	<0.05	64	38	0.18	267	14	0.19	0.19	<0.05	0.06	0.08	1	30	63
	N	09/25/2000	<2	236	0	0	193	<0.05	66	43	0.2	264	12	0.1	0.1	<0.05	0.06	0.08	<1	31	72
	N	12/19/2000	<2	231	0	0	189	<0.05	66	53	0.18	302	14	0.06	0.06	<0.05	0.064	0.07	1	39	78
SC-SW-11	N	06/22/2000	<2	211	0	0	173	<0.05	47	2	0.09	179	15	<0.05	<0.05	<0.05	0.01	0.03	<1	3	10
SC-SW-12	N	06/22/2000	<2	238	0	0	195	<0.05	48	5	0.28	188	19	0.1	0.1	<0.05	0.009	0.02	<1	4	14

Notes:

- < Indicates analyte not detected above laboratory practical quantification limit (PQL)
- - Field data or laboratory samples were not collected or analyzed
- (mg/L) Milligrams per liter
- N Natural sample
- D Field duplicate sample

Summary of Year 2000 Surface Water Data
Analysis for Major Ions and Nutrients
Smoky Canyon Mine
Baseline Study

Site		Date	Acidity (mg/L)	Alkalinity Bicarbonate (mg/L)	Alkalinity Carbonate (mg/L)	Alkalinity Hydroxide (mg/L)	Alkalinity Total (mg/L)	Ammonia Undistilled (mg/L)	Calcium (mg/L)	Chloride (mg/L)	Fluoride Undistilled (mg/L)	Hardness (mg/L)	Magnesium (mg/L)	Nitrate and Nitrite (mg/L)	Nitrate (mg/L)	Nitrite (mg/L)	Phosphorous Ortho (mg/L)	Phosphorous Total (mg/L)	Potassium (mg/L)	Sodium (mg/L)	Sulfate (mg/L)
SC-SW-12	N	09/26/2000	<2	211	0	0	173	<0.05	47	4	0.24	200	20	0.16	0.16	<0.05	0.02	0.03	<1	4	15
SC-SW-13	N	06/22/2000	<2	205	0	0	168	<0.05	53	2	0.08	186	13	0.06	0.06	<0.05	0.02	0.03	<1	3	15
	N	09/26/2000	<2	182	0	0	149	<0.05	50	1	0.09	183	14	0.11	0.11	<0.05	0.02	0.03	<1	3	26
SC-SW-14	N	06/21/2000	<2	205	0	0	168	<0.05	54	1	0.11	188	13	<0.05	<0.05	<0.05	0.01	0.07	<1	3	16
	N	09/26/2000	<2	192	0	0	157	<0.05	54	1	0.11	192	14	<0.05	<0.05	<0.05	0.05	0.06	<1	3	25
SC-SW-15	N	06/22/2000	<2	211	0	0	173	<0.05	54	2	0.1	176	10	<0.05	<0.05	<0.05	0.009	0.03	<1	3	12
	N	09/26/2000	<2	187	0	0	153	<0.05	52	2	0.09	179	12	0.05	0.05	<0.05	0.02	0.03	<1	3	19
SC-SW-16	N	06/22/2000	<2	311	0	0	255	<0.05	110	2	0.33	357	20	0.06	0.06	<0.05	0.02	0.16	<1	4	134
SC-SW-17	N	06/22/2000	<2	238	0	0	195	<0.05	54	6	0.35	236	24	0.15	0.15	<0.05	0.01	0.02	<1	6	47
	N	09/26/2000	<2	211	0	0	173	<0.05	53	6	0.35	219	21	0.17	0.17	<0.05	0.02	0.03	<1	7	50
SC-SW-18	N	03/15/2000	<2	271	0	0	222	<0.05	67	31	0.13	233	16	0.14	0.14	<0.05	0.02	0.06	<5	23	21
	N	09/25/2000	<2	236	0	0	193	<0.05	63	6	0.1	225	17	<0.05	<0.05	<0.05	0.04	0.06	1	3	23
SC-SW-19	N	09/07/2000	<2	309	0	0	253	<0.05	71	3	0.12	266	22	<0.05	<0.05	<0.05	0.02	0.05	<1	5	21
	N	09/26/2000	<2	260	0	0	213	<0.05	65	1	0.11	249	21	0.05	0.05	<0.05	0.04	0.04	<1	5	23
	N	12/20/2000	<2	265	0	0	217	<0.05	63	13	0.11	248	22	<0.05	<0.05	<0.05	0.026	0.07	<1	6	29
SC-SW-20	N	12/20/2000	<2	216	0	0	177	<0.05	55	14	0.1	226	22	0.14	0.14	<0.05	0.008	0.04	1	6	29

Notes:

- < Indicates analyte not detected above laboratory practical quantification limit (PQL)
- – Field data or laboratory samples were not collected or analyzed
- (mg/L) Milligrams per liter
- N Natural sample
- D Field duplicate sample

Summary of Year 2000 Groundwater Data
Analysis for Dissolved Metals
Smoky Canyon Mine
Baseline Study

Site		Date	Aluminum (mg/L)	Antimony (mg/L)	Arsenic (mg/L)	Barium (mg/L)	Beryllium (mg/L)	Boron (mg/L)	Cadmium (mg/L)	Chromium (mg/L)	Copper (mg/L)	Iron (mg/L)	Lead (mg/L)	Manganese (mg/L)	Mercury (mg/L)	Nickel (mg/L)	Selenium (mg/L)	Silver (mg/L)	Thallium (mg/L)	Vanadium (mg/L)	Zinc (mg/L)
SC-GW-07	N	03/15/2000	<0.1	<0.001	<0.001	<0.1	<0.001	<0.1	<0.0001	<0.01	<0.01	<0.05	<0.001	<0.02	<0.0002	<0.02	<0.001	<0.001	<0.002	<0.005	<0.02
	N	06/23/2000	<0.1	<0.001	<0.001	<0.1	<0.001	0.03	<0.0001	<0.01	<0.01	<0.05	<0.001	<0.02	<0.0002	<0.02	<0.001	<0.001	<0.002	<0.005	<0.02
	N	09/28/2000	<0.1	0.001	0.002	<0.1	<0.001	<0.01	0.0002	<0.01	<0.01	<0.05	<0.001	<0.02	<0.0002	<0.02	<0.001	<0.001	<0.002	<0.005	<0.02
	D	09/28/2000	<0.1	<0.001	0.001	<0.1	<0.001	<0.01	<0.0001	<0.01	<0.01	<0.05	<0.001	<0.02	<0.0002	<0.02	0.001	<0.001	<0.002	<0.005	<0.02
	N	12/21/2000	0.6	<0.001	<0.001	<0.1	<0.001	0.05 (2)	0.0001	<0.01	<0.01	0.39	<0.001	<0.02	<0.0002(1)	<0.02	0.001	<0.001	<0.002	<0.005	<0.02
SC-GW-08	N	03/16/2000	<0.1	0.001	<0.001	<0.1	<0.001	<0.1	<0.0001	<0.01	<0.01	<0.05	<0.001	<0.02	<0.0002	<0.02	<0.001	<0.001	<0.002	<0.005	<0.02
	N	06/22/2000	<0.1	<0.001	<0.001	<0.1	<0.001	0.02	<0.0001	<0.01	<0.01	<0.05	<0.001	<0.02	<0.0002	<0.02	<0.001	<0.001	<0.002	<0.005	<0.02
	N	09/28/2000	<0.1	<0.001	<0.001	<0.1	<0.001	<0.01	<0.0001	<0.01	<0.01	<0.05	<0.001	<0.02	<0.0002	<0.02	<0.001	<0.001	<0.002	<0.005	<0.02
	N	12/21/2000	1.5	<0.001	0.002	<0.1	<0.001	0.02	0.0004	<0.01	<0.01	1.37	0.006	0.2	<0.0002(1)	<0.02	0.003	<0.001	<0.002	0.011	<0.02
SC-GW-09	N	09/28/2000	<0.1	0.002	0.006	<0.1	<0.001	<0.01	0.0008	<0.01	<0.01	<0.05	<0.001	0.3	<0.0002	<0.02	0.048	<0.001	<0.002	0.012	<0.02
SC-GW-11	N	12/22/2000	<0.1	0.001	0.192	<0.1	<0.001	0.05	0.0391	<0.01	<0.01	<0.05	<0.001	<0.02	<0.0002(1)	0.34	2.37	<0.001	<0.002	0.043	2.79
SC-GW-12	N	09/06/2000	<0.1	<0.001	<0.001	0.1	<0.001	0.04	<0.0001	<0.01	<0.01	<0.05	<0.001	0.25	<0.0002	<0.02	<0.001	<0.001	<0.001	<0.005	<0.02
	N	12/21/2000	<0.1	<0.001	<0.001	0.1	<0.001	0.05	<0.0001	<0.01	<0.01	<0.05	<0.001	<0.02	<0.0002(1)	<0.02	0.003	<0.001	<0.002	<0.005	<0.02
SC-GW-13	N	09/07/2000	0.2	0.01	0.006	0.3	<0.001	0.02	<0.0001	<0.01	0.04	0.22	0.001	0.32	<0.0002	<0.02	<0.001	<0.001	<0.001	<0.005	0.06
SC-GW-14	N	09/06/2000	<0.1	0.002	0.001	0.4	<0.001	0.08	0.0002	<0.01	0.06	<0.05	0.006	0.7	<0.0002	<0.02	<0.001	<0.001	<0.001	<0.005	1.61
	N	12/21/2000	<0.1	<0.001	0.002	0.3	<0.001	0.05	<0.0001	<0.01	<0.01	<0.05	<0.001	0.25	<0.0002(1)	<0.02	<0.001	<0.001	<0.002	<0.005	<0.02
SC-GW-CW	N	06/22/2000	<0.1	<0.001	0.004	<0.1	<0.001	0.02	0.0014	<0.01	<0.01	<0.05	<0.001	<0.02	<0.0002	<0.02	0.031	<0.001	<0.002	0.013	0.06
	D	06/22/2000	<0.1	<0.001	0.003	<0.1	<0.001	0.03	0.0014	<0.01	<0.01	<0.05	<0.001	<0.02	<0.0002	<0.02	0.032	<0.001	<0.002	0.013	0.06
	N	12/22/2000	<0.1	<0.001	0.002	<0.1	<0.001	0.04	0.0009	<0.01	<0.01	<0.05	<0.001	<0.02	<0.0002(1)	<0.02	0.014	<0.001	<0.002	0.012	0.14
SC-GW-IW	N	09/27/2000	<0.1	<0.001	0.004	0.1	<0.001	<0.01	0.0003	<0.01	<0.01	<0.05	<0.001	<0.02	<0.0002	<0.02	0.011	<0.001	<0.002	0.012	0.03
	N	12/19/2000	<0.1	<0.001	0.002	0.1	<0.001	0.03	0.0002	<0.01	<0.01	<0.05	<0.001	<0.02	<0.0002	<0.02	0.012	<0.001	<0.002	0.011	<0.02

Notes:

- < Indicates analyte not detected above laboratory practical quantification limit (PQL)
- -- Field data or laboratory samples were not collected or analyzed
- (mg/L) Milligrams per liter
- N Natural sample
- D Field duplicate sample
- (1) Estimated concentration. The analysis was performed after the holding time had passed. The results of the analysis performed within the holding time were unusable.
- (2) Verified by a second analysis.

Summary of Year 2000 Groundwater Data
Analysis for Other Parameters
Smoky Canyon Mine
Baseline Study

Site		Date	Electrical Conductivity (umhos/cm)	pH	Sodium Adsorption Ratio	Total Dissolved Solids (mg/L)	Total Suspended Solids (mg/L)	Turbidity (NTU)
SC-GW-07	N	03/15/2000	356	7.7	0.21	215	2630	2750
	N	06/23/2000	332	7.7	0.22	245	9	1.3
	N	09/28/2000	431	7.3	0.16	259	245	160
	D	09/28/2000	404	7.2	0.22	240	11	9
	N	12/21/2000	364	8.2	0.30	215	191	190
SC-GW-08	N	03/16/2000	393	7.6	0.18	246	5470	3750
	N	06/22/2000	326	7.7	0.18	251	285	140
	N	09/28/2000	389	7.2	0.20	247	7	9.6
	N	12/21/2000	396	8.1	0.18	250	6420 (4)	8600
SC-GW-09	N	09/28/2000	433	7.7	0.34	252	<4	2.5
SC-GW-11	N	12/22/2000	2960	7.8	0.18	2950	15	6.9
SC-GW-12	N	09/06/2000	493	7.6	0.51	311	530	200
	N	12/21/2000	491	8.2	0.46	286	763	990
SC-GW-13	N	09/07/2000	9370	8	82.8	4740	7750	3600
SC-GW-14	N	09/06/2000	27,000	8	224	15,100	25	9.8
	N	12/21/2000	9150	8.3	94.1	4990	76	31
SC-GW-CW	N	06/22/2000	367	7.6	0.08	306	<2	<0.1
	D	06/22/2000	368	7.6	0.11	297	<2	0.12
	N	12/22/2000	518	7.8	0.10	334	6	12
SC-GW-IW	N	09/27/2000	478	7.3	0.08	286	1	0.6
	N	12/19/2000	452	8.3	0.08	248	2	1.3

Notes:

<	Indicates analyte not detected above laboratory practical quantification limit (PQL)
--	Field data or laboratory samples were not collected or analyzed
(mg/L)	Milligrams per liter
N	Natural sample
D	Field duplicate sample
(umhos/cm	Micromhos per centimeter
(NTU)	Nephelometric Turbidity Unit
(4)	Estimated concentration. The sample duplicate result was not within 20% relative percent difference.

Summary of Yaar 2000 Groundwater Data
Analysis for Major Ions and Nutriants
Smoky Canyon Mine
Baseline Study

Site		Date	Acidity (mg/L)	Alkalinity Bicarbonate (mg/L)	Alkalinity Carbonate (mg/L)	Alkalinity Hydroxide (mg/L)	Alkalinity Total (mg/L)	Ammonia Undistilled (mg/L)	Calcium (mg/L)	Chloride (mg/L)	Fluoride Undistilled (mg/L)	Hardness (mg/L)	Magnesium (mg/L)	Nitrate and Nitrite (mg/L)	Nitrate (mg/L)	Nitrite (mg/L)	Phosphorous Ortho (mg/L)	Phosphorous Total (mg/L)	Potassium (mg/L)	Sodium (mg/L)	Sulfate (mg/L)
SC-GW-07	N	03/15/2000	<2	238	0	0	195	<0.05	67	10	0.12	200	8	0.36	0.36	<0.05	0.03	0.69	<5	7	6
	N	06/23/2000	<2	232	0	0	190	<0.05	67	10	0.12	200	8	0.33	0.33	<0.05	0.04	0.02	1	7	<5
	D	09/28/2000	<2	206	0	0	169	0.11	61	10	0.13	185	8	0.37	0.37	<0.05	0.04	0.06	<1	7	7
	N	09/28/2000	<2	201	0	0	165	<0.05	63	14	0.17	186	7	0.35	0.35	<0.05	0.28	0.16	<1	5	8
	N	12/21/2000	<2	206	0	0	169	<0.05	71	17	0.2	210	8	0.41	0.41	<0.05	0.055	0.2	<1	8	11
SC-GW-08	N	03/16/2000	<2	225	0	0	184	0.06	75	21	0.15	220	8	0.33	0.33	<0.05	0.03	0.19	<5	6	7
	N	06/22/2000	<2	245	0	0	201	0.09	68	14	0.18	203	8	0.37	0.37	<0.05	0.09	0.06	2	6	7
	N	09/28/2000	<2	206	0	0	169	<0.05	59	8	0.13	176	7	0.37	0.37	<0.05	0.05	0.06	<1	6	7
	N	12/21/2000	<2	362	0	0	297	0.25	95	26	0.47	278	10	0.38	0.33	0.05	0.075	42	2	7	12
SC-GW-09	N	09/28/2000	<2	226	0	0	185	<0.05	50	3	0.26	191	16	0.2	0.2	<0.05	0.05	0.09	<1	11	21
SC-GW-11	N	12/22/2000	<2	282	0	0	215	0.08	736	60	0.53	2340	123	0.18	0.18	<0.05	0.022	2.2	2	20	1810
SC-GW-12	N	09/06/2000	<2	270	0	0	221	<0.05	76	19	0.13	231	10	0.22	0.22	<0.05	0.1	0.61	1	18	24
	N	12/21/2000	<2	240	0	0	197	0.21	85	34	0.13	253	10	0.23	0.18	0.05	0.072	3.8	1	17	24
SC-GW-13	N	09/07/2000	<2	167	0	0	137	0.96	32	2900	0.22	96	4	0.25	0.13	0.12	0.15	16	4	1870	5
SC-GW-14	N	09/06/2000	<2	437	0	0	358	1.13	44	8530	0.27	135	6	0.07	0.07	<0.05	0.04	0.12	6	5980	144
	N	12/21/2000	<2	153	0	0	125	0.87	33	3110	0.19	99	4	0.1	0.1	<0.05	0.056	0.18	4	2150	135
SC-GW-CW	N	06/22/2000	<2	245	0	0	201	<0.05	70	7	0.14	253	19	0.2	0.2	<0.05	0.04	<0.005	<1	3	45
	D	06/22/2000	<2	236	0	0	195	<0.05	75	8	0.14	273	21	0.2	0.2	<0.05	0.04	<0.005	<1	4	45
	N	12/22/2000	<2	226	0	0	185	<0.05	87	43	0.18	308	22	0.26	0.26	<0.05	0.037	0.25	<1	4	76
SC-GW-IW	N	09/27/2000	<2	226	0	0	185	<0.05	62	2	0.13	258	25	0.18	0.16	<0.05	0.05	0.05	<1	3	44
	N	12/19/2000	<2	231	0	0	189	<0.05	85	11	0.11	265	25	0.13	0.13	<0.05	0.033	0.04	<1	3	37

Notes:

< Indicates analyte not detected above laboratory practical quantification limit (PQL)
– Field data or laboratory samples were not collected or analyzed
(mg/L) Milligrams per liter
N Natural sample
D Field duplicate sample

Comparison of Sediment and Surface Water Sampling Data
Analysis for Total Metals
Smoky Canyon Mine
Baseline Study

Site		Type	Date	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Mercury	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc
SC-SW-01	N	WATER	09/25/2000	0.1	<0.001	<0.001	<0.1	<0.001	0.01	<0.0001	<0.01	<0.01	0.08	<0.001	<0.02	<0.0002	<0.02	<0.001	<0.001	<0.002	<0.005	<0.02
	N	SED	09/05/2000	11800	<5	<5	155	<5	6	2	16	13	15800	11	2700	<1	16	<5	<5	<5	18	51
SC-SW-02	N	WATER	09/25/2000	0.2	<0.001	<0.001	<0.1	<0.001	0.01	<0.0001	<0.01	<0.01	0.26	<0.001	0.08	<0.0002	<0.02	<0.001	<0.001	<0.002	<0.005	<0.02
	N	SED	09/05/2000	6120	<5	<5	39	<5	6	2	15	8	8640	<5	446	<1	8	<5	<5	<5	14	40
SC-SW-05	N	WATER	09/25/2000	0.3	<0.001	0.003	<0.1	<0.001	0.01	<0.0001	<0.01	<0.01	0.26	<0.001	0.06	<0.0002	<0.02	<0.001	<0.001	<0.002	<0.005	<0.02
	N	SED	09/06/2000	3090	<5	<5	54	<5	<5	2	13	<5	3100	6	120	<1	<5	<5	<5	<5	11	23
SC-SW-06	N	WATER	09/25/2000	0.8	<0.001	<0.001	8.4	<0.001	0.01	<0.0001	<0.01	0.02	0.66	0.004	0.2	<0.0002	<0.02	<0.001	<0.001	<0.002	0.013	<0.02
	N	SED	09/05/2000	2580	<5	<5	30	<5	<5	<1	18	<5	2430	<5	89	<1	<5	<5	<5	<5	11	11
SC-SW-18	N	WATER	09/25/2000	0.2	0.001	<0.001	<0.1	<0.001	0.02	<0.0001	<0.01	<0.01	0.23	<0.001	0.11	<0.0002	<0.02	<0.001	<0.001	<0.002	<0.005	<0.02
	N	SED	09/05/2000	7860	<5	<5	76	<5	11	2	18	7	7990	<5	733	<1	9	<5	<5	<5	15	49

Notes:

< Indicates analyte not detected above laboratory practical quantification limit (PQL)
– Field data or laboratory samples were not collected or analyzed
N Natural sample
D Field duplicate sample
Water data are reported in milligrams per liter
Sediment data are reported in micrograms per gram

Appendix 3B

Watershed Analysis

TYGEE CREEK BASIN
WATERSHED ANALYSIS

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TYGEE CREEK BASIN
WATERSHED ANALYSIS

1.0 Executive Summary

The Tygee Creek basin is a 37-square mile basin in southeastern Idaho. Land uses are varied, and include mining, timber harvesting, livestock grazing, and agriculture; land ownership is also varied, with the majority being public lands. As new projects are proposed on federally managed lands in the Tygee Creek basin, this Watershed Analysis can be used to provide an overall watershed context in which to assess management actions.

2.0 Introduction

This report has been prepared in accordance with *Ecosystem Analysis at the Watershed Scale, Federal Guide for Watershed Analysis, Version 2.2* (Regional Ecosystem Office, 1995), referred to hereafter as *the guidance*. *The guidance* was developed for use under the Inland Native Fish Strategy (INFISH) program, as outlined by the Upper Columbia River basin Assessment; it directs the user through a series of steps to prepare a Watershed Analysis. Watershed Analyses are used by public land administrators to characterize specific watersheds using ecosystem elements, and to provide an overall watershed context in which to assess management actions.

The United States Forest Service (USFS), Caribou-Targhee National Forest has requested that a Watershed Analysis be prepared for the Tygee Creek basin, as shown in Figure 1. Planned mining of the B & C panels at J.R. Simplot's Smoky Canyon Mine, and the required environmental analysis as required by the National Environmental Policy Act (NEPA), prompted the need to prepare the Watershed Analysis. The proposed mining would occur entirely within headwater tributaries to Tygee Creek. The information provided by the Watershed Analysis, in conjunction with the Smoky Canyon Mine Supplemental Environmental Impact Statement (SEIS), can be used by agency decision makers to assess the consequences of Simplot's project on the Tygee Creek basin. However, it is not the intent of the Watershed Analysis to focus solely on the B & C panel mining project and its potential impacts. Instead, the Watershed Analysis provides an information base within the geographic area of the watershed, to which land managers can turn for support as they make management decisions within the Tygee Creek basin. These management decisions may include approval of Simplot's proposed activities as well as other, unrelated, activities within the National Forest System lands and public lands within Tygee Creek basin.

The report is organized according to the recommendations in *the guidance*. Section 3 of the Watershed Analysis includes brief descriptions of seven separate ecosystem components, and directs the focus of the analysis. These seven components are the key topics as outlined in *the guidance*. Section 4 provides a listing of issues and key questions that arose from the watershed characterization in Section 3. The remaining sections expand upon Section 3 information in order to provide a context within which the identified issues can be addressed. Sections 5 and 6 of the report give time-related aspects of the seven core topics, presenting both their current condition in the watershed and their reference condition. The reference condition is defined in *the guidance* as the historical period over which ecosystem comparisons are made with current conditions. In Section 7, the interrelationship of these seven separate topics is discussed, with comparisons between reference and current conditions. Lastly,

Section 8 provides recommendations for overall management within the basin, and recommendations for further evolution of the Watershed Analysis itself.

By its inherent nature as described in *the guidance*, a Watershed Analysis is meant to be an evolving document that is updated and revised as new information becomes available. Therefore, this document was prepared using existing, readily available information, much of which was generated in response to Simplot's existing and proposed mine operations and related permitting needs. Data gaps, either throughout the entire watershed, or in certain areas of it, are described, and recommendations for future studies are made, based upon the stated issues and key questions.

3.0 Watershed Characterization

The majority of Tygee Creek basin is located in southeastern Idaho in eastern Caribou County; a very small portion of its northeastern area spans the Idaho-Wyoming border. The 8,000 to 9,000-foot above mean sea level (AMSL) peaks of the Webster Range form the western boundary of the Tygee Creek basin, and the 7,000 to 7,500-foot AMSL crest of Tygee Ridge forms the eastern boundary, as shown on Figure 2. Buck Mountain makes up the southern boundary. Tygee Creek flows northward through a relatively narrow alluvial valley located toward the eastern side of the basin, thus most contributing drainage area is from the west out of canyons draining the Webster Range.

With a drainage area of about 37 square miles, Tygee Creek (Water Body Unit US-7) is tributary to Stump Creek (Water Body Unit US-6), and joins it about one and one half miles west of the Idaho/Wyoming border. Stump Creek flows eastward into Wyoming and is tributary to the Salt River (Hydrologic Unit Code 17040105). The Salt River flows northward through western Wyoming, and ultimately joins the Snake River; the Snake River is part of the Columbia River system.

Geographically located within both privately owned and federally managed lands, and spanning elevations ranging from about 6,160 feet to about 9,200 feet AMSL, the Tygee Creek basin is characterized by a variety of vegetative types and land uses. These and other watershed elements are characterized in the following discussions, organized by the seven core topics specified in *the guidance*.

3.1 Erosion Processes

Soil factors that are important in a watershed context include site productivity, sedimentation, erosion processes and rates, topsoil/growth medium management, and reclamation potential. This Watershed Analysis focuses on erosion and sedimentation factors. These have been evaluated using the Caribou National Forest Soil Survey (USFS, 1990) and the Soil Survey of Star Valley Area, Wyoming-Idaho (USDA, 1976) and updates to these documents based on the United States Department of Agriculture (USDA) Soil Survey Manual (USDA, 1993) and the USDA National Soil Survey Handbook (USDA, 1998). These documents also include information on soil resource factors other than erosion, that are not discussed herein. Further, Maxim Technologies, Inc. recently completed an Order II survey within a small portion of the Tygee Creek basin (that which would be disturbed by Simplot's development of the B & C panels. This survey provided details on soil characteristics related to revegetation and reclamation of the mine disturbances; its results are described in the Soils and Watershed Technical (JBR Environmental Consultants, 2001a), but are not discussed in this Watershed Analysis.

The hazard of erosion for soils has been determined by the soil surveys conducted within the Tygee Creek basin (USFS, 1990; USDA, 1976). Erosion hazard is a measure of a given soil's susceptibility or potential to erode. It is based both upon the inherent erodibility (as indicated by its K value) of a soil as determined in large part by its texture, and upon its typical position in the landscape. In general, the upland areas of the Tygee Creek basin are more susceptible to erosion than lowland sites, and the areas with higher coarse fragment content and lower slope steepness have lower potential for water erosion hazard.

3.2 Hydrology

Within the Tygee Creek basin, surface water and groundwater relationships typically drive the dominant hydrologic processes. Springs and diffuse, influent, groundwater provide flow to support perennial and intermittent stream reaches; in turn, those stream reaches may provide recharge to aquifers in other formations as they lose flow downstream. The alluvial valley through which Tygee Creek flows supports a limited regional aquifer. Precipitation averages 30-33 inches annually at the higher elevations in the basin, much of which supports stream flow and recharges the groundwater system. Most runoff in the basin is attributed to snow melt (USGS, 1977), with winter snow pack often in excess of 100 inches annually (Simplot Agribusiness, 2000).

As Tygee Creek flows northward, it captures flow primarily from the east slopes of the Webster Range via Roberts Creek, Smoky Creek, Draney Creek, Salt Lick Creek, Webster Canyon Creek, and Spring Creek as shown by Figure 3. All of these tributaries except Roberts Creek are perennial. The west slopes of Tygee Ridge and the north slopes of Buck Mountain do not have any named streams; the small intermittent or ephemeral channels draining these eastern and northern areas of the Tygee Creek basin likely provide only a very small portion of the basin's total yield.

Springs associated with various geologic formations can be found throughout the basin, as shown on Figure 3. Typically, they supply flow to the headwaters of the tributary streams, as well as to several of the streams at the flanks of the range. For many of these springs, there is little or no information regarding their flow characteristics, although flows are sufficient at some of the springs to support adjudicated water uses such as stock watering and fish rearing. In a few instances, such as at Falls Spring (which supplies water to the Auburn Fish Hatchery) flow records may be kept as part of a water user's operations.

Neither Tygee Creek, nor any of its tributary streams, are gauged as part of the United States Geological Survey's (USGS) stream gauging program. However, some stream flow data have been collected for some areas of the basin as part of the Smoky Canyon Mine's various environmental permit requirements. These data have been used to derive estimates of basin yield and seasonal flow variations. Estimates have been derived for high return period peak flow events using USGS regression equations (Thomas et al, 1994). These various estimates are described in Section 5.0.

3.3 Vegetation

As is common in the western United States, vegetation distribution in the Tygee Creek basin is in large part controlled by altitude, latitude, direction of prevailing winds, and slope exposure. The vegetation on the bottom-lands, toe-slopes and ridges of the basin is characterized by a mosaic of sagebrush/grassland, aspen, and douglas-fir and lodgepole pine communities, as shown on Figure 4. The sagebrush/grassland community type covers approximately 35 percent of the basin, coniferous forest

covers about 25 percent, aspen forest about 15 percent, and mixed conifer/aspen forests about 5 percent. Mixed shrub, wetland and riparian communities account for about one percent each, while agricultural practices have altered native vegetation over about 13 percent of the basin. Existing mining related uses have altered or eliminated vegetation over about 3 percent of the basin.

3.4 Stream Channel

While no comprehensive stream characterization studies have been done across the Tygee Creek basin, limited field observations provide general indications of stream channel conditions.

As expected, the morphology of Tygee Creek and its tributaries is in large part dictated by the topographic positions of various stream reaches. The headwater reaches of the tributary streams are generally confined within narrow canyons, and as such, typify a Rosgen Type A channel. These reaches have a steep gradient and very little meander development; they typically lack a developed floodplain. Where they must compete for space within the narrow canyon bottom with a roadway, such as in Smoky Canyon, stream channels have typically been realigned, channelized, and bermed. As a result, riparian development adjacent to the headwater canyon reaches is generally limited to narrow, stringer features, and in-stream flow velocities are generally fast.

As the streams make their way downstream and canyons open up, the channels tend to increase meandering, with consequent greater bar and riparian development. Floodplains are still generally lacking, or are confined to the meander width. Most of the reaches within this position on the landscape appear to be similar to Rosgen B and C types.

Within the lower alluvial valley of the basin, some of the stream reaches would likely be Rosgen Type E if classified; others may be tending toward F or G where livestock related impacts are seen. E-type streams are very sinuous and have a wide over-bank area and a wide riparian/wetland corridor. Bank erosion and loss of stream side vegetation can destabilize banks, often resulting in a more gully-like appearance similar to an F or G Rosgen type.

3.5 Water Quality

Tygee Creek, its tributaries, and its receiving stream (Stump Creek) are all undesignated surface waters under the Idaho State Water Quality Standards at IDAPA 58.01.02 in regard to their beneficial uses. However, for such undesignated waters, cold water aquatic and contact recreation beneficial uses are presumed by default. In general, the available data indicates that most of the surface waters in the Tygee Creek basin appear to meet the criteria associated with those uses (USFS, 1981 and 1982; Montgomery Watson, 1999).

None of the streams within the Tygee Creek basin are on the current (1998) State of Idaho 303(d) list of impaired waters, nor are they on the list of streams whose quality has been determined to be threatened (State of Idaho, 1999). Both Tygee Creek and Stump Creek were surveyed by the Division of Environmental Quality in the mid 1990's and were found to be of sufficient quality to support their beneficial uses.

In a baseline water quality report prepared by Maxim Technologies, Inc. (2000a), the current water quality of the three streams in the Simplot Project Area (Tygee Creek, Smoky Creek, and Roberts Creek) was described based upon sampling events at six sites during 2000. That report described those surface

waters as generally of a calcium-bicarbonate type, of moderate hardness or very hard, neutral pH, and with low nutrient levels.

3.6 Species and Habitats

Wetland and riparian areas within the Tygee Creek basin provide important habitat for many wildlife species including amphibians and birds. The sagebrush, mixed brush, and forest communities provide food, water, cover, and space for a variety of ungulates, birds, small mammals, and other wildlife. Non-native habitat occurs in areas where mining, timber cutting, and agricultural uses have altered the vegetative landscape.

Several mammalian species are known or expected to occur within the basin. These species include several members of the rodent family; various bats; intermediately sized species such as skunks, coyotes, badgers, bobcats, cottontails, and jackrabbits; and large mammals including deer, elk, moose, black bear, and mountain lions. Elk and mule deer are the two most highly visible and common of the large mammals within the area. There is also potential lynx habitat in the basin.

Raptors, upland game birds (including sage grouse), passerines, song birds, waterfowl, and shorebirds are some of the types of avians present in the basin. Several species of reptiles and amphibians are also found in the Tygee Creek basin.

3.7 Human Uses

Phosphate mining, sheep and cattle grazing, timber harvest, agriculture, and fish rearing represent the dominant human land uses in the Tygee Creek basin. Hunting, fishing, camping, and other forms of outdoor recreation are also important uses; a dairy farm is also present. As shown in Figure 2, the western half of the basin is primarily National Forest System lands, which comprises approximately 53 percent of the total area of the basin. Approximately 42 percent of the basin is private land and 5 percent is administered by the Bureau of Land Management. In the extreme eastern portion of the basin are 46 acres of State of Wyoming land. Part of J.R. Simplot's Smoky Canyon phosphate mine is located in the southern half of the basin. Portions of four USFS grazing allotments, shown on Figure 5, are found in the central and west basin, and agricultural cropping and grazing on private lands are dominant uses in the Tygee Creek valley in the east. No major highways are found in the basin and various paved, gravel, and dirt roads generally support the land uses.

4.0 Issues and Key Questions

The Tygee Creek basin generally appears to be a functioning ecosystem with the ability to support the types of uses that it incurs: overall water quality is good (State of Idaho, 1999; Maxim, 2000; Montgomery Watson, 1999); a variety of animal species are supported by the available vegetative communities, including critical range for deer and elk (Anderson, 2000); and grazing/agricultural interests have been ongoing for many years. One of the major land uses in the basin is phosphate mining by the J.R. Simplot Company. Many of the important issues that need to be addressed within the Tygee Creek basin relate to these mining activities and the types of effects they may have on the basin as Simplot's area of influence expands. Issues specific to timber harvest, ranching, grazing, or other activities have not been identified to be of concern presently in this basin.

One identified issue relates to the overall areal extent of mining operations and the potential to displace existing biotic ecosystem components such as vegetation and wildlife, and the potential to overtake other existing land uses such as forest harvesting and livestock grazing. These subjects will become important if mining within the basin expands, and will be discussed below.

Another issue that is relevant to the basin is the recently discovered selenium impact potential. While impacts have not been reported to surface waters within the Tygee Creek basin, they have been reported elsewhere in the southeastern Idaho region where phosphate mining occurs, and mining facilities within the basin associated with Simplot's activities do have elevated selenium concentrations. The potential for selenium impacts to water and to other ecosystem components in the Tygee Creek basin will also be discussed in this report.

Thirdly, available soils information indicates that erosion hazard is of concern particularly within the USFS lands where the most intensive land uses are occurring; thus another important issue is whether these land use practices are being accomplished without excessive loss of soil resources in the upland areas and without excessive sediment loading to Tygee Creek and its downstream receiving waters.

All three of these issues can be covered by the following question:

> Do the existing and likely future land uses within the Tygee Creek basin, most noticeably mining, have the ability to continue without compromising other existing land uses and ecosystem functioning?

5.0 Current Conditions

This section describes the current conditions of the same seven core topics as described in Section 3, providing greater detail where the information is available to do so.

5.1 Erosion Processes

The Soil Survey of Star Valley Area, Wyoming-Idaho (USDA, 1976) identifies three major soil associations located in Tygee Creek basin in the eastern half of the area outside of the National Forest boundary. These are the Paulson-Lail-Stony rock land, Robana-Buckskin-Cowdrey, and Turson-Dipman associations, as mapped by the USDA Soil Conservation Service, currently known as the Natural Resource Conservation Service (USDA, 1976). The Paulson-Lail-Stony rock land association is the slight majority soil in this area representing approximately 40 percent of the acreage, the Robana-Buckskin-Cowdrey association represents approximately 35 percent, the Turson-Dipman association represents approximately 5 percent, the remaining land consists of other minor soils.

The Paulson-Lail-Stony rock land association consists of steep to very steep, well-drained silty clay loams and silt loams and Stony rock land on foothills and mountains, generally to the east of Tygee Creek. Paulson soils are steep to very steep deep silty clay loams on side slopes that face south and west. Lail soils are deep silt loams, steep to very steep, and are on forested foot slopes that face north. Stony rock land is very steep and is on mountains that face south and west. It consists of rock outcrop and very stony and gravelly colluvium. Approximately 60 percent of the individual soil series which compose the Paulson-Lail-Stony rock land association are rated as having a high hazard of erosion, with the remaining

soils in the slight to moderate or moderate to high range. Vegetation is mainly bunchgrass, shrubs, and trees. Elevation ranges from approximately 5,800 to 8,000 feet AMSL. (USDA, 1976).

The Robana-Buckskin-Cowdrey association consists of rolling and hilly, deep, well-drained, silt loams and clay loams, generally to the west of Tygee Creek. Robana and Buckskin soils are on uplands and consist of silt loams. Cowdrey soils are clay loams on forested foot slopes that face north. Vegetation is mainly bunchgrass and shrubs, but does contain some areas of trees. Elevation ranges from approximately 5,600 to 7,200 feet AMSL. Overall hazard for erosion is slight to moderate, however the hazard for water erosion is severe in some places and soil and water conservation practices are needed for dryland crops and for homesites. (USDA, 1976).

Within the basin, the Turson-Dipman association consists of nearly level, somewhat poorly drained and poorly drained silt loams and silty clay loams on flood plains of Tygee Creek. The soils of this association formed in alluvium. Vegetation is grasses, sedges, rushes, and willows. Elevation ranges from 5,600 to 7,000 feet AMSL. Hazard for erosion for soils in this association is slight. Turson soils are somewhat poorly drained and consist of silt loams that have a very gravelly loamy sand at a depth of 20 to 40 inches. The water table fluctuates between depths of three and five feet. Dipman soils are poorly drained with a surface layer of silty clay loam in the upper part and silty clay in the lower part (USDA, 1976).

Within the western part of the Tygee Creek basin where land is administered by the USFS, soils were not mapped by the Soil Conservation Service (or the Natural Resource Conservation Service as it is now known). However, the Caribou National Forest performed its own soil survey, so soils in this part of the basin have been mapped (USFS, 1990). These soils have been given numbered mapping units rather than named associations as in the USDA soil survey (USFS, 1990). Over 80 percent of the soils in this part of the Tygee Cree basin are classified as having a moderate to high hazard of erosion. The remaining 20 percent of the soils are approximately evenly represented by moderate or low to moderate hazards of erosion.

Table 5.2-1 shows erosion hazard ratings for soils in the basin. Throughout the entire Tygee Creek basin, as represented by both soil surveys, approximately 80 percent of the soils are classified as having a moderate to high hazard of erosion, approximately 10 percent have a low to moderate hazard of erosion, and approximately 10 percent have a moderate hazard of erosion.

Selenium information regarding soil resources in the basin is described in the Soils and Watershed Technical Report (JBR Environmental Consultants, 2001a).

5.2 Hydrology

The USGS (1977) characterizes annual hydrographs for Tygee Creek and its tributaries as reflective of high spring flood peaks associated with snow melt, and much smaller sustained base flows. For the receiving Stump Creek and Salt Creek streams, however, it notes that flood peaks are relatively low and base flows proportionally higher.

Neither Tygee Creek nor any of its tributary streams are gauged as part of the USGS's stream gaging program. However, some limited stream flow measurements and modeled yield/peak flow predictions have been made in conjunction with Simplot's mining related permitting at some locations in the Tygee Creek basin. For example, Tygee Creek at a point about four miles upstream from its mouth (and upstream from the major contributing tributaries) has been monitored biannually since 1986 (TRC Mariah Associates, Inc., 2000a). These data show spring season measurements ranging from less than one cubic feet per second (cfs) up to 17 cfs and reflect snowmelt conditions. Fall season measurements are typically much lower (0.2 cfs to 3.1 cfs) and reflect baseflow conditions.

Table 5.2-1 Erosion Potential of Surveyed Soils in the Tygee Creek Basin Area

Soil Association/ Soil Mapping Unit	Erosion Hazard	Approximate Percentage of Basin Area
Paulson-Lail-Stony rock land association	slight to high (60% are rated high)	20
Robana-Buckskin-Cowdrey association	slight to moderate	20
Turson-Dipman association	slight	5
081	moderate to high	2
082	moderate to high	3
300	moderate	4
380	moderate to high	2
404	moderate to high	3
410	moderate to high	6
456	moderate to high	3
551	moderate to high	7
553	moderate to high	3
554	moderate	4
755	moderate to high	3
870	low to moderate	7
911	moderate to high	3
912	moderate to high	5

Sources: USFS, 1990; USDA, 1976

Biannual data collected from this site, which is located in the upper part of the basin, are insufficient to determine yield for the Tygee Creek basin as a whole. However, an estimate of mean daily flow was

derived for a site (at the approximate location of site SW-18 shown on Figure 3) on the upper part of Tygee Creek that drains an area of 17.7 square miles (USFS, 1981 and 1982). Extrapolating that value (1.3 cfs) over the entire 37-square mile basin, and converting the mean daily flow rate to a volume of water discharged over an entire year, provides a rough estimate of annual yield for the Tygee Creek basin of close to 2,000 acre-feet.

The recent stream flow measurements for the basin are those obtained by Maxim (2000a). Table 5.2-2 shows the results of their monitoring.

Table 5.2-2 Recent Stream Flow Measurements in the Tygee Creek Basin

Site Location	Site Identification (See Figure 3)	Stream Flow Measurement (cfs)		
		March, 2000	June, 2000	Sept., 2000
Upper Tygee Creek	SW-6	0.34	0.39	0.18
East Tygee Creek	SW-7	0.03	0.42	0.02
Lower Tygee Creek	SW-5	0.37	0.63	0.41
Upper Smoky Creek	SW-1	0.01	0.47	0.21
Lower Smoky Creek	SW-2	0.58	1.17	0.42
Lower Smoky Creek #2	SW-3	No data	0.58	No data
Tygee Creek below Smoky	SW-18	1.20	no data	0.48
Upper Roberts Creek	SW-4	no data	0.42	0.71

Data Taken From: (Maxim Technologies, Inc., 2000a).

Estimates of flood flows (Table 5.2-3) were made using USGS regression equations for estimating regional flood-frequency relations (Thomas et al, 1994).

Table 5.2-3 Flood Flow Estimates - Tygee Creek

10-Year Flood Peak (cfs)	50-Year Flood Peak (cfs)	100-Year Flood Peak (cfs)
369	583	673

Under undisturbed conditions, surface runoff from rainfall is typically low throughout the Tygee Creek basin due to an overall high infiltration rate. Much of the area within the Tygee Creek basin is currently relatively undisturbed, and that trend is not expected to change in the near future. Disturbances that currently occur within the basin include grazing, agriculture, and mining disturbances.

While disturbed areas associated with mining activities in Smoky Creek and Roberts Creek watersheds likely generate more runoff than under natural conditions, runoff from those areas to the main Tygee Creek drainage is currently reduced over natural conditions due to the sediment and runoff retention basins. Although existing streamflow measurements are not adequate to quantify that reduction, it is not expected to be large currently, when looked at proportionally to the whole basin. However, as most runoff in the basin is generated during the spring snowmelt season, the effects of the sediment ponds'

reductions are also mostly during that season. As increases in disturbed areas continue, the trend would be to further reduce the amount of flow to the Tygee Creek basin as long as the basins continue to operate as designed.

A tailings pond was constructed in upper Tygee Creek near its confluence with Roberts Creek in the mid-1980s. The pond is unlikely to have had a large influence on the hydrologic regime of Tygee Creek as most of the up-gradient stream flow is diverted around the pond and back into Tygee Creek. However, some portion of Roberts Creek water is withheld from the system when the Smoky Canyon Mine directs its flow into the tailings pond. Because Simplot does not track the frequency or volume of this water use, the effect on the hydrologic regime of Tygee Creek cannot be known with certainty. As the tailings pond is expanded under future plans, these diversions would be expected to continue.

The upper headwaters of Tygee Creek include its main stem, which flows perennially, and several small, unnamed ephemeral or intermittent channels that drain northward from the southern tip of the basin, or eastward from Tygee Ridge.

Brief characterizations of named tributaries to Tygee Creek are given below. As stated previously, however, flow measurement data for these streams are generally lacking.

5.2.1. Roberts Creek

Roberts Creek is an intermittent stream that drains a 2.5-square-mile watershed in the southwest part of the Tygee Creek basin (see Figure 3). Between 1979 and 1988, flows in Roberts Creek ranged from 0.7 cfs to 3.3 cfs in the spring, and 0.3 to 1.4 cfs in the fall (Mariah, 1990).

5.2.2. Smoky Creek

The Smoky Creek watershed encompasses an area of about 6.6 square miles (see Figure 3). Its flow, as with flow in other streams draining the east side of the Webster Range, varies spatially along its alignment. Groundwater, discharged from distinct in-channel springs and from diffuse sources, contributes to stream flow. Conversely, along other parts of the stream, in-channel surface flow is lost to the substrate, either dispersing to recharge a groundwater system, or reappearing as surface flow at some point downstream. As a result, flows in a down-canyon direction increase or decrease. Such gain/loss characteristics were described in the late 1970s (Ralston, 1979) for portions of Smoky Creek and other streams in the general area.

Due to its proximity to the existing Smoky Canyon Mine, more is known about the hydrologic characteristics of Smoky Creek than of other streams tributary to Tygee Creek. Specifically, the stream flow in Smoky Creek is perennial from about its 7,200-foot elevation downstream about 2,500 feet; in this reach, the stream flows across the Lower Dinwoody and Phosphoria Formations. From that point, downstream to about the 7,000-foot elevation, the stream flows over outcrop of the Wells Formation, Rex Chert, and Dinwoody Formation, where it loses all flow (Ralston, 1979) through percolation downward into the underlying rock with the stream eventually drying up during most seasons in most years. As reported by Ralston, a spring discharging into the Smoky Creek channel in the southwest corner of Section 17 (see Figure 3) supports perennial flow in lower Smoky Creek.

Approximately 20 years of biannual flow data have been obtained on Smoky Creek (TRC Mariah, 2000b) at a site about one mile downstream of the previously mentioned Section 17 spring and about 1.3 miles upstream of the confluence of Smoky Creek with Tygee Creek. Spring flows ranged from 0.2 cfs to 12.9

cfs and fall flows ranged from 0.2 cfs to 2 cfs. This likely represents the general order of magnitude of flows that the Smoky Creek watershed currently contributes to Tygee Creek.

5.2.3. Draney Creek

Draney Creek watershed, at 5.2 square miles, is slightly smaller than the Smoky Creek watershed, but has a similar physiography. Its divide includes Draney Peak, the highest point in the Tygee Creek basin. Geologic conditions are fundamentally different from the Smoky Creek drainage, however perennial flow in Draney Creek is likely similarly supported by groundwater contributions from the Thaynes and Dinwoody formations. Unlike Smoky Creek, Draney Creek does not cross the Wells formation outcrop, and thus may not exhibit as much flow loss to the subsurface.

No flow records are apparently available for Draney Creek.

5.2.4 Salt Lick Creek

Salt Lick Creek flows across the lower flanks of the Webster Range between Draney Creek and Webster Canyon Creeks. It drains about 1.5 square miles, and is mapped as perennial in its lower reaches.

5.2.5 Webster Canyon Creek

Webster Canyon Creek drains an area of about 9.2 square miles and thus is the largest tributary watershed to Tygee Creek. Flow records are lacking for this creek, but it likely supplies a substantial quantity of flow to Tygee Creek. Falls Spring supplies water to the Auburn State Fish Hatchery along Webster Creek; flow rates for the spring have been reported to be approximately 8 cfs (USFS, 1981 and 1982).

Included within the Webster Canyon watershed is a small, intermittent drainage known as Spring Creek. Spring Creek drains the northern part of the Webster Canyon watershed, and enters Webster Canyon Creek just above the Tygee Creek confluence. A spring in this drainage supplies water to a privately owned fish rearing facility known as Star Valley Fish Ranch. The spring discharges flows in the range of 3 to 4 cfs (USFS, 1981 and 1982).

5.3 Vegetation

Information for current vegetative types and conditions within the Tygee Creek basin was obtained by baseline data associated with the Smoky Canyon Mine located in the southern half of the basin. Additional data was compiled from GIS vegetation maps generated by the Caribou-Targhee National Forest. No surveys for vegetation have been performed in the northern half of the basin included in this analysis, therefore, specific vegetative types can only be extrapolated from data from nearby locales.

Topography in the Tygee Creek basin is characterized by bottom-lands, toe-slopes and ridges, and these features are vegetated with a mosaic of sagebrush/grassland, aspen, and douglas-fir and lodgepole pine. Current land use, primarily agricultural and mining, has altered vegetative mosaics in less than 20 percent of the basin. Figure 4 shows major vegetation types found in the basin. The sagebrush/grassland community type covers approximately 8,600 acres in the mid-elevations of the basin. Approximately 6,000 acres of the basin is forested with conifers, approximately 3,700 acres are aspen-dominated, and approximately 1,300 acres are forested with a mix of aspen and conifer; these three forested community types cover approximately 45 percent of the basin, mostly over its higher elevations. Covering much smaller, localized areas are wetland/riparian zones (300 acres) and mixed shrub communities

(approximately 400 acres). Agricultural uses of the basin encompass about 3,200 acres and uses related to mining cover about 800 acres.

Vegetation was surveyed in 2000 over parts of the Smoky Canyon watershed, that is within Simplot's proposed mining area in the southern half of the Tygee Creek basin. Though surveys did not extend to the northern half of the Tygee Creek basin, similar topography and hydrology would tend to support similar vegetation there as well, as indicated by USFS geographic information systems (GIS) mapping in the Caribou-Targhee National Forest.

Four principal vegetation types have been identified in the Smoky Canyon Mine area. Valleys and lower elevation south-facing slopes support a big sagebrush (*Artemeisia tridentata*) and grassland community. Higher elevation north and east facing slopes support mixed conifer forest. This habitat type includes Douglas-fir (*Pseudotsuga menziesii*), lodgepole pine (*Pinus contorta*), and subalpine fir (*Abies lasiocarpa*). Aspen (*Populus tremuloides*) communities are interspersed throughout the coniferous forest on mesic sites. Riparian vegetation, including willows (*Salix* spp.) and sedges (*Carex* spp.), occurs along Smoky, Roberts and Tygee Creeks.

Vegetation in the lower valleys of the Tygee Creek basin consists of agricultural pasture lands and contiguous sagebrush/grassland communities dominated by sagebrush, and both native and introduced forage species. Aspen and mixed shrub communities of varying densities occur in scattered patches. These vegetation communities occur predominantly on the eastern side of the valley and extend uninterrupted along the length of the valley floor.

Wetlands in the basin are primarily associated with streams, ponds, springs, and seeps. Wetland vegetation is dominated by willow species, forbs, and grass-like vegetation including rushes, sedges, and other broadleaf shrubs. U.S. Fish and Wildlife wetland maps (USFWS, 2001) for the area indicate that wetlands along the main stem of Tygee Creek and up the lower portions of Spring Creek and Webster Creek are predominantly Palustrine Emergent type with temporary to seasonal flooding and smaller areas of Palustrine Open Water. Wetlands upstream from Tygee Creek on the other tributary channels are predominantly Palustrine Scrub-Shrub type with broadleaf deciduous vegetation.

Toe-slopes and ridges above the valley floor are dominated with pure stands of aspen, mixtures of conifers and aspens, and forests of mixed conifers such as Douglas fir and lodgepole pine. These mosaic canopies form a dense forest cover, while mature stands of Douglas fir and lodgepole pine tend to have an open canopy structure. Pine beetle infestation is a concern in the mature lodgepole pine stands.

Native plant communities have been impacted primarily by mining and range management within the basin. Approximately 60 miles of roads have been built in the analysis area. The majority of these vegetative disturbances have occurred in the southern and eastern portions of the basin. Some timber harvest has occurred, but has been associated primarily with mining. Some of the disturbed areas associated with mining have been seeded with non-native forage grasses, and grazing in riparian areas has reduced the amount of vegetative cover along streams. Impacts to vegetation due to the selenium issue are described in JBR Environmental Consultants (2000a).

Plant species classified as threatened, endangered or candidate under the Endangered Species Act of 1973, were surveyed during the 2000 field season at the Smoky Canyon Mine (Maxim, 2000b). One threatened, one candidate, and two sensitive species were noted to have the potential to occur within the

area of the plant surveys, however none of these plants were found during the survey. The moist soils occurring in wet meadows near springs, lakes or perennial streams are the preferred habitat of the threatened Ute ladies'-tresses; such habitat was found within the survey area, however no Ute Ladies Tresses were found. Suitable habitat associated with the slick-spot peppergrass, identified as a Candidate species, was not found during the survey. Both of the sensitive species surveyed (Cache's beardtongue and Payson's bladderpod) are associated with high elevation open areas; only borderline habitat associated with the former was found during the noted surveys.

5.4 Stream channel

As stated above in Section 3.4, no comprehensive stream characterization studies have been done across the Tygee Creek basin. Aside from the limited field observations that provided the general descriptions in Section 3.4, available information is limited to various studies completed as part of aquatic assessments related to Simplot's mining activities. The Caribou-Targhee National Forest has Proper Functioning Condition (PFC) Assessments for a number of streams in the watershed. They are: Salt Lick Creek - Functional-at-Risk-High: Draney Creek -Functional-at-Risk-High; Smoky Creek - Functional-at-Risk-Moderate; and Pole Canyon Creek - Functional-at-Risk-Low.

A two-mile reach of Tygee Creek and slightly less than a one-mile reach of lower Roberts Creek have been inundated by Simplot's tailings pond. A diversion, approximately three miles long, and at a lower gradient than the original natural channels, has been constructed around the east side of the pond to replace the channels in those areas. As stipulated by the U.S. Army Corps of Engineers, the Idaho Department of Fish and Game (IDFG), the Idaho Division of Environmental Quality, and the Idaho Department of Water Resources, the diversion must be maintained in a stable, non-eroding condition (Mariah, 1994).

Smoky Creek's channel alignment and cross section, particularly within the canyon, have been altered by various human activities. Primarily, the presence of a road within the narrow canyon confines has resulted in realignment, channelization, and berming throughout much of its length (Maxim Technologies, Inc., 2000b).

TRC Mariah (2000b) describes the Upper Smoky site (TRC-USm) as being confined within the canyon, occurring within forested and riparian vegetation communities, and possessing cobble and earthen banks. They report the base flow channel as having an average width and depth of 3.0 feet and 0.2 feet, respectively. In contrast, the Lower Smoky site (TRC-LSm) is located within shrub/grass communities and its banks are comprised of fine-grained sediments; this site is noted as being impacted by livestock trampling. The base flow channel is reported as having an average width of 6.2 feet and an average depth of 0.6 feet.

They describe upper Tygee Creek (upstream of the tailings pond site) and its east fork as a slow-moving stream with fine-grained bed and banks, with adjacent grass, pasture, and willow. This area is noted as having been impacted by livestock. The base flow channel dimensions are reported as 2.0 feet wide and 0.2 feet deep.

5.5 Water quality

Simplot and/or its consultants have been monitoring water quality biannually at several sites within the Tygee Creek basin since 1979 (Mariah, 1988, 1993-1996; TRC Mariah, 1997-2000b). Summaries of some of those data can be found in TRC Mariah (2000b), and are provided in Table 5.5-1 below.

Table 5.5-1Historic Water Quality - Range of Reported Values, 1979 - 1999

Parameter, in mg/l unless noted	Lower Smoky Creek (Map ID TRC-LSm)	Lowest Tygee Creek (Map ID TRC-LT3) (data from 1986 - 1999)
Oxygen, D*	6.0 - 14.4	5.4 - 16.2
Temp., °C	0.0 - 12.0	2 - 18
Aluminum, T**	ND*** - 5.65	ND - 1.01
Arsenic, T	ND - 0.003	ND - 0.002
Barium, T	ND - 0.200	0.090 - 0.171
Boron, D	ND - 0.257	ND - 0.04
Cadmium, T	ND - 0.01	ND - 0.003
Calcium, D	39 - 71	38 - 162
Chromium, T	ND - 0.01	ND - 0.06
Copper, T	ND - 0.03	ND - 0.04
Iron, T	0.12 - 5.86	0.05 - 0.89
Lead, T	ND - 0.10	ND - 0.001
Magnesium, D	14 - 20	15 - 69
Manganese, T	0.050 - 0.540	0.020 - 0.220
Mercury, T	ND - 0.002	ND
Nickel, T	ND - 0.01	ND - 0.03
Potassium, D	ND - 1.1	ND - 2
Selenium, T	ND - 0.001	ND - 0.004
Silver, T	ND - 0.01	ND
Sodium, D	2 - 9	10 - 1,895
Vanadium, T	ND - 0.01	ND - 0.01
Zinc, T	ND - 0.35	ND - 0.09
Bicarbonate ($CaCO_3$)	180 - 221	163- 302
Carbonate ($CaCO_3$)	ND - 16	0 - 24
Total Alkalinity ($CaCO_3$)	186 - 233	163 - 310

Table 5.5-1 Continued.

Parameter, in mg/l unless noted	Lower Smoky Creek (Map ID TRC-LSm)	Lowest Tygee Creek (Map ID TRC-LT3) (data from 1986 - 1999)
Chloride	ND - 14	6 - 1,270
Specific Conductivity, μmhos/cm	231 - 451	402 - 27,900
Fluoride	ND - 0.4	0.1 - 0.5
Hardness ($CaCO_3$)	208 - 246	195 - 508
Nitrate as N, D	ND - 1.40	ND - 0.16
Nitrate/Nitrite as N, D	ND - 1.40	ND - 0.16
Nitrite as N, D	ND - 0.01	ND - 0.01
Nitrogen Ammonia	ND - 1.12	ND - 0.09
pH	7.8 - 8.6	8.0 -8.7
Phosphorus, ortho, D	ND - 0.220	ND - 0.043
Phosphorus, T	ND - 2.3	0.007 - 0.24
Total Dissolved solids	220 - 448	220 - 17,760
Total Suspended Solids	ND - 240	ND - 28
Sulfate	ND - 33	ND - 290
Turbidity, NTU	0.3 - 133	1.2 - 18

* Dissolved ** Total ***Non-detectable, value below method detection limit

TRC Mariah (2000b) also reports some limited water quality data obtained in Draney Creek in 1999. Those data show total dissolved solids and alkalinity levels as being similar to Smoky Creek.

In recent years, some surface waters in the general region in which the Tygee Creek basin is located have experienced elevated levels of selenium and other metals; reported levels have exceeded relevant aquatic criteria in some instances. These levels are thought to be related to phosphate mining activities, at least in part (Montgomery Watson, 1999). However, this has not been reported for streams within the Tygee Creek basin. Some of the waters within Smoky Canyon Mine's facilities within the Tygee Creek basin, which are not discharged - and thus not held to aquatic criteria - do have elevated concentrations of selenium and cadmium (JBR, 2001b). There have been no reports of elevated selenium levels reporting to Tygee Creek or Smoky Creek from these sources, however. The Water Resources Technical Report (JBR, 2001b) provides a full discussion on the selenium issue in regard to water resources.

Suspended sediment levels (and the related turbidity) within the Smoky Canyon part of the Tygee Creek basin have been analyzed for both the existing conditions and the projected conditions once mining of the B & C panels occurs. Those analyses (JBR Environmental Consultants, 2001b) do not provide a consistent indication that mining has substantially increased sediments in streams.

In a baseline water quality report prepared by Maxim Technologies, Inc. (2000a), the current water quality of the three streams within the basin (Tygee Creek, Smoky Creek, and Roberts Creek) was described based upon sampling events at six sites during 2000. That report described those surface waters as generally of a calcium-bicarbonate type, of moderate hardness or very hard, neutral pH, and with low nutrient levels. Data from those sites met aquatic water quality criteria.

5.6 Species and habitats

Information for the existing habitat types within the Tygee Creek watershed was obtained by baseline data associated with the Smoky Canyon Mine located in the southern half of the basin. Additional data was compiled from GIS vegetation maps generated by the Caribou-Targhee National Forest. Surveys for wildlife have also been associated with mining in the southern portion of the basin. No surveys for wildlife species have been performed in the northern portion of the basin included in this analysis, therefore, specific wildlife species can only be extrapolated from data by nearby locales. Similar vegetation types and subsequent habitat types are found in both the northern and southern portions of the basin.

The dominant habitat types within the Tygee Creek basin, as shown on Figure 4 are forested and sagebrush communities (Maxim, 2000b; USFS, 2000). Forested areas are on the higher elevation slopes and ridges, and are comprised of pockets are dominated by conifer (e.g., Douglas-fir (*Pseudotsuga Menziesii)*, lodgepole pine (*Pinus contorta*) and sub-alpine fir (*Abies Lasiocarpa*)), quaking aspen (*Populus tremuloides*), and aspen/conifer mixtures. Sagebrush communities occur within the valleys and on the lower south facing slopes, and are dominated by mountain big sagebrush (Artemisia tridentata vaseyana) and various grasses. The Tygee Creek basin also contains wetlands, meadows, agricultural fields, and mixed brush communities. The majority of the meadow and agricultural field habitat is located in the eastern portion of the basin. Wetland and riparian areas occur along Tygee, Spring, Webster, Salt Lick, Draney, Roberts and Smoky Creeks, as well as along some of their tributaries. These wetland and riparian areas provide important habitat for many wildlife species including amphibians and birds. These various habitat types provide food, water, cover, and space for a variety of ungulates, raptors, game birds, small mammals, song birds, predators, and other wildlife.

Non-native habitat occurs in areas where mining, timber cutting, and agricultural uses have altered the vegetative landscape. Mining has altered native habitat in the mainly forested, southern portion of the basin and agricultural uses of the landscape have altered the sage and meadow habitat in the eastern portion of the basin.

Several mammalian species are known or expected to occur within the area. These species include several members of the rodent family; several species of bats; mid-size species such as skunks, coyotes, badgers, bobcats, cottontails, and jackrabbits; and large mammals including deer, elk, moose, black bear, and mountain lions. Potential lynx habitat is also present. The Caribou-Targhee National Forest has identified the Rocky Mountain elk (*Cervus canadensis*) and the mule deer (*Odocoileus hemionus*) as Management Indicator Species of general forest health.

5.6.1 Big Game

Elk and mule deer are the two most highly visible and common large mammals that occur within the Tygee Creek basin. Both species can be found within and around the mid and higher elevations during spring, summer, and fall. During winter these species migrate to areas with less snow accumulation and greater forage availability. The Tygee Creek basin currently contains approximately 2,400 acres of

critical elk and deer winter range (personal communication, C. Anderson, 2000); Caribou-Targhee National Forest, 2000). This area is generally located on lower-elevation west- and south-facing slopes located to the east of Tygee Creek, as shown on Figure 4. High value elk calving occurs in approximately 2,000 acres in the northwest portion of the analysis area near Draney Peak and north of Webster Canyon.

Regional studies conducted by the IDFG (Kuck, 1984) indicate that most elk in southeast Idaho tend to be nomadic, but do not migrate long distances between summer and winter ranges. The mean year-round home range for elk was reported as 26 square miles, with a mean migration distance between summer and winter ranges of 4.1 miles. Unlike elk, mule deer migrate greater distances from winter and summer ranges and do not show specificity to particular ranges. Deer migrate through the Tygee Creek basin during the fall months en route to winter range and during the spring months en route to summer range. However, no specific migratory corridors have been identified within the area. Monitoring studies conducted in 1979 and 1980 (Kvale, 1980) found that mule deer migrate north in the spring and cross the basin in the vicinity of Smoky Canyon Mine. This raises the issue that mine activities could adversely affect deer movement.

Optimum habitat for both deer and elk is determined by the amount, and spatial arrangement, of cover and forage areas (Thomas et al., 1979). In general, elk and deer prefer edges between cover and forage areas. Large forage areas lacking sufficient adjacent cover are generally low-use areas. Foraging areas for elk and deer occur along unforested meadows, grasslands, and shrublands; on windswept ridges; and bottomlands near drainages bisecting Tygee Creek. Rubright (1980) monitored radio-collared deer and elk within the Smoky Canyon area. His work revealed that deer in this area tend to select conifer and sagebrush habitat types, whereas elk tend to prefer more closed canopied vegetation types, especially during the summer months, and tend to utilize aspen and riparian areas for forage, and aspen stands for calving activities.

In addition to deer and elk, moose (*Alces alces*) can also be found throughout the Tygee Creek basin at any time of the year (personal communication, C. Anderson, 2000). During baseline data collection efforts associated with Simplot's proposed mining, a cow and calf moose were seen within both the Smoky Creek and Roberts Creek drainages on several occasions. Several other individual moose were also seen in the area. Moose in the area do not concentrate in specific wintering areas, but are widely dispersed in aspen and conifer communities year-round (Kuck, 1984). Moose tend to stay within a small home range and are well adapted for foraging in deep snow. The most recent survey for moose populations in the area was conducted by IDFG in 1999 for Management Unit 76. A total of 140 moose were observed; population estimates for the area are between 437 - 729 (IDFG, 2000).

5.6.2 Birds

A variety of vegetation types occur within the Tygee Creek basin that provide a diversity of habitats for many species of birds. While each vegetation type offers important habitat components, the riparian areas that occur along the creeks are the most heavily utilized habitat by the birds in the area. The riparian areas are important during migration as these are often the only habitats within the arid west that have similar characteristics of more mesic habitats found outside the Intermountain region. The abundance of insects makes riparian areas important foraging habitats for species that nest in the grass or shrublands adjacent to the riparian areas. The following bird species are used by the Caribou-Targhee National Forest as Management Indicator Species for specific habitat types: Northern goshawk (*Accipiter gentilis*), for old growth conifer and aspen; hairy woodpecker (*Picoides villosus*), for snag management;

yellow-bellied sapsucker (*Sphyrapicus varius*), for aspen; and sage grouse (*Centrocercus urophasianus*), for sagebrush.

Raptors

The timbered and riparian areas provide numerous nesting opportunities for raptors. Foraging opportunities for raptors are also plentiful and occur throughout the various habitat types found within the area. Surveys for special status raptor species were performed in the spring of 2000 near the Smoky Canyon Mine site (Maxim 2000c) and included: bald eagle (*Haliaeetus leucocephalus)*, Northern goshawk, boreal owl (*Aegolius funereus*), flammulated owl (*Otus flammeolus)*, and great gray owl (*Strix nebulosa)*. Results of these surveys are referenced in the Threatened and Endangered Species Technical Report for Simplot's proposed mining (JBR, 2000b). Other raptors, such as golden eagles (*Aquila chrysaetos)*, red-tailed hawk (*Buteo jamaicensis)*, Swainson's hawk (*Buteo swainsoni)*, Coopers's Hawk (*Accipiter cooperii)*, great horned owl (*Bubo virginianus*), American kestrel (*Falco sparverius)*, and sharp-shinned hawk *(Accipiter striatus)* may nest in the aspen or conifer stands, or forage within the various vegetation types throughout the analysis area. Northern harrier (*Circus cyaneus*), typically nest in grassland habitat (in the eastern portion of the analysis area) and may also be found foraging in the basin. No studies have been completed within the area concerning the uptake of selenium by predators as a result of feeding on prey species that were exposed to elevated levels of selenium in vegetation.

Upland Game Birds

Prior to the construction of Simplot's tailings ponds, there was an active sage grouse (*Centrocercus urophasianus*) lek within close proximity of the pond location (Mariah, 1980, 1990). Mariah (1996) reported that sage grouse had established a lek on a knoll northwest of the new tailings pond dam site. Sage grouse were also observed to be strutting in the meadow south of the original lek. Recent surveys in and around the Smoky Canyon Mine identified two individual sage grouse and no active leks (Maxim, 2000c). Blue grouse (*Dendragapus obscurus*) and roughed grouse (*Bonasa umbellus*) are commonly found utilizing dense conifer and aspen stands in the area.

Other Birds

Many additional bird species utilize the habitats found in the Tygee Creek basin at some time during the year. In addition to the species discussed above, Maxim (2000c) recorded the presence of approximately 50 additional species including various passerines, waterfowl, and shorebirds. In terms of selenium, Ratti and Garton (2000) collected 98 and 117 eggs from several bird species (many of which were the same as those identified by Maxim, 2000c) at both non-mining and mining areas, respectively, in 1999. Their work revealed that selenium levels in egg tissues on phosphate mining sites were significantly higher than on non-mining sites. However, only 12.8% of the mining site eggs contained selenium exceeding 10 ppm, a level considered problematic for embryo viability (Skorupa, 1998:167).

5.6.3 Amphibians and Reptiles

Amphibian dependence on water limits their potential for distribution in the Tygee Creek basin primarily to areas along perennial streams or near springs. Intermittent and ephemeral water sources that occur in the minor drainages that intersect Tygee Creek may also be used as breeding sites and areas where the young develop. Recent surveys conducted in the vicinity of the Smoky Canyon Mine (Shiva, et al, 2000) revealed the presence of the tiger salamander (*Ambystoma tigrinum*) and the boreal chorus frog (*Pseudacris maculata*); these species may also occur in suitable habitat in other parts of the Tygee Creek Basin. Other amphibians, including the Great Basin spadefoot toad (*Spea intermontanus)*, the Columbia spotted frog (*Rana luteiventris*), the Western toad (*Bufo boreas),* and the Northern leopard frog (*Rana pipiens*), may also occur in the basin, but were not discovered during the Smoky Canyon surveys. The

Western toad and the Northern leopard frog are considered as species of special concern by IDFG and the US Fish and Wildlife Service.

Reptile surveys recently conducted near the Smoky Canyon Mine (Shiva, et al, 2000) found the rubber boa (*Charina bottae*) and the Western terrestrial garter snake (*Thamnophis elegans*). Additional reptiles, including the sagebrush lizard (*Sceloporus graciosus*), gopher snake (*Pituophis catenifer*), common garter snake (*Thamnophis sirtalis*), and short-horned lizard (*Phrynosoma douglassii*), were not found during the survey, but may also occur within the Tygee Creek Basin. It is not expected that any reptiles species of special concern occur within the basin.

5.6.4 Fisheries

Data for fisheries in the basin have been obtained primarily from studies on mining operations in the southern part of the Tygee Creek basin. A detailed analysis of fisheries, including selenium issues, for Smoky and Tygee Creeks can be found in the Fisheries and Aquatics Technical Report (JBR, 2000c). No information is available for fisheries in the northern section of the Tygee Creek basin.

Fish surveys conducted as a part of the original Smoky Canyon Mine Environmental Impact Statement (EIS) (USFS, 1981 & 1982) investigated fish populations present in Sage (just south of the basin), Roberts, Smoky and Tygee Creeks. Fisheries information presented in that EIS indicates that Smoky and Stump Creeks are among streams that serve as important spawning habitat for trout inhabiting the Salt River system. Electrofishing conducted as a part of the original EIS baseline data gathering effort found that both cutthroat and brook trout were present in Smoky Creek, and a small number of cutthroat were found in Tygee Creek. The EIS refers to the Salt River system as "the parent source of fine spotted cutthroat trout that are found in southeast Idaho" (USFS, 1981 & 1982) No salmonids were found in Roberts Creek.

In early August of 2000 (Maxim, 2000d), Maxim sampled fish populations in Smoky Creek. Cutthroat trout, sculpin (*Cottus* sp.), brook trout, and longnose dace (*Rhinichthys cataractae*) were noted during the survey. Near the Tygee Creek/Smoky Creek confluence, cutthroat and brook trout were found. Those two fish were also found, along with leatherside and Utah chub (*Gila copei* and *G. atraria*, respectively), redside shiner (*Richardsonius balteatus*), longnose dace and sculpin, in Tygee Creek below Simplot's tailings ponds (Maxim, 2000d).

The Wyoming Fish and Game Department operates a fish hatchery on Webster Creek located in the northern section of the basin. Due to whirling disease concerns, only the spring water is utilized in hatchery operations.

5.6.5 Threatened, Endangered and Sensitive Animal Species

No animal species classified as threatened or endangered under the Endangered Species Act of 1973 are known to regularly inhabit the Tygee Creek basin. Several species classified as sensitive by USFS that receive special management consideration are known to occur or have the potential to occur in the basin. The following discussion lists these species and provides basin-specific comments on their potential presence if known. JBR (2000b) elaborates on this issue.

The gray wolf (*Canis lupus*), is a threatened species that has recently been reintroduced into central Idaho and Yellowstone. In recent years, a single wolf siting has been reported, but unconfirmed, in the Caribou County area (Vering, 2000), however, Maxim (2000c) did not detect any evidence of wolves during their baseline surveys of the Smoky Canyon area. In the late fall of 2000, a single wolf which had

been preying on sheep in Caribou County was killed under a lethal taking provision authorized by the USFWS (Caribou County Sun, December 7, 2000). Track surveys conducted in the area of sheep kills indicated a single wolf was involved in these predations. This wolf may have dispersed from one of the Yellowstone or Idaho releases. During a track survey conducted at the Manning Creek Project Area (just south of the Tygee Creek basin) in January, 2001, a single set of wolf tracks was discovered by JBR biologists (JBR Environmental Consultants, 2001c).

The grizzly bear *(Ursus arctos)* is also listed as threatened. No reported sightings have occurred in the Tygee Creek basin although the original Smoky Canyon Mine EIS (USFS 1981 and 1982) noted that the nearest recent grizzly bear sightings were made on the Targhee National Forest approximately 75 miles north of the basin, while the nearest recorded sightings were made approximately 50 miles north of the area. Grizzly bear tracks were reported near Stump Creek (just north of the basin) in 1974.

Maxim conducted winter track surveys for the threatened Canada Lynx (*Lynx canadensis*) in the Smoky Canyon Mine area in 2000. They found no evidence of lynx. They noted that while the local government trapper working in the area for the past 15 years had never seen evidence of lynx, there were two unconfirmed lynx taken in the area in the 1960's, and an unconfirmed sighting in 1997.

Maxim conducted an aerial winter bald eagle *(Haliaeetus leucocephalus)* survey in February of 2000, following established protocols. The survey area included the Tygee Creek drainage. No bald eagles were recorded during this survey, nor were any bald eagles recorded in the area during other Maxim 2000 survey work. Maxim notes, however, that waterfowl utilized the Smoky Canyon Mine tailings ponds, and represent a prey base which could attract eagles to the area. Bald eagles have been known to winter in the Crow Creek area, south of the Tygee Creek basin (JBR Environmental Consultants, 2001c). This species is listed as threatened.

Maxim did not observe whooping cranes *(Grus americanus)* in the area during their 2000 baseline surveys, nor were any of these endangered birds observed during studies done as part of the original Smoky Canyon Mine EIS (USFS, 1981 & 1982).

Maxim did not detect any spotted bats *(Euderma maculatum)* or Townsend's big-eared bats (*Corynorhinus townsendii*) in the baseline survey area near the Smoky Canyon Mine, and only noted minimal habitat potential for these sensitive species.

Wolverines (*Gulo gulo*) are another sensitive species for which Maxim surveyed in the vicinity of the Smoky Canyon Mine; no evidence of wolverine presence was detected during these surveys.

Listed as sensitive, Harlequin ducks *(Histrionicus histrionicus)* and trumpeter swans (*Cygnus buccinator*) may stop briefly in the basin or on the Simplot tailings ponds, but would not be expected to remain in the area for extended periods. None have been reported.

Maxim conducted northern goshawk *(Accipiter gentilis)* surveys of the Smoky Canyon Mine area in mid-May and mid-July of 2000. Much of the proposed mining area is considered as potential northern goshawk habitat, however there were no goshawks, nests, or other evidence of goshawks (plucking perches, etc.) found. A goshawk nesting territory is reported to exist within the basin, approximately one mile west of the Smoky Canyon Mine (Maxim, 2000c). This species is listed as sensitive.

The sensitive Columbia Sharp-tailed Grouse (*Tympanuchus phasianellus columbianus*) species was not found during the recent Maxim baseline studies, and Maxim further notes that the species has not been reported in earlier baseline reports conducted in the area (Maxim, 2000c).

Three sensitive owl species were surveyed by Maxim in 2000: the boreal owl (*Aegolius funereus*), the flammulated owl (*Otus flammeolus*), and the great gray owl (*Strix nebulosa*).
No boreal owls or great gray owls were detected. Flammulated owls responded to calls at three locations near the Smoky Canyon Mine during the May surveys, but searches conducted following these responses did not locate any flammulated owl nests.

No three-toed woodpeckers *(Picoides tridactylus)* nor evidence of the species were detected in the area.

Designated as sensitive, no spotted frogs *(Rana pretiosa)* were found during Maxim's 2000 surveys.

5.7 Human uses

At present, phosphate mining, livestock grazing, timber harvest, and agriculture are the dominant land uses in the Tygee Creek basin. Outdoor recreational activities such as camping, hunting, fishing, wood gathering, and snowmobile operation, which occur primarily on the Caribou-Targhee National Forest, are also important but affect the basin at a lesser scale than the dominant uses. Most of the USFS land in the basin is within the boundaries of either the Stump Creek Roadless Area (#04173) or the Sage Creek Roadless Area (#04166).

A portion of J.R. Simplot's Smoky Canyon phosphate mine lies within the basin. The existing mine facilities in the basin include the mill site, inactive mine panels, some of which have been partially backfilled, and the two tailings ponds on Roberts Creek and Tygee Creek. The proposed mining of the B & C Panels would include mine panels along Smoky Creek and an external overburden disposal site on the ridge on the west side of Roberts Creek watershed. The tailings pond area would also increase as more tailings are deposited over the years. A summary of existing and proposed mining disturbances in the Tygee Creek basin is given in Table 5.7-1. (Note that some of Simplot's existing disturbances, reclaimed areas, and proposed disturbances are outside of the Tygee Creek basin, to the south.) At full development levels, mining disturbances in the Tygee Creek basin would cover over 1,370 acres, or over 5.8 percent of the total basin area.

Table 5.7-1 Approximate Simplot Disturbance in the Tygee Creek Basin (Acres)

Area Currently Disturbed	Area Currently Reclaimed	Area* Proposed for Disturbance	Proposed Disturbance Area Eventually Reclaimed	Proposed Disturbance Area to Remained Un-Reclaimed
427	5	1374	1361	13

The process of developing the Smoky Canyon Mine began with the Draft EIS in 1981. The current mining and milling operations were authorized by the USFS in 1983 after completion of the Final Smoky Canyon Phosphate Mine EIS (USFS, 1982). Mining operations consist of hauling ore from the pits to the mill where phosphate mineral is separated from the ore. The phosphate mineral slurry is then pumped through a buried pipeline which runs west to Simplot's fertilizer plant in Pocatello, Idaho. Mill tailings are

piped to the tailings ponds east of the pits and mill. Makeup water for mine operation is supplied by Roberts Creek and two water wells located near the mill.

Reclamation of land disturbed by mining operations has already begun on the Smoky Canyon mine site by regrading and revegetation directly on mine spoil or on a surface layer of growth medium covering the spoil. Land disturbance for the proposed mine facilities would also be reclaimed but the process has been modified. As information about the problems posed by selenium accumulation in water and vegetation has become available, it became clear that additional steps were necessary to keep selenium in mine spoil sequestered from the environment. The proposed reclamation method for the newly disturbed areas is to cover seleniferous overburden fill with a 10-foot thick layer of non-mineralized chert and an additional layer of topsoil one to three feet thick. This method is expected to prevent selenium accumulation in forage to livestock and wildlife, as well as other non-forage vegetation species, as described in detail JBR Environmental Consultants (2001a). Currently, less than five acres of mining disturbances within the Tygee Creek basin have been reclaimed with waste shale.

Portions of three USFS grazing allotments are included in the basin and one allotment, Salt Lick, lies completely within the basin. The Salt Lick allotment is 1,133 acres in size and 99 head of cattle are grazed from June 6 through September 1, a total of 290 animal unit months. Approximately 80 percent of the Pole Canyon allotment lies within the basin. This rather large sheep allotment encompasses 12,658 acres and is grazed by 1,020 animals from June 27 through September 20, or 2,924 animal unit months. The southern half of the Webster Creek allotment also lies within the basin. This allotment is 6,120 acres in size and is for 1,000 head of sheep from July 1 to August 31, or 2,038 animal unit months. The Webster Creek allotment is currently vacant, with the western third temporarily being used by another permittee. The future of the Webster Creek allotment is currently under review. If the allotment is found to be not viable, portions of it will likely be combined with allotments on its western border (personal communication, L. Mickelsen, 2000). A small portion of the Stump Creek allotment is within the basin, approximately 340 acres. The Stump Creek allotment is 18,541 acres in size and is grazed by 586 head of cattle from June 6 to September 30, or 2,254 animal months. A new Allotment Management Plan for the Stump Creek allotment is currently going through the NEPA review process and is scheduled to be completed in 2001 (personal communication, L. Mickelsen, 2000). In summary, approximately 15,000 acres, representing 63 percent of the Tygee Creek basin, is subject to grazing by USFS permitees (when the Webster Creek allotment is being utilized); some additional grazing also occurs on other non-forest lands.

Timber harvest in the Tygee Creek basin has been minimal in recent years. Some harvest typically occurs in conjunction with clearing land scheduled for mining. Timber sales on USFS land in the basin also occur at appropriate levels for reducing fire fuel load and managing trees damaged by disease, insects, or storms. However, future timber harvests in the basin may be limited as a result of the recently adopted Forest Service Roadless Area Conservation proposal. The effective date of this rule is May 12, 2001.

Recreational use of the Tygee Creek basin includes deer and elk hunting, fishing, wood gathering, snowmobile operation, and camping, although there are no established campgrounds in the basin. The Webster Ridge Trail is located along the western boundary of the basin. The trail is used mainly by all terrain vehicles, hikers, and horse back riders. The Webster Ridge Trail has been proposed by the USFS to become part of the Great Western Trail system and a Millennium Trail.

The Auburn Fish Hatchery, which is operated by the Wyoming Game and Fish Department, is located on the Caribou-Targhee National Forest in the north-central portion of the basin near Webster Creek. Although it is located in Idaho, the hatchery produces fish for Wyoming under a permit first issued by the USFS in 1941. Most of the existing buildings were constructed in 1942 and new buildings are currently under construction in order to allow expansion of operations and isolate the hatchery from the creek to reduce the risk of whirling disease. About half of the water for hatchery operation comes from springs on the mountainside west of the hatchery and the rest comes from Webster Creek. Approximately 3 million gallons of water per day are used by the hatchery to produce a total of approximately 40,000 pounds of cutthroat and Mackinaw trout per year.

Agriculture and grazing on private lands dominate land use in the eastern portion of the basin. Agricultural lands, shown on Figure 4, cover about 3,000 acres, or 12 percent of the basin. A dairy ranch is also present. No major highways are found in the Tygee Creek basin. Existing roads largely serve the needs of mining, agriculture, and timber harvest operations.

6.0 Reference Conditions

Reference conditions in the Tygee Creek basin are those associated with the time period in history prior to major European influences. The condition of the various ecosystem components during that time period, where known, can be contrasted with current conditions in order to determine how the system has changed and evolved since that time.

6.1 Erosion Processes

Soil in the area is derived primarily from parent materials including sandstone, shale, and siltstone (Maxim, 2000e). The majority of soil associations in the Tygee Creek basin area consist of loamy textured soils and were formed from alluvium, wind-deposited silt, and slope wash. Soils on ridges and plateaus have developed from sandstone, shale, or siltstone residua. Colluvium is the parent material for development of soils on slopes. Soils in drainages and swales have developed from alluvial materials. The sedimentary bedrock formation in the Smoky Canyon area consists primarily of shale, chert, and limestone.

The mountainous terrain does not favor optimal soil development. Soils on nearby mountain slopes are susceptible to increased erosion rates that constantly remove the fine particles from the surface and deposit them on the surfaces of soils occupying the alluvial or valley slopes. Soils in the mountains also tend to have high concentrations of coarse fragments which are transported to the alluvial slopes during landslide events and over time.

6.2 Hydrology

There is no known direct evidence by which to assess whether hydrologic characteristics in the Tygee Creek basin have changed during the previous 100-year time frame. Instead, indirect measures may be used. Stream flow patterns are the result of precipitation characteristics and basin characteristics, so changes in either of these two indices may indicate that changes in stream flow have also occurred.

Precipitation information of a long enough time span to indicate changes in rainfall patterns, average depths, etc. near the basin are not available. However, to provide an indication of whether regional

precipitation has changed over the reference period, the Pocatello, Idaho weather station data were examined. Although records don't begin until well into the reference period (1939), the long term average annual precipitation based upon that record is 12.14 inches, as compared with the current average of 11.75 inches (Western Regional Climate Center, 2000).

Watershed characteristics are not thought to have changed drastically over the Tygee Creek basin as a whole. The basin is essentially free of major developments or disturbances that would typically notably alter the soil's ability to intake precipitation, such as pavement or compaction. The Smoky Canyon Mine is the largest such facility in the basin with such a potential, however the Smoky Creek stream flow records obtained biannually since mining began do not indicate that the mine has altered the regime in Smoky Creek (JBR, 2001b). Vegetation is not noted to have been altered substantially during the reference period, as described further below, so it's contribution to runoff patterns has not likely changed.

However, one subtle change that may have affected runoff patterns, although to an undocumented degree, is livestock grazing. Across the western United States, heavy livestock grazing has commonly disrupted at least stream-side riparian vegetation patterns, if not upland areas. Regional streams have commonly seen an increase in flooding, and a decrease in baseflow as a result. Again, these impacts have not been document in the Tygee Creek basin, but may have occurred, as livestock grazing has been a major historical use of the basin lands, and livestock disturbances adjacent and in the basin's streams have been noted (TRC Mariah, 2000b).

6.3 Vegetation

Reference vegetation patterns in the Tygee Creek basin are the result of aspect, elevation, moisture, temperature, and soils. Topographic and climatic conditions in the basin probably limited fire frequency as a major disturbance factor. Fires played a critical role in the forests of southeastern Idaho (Barrett, 1994). Two or three fire-initiated seral age classes in the Caribou-Targhee National Forest indicates that natural fire maintained forest mosaic makeup until the settlement of Europeans in the late 1800's. Landscape patterns suggest most fires were patchy, and only rarely burned extensive areas. Conifer and aspen cover types likely predominated at the upper elevations of the basin and sagebrush/grassland cover types predominated in the valley bottom. Mountain brush was probably intermixed with confer/aspen stands on drier, exposed sites. Riparian/wetland cover was likely found associated with streams, springs, seeps, and ponds primarily at lower elevations. Plant communities consisted of native plant species. Plant community distribution was probably much like current conditions.

6.4 Stream channel

As discussed in Section 6.2, livestock grazing may have had some affect on stream flow conditions. Similarly, it may also have had effects on stream channel morphology. Stream side grazing, in-stream watering, and upland impacts can all contribute to stream destabilization, sediment loading, and disruption of riparian and overbank areas. While the Tygee Creek basin does not appear to have experience major stream channel entrenchment, alluvial dewatering, and gullying that is common throughout the west, some noted livestock-related impacts may have occurred within the reference period.

In addition, roads constructed within narrow canyon bottoms such as Smoky Canyon have altered the streams' alignment, meandering patterns, and overbank flow abilities.

The relatively recent re-routing of lower Roberts Creek and parts of Tygee Creek within the reference period have resulted in a definite morphological change in those natural stream reaches. The existing replacement channel is less sinuous, of flatter gradient, and more ditch-like that the natural stream channels, likely of a Rosgen's C type, that were in place during most of the reference period.

6.5 Water quality

Water quality in the Tygee Creek basin has not been documented throughout most of the reference period. It is assumed that much of the headwater area had good quality waters, similar to the current conditions. However, within the area of Tygee Creek where the tailings pond now occurs, water quality can be assumed to be different now than previously. During the reference period, the stream flowed through natural alkaline soil flats and saline spring discharge, as it did prior to the construction of the pond in the late 1980's (Mariah, 1990). The stream therefore had higher conductivity and dissolved solids downstream of the alkaline flats than upstream of the flats, and the elevated levels may have persisted downstream to the mouth of Tygee Creek, depending upon dilution as Draney and Webster Creeks entered the flow.

When the tailings ponds were constructed, the alkaline spring area was covered by a clay cap and Tygee Creek was diverted, which resulted in improved water quality in Tygee Creek downstream of the tailings pond than was natural for this area (JBR, 2001b).

6.6 Species and Habitats

Past dominant habitat types within the Tygee Creek basin were probably similar to the dominant habitat types found today. Currently, the habitats dominating the Tygee Creek basin are forested and sagebrush communities with riparian corridors along streams. Two animal species currently classified or proposed as threatened or endangered under the Endangered Species Act of 1973 were likely to be occupants in the Tygee Creek basin, the gray wolf and the North American lynx. Extensive trapping and hunting have been factors for their absence in the region. The former ranges of both species included the Tygee Creek basin. The absence of disturbance likely resulted in higher habitat quality in the past. Other threatened or endangered species that potentially occurred in the Tygee Creek basin include: bald eagle, whooping crane, and peregrine falcon. These species may have been transient occupants, much as they are today.

Animal species classified as sensitive by the USFS were likely inhabitants in the basin. With the exception of habitat conversion by mining and agricultural activities, vegetative community mosaics supporting several of these species (wolverine, great gray owl, northern goshawk, and Columbian sharp-tailed grouse) are comparable to current conditions. With the absence of human disturbance, overall habitat quality was probably greater, and favored species such as wolverine, northern goshawk, and great gray owls. However, native shrub communities, as altered by fire regimes and livestock grazing, could have enhanced habitat for species such as the Columbian sharp-tailed grouse. Habitat conversion (such as fire or plant succession) outside the basin would have likely limited distribution of other sensitive species, much as it currently does.

The Salt River Drainage has historically supported a high quality Yellowstone cutthroat trout fishery. In the early 1960's, efforts were made to eradicate non-game fish species in tributary streams by use of chemicals. The native Yellowstone cutthroat trout fisheries were depleted as a result of this effort and

the subsequent stocking of non-native trout (brook, German brown, and rainbow) which in some cases, can out compete native cutthroat trout for resources, have further depleted native trout populations.

6.7 Human Uses

The prehistory of southeast Idaho can be divided into three distinctive periods: Paleo Indian, Archaic, and Proto-historic. Each period is defined by particular tool types and subsistence strategies.

6.7.1 Paleo Indian Period

The Paleo Indian culture thrived in the area from ca. 14,500 BP to 7,000 BP, and can be identified and characterized by three distinct tool assemblages: Clovis, Folsom and Plano. The culture derived much of its subsistence from the Pleistocene megafauna such as mammoth, mastodon, horse, camel and bison. The culture has been characterized as being extremely mobile in that they depended on a migratory food source. While the Paleo Indian period generally is accepted as the earliest period of human occupation in southeastern Idaho, it is possible that groups inhabited the area a few thousand years earlier. The oldest evidence of human occupation in southeastern Idaho comes from Wilson Butte Cave; it consists of lithic and bone artifacts in a radiocarbon-dated context of 14,500 $\pm$ 500 B.P.

Clovis projectile points and tools date from 12,000 to 11,000 BP. Archaeological evidences from this time period demonstrate that a primary source of food was derived from the hunting of large megafauna such as mammoth, mastodon, bison and others.

Folsom-style projectile points have generally been found in association with bison (*bison antiquis*) and represent a different culture period from Clovis that dates from 11,000 to 10,600 BP. Folsom projectile points and tools have been recovered from sites such as Owl Cave and other surface deposits in and around southeastern Idaho. Plano-style points and tools are the most prominent of Paleo Indian tool-types to be found in southeast Idaho. The Plano period dates from 10,600 to 7,800 BP, and is also characteristic of a high degree of mobility and a dependance on large fauna for subsistence.

6.7.2 Archaic Period

The Archaic period (7,000 - 300 BP) is distinctive from the earlier period by the appearance of new projectile point styles (stemmed and notched points) that may have come as a result of new technology, and increased exploitation of other types of food-bearing resources and the first evidences of ground stone and ceramics. The Archaic period is divided into three distinctive parts: early, middle and late.

The Early Archaic period (7,000 - 4,500 BP) is marked by the introduction of large side-notched and bifurcate stemmed points (Northern Side-notched or Bitteroot and Pinto series, respectively). Although evidence supports the continued dependance on large mammals as a source of food, it is also characterized by an expansion of the resource base to include both plants and other types of small mammals. Semi-subterranean structures started appearing toward the end of the early Archaic (4,300 BP) with evidence of occupation near Givens Hot Springs in southeast Idaho.

The Middle Archaic (4,500 - 1,300 BP) is characterized by the discovery of earthen oven features, ground stone, and different projectile point styles (Pinto, Gatecliff, Elko, Humboldt series). Exploitation of a variety of different resources continued and diversified through the middle archaic, and the bow and arrow is believed to have come into southeast Idaho around 1650 BP. This technological change brought about smaller projectile points and a shift in hunting strategies toward the end of the middle archaic period.

The Late Archaic period in southeastern Idaho is defined by the introduction of ceramics and small triangular projectile points. An increase in sedentary groups and a stronger reliance on smaller animals and a variety of plants are also distinctive characteristics of this period. The Late Archaic can be divided between two culture groups; the Fremont (1300 - 650 BP) and the Shoshonean (700 BP - present). The Fremont are generally considered to be agriculturalists, and although evidences of Fremont pottery have been discovered in southeast Idaho, the evidence of early agriculture has not. Speculation exists about whether or not the Fremont were in Idaho or if the artifacts were brought there by trade. Other arguments claim that the Fremont culture had aspects of hunting and gathering, and aspects of agriculture. Investigations of the Fremont in southeastern Idaho have been hindered because many Fremont artifacts have gone unrecognized or misclassified as Shoshonean. The Shoshonean occupation of this area of Idaho coincides with the expansion of the Numic Speaking peoples from the southwest Great basin area. These cultures exhibit aspects of hunter/gatherer groups and evidence has shown a continual occupation in Idaho from ca. 700 BP.

6.7.3. Proto-Historic Period

Probably the first white men to enter what is now the State of Idaho were the members of the Lewis and Clark expedition in 1805. Their influence in the region was probably negligible but the expedition marked the beginning of the influence of European-Americans. Horses were introduced, and fur trading began, soon after the expedition and provided the initial basis for an expansion of exploration and trade contacts with native Americans. Fur traders were followed by waves of settlers as they passed through the area on their way to lands farther west. The Oregon Trail, which crosses the eastern Idaho border near Montpelier, was established in Idaho in 1843. As the Mormon settlement in Salt Lake prospered and grew in the 1860s, homesteaders expanded outward into surrounding areas and eventually reached southeastern Idaho where farms and small agriculture-based communities were established.

With the introduction of the horse, the lifestyles of the Shoshone and Bannock changed dramatically. Horses brought about a change in subsistence strategies and allowed new methods and techniques for hunting. Transportation of food was facilitated by the introduction of the horse, and a greater area could then be exploited for resources. This led to more permanent villages and hunting forays into Wyoming and other areas that had previously been too distant.

Gold mining in southeastern Idaho was initiated in the early 1860s, further disrupting traditional Native American livestyles. A wave of prospectors and their suppliers moved into the region, and gold mining in the late 1800s and early 1900s generated increased trade with Salt Lake and a further increase in settlement. Roads were continually improved to manage the increase in goods transport, and the completion of the transcontinental railway in 1869 also improved transportation to southern Idaho.

This westward expansion and increasing conflicts with Euroamericans eventually forced most of the Shoshone and Bannock into the reservation system. The Western Shoshone signed a treaty in 1863 with the United States Government which set aside large tracts of Indian land in Idaho, Nevada, Oregon, Utah, and Wyoming. The Bannock were assigned to the Fort Hall Reservation in 1869, and from 1879 to 1907 a number of other Native American groups were relocated to Fort Hall as well. Many sacred sites are located throughout the region; those that can be identified include burials, rock art, monumental rock features and formations, rock structures or rings, sweat lodges, timber and brush structures, eagle catching pits, and prayer and offering locales. Much of the landscape in southeastern Idaho is still considered to be sacred to local Native American groups.

By the early 1900s, agriculture, gold mining, and grazing on public and private lands formed the economic base of southeastern Idaho. In 1920, phosphate mining began near Conda, marking a new phase of economic development in southeastern Idaho. Early underground phosphate mines were eventually replaced by large scale open pit operations as technology improved in the 1940s.

J.R. Simplot has been mining phosphate in southeastern Idaho since 1945. As the original mines were depleted, other phosphate sources, such as the Smoky Canyon Mine, were sought in order to supply Simplot's fertilizer plant in Pocatello, Idaho. Fertilizer produced by the plant is used in agriculture, mainly in the western United States. The other major sources of phosphate rock are found in the eastern United States, giving western phosphate sources a competitive advantage in supplying the needs of the western United States (USFS,1981 and 1982).

7.0 Synthesis and Interpretation

A comparison of current conditions and reference conditions for each of the ecosystem components covered in this analysis shows very few documented changes. However, this is not necessarily indicative that changes have not occurred, rather it reflects the facts that (1) direct information on general reference conditions is lacking, and (2) even for current conditions, the entire basin has not been subject to detailed study. In fact, much of the available information for the Tygee Creek basin comes directly from studies in and around the Smoky Canyon Mine, and this information was only obtained beginning in the early 1980s.

However, although extreme changes in ecosystem functioning have not been documented in the basin, it is likely that some changes have occurred. Given the high erosion hazard of many of the soils, and the long term land uses of grazing and timber production, both of which are generally known to contribute to erosion, it would be reasonable to assume that some changes in water quality, channel morphology, and runoff patterns have occurred since the early reference period beginnings. However, it also appears that any such changes have not comprised the basin's ability to provide a set of diverse habitats and characteristics for both non-human and human uses.

The relatively long list of threatened, endangered, and sensitive species that may have been present in the Tygee Creek basin at one time in the past, but that are no longer found may also indicate that ecosystem functioning has likely changed, at least subtly, over the reference period. However, this is not unusual for the region, and while human uses may be at least partly responsible for these species' decline, the Tygee Creek basin is still relatively undeveloped. Active management in the future can help to insure that the species currently present in the basin can continue to thrive.

Simplot's phosphate mining and associated activities such as road construction have undoubtedly been one of the major human uses in the Tygee Creek basin in recent years. Local erosion, runoff patterns, channel morphology, and water quality may have been affected within their direct disturbed areas, but ongoing sediment control and interim reclamation have apparently been effective as substantial off site sediment impacts have not been indicated through either water quality, stream flow, or aquatic habitat monitoring (JBR, 2000c and 2001b). While local vegetation and habitats have also been altered in specific areas where the mining activities have taken place, these effects have apparently been localized. As active mining areas are completed in the future, and sediment/erosion control becomes indirect due to the level of success of reclamation efforts, the short or long term nature of these effects will become

known. It will be important for land managers to recognize the sensitivity of much of the basin's lands to erosion, and to manage land uses accordingly.

Not only mining, but other land uses in the basin can be the subject of best management practices to reduce erosion and subsequent sediment loading to Tygee Creek and its receiving waters. Basin soil limitations suggest that most disturbed areas will experience increased erosion potential, either by wind or water. Native soils can be lost due to the breakdown of soil structure and discontinuation of natural soil development as a result of surface disturbance. Successful reclamation of disturbed areas associated with mining and with other land uses would expedite these natural processes and create an environment suitable for long-term vegetation establishment. This in turn, reestablishes habitat and maintains water quality.

Another aspect of best management practices in the Tygee Creek basin is more specifically related to mining. As described above, selenium has recently been noted to be of concern in various parts of eastern Idaho where phosphate mining occurs. Just south of the Tygee Creek basin, it is apparent that in some reclaimed areas of the Smoky Canyon Mine, selenium is accumulating in vegetation growing directly in seleniferous overburden (JBR, 2000e). (All of the areas sampled in the JBR (2000e) study were just outside and south of the Tygee Creek basin's southern boundary, not within Tygee Creek basin itself.) Reclamation of the existing and proposed mine disturbances lying within Tygee Creek basin, is planned to utilize selective handling to segregate seleniferous overburden from the surface environment, and thus reduce livestock, vegetation, and wildlife impacts. Similarly, water quality related selenium impacts that have been documented just south of the Tygee Creek basin may not occur within the basin if proposed mitigative measures for future mining activities are effective. The Geology and Minerals Technical Report (JBR Environmental Consultants, 2001d) provides a discussion of recommended best management practices and their effectiveness. Based upon existing selenium information in the basin, and the predicted effectiveness of these practices, the selenium issue can be expected to be of low risk to the Tygee Creek basin.

Timber harvest, livestock grazing, and recreation can be sustainable and compatible land uses if they do not exceed the limits necessary to maintain long term ecosystem health. Currently, timber harvest is occurring on a negligible percentage of basin lands; grazing is occurring on at least 63 percent, and agricultural production is occurring on about 12 percent. On public lands, the NEPA process has, within the recent history of the reference time frame, had a significant effect in ensuring that environmental impacts of land use decisions are thoroughly discussed and weighed against potential economic benefits. Private lands in the basin are not normally subject to the requirements of NEPA and private land use decisions tend to be driven primarily by market conditions, at least in the short term

Almost all of the area in which mining has taken place, as well as other historic land uses including timber harvesting and grazing, is in the upland portions of the basin which are administered by the USFS. The potential for erosion may represent the greatest risk to the basin, given the nature of the soils, and the nature of the land uses that occur in the headwater areas. Given the headwater positions of these public lands, as well as their susceptibility to erosion, thoughtful management is essential to the ecosystem health of the basin as a whole. Without such concerted efforts, future land uses in a functioning ecosystem within the Tygee Creek basin will be unlikely to continue.

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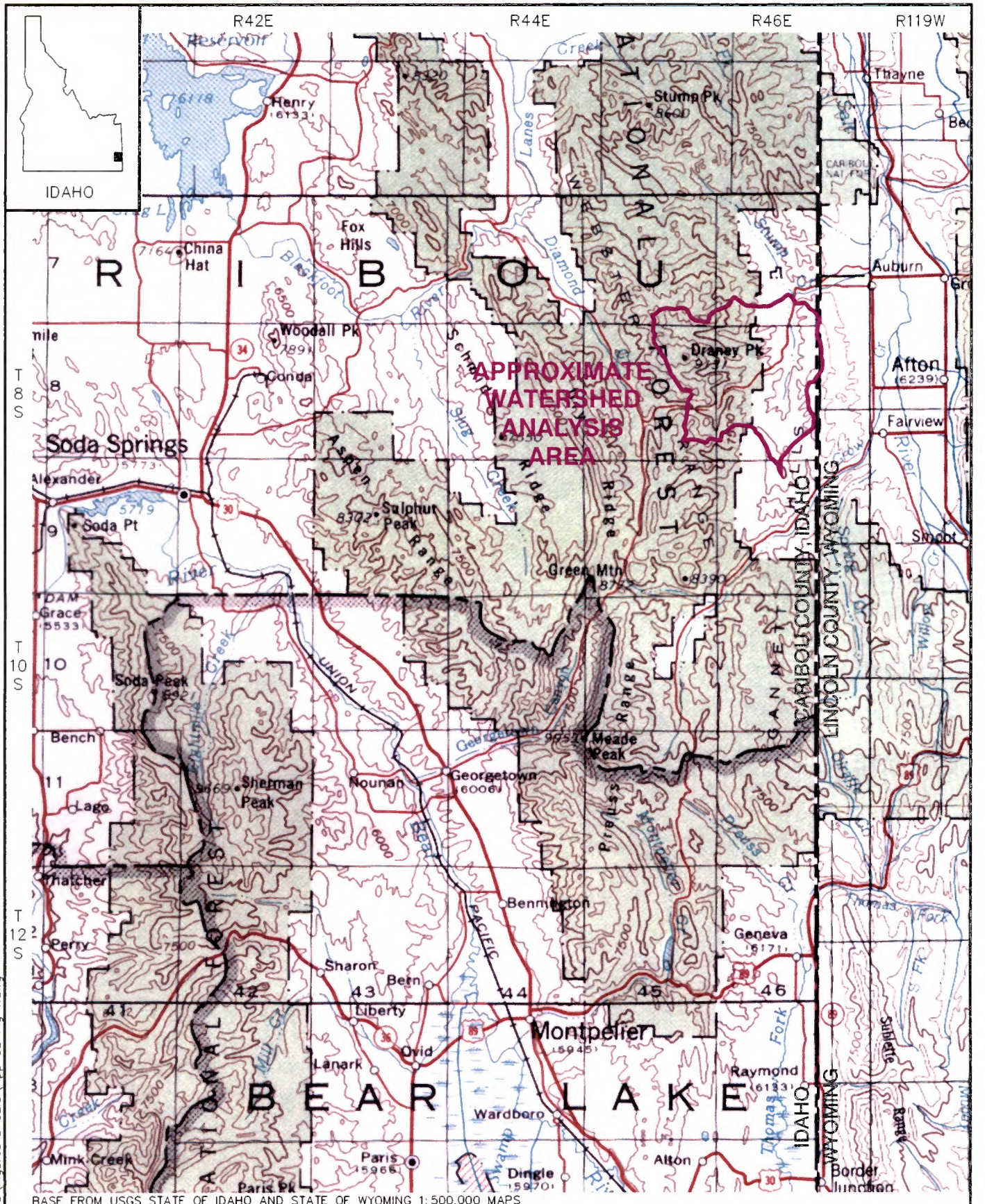

FIGURE 1
LOCATION MAP
WATERSHED ANALYSIS - TYGEE CREEK BASIN

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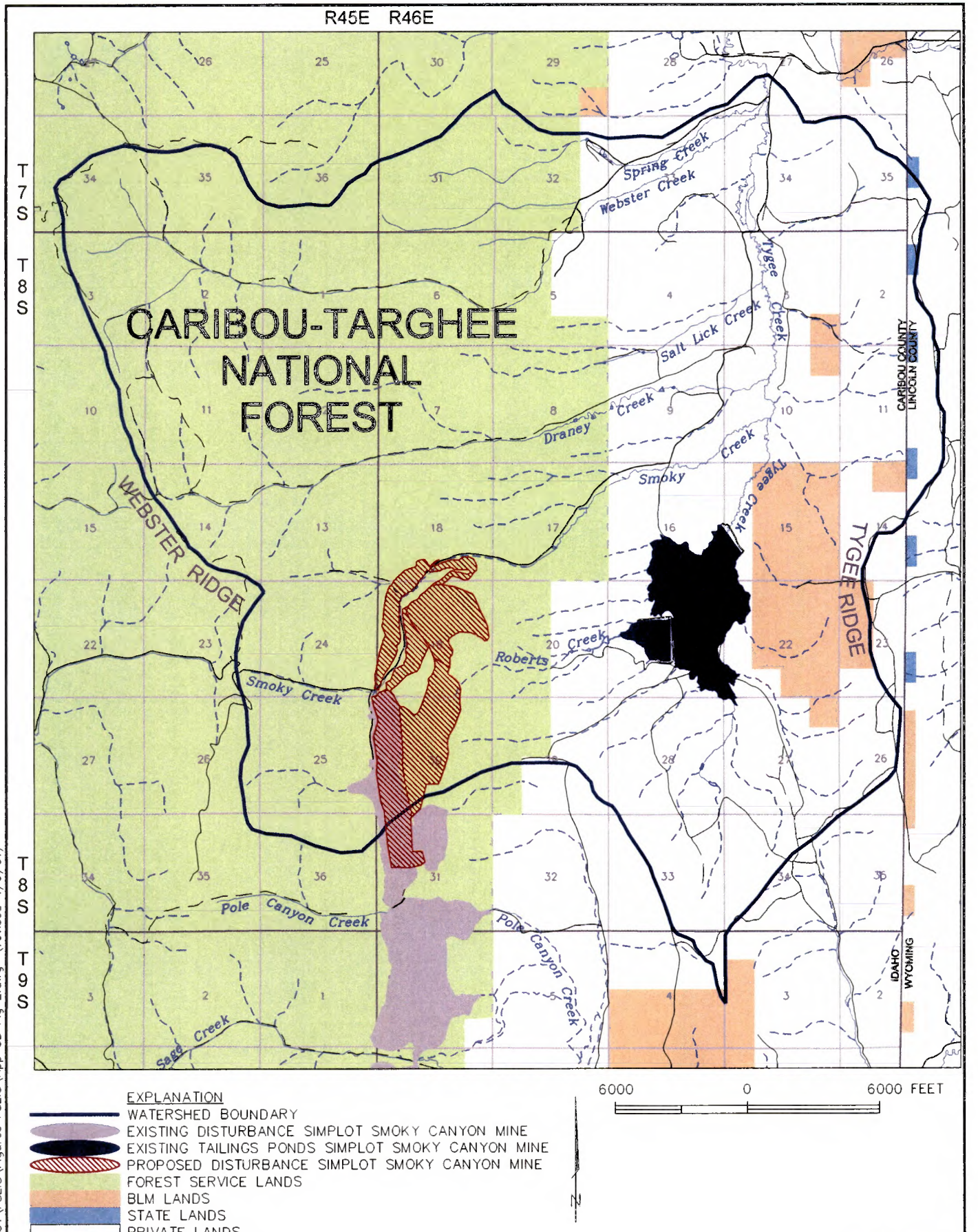
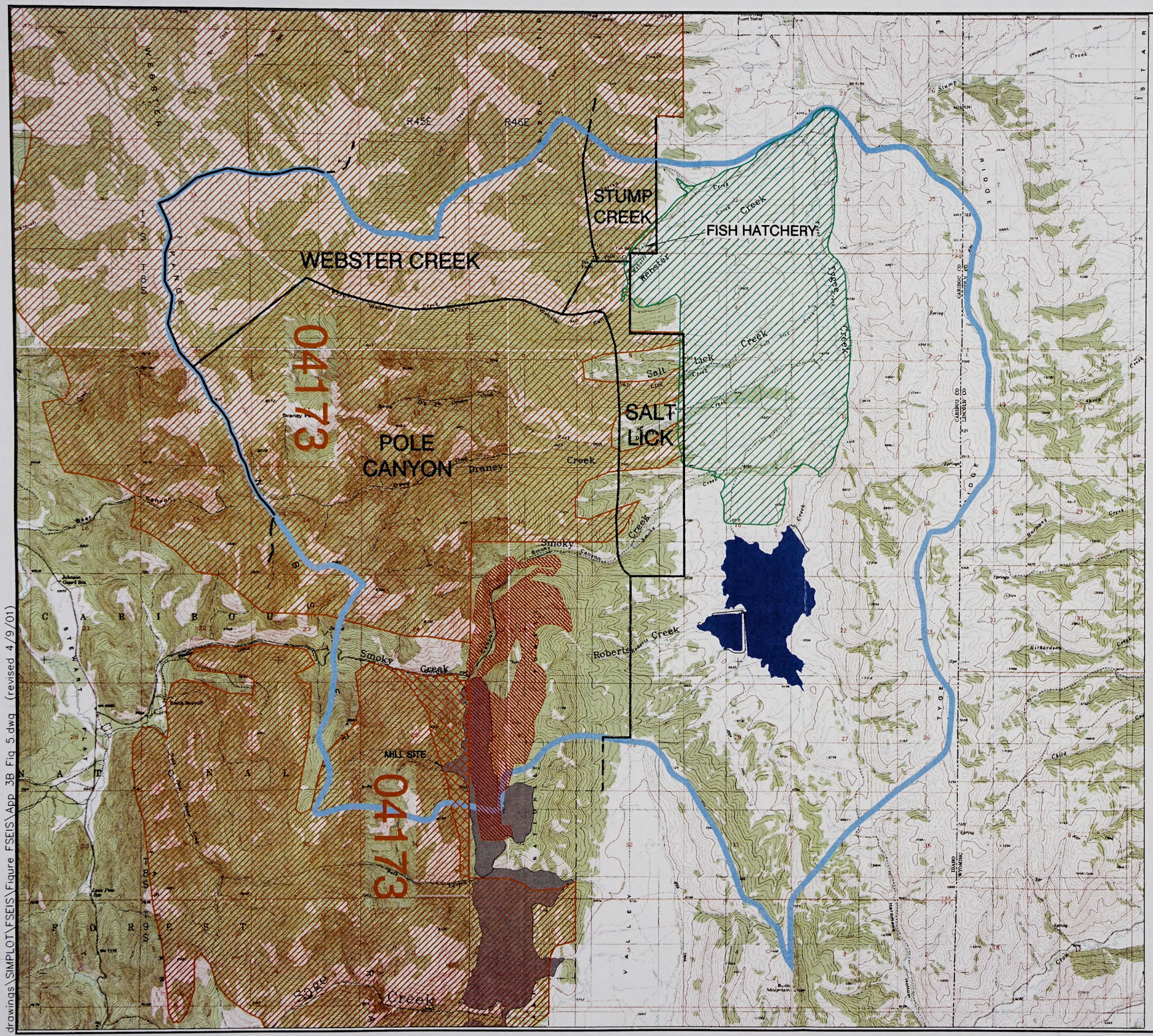


FIGURE 2
LAND OWNERSHIP
WATERSHED ANALYSIS - TYGEE CREEK BASIN

drawings\SIMPLOT\FSEIS\Figures FSEIS\App 3B Fig 2.dwg (revised 4/9/01)



EXPLANATION

- Tygee Creek Basin
- Grazing Allotments – USFS
- Agricultural Lands
- Proposed Mine Disturbance Simplot Smoky Canyon Mine
- Existing Mine Disturbance Simplot Smoky Canyon Mine
- Existing Tailings Ponds Simplot Smoky Canyon Mine
- Roadless Area
- 04166 Roadless Area Identification
- Lands inventoried as roadless during Rare II that have been developed and no longer meet roadless area criteria.

N

5000 0 5000 FEET

FIGURE 5
CURRENT LAND USE
WATERSHED ANALYSIS - TYGEE CREEK BASIN

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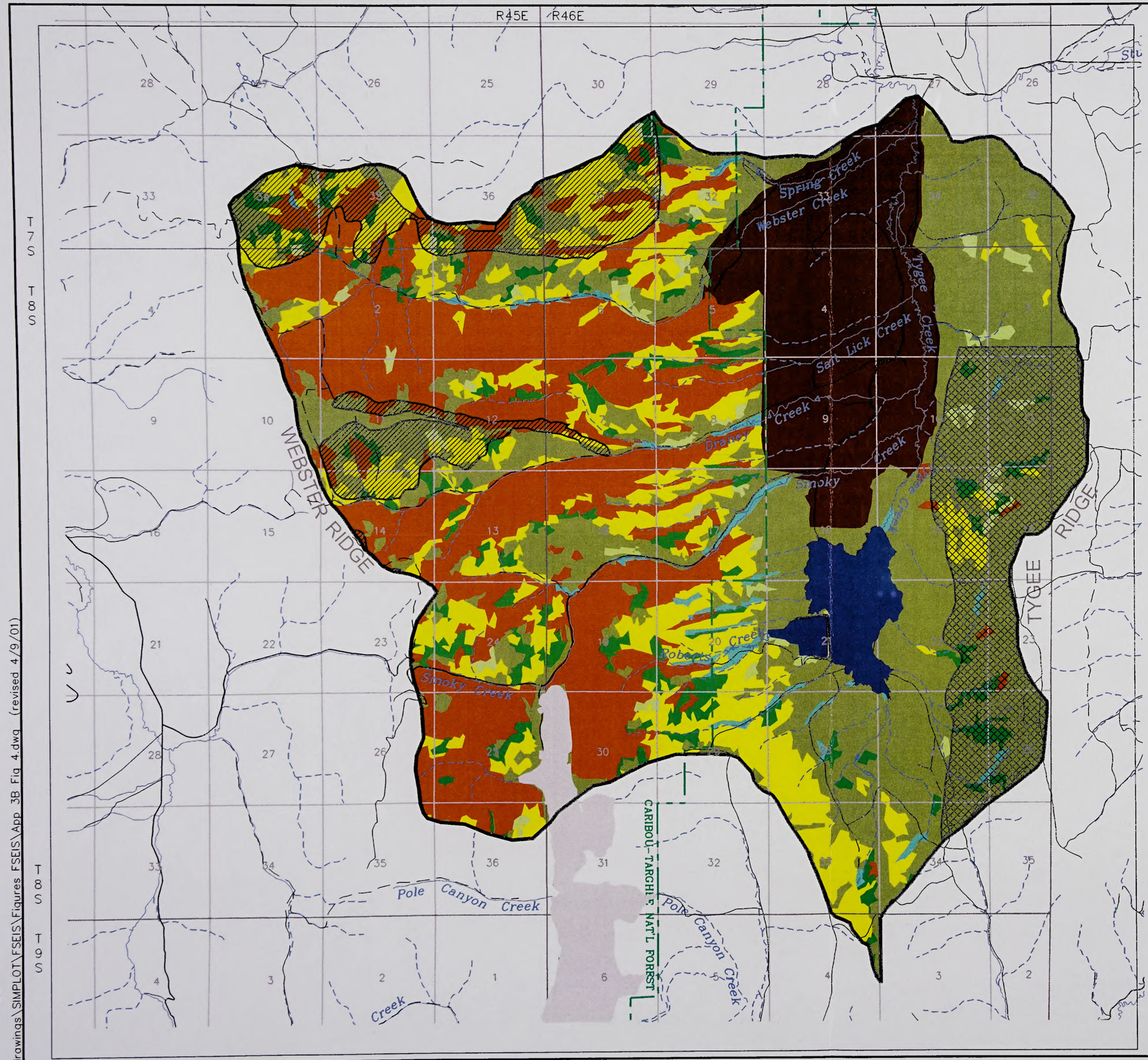

EXPLANATION

- Tygee Creek Basin
- Existing Mine Disturbance Simplot Smoky Canyon Mine
- Existing Tailings Ponds Simplot Smoky Canyon Mine
- Big Game Area
- Elk Calving Area

VEGETATION TYPES

- Agricultural
- Aspen
- Aspen/Conifer Mixed
- Conifer
- Disturbed
- Mixed Shrubs
- Riparian/Wetland
- Sagebrush
- Water

N

5000 0 5000 FEET

Adapted from Idaho Cooperative Fish and Wildlife Research Unit (ICFWRU), USGS, 2000, Idaho GAP Analysis Project 2, University of Idaho Web Site, Downloaded September 2000, <http://www.wildlife.uidaho.edu/data.htm>

drawings\SIMPLOT\FSEIS\Figures FSEIS\App 3B Fig 4.dwg (revised 4/9/01)

FIGURE 4
VEGETATION COMMUNITIES AND HABITAT DESIGNATIONS
WATERSHED ANALYSIS - TYGEE CREEK BASIN

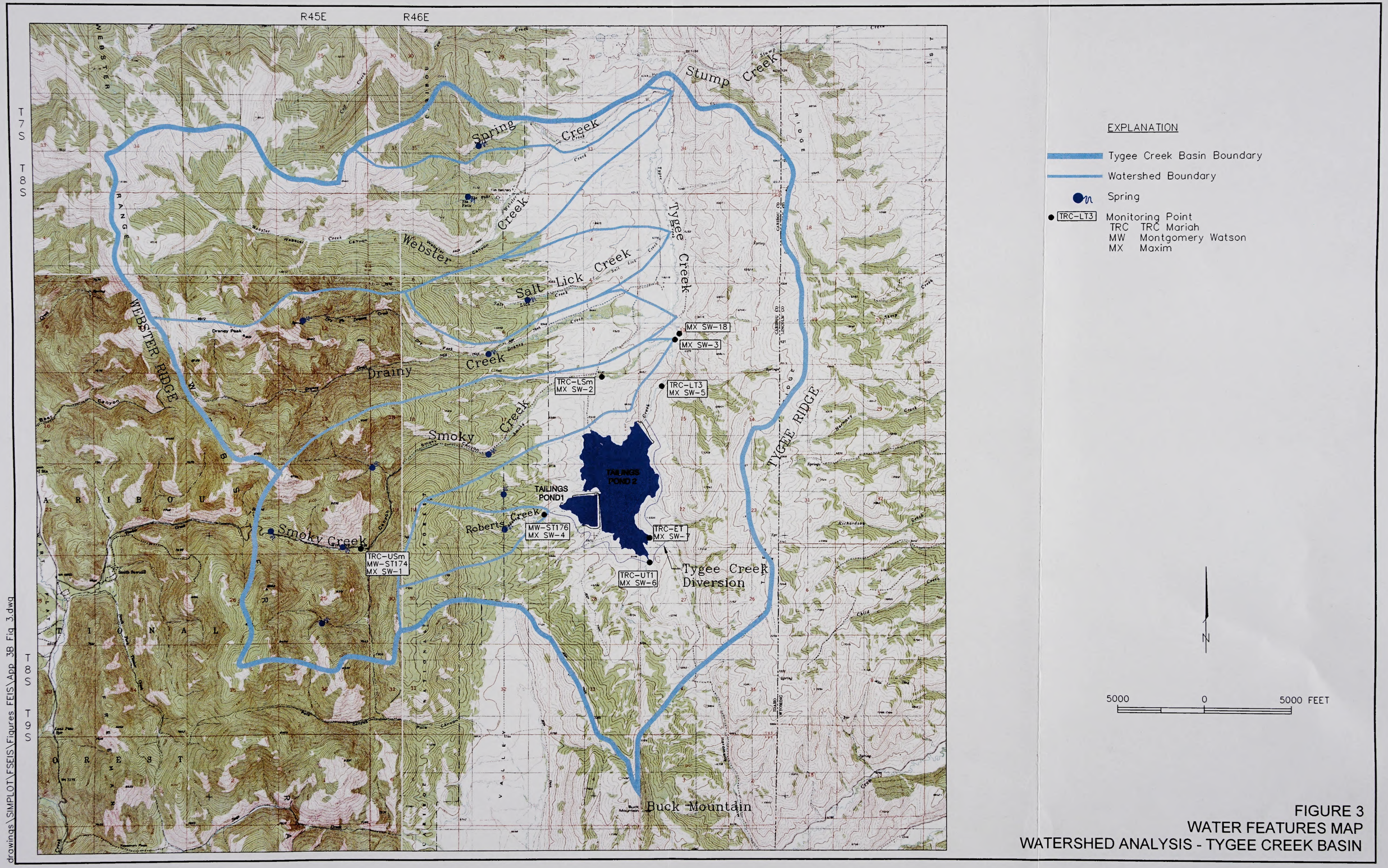

FIGURE 3
WATER FEATURES MAP
WATERSHED ANALYSIS - TYGEE CREEK BASIN

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Appendix 4A

Geotechnical Factors and Operational Practices

SMOKY CANYON MINE
WASTE ROCK DISPOSAL FACILITIES
SLOPE STABILITY

J.R. Simplot
Jim Louis
September 2000

SLOPE STABILITY

Overburden waste rock which is removed to expose the ore is disposed of by initially hauling and placing it in an external disposal site or ultimately in a mined out area of the pit. These waste rock dumps are created by end dumping the rock over the active or advancing end of the overburden pile. It is preferred that the dump be on relatively flat ground. The angle of repose of this free dumped material is between 1:1 and 1.5:1 depending on the size of the material. The coarser material normally creates the steeper slope. A number of examples of these slopes at the angle of repose still exist at the Smoky Canyon Mine and the Conda Mine. At the Smoky Canyon Mine the south end of D-3 pit which is awaiting final contouring has been at the angle of repose after about five years and at the Conda Mine some unreclaimed slopes at the angle of repose still exist after 20 years. Our final reclamation contouring at Smoky Canyon Mine now requires that we bring the slopes down to 3:1 or less. In both of these areas, the dumps were created on steeply dipping surfaces. Where we are forced to create an external overburden site on a sloping surface we endeavor to have the final reclamation plan toe out against a natural topographic ridge that acts as a stop barrier such as the east side of Panel E External dump. However, because of lease or permit restrictions, dumping on a flat surface or toeing out against a ridge is not always possible, as was the case with Panel A External dump and will be the case with the Ridge Top External dump of Panels B and C. The A-Panel External dump was put in place to the east of the A-pit onto a surface sloping to the east. The surface gradually increased from near flat to between 5:1 and 6:1 maximum slope reaching a depth of 150 to 200 feet over the natural topography. The A-External dump was created by end dumping from the initial topography to the top of dump final height. The slopes were then contoured to a slope of 3:1 or less. No failures were recorded during its construction or after final contouring. It has been in existence for about 15 years now. The Ridge Top External dump associated with Panels B and C is just an extension toward the north of the A-Panel External dump. It will be placed to the east of the Panel A pit area but the slopes of the original topography will only range from flat to 4 or 5:1.

Operationally a number of important practices regarding dump construction have evolved over the years of experience that the Simplot mine personnel have accumulated at Smoky Canyon Mine and other mines. One of the two factors leading to slope instability is stress, that is usually in the form of shock loading or excessive loading. Signs of a potential slope failure include minor slumping on the slope face, the toe of the dump kicking out or cracks on the surface of the dump. A dozer operator who maintains the safety berm on the edge of the active dump acts as a spotter for the dump trucks. He also has the responsibility of watching for signs of failure at the dump site. If any of the above indicators of portending slope failure evidence themselves measures are taken to stabilize the slope. First end dumping at the point of potential slope failure is stopped. The trucks are directed to dump short away from the edge and the dozer pushes the material over the edge. The intent is to add more material to the toe and slope but at the same time removing the transitory shock of a fully loaded truck rolling to the edge of the slope. If the slope still does not stabilize then new material is dumped directly at the toe or pushed to the toe to create a berm large enough to act as a barrier to any further movement. In the past it was common practice to end dump from benches of any height. Observations over the years show that the signs of impending slope failure developed more often on slopes greater than 75 feet in height with almost no signs developing on those slopes less than 75 feet. Our current practice requires that end dump bench heights do not exceed 75 feet. This removes another stress factor of excessive loading on any given slope. The slope failure that was experienced while filling Pole Canyon was due to excessive loading. However, we were operating as part of an approved dumping plan at a height of 300 feet purposely so that we had good sorting of the waste rock for a french drain. The other major factor leading to slope instability is a reduction in strength of the waste pile. The primary cause of concern at Smoky Canyon

Mine in this regard is the incorporation of water into the active dump slopes. An example of this is the slope failure that occurred on the east facing D1 dump. Prior to the failure of this dump slope, mud, rock and snow were all being dumped on the same slope due to the fact the we did not have sufficient area available to dump them separately. As a result of this experience saturated conditions will not be allowed to develop within the overburden dumps especially near the active or free face of the dump. One firm rule that resulted from our experience is that rock, mud and snow are not mixed on the same dump slope. Snow and mud-slush, which are removed as part of the mining operation, are to be dumped in a special area away from the active rock dumps. In addition, the tops of the active dumps all have a slight slope (at least 2%) so that no water ponds near the edge and the drainage from these areas is directed around the active dump slopes. Where possible those slopes, which have been bared of snow by melting due to their orientation, are the preferred dump sites. When no bared slopes exist waste rock is routed to the in-pit dumps rather that the external dumps.

These same practices developed for the external dumps also apply to the back filling of the mined out pits. However, it has sometimes become necessary to begin back filling pits while they were still being actively mined. Examples of this are the D-2 pit when active mining operations were taking place in the D-3 pit and the E-1 north pit being back filled from the E-1 south active pit. When dumping above or up slope of the active mining operations was unavoidable pit floor irregularities such as rolls or faults were taken advantage of by allowing the dump to toe out against these natural berms. Where these features were not present berm roads were constructed across the sloping pit floor to not only catch run away boulders but to act as a stop berm for the dump bench slopes. In the cases of the C1-pit, C2-pit, B1-pit, B2-pit and B3-pit they will all be mined out before back filling commences. Only the B4-pit will present the situation in which waste rock will be dumped up slope from the active mine operations. The pit floor in the B4-pit is a 3:1 slope at its steepest and our final reclamation contouring is also to 3:1 or less. The best practice would be to limit the back fill to 75 feet or less over the entire B4-pit. Then we are dealing with only one dump bench height above our mining operations. By scheduling our reclamation contouring for the B4 back fill to follow as closely behind its placement as possible we will minimize the amount of material at the angle of repose. In addition we will be using all of the previously described practices.

Because of the dump construction practices developed and the similarity of the proposed dumps to those stable dumps that are already in existence it would be reasonable to assume that slope stability would be just as good or better than that experienced in the past.

Appendix 4B

Selenium Data for Southeast Idaho

SELENIUM DATA FOR SOUTHEAST IDAHO

As directed by the Simplot SEIS I.D. Team, JBR Environmental Consultants contacted various agencies to obtain available data on selenium concentrations in water samples at phosphate mines in southeast Idaho. The objective of this was to try to get a feel for what the range of selenium concentrations were in water discharging from overburden seeps and french drains which could be compared to the site-specific data for column testing of the Smoky Canyon overburden.

DATA SOURCES

The following persons and agencies were contacted to obtain data:

Jeff Cundick, BLM
Philippe de Hénaut, USFS
Jeff Jones, USFS
James Herring, USGS
Dave Hull, IDEQ
Dr. Greg Möller, U. of Idaho

Jeff Cundick provided annual report monitoring data for Monsanto and Agrium. Jim Herring had data but could not provide it until the USGS published the open file reports containing the data. Phil de Hénaut provided results of analyses of the Simplot D- and E-Panel overburden seeps obtained by the USFS. Dr. Greg Möller provided data for the Simplot D- and E-Panel seeps and Pole Canyon Creek for certain months in 2000. Jeff Jones provided copies of site investigation reports on Maybe Canyon. Dave Hull provided copies of analytical reports for samples obtained by IDEQ at various active and inactive phosphate mines throughout southeast Idaho.

Other sources of public domain data were the Montgomery Watson investigation reports for their 1997 and 1998 field investigations.

Finally, monitoring data collected by TRC-Mariah and JBR at the Smoky Canyon Mine were also used.

RAW DATA ENTRY

The data consisted of information from three general types of sources: overburden seeps or springs affected by overburden piles, french drains, and ponds. Available data on live streams, soils, biota etc. were not used because they did not directly apply to the study objective. The data as obtained from the various sources were considered to be "raw" data when it was recognized that some revision of the data would be necessary for further evaluation.

The three categories of the raw data were entered into separate spreadsheets indicating the site identification, location and description, the sample date, selenium concentration, and reference for the data source.

DATA REVISION

The raw data contained multiple samples for some sites and single samples for other sites. To prevent the multiple samples from skewing the statistics for the data sets, the multiple samples for each site were

averaged. In this way, each site was represented by only one selenium concentration. The revised data sets were also censored to remove all data that were less than 0.005 mg/l. This was done because we were not personally familiar with each sample site and some of the sites with very low selenium concentrations may not be physically connected to selenium sources. To be conservative, we eliminated these low concentration values assuming they were not representative of water that had been impacted by selenium sources.

The revised data sets were then listed in separate tables showing the source of the data and what data were averaged together.

STATISTICS

The revised data were evaluated by calculating means and 95% confidence intervals around the means. The revised data, their means, and their confidence intervals were then plotted on charts. Statistical characteristics of the revised data sets were also analyzed and presented. These statistics are presented to help the user obtain a general characterization for the data. The use of statistically derived values for these data is not recommended because the data were not collected as part of a uniform study designed to produce representative data for a defined sample population. Such studies are designed to reduce artificial variability in the data from the data collection itself. In fact, these data are quite non-homogeneous with regard to: field workers and sampling methods, sampling protocols, months and year of sampling, laboratories, analytical methods, and likely other factors. This influences the significance of the statistics derived from the data.

Keeping in mind the limitations described above, the data and statistics discussed in the following sections are helpful in that they generally describe the variability, ranges and approximate maximum values that might be expected to occur in water samples obtained from overburden seeps, french drains, and ponds at phosphate mines in southeast Idaho.

Ponds

There were 54 data points in the raw data set and 29 data points in the revised pond data set. The statistics on the revised data set are:

Average	0.080 mg/l
Standard Deviation	0.059 mg/l
Median	0.057 mg/l
Maximum Value	0.22 mg/l
Minimum Value	0.008 mg/l

Inspection of the graph of the data shows that 24 of the 29 revised data points were at or below 0.1 mg/l. Inspection of the raw data table indicates that 48 of 54 data points were at or below 0.1 mg/l and 6 data points were above 0.1 mg/l.

Overburden Seeps and Springs Below Overburden

There were 45 data points in the raw data set and 23 data points in the revised overburden seep and spring data set. The statistics on the revised data set are:

Average	0.252 mg/l
Standard Deviation	0.427 mg/l
Median	0.114 mg/l
Geometric Mean	0.088 mg/l
Maximum Value	1.617 mg/l
Minimum Value	0.005 mg/l

Inspection of the graph of the data shows that 20 of the 23 revised data points were below 0.33 mg/l. Inspection of the raw data table indicates that 36 of 45 data points were below 0.33 mg/l and 9 data points were above 0.33 mg/l.

The average value for the Smoky Canyon D-Panel Seep is 0.716 mg/l and the average for the E-Panel Seep is 0.31 mg/l.

French Drains

There were 32 data points in the raw data set and 4 data points in the revised dump seep and spring data set. The statistics on the revised data set are:

Average	0.508 mg/l
Standard Deviation	0.499 mg/l
Median	0.414 mg/l
Maximum Value	1.14 mg/l
Minimum Value	0.065 mg/l

Inspection of the graph of the data shows that 2 of the 4 revised data points were below 0.33 mg/l. Inspection of the raw data table indicates that 16 of 32 data points were at or below 0.33 mg/l and 16 data points were above 0.33 mg/l.

CONCLUSIONS

There were a total of 131 data points in all the raw data sets and 56 data points in all the revised data sets.

For overburden seeps alone, 20 of 23 revised data points (87%) were below 0.33 mg/l. 36 of 45 raw data points (80%) were below 0.33 mg/l. The data are apparently strongly skewed and the arithmetic average may not be the preferred estimator of the true mean which would likely be lower than the average. The median value for the revised data set is 0.114 mg/l and the geometric mean is 0.088 mg/l.

With regard to the Smoky Canyon site, there were a total of 13 raw data points for overburden seeps (D- and E-Panel). 8 of 13 of these points (62%) were less than 0.33 mg/l.

For french drains, there is a wide range of values but 2 of the 4 revised data points (50%) have values lower than 0.33 mg/l. The Smoky Canyon Lower Pole Canyon Creek average was 0.673 mg/l for all the data and 0.36 mg/l for the TRC Mariah data, which is the longest-term monitoring database for Lower Pole Canyon Creek.

For ponds, all data points were at or below 0.22 mg/l and 24 of 29 revised data points (82.7%) were at or below 0.1 mg/l.

Raw Data Overburden Seeps & Springs Below Overburden

Site	Location	Description	Sample Date	Selenium (mg/l)	Reference
1	N. Maybe	East Mill Dump	9/16/1997	0.0336	1
6	Mtn. Fuel	New Spring #1	9/17/1997	0.0431	1
7	Mtn. Fuel	New Spring #2	9/18/1997	0.0209	1
8	Mtn. Fuel	New Spring #3	9/19/1997	0.0034	1
10	Champ	Champ Dumps	9/17/1997	0.0149	1
29	Henry	Crs. Rock Fill	9/19/1997	0.00106	1
42	Wooley V.	Unit III Dump	9/19/1997	0.065	1
46	Conda	SW3 Seep	9/29/1997	1.55	1
DS003	Dry Valley	S. B-Dump	5/ /98	0.036	2
DS003	Dry Valley	S. B-Dump	9/ /98	0.0069	2
DS010	Wooley V.	Unit I Dump	5/ /98	0.085	2
DS010	Wooley V.	Unit I Dump	9/ /98	0.072	2
DS011	Wooley V.	Unit III Dump	5/ /98	0.037	2
DS011	Wooley V.	Unit III Dump	9/ /98	dry	2
DS012	Wooley V.	Unit IV Dump	5/ /98	1.4	2
DS012	Wooley V.	Unit IV Dump	9/ /98	dry	2
DS015	Conda	West Limb	5/ /98	2	2
DS015	Conda	West Limb	9/ /98	1.3	2
Dump Seep	Smoky Cyn.	E Dump Seep	7/17/2000	0.27	3
Dump Seep	Smoky Cyn.	E Dump Seep	10/12/2000	0.27	3
D Dump	Smoky Cyn.	D Dump Seep	10/2/2000	0.29	3
D Dump	Smoky Cyn.	D Dump Seep	10/12/2000	0.29	3
North B Dump	Dry Valley	North B Dump	4/26/1999	0.18	3
North B Dump	Dry Valley	North B Dump	5/12/1999	0.047	3
East Spring	Conda	East Spring	9/11/1997	0.325	3
Hidden Lake	Conda	Hidden Lake	9/11/1997	0.15	3
Shop Spring	S. Rasmussen Ridge	Shop Spring	4/28/1999	0.27	3
Shop Spring	S. Rasmussen Ridge	Shop Spring	5/27/1999	0.21	3
No Name Ck. Spring	S. Rasmussen Ridge	No Name Creek Sp	4/28/1999	0.16	3
No Name Ck. Spring	S. Rasmussen Ridge	No Name Creek Sp	5/27/1999	0.18	3
D Seep	Smoky Cyn.	D Dump Seep	12/13/2000	0.28	4
E Ext Seep	Smoky Cyn.	E Dump Seep	12/14/2000	0.24	4
D Panel Seep	Smoky Cyn.	D Dump Seep	4/18/2001	1.98	7
D Panel Seep	Smoky Cyn.	D Dump Seep	9/ /00	0.4	7
E Panel Seep	Smoky Cyn.	E Dump Seep	4/18/2001	0.99	7
E Panel Seep	Smoky Cyn.	E Dump Seep	7/17/2000	0.25	7
E Panel Seep	Smoky Cyn.	E Dump Seep	/ /99	0.085	7
West Seep	Enoch Valley	West Seep	5/31/2000	0.008	8
SE Well 99-1	Enoch Valley	Se Well 99-1	6/6/2000	0.005	8
SE Well 99-2	Enoch Valley	Se Well 99-2	6/6/2000	0.13	8
SE Well 99-3	Enoch Valley	Se Well 99-3	6/6/2000	0.14	8
1	S. Rasmussen Ridge	Wetlands S. of Shop	4/10/2000	0.13	9
2	S. Rasmussen Ridge	Spr. S. of Shop	4/10/2000	0.023	9
11	S. Rasmussen Ridge	No Name Creek Sp	4/10/2000	0.13	9
16	S. Rasmussen Ridge	Wetlands S. of Shop	4/17/2000	0.2	9
D Panel Seep	Smoky Cyn.	D Dump Seep	5/ /00	0.82	10
D Panel Seep	Smoky Cyn.	D Dump Seep	6/ /00	0.95	10

Count	45
Average	0.357152444
Standard Dev	0.520907809
Maximum	2
Minimum	0.00106
Variance	0.271344945

Revised Data Overburden Seeps & Springs Below Overburden

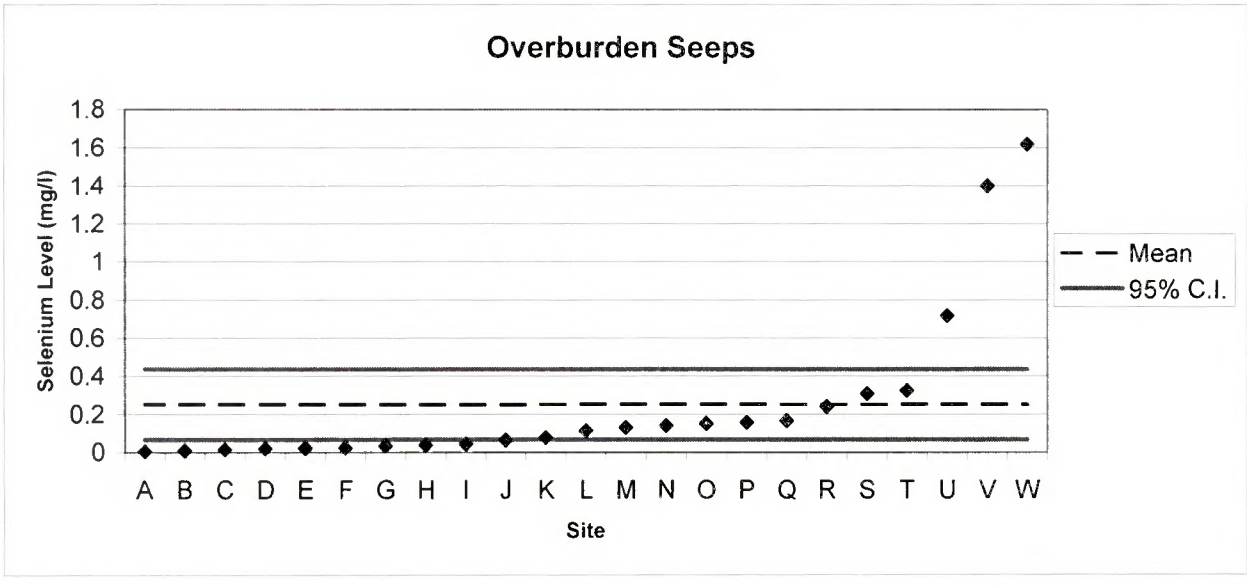
Site	Site	Location	Description	Sample Date	Selenium (mg/l)	Reference
A	SE Well 99-1	Enoch Valley	Se Well 99-1	6/6/2000	0.005	8
B	West Seep	Enoch Valley	West Seep	5/31/2000	0.008	8
C	10	Champ	Champ Dumps	9/17/1997	0.0149	1
D	7	Mtn. Fuel	New Spring #2	9/18/1997	0.0209	1
E	DS003	Dry Valley	S. B-Dump	Avg. 5&9/98	0.02145	2
F	2	S. Rasmussen Ridge	Spr. S. of Shop	4/10/2000	0.023	9
G	1	N. Maybe	East Mill Dump	9/16/1997	0.0336	1
H	DS011	Wooley V.	Unit III Dump	Avg. 5&9/98	0.037	2
I	6	Mtn. Fuel	New Spring #1	9/17/1997	0.0431	1
J	42	Wooley V.	Unit III Dump	9/19/1997	0.065	1
K	DS010	Wooley V.	Unit I Dump	Avg. 5&9/98	0.0785	2
L	North B Dump	Dry Valley	North B Dump	Avg. 4&5/99	0.114	3
M	SE Well 99-2	Enoch Valley	Se Well 99-2	6/6/2000	0.13	8
N	SE Well 99-3	Enoch Valley	Se Well 99-3	6/6/2000	0.14	8
O	Hidden Lake	Conda	Hidden Lake	9/11/1997	0.15	3
P	No Name Ck. Spring	S. Rasmussen Ridge	No Name Creek Sp	Avg 4&5/99, 4/00	0.1567	3, 9
Q	1, 16	S. Rasmussen Ridge	Wetlands S. of Shop	4/10&17/00	0.165	9
R	Shop Spring	S. Rasmussen Ridge	Shop Spring	Avg 4&5/99	0.24	3
S	E Dump	Smoky Cyn.	E Dump Seep	Avg. 99&7,10,12/00&4/0	0.31	3, 4, 7
T	East Spring	Conda	East Spring	9/11/1997	0.325	3
U	D Dump	Smoky Cyn.	D Dump Seep	Avg. 5,6,9,10,12/00 &4/0	0.716	3, 4, 7, 10
V	DS012	Wooley V.	Unit IV Dump	Avg. 5&9/98	1.4	2
W	46 & DS015	Conda	SW3/West Limb Seep	9/97&5&9/98	1.617	1,2

Count	23
Average	0.25278913
Standard Dev	0.427315708
Maximum	1.617
Minimum	0.005
Variance	0.182598714
Geometric Mean	0.088009474

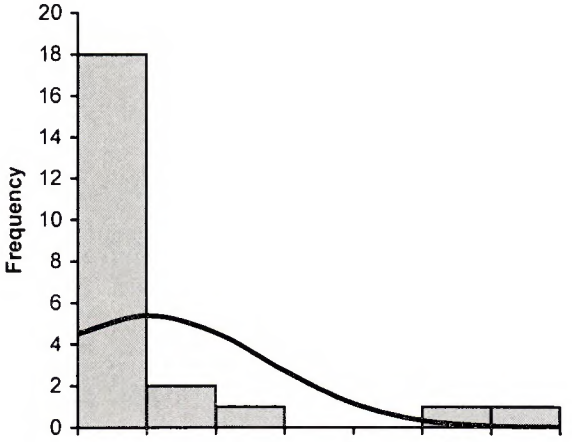
Note: Revised data has been modified to combine multiple samples at the same location and delete samples that are near or below 0.005 mg/l.

Site	Selenium (mg/l)	Mean	95% C.I.	UCL
A	0.005	0.251658696	0.067413	0.435904
B	0.008	0.251658696	0.067413	0.435904
C	0.0149	0.251658696	0.067413	0.435904
D	0.0209	0.251658696	0.067413	0.435904
E	0.02145	0.251658696	0.067413	0.435904
F	0.023	0.251658696	0.067413	0.435904
G	0.0336	0.251658696	0.067413	0.435904
H	0.037	0.251658696	0.067413	0.435904
I	0.0431	0.251658696	0.067413	0.435904
J	0.065	0.251658696	0.067413	0.435904
K	0.0785	0.251658696	0.067413	0.435904
L	0.114	0.251658696	0.067413	0.435904
M	0.13	0.251658696	0.067413	0.435904
N	0.14	0.251658696	0.067413	0.435904
O	0.15	0.251658696	0.067413	0.435904
P	0.1567	0.251658696	0.067413	0.435904
Q	0.165	0.251658696	0.067413	0.435904
R	0.24	0.251658696	0.067413	0.435904
S	0.31	0.251658696	0.067413	0.435904
T	0.325	0.251658696	0.067413	0.435904
U	0.716	0.251658696	0.067413	0.435904
V	1.4	0.251658696	0.067413	0.435904
W	1.617	0.251658696	0.067413	0.435904

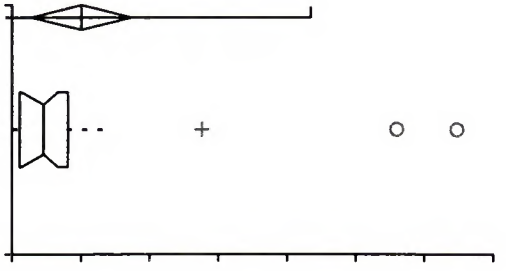
Column1	
Mean	0.251659
Standard Error	0.088841
Median	0.114
Mode	#N/A
Standard Deviation	0.426067
Sample Variance	0.181533
Kurtosis	6.112901
Skewness	2.584753
Range	1.612
Minimum	0.005
Maximum	1.617
Sum	5.78815
Count	23
Confidence Level(95.0%	0.184245



Test	Continuous summary descriptives		
	Selenium (mg/l)		
Performed by	Eric A. Holt	Date	21 May 2001

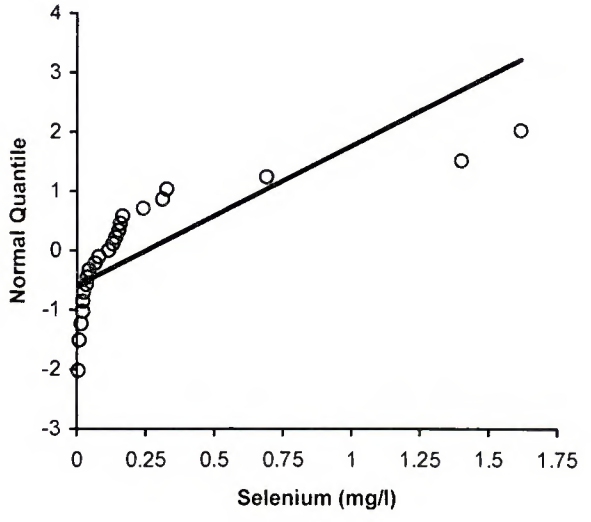


n	23
Mean	0.252
95% CI	0.067 to 0.436
Variance	0.1815
SD	0.4261
SE	0.0888
CV	169%



Median	0.114
96.5% CI	0.034 to 0.165
Range	1.612
IQR	0.1742

Percentile	
2.5th	-
25th	0.028
50th	0.114
75th	0.203
97.5th	-



	Coefficient	p
Shapiro-Wilk	0.5859	<0.0001
Skewness	2.5848	<0.0001
Kurtosis	6.1129	0.0015

Raw Data French Drains

Site	Location	Description	Sample Date	Selenium (mg/l)	Reference
44	Conda	SL3 Drain	9/20/1997	0.065	1
48	Conda	Camp G Ck. Below Camp G Dump	9/20/1997	0.000999	1
50	Gay	Ross Fork Below South 40	9/21/1997	0.000517	1
52	Gay	Lincoln Ck. Below North Limb	9/22/1997	0.000871	1
66	Smoky Cyn	Pole Creek Below Pole Cyn. Dump	9/15/1997	0.583	1
FD001	Conda	Conda Mine French Drain	5/ /98	0.24	2
FD001	Conda	Conda Mine French Drain	9/ /98	0.068	2
FD002	Henry	S. Pit Dump Limestone Drain	5/ /98	0.00065	2
FD002	Henry	S. Pit Dump Limestone Drain	9/ /98	0.00028	2
Pole Creek	Smoky Cyn	Pole Creek Below Pole Cyn. Dump	4/26/1999	2.35	3
Pole Creek Dump	Smoky Cyn	Pole Creek Below Pole Cyn. Dump	5/12/1999	1.4	3
SW-2	Maybe Cyn.	Maybe Creek Below Cross Valley Fill	5/22/1997	1.02	5
SW-2	Maybe Cyn.	Maybe Creek Below Cross Valley Fill	6/10/1997	0.71	5
SW-2	Maybe Cyn.	Maybe Creek Below Cross Valley Fill	6/17-19/97	0.64	5
SW-2	Maybe Cyn.	Maybe Creek Below Cross Valley Fill	7/29/1997	1.12	5
SW-2	Maybe Cyn.	Maybe Creek Below Cross Valley Fill	10/6/1997	1.5	5
SW-2	Maybe Cyn.	Maybe Creek Below Cross Valley Fill	10/27/1997	1.21	5
SW-2	Maybe Cyn.	Maybe Creek Below Cross Valley Fill	5/26/1998	1.43	5
SW-2	Maybe Cyn.	Maybe Creek Below Cross Valley Fill	10/12/1998	1.5	5
Lower Pole Creek	Smoky Cyn	Pole Creek Below Pole Cyn. Dump	Spring 1991	0.07	6
Lower Pole Creek	Smoky Cyn	Pole Creek Below Pole Cyn. Dump	Spring 1992	0.125	6
Lower Pole Creek	Smoky Cyn	Pole Creek Below Pole Cyn. Dump	Spring 1993	0.17	6
Lower Pole Creek	Smoky Cyn	Pole Creek Below Pole Cyn. Dump	Spring 1994	0.262	6
Lower Pole Creek	Smoky Cyn	Pole Creek Below Pole Cyn. Dump	Spring 1995	0.5	6
Lower Pole Creek	Smoky Cyn	Pole Creek Below Pole Cyn. Dump	Spring 1996	0.21	6
Lower Pole Creek	Smoky Cyn	Pole Creek Below Pole Cyn. Dump	Spring 1997	0.33	6
Lower Pole Creek	Smoky Cyn	Pole Creek Below Pole Cyn. Dump	Spring 1998	0.22	6
Lower Pole Creek	Smoky Cyn	Pole Creek Below Pole Cyn. Dump	Spring 1999	1	6
Lower Pole Creek	Smoky Cyn	Pole Creek Below Pole Cyn. Dump	Spring 2000	0.71	6
Lower Pole Creek	Smoky Cyn	Pole Creek Below Pole Cyn. Dump	Spring 2001	1.88	7
Lower Pole Creek	Smoky Cyn	Pole Creek Below Pole Cyn. Dump	May-00	0.66	10
Lower Pole Creek	Smoky Cyn	Pole Creek Below Pole Cyn. Dump	Jun-00	0.29	10

Count	32
Average	0.63332241
Standard Dev	0.6324274
Maximum	2.35
Minimum	0.00028
Variance	0.39996442

Revised Data French Drains

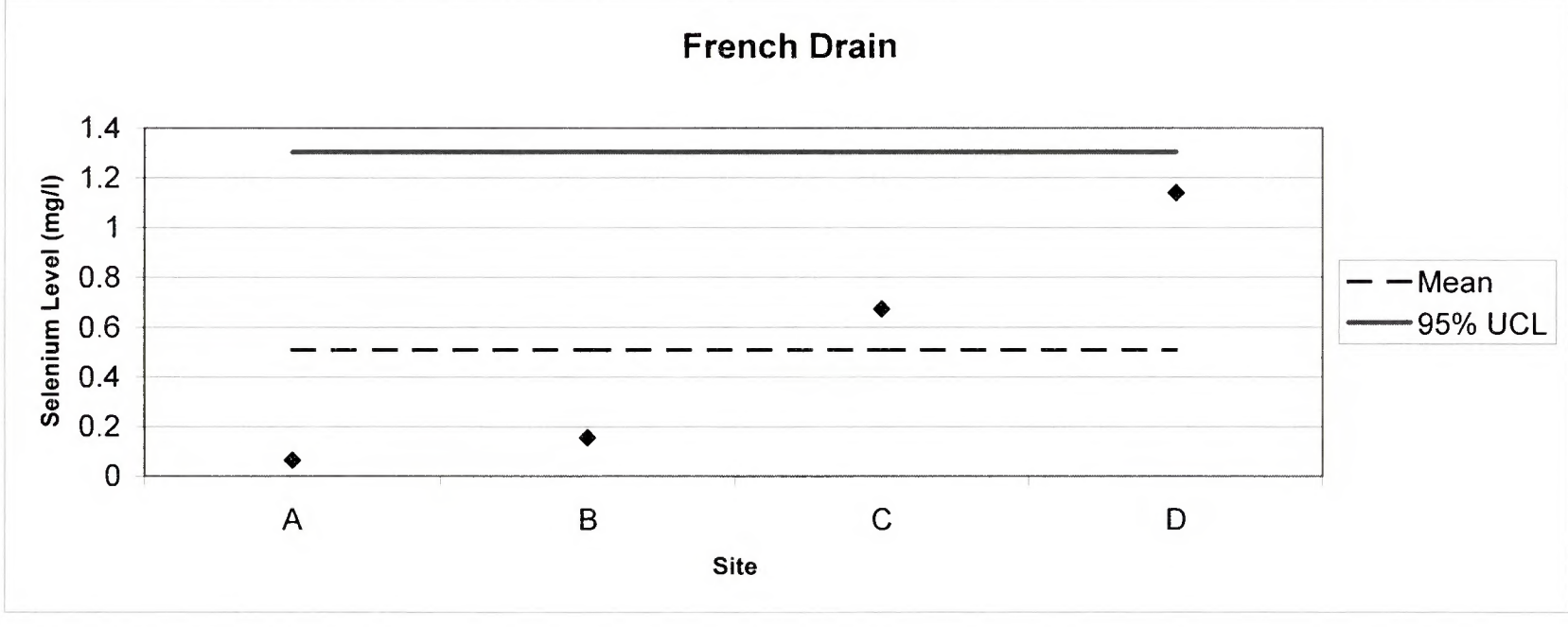
Site	Site	Location	Description	Sample Date	Selenium (mg/l)	Reference
A	44	Conda	SL3 Drain	9/20/1997	0.065	1
B	FD001	Conda	Conda Mine French Drain	Avg. 5&9/98	0.154	2
C	66 & Pole Creek	Smoky Cyn	Pole Creek Below Pole Cyn. Dump	Avg. 1991-2001	0.673	1,3,6,7,10
D	SW-2	Maybe Cyn.	Maybe Creek Below Cross Valley Fill	Avg 5/97-10/98	1.14	5

Count	4
Average	0.508
Standard Dev	0.49940431
Maximum	1.14
Minimum	0.065
Variance	0.24940467

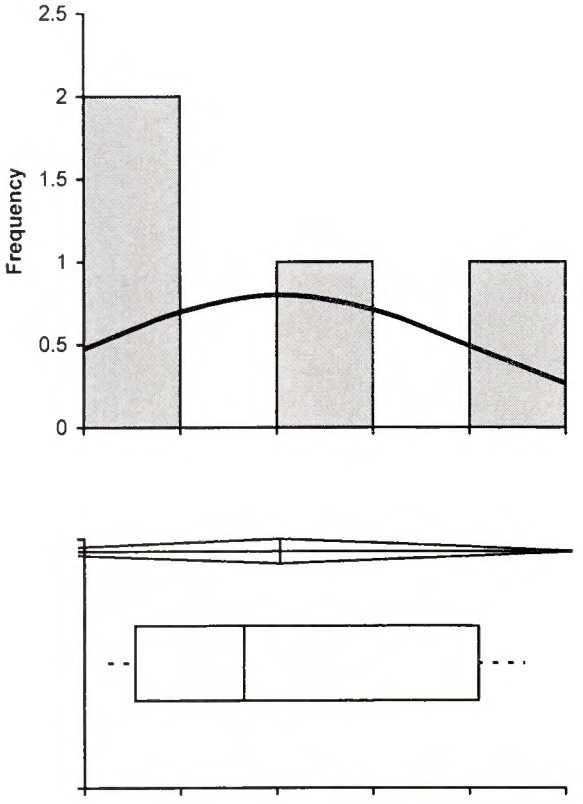
Note: Revised data has been modified to combine multiple samples at the same location and delete samples that are near or below 0.005 mg/l.

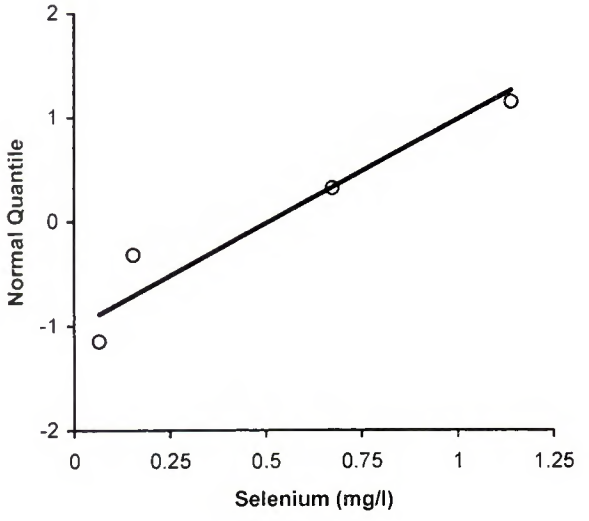
Site	Selenium (mg/l)	Mean	95% LCL	95% UCL
A	0.065	0.508	-0.28666	1.302664
B	0.154	0.508	-0.28666	1.302664
C	0.673	0.508	-0.28666	1.302664
D	1.14	0.508	-0.28666	1.302664

Column1	
Mean	0.508
Standard Error	0.249702156
Median	0.4135
Mode	#N/A
Standard Deviation	0.499404312
Sample Variance	0.249404667
Kurtosis	-2.00540011
Skewness	0.672416024
Range	1.075
Minimum	0.065
Maximum	1.14
Sum	2.032
Count	4
Confidence Level(95.0%)	0.794664449



Test	**Continuous summary descriptives**		
	Selenium (mg/l)		
Performed by	Eric A. Holt	**Date**	8 June 2001





n	4
Mean	0.508
95% CI	-0.287 to 1.303
Variance	0.2494
SD	0.4994
SE	0.2497
CV	98%
Median	0.414
95% CI	- to -
Range	1.075
IQR	0.8915

Percentile	
2.5th	-
25th	0.132
50th	0.414
75th	1.023
97.5th	-

	Coefficient	**p**
Shapiro-Wilk	0.9100	0.4822
Skewness	0.6724	-
Kurtosis	-	-

Raw Data Ponds

Site	Location	Description	Sample Date	Selenium (mg/l)	Reference
9	Mtn. Fuel	Stock Pond	9/16/1997	0.00538	1
25	Henry	Henry Pond	9/19/1997	0.00669	1
26	Henry	Smith Pond	9/19/1997	0.0402	1
27	Henry	Center Henry	9/19/1997	0.0248	1
30	Enoch V.	Shop Pond	9/18/1997	0.00512	1
31	Enoch V.	Stock Pond	9/18/1997	0.02474	1
32	Enoch V.	Bat Cave Pond	9/18/1997	0.0161	1
33	Enoch V.	West Pond	9/18/1997	0.0214	1
34	Enoch V.	South Pond	9/18/1997	0.00914	1
35	Enoch V.	Tipple Pond	9/18/1997	0.0708	1
36	Enoch V.	Haul Road Pond	9/18/1997	0.065	1
37	Enoch V.	North Pond	9/18/1997	0.185	1
39	Wooley V.	Large Haul Road Pond	9/19/1997	0.075	1
40	Wooley V.	Unit III Panel E Pond	9/19/1997	0.0746	1
41	Wooley V.	Unit III Panel F Pond	9/19/1997	0.098	1
55	Gay	JF Pit Lake	9/23/1997	0.0468	1
56	Gay	A-12 Pit Lake	9/23/1997	0.1	1
57	Gay	W Pit Lake	9/23/1997	0.00044	1
58	Gay	Z Pit Lake	9/29/1997	0.0583	1
71	Conda	NL4 Pond	9/29/1997	0.151	1
A-Pit	Smoky Canyon	A-Pit Pond	5/ /98	0.064	2
A-Pit	Smoky Canyon	A-Pit Pond	9/ /98	0.097	2
Haul Road Pond	Enoch Valley	Haul Road Pond	4/28/1999	0.013	3
Haul Road Pond	Enoch Valley	Haul Road Pond	5/27/1999	0.0205	3
Tipple Pond	Enoch Valley	Tipple Pond	4/28/1999	0.0235	3
Tipple Pond	Enoch Valley	Tipple Pond	5/27/1999	0.0295	3
Wooley Ridge Pit Pond South	Wooley V.	Wooley Ridge Pit Pond South	4/28/1999	0.058	3
Wooley Ridge Pit Pond South	Wooley V.	Wooley Ridge Pit Pond South	5/27/1999	0.033	3
Wooley Ridge Pit Pond North	Wooley V.	Wooley Ridge Pit Pond North	4/28/1999	0.049	3
Wooley Ridge Pit Pond North	Wooley V.	Wooley Ridge Pit Pond North	5/27/1999	0.014	3
South Rasmussen Dump Pond	South Rasmussen Ridge	South Rasmussen Dump Pond	4/28/1999	0.066	3
South Rasmussen Dump Pond	South Rasmussen Ridge	South Rasmussen Dump Pond	5/27/1999	0.0365	3
Shop Pond	Enoch Valley	Shop Pond	5/97 - 8/00	0.0048	8
Haul Road Pond	Enoch Valley	Haul Road Pond	6/99 - 8/00	0.0533	8
Tipple Pond	Enoch Valley	Tipple Pond	6/99 - 8/00	0.0423	8
Stock Pond	Enoch Valley	Stock Pond	5/97 - 8/00	0.0766	8
West Pond	Enoch Valley	West Pond	6/99 - 8/00	0.065	8
Bat Cave Pond	Enoch Valley	Bat Cave Pond	6/00 - 8/00	0.024	8
Keyhole Pond	Enoch Valley	Keyhole Pond	5/00 - 8/00	0.192	8
South Pond	Enoch Valley	South Pond	6/99 - 8/00	0.071	8
West Depression	Enoch Valley	West Depression	6/00 - 8/00	0.009	8
East Depression	Enoch Valley	East Depression	6/20/2000	0.22	8
3	South Rasmussen Ridge	Haulroad Pond on East Road	4/10/2000	0.057	9
4	South Rasmussen Ridge	Haulroad Pond on East Road	4/10/2000	0.05	9
6	South Rasmussen Ridge	Dravo Pond	4/10/2000	0.075	9
7	South Rasmussen Ridge	Haulroad Pond near shop/office	4/10/2000	0.22	9
8	South Rasmussen Ridge	Haulroad Pond near Coyote Cnr	4/10/2000	0.095	9
12	South Rasmussen Ridge	Haulroad Pond in Ras. Valley	4/10/2000	0.05	9
13	South Rasmussen Ridge	Haulroad Pond in Ras. Valley	4/10/2000	0.008	9
14	South Rasmussen Ridge	Haulroad Pond in Ras. Valley	4/10/2000	0.054	9
15	South Rasmussen Ridge	Haulroad Pond in Ras. Valley	4/10/2000	0.039	9
16	South Rasmussen Ridge	Haulroad Pond by Ctlguard	4/10/2000	0.05	9
17	South Rasmussen Ridge	Pond E. of shop/office- North	4/17/2000	0.2	9
18	South Rasmussen Ridge	Pond E. of shop/office- South	4/17/2000	0.22	9

Count	54
Average	0.064046481
Standard Dev	0.059168496
Maximum	0.22
Minimum	0.00044
Variance	0.003500911

Revised Data Ponds

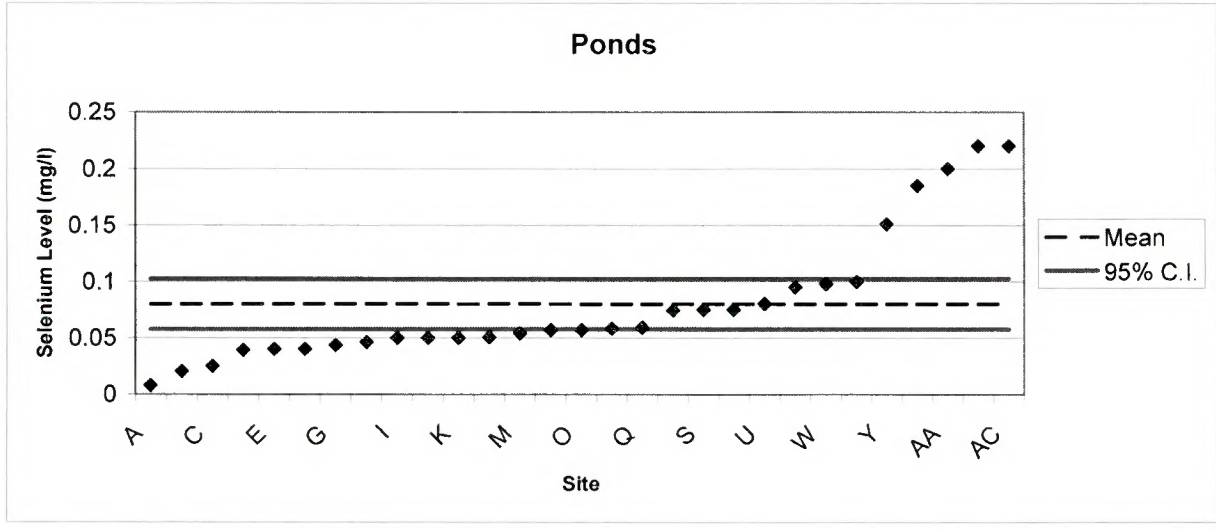
Site	Site	Location	Description	Sample Date	Selenium (mg/l)	Reference
A	13	South Rasmussen Ridge	Haulroad Pond in Ras. Valley	4/10/2000	0.008	9
B	32	Enoch V.	Bat Cave Pond	9/97 - 8/00	0.0201	1, 8
C	27	Henry	Center Henry	9/19/1997	0.0248	1
D	15	South Rasmussen Ridge	Haulroad Pond in Ras. Valley	4/10/2000	0.039	9
E	34	Enoch V.	South Pond	9/97 - 8/00	0.0401	1, 8
F	26	Henry	Smith Pond	9/19/1997	0.0402	1
G	33	Enoch V.	West Pond	9/97 - 8/00	0.0432	1, 8
H	55	Gay	JF Pit Lake	9/23/1997	0.0468	1
I	4	South Rasmussen Ridge	Haulroad Pond on East Road	4/10/2000	0.05	9
J	12	South Rasmussen Ridge	Haulroad Pond in Ras. Valley	4/10/2000	0.05	9
K	16	South Rasmussen Ridge	Haulroad Pond by Ctlguard	4/10/2000	0.05	9
L	31	Enoch V.	Stock Pond	5/97 - 8/00	0.0507	1, 8
M	14	South Rasmussen Ridge	Haulroad Pond in Ras. Valley	4/10/2000	0.054	9
N	35	Enoch V.	Tipple Pond	9/97 - 8/00	0.057	1, 8
O	3	South Rasmussen Ridge	Haulroad Pond on East Road	4/10/2000	0.057	9
P	58	Gay	Z Pit Lake	9/29/1997	0.0583	1
Q	36	Enoch V.	Haul Road Pond	9/97 - 8/00	0.0592	1, 8
R	40	Wooley V.	Unit III Panel E Pond	9/19/1997	0.0746	1
S	39	Wooley V.	Large Haul Road Pond	9/19/1997	0.075	1
T	6	South Rasmussen Ridge	Dravo Pond	4/10/2000	0.075	9
U	A-Pit	Smoky Canyon	A-Pit Pond	5&9/98	0.0805	2
V	8	South Rasmussen Ridge	Haulroad Pond near Coyote Cmr	4/10/2000	0.095	9
W	41	Wooley V.	Unit III Panel F Pond	9/19/1997	0.098	1
X	56	Gay	A-12 Pit Lake	9/23/1997	0.1	1
Y	71	Conda	NL4 Pond	9/29/1997	0.151	1
Z	37	Enoch V.	North Pond	9/18/1997	0.185	1
AA	17	South Rasmussen Ridge	Pond E. of shop/office- North	4/17/2000	0.2	9
AB	7	South Rasmussen Ridge	Haulroad Pond near shop/office	4/10/2000	0.22	9
AC	18	South Rasmussen Ridge	Pond E. of shop/office- South	4/17/2000	0.22	9

Count	29
Average	0.080086207
Standard Dev	0.058560956
Maximum	0.22
Minimum	0.008
Variance	0.003429386

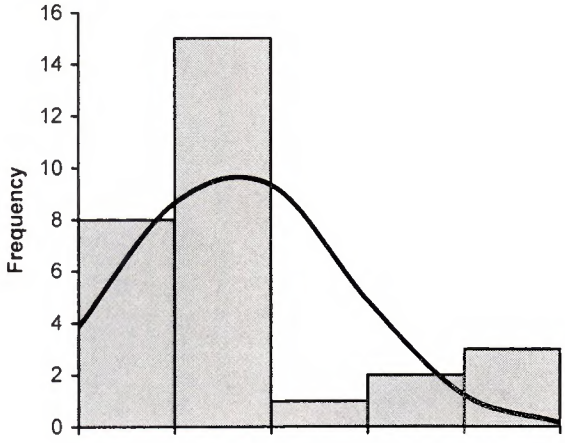
Note: Revised data has been modified to combine multiple samples at the same location and delete samples that are near or below 0.005 mg/l.

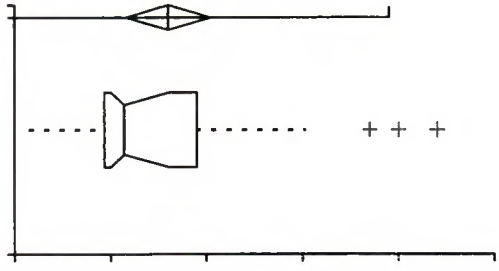
Site	Selenium (mg/l)	Mean	95% C.I.	95% UCL
A	0.008	0.080086	0.057811	0.102362
B	0.0201	0.080086	0.057811	0.102362
C	0.0248	0.080086	0.057811	0.102362
D	0.039	0.080086	0.057811	0.102362
E	0.0401	0.080086	0.057811	0.102362
F	0.0402	0.080086	0.057811	0.102362
G	0.0432	0.080086	0.057811	0.102362
H	0.0468	0.080086	0.057811	0.102362
I	0.05	0.080086	0.057811	0.102362
J	0.05	0.080086	0.057811	0.102362
K	0.05	0.080086	0.057811	0.102362
L	0.0507	0.080086	0.057811	0.102362
M	0.054	0.080086	0.057811	0.102362
N	0.057	0.080086	0.057811	0.102362
O	0.057	0.080086	0.057811	0.102362
P	0.0583	0.080086	0.057811	0.102362
Q	0.0592	0.080086	0.057811	0.102362
R	0.0746	0.080086	0.057811	0.102362
S	0.075	0.080086	0.057811	0.102362
T	0.075	0.080086	0.057811	0.102362
U	0.0805	0.080086	0.057811	0.102362
V	0.095	0.080086	0.057811	0.102362
W	0.098	0.080086	0.057811	0.102362
X	0.1	0.080086	0.057811	0.102362
Y	0.151	0.080086	0.057811	0.102362
Z	0.185	0.080086	0.057811	0.102362
AA	0.2	0.080086	0.057811	0.102362
AB	0.22	0.080086	0.057811	0.102362
AC	0.22	0.080086	0.057811	0.102362

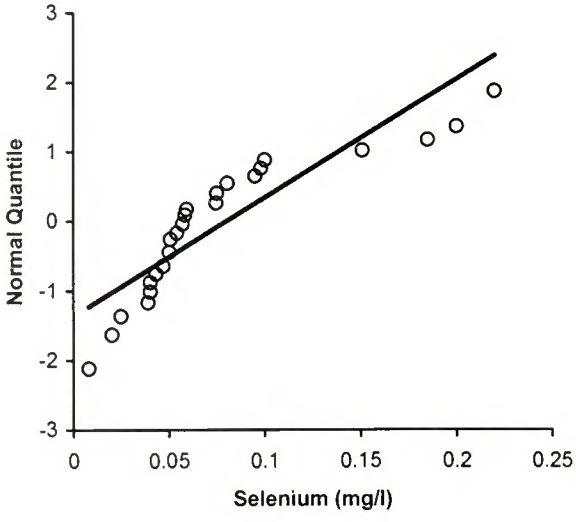
Column1	
Mean	0.080086
Standard Error	0.010874
Median	0.057
Mode	0.05
Standard Deviation	0.058561
Sample Variance	0.003429
Kurtosis	1.108963
Skewness	1.435987
Range	0.212
Minimum	0.008
Maximum	0.22
Sum	2.3225
Count	29
Confidence Level(95.0	0.022275



Test	**Continuous summary descriptives**		
	Selenium (mg/l)		
Performed by	Eric A. Holt	**Date**	14 March 2001







n	29
Mean	0.080
95% CI	0.058 to 0.102
Variance	0.0034
SD	0.0586
SE	0.0109
CV	73%
Median	0.057
97.6% CI	0.050 to 0.081
Range	0.212
IQR	0.0482

Percentile	
2.5th	-
25th	0.047
50th	0.057
75th	0.095
97.5th	-

	Coefficient	**p**
Shapiro-Wilk	0.8026	<0.0001
Skewness	1.4360	0.0029
Kurtosis	1.1090	0.1866

References

1 Montgomery Watson, 1997. Draft Fall 1997 Interim Surface Water Survey Report Southeast Idaho Phosphate Resource Area Selenium Project, December 1997.

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3 Idaho Department of Environmental Quality, 2001. Letter and Copies of Analytical Reports for Smoky Canyon, December 6, 2000 and February 20, 2001.

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5 USFS, 2001. Copies of data tables for South Maybe Canyon Site Investigations February 20, 2001.

6 TRC-Mariah, 2000. Smoky Canyon Mine Water Quality Data

7 U.S. Forest Service, 2000. Personal Communication with Phil De Henaut on Samples Obtained by the USFS and by University of Idaho for the Simplot Panel D and E seeps.

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Appendix 4C

Infiltration Modeling

SMOKY CANYON MINE
SUPPLEMENTAL EIS
OVERBURDEN FILLS
INFILTRATION MODELING

Seepage calculations through the proposed pit backfills and the external overburden disposal site were performed by using the U.S. Environmental Protection Agency model HELP3 (Hydrologic Evaluation of Landfill Performance, Version 3.07, Schroeder et al, 1994). This model was developed by the U.S. Corps of Engineers, Risk Reduction Engineering Laboratory to assess seepage of precipitation through solid waste disposal sites. The model utilizes input data on weather, soil and waste conditions, cover and base liner designs and interior drainage systems. It uses a number of internal solution techniques to account for the effects of surface runoff, surface storage, snowmelt, infiltration, evapotranspiration, vegetative growth, soil moisture storage, lateral drainage and unsaturated vertical drainage through waste and infiltration barriers. The overburden fills were divided into 5 areas of similar configuration as shown in **Table 1**.

Table 1 Facility Areas and Slopes for Infiltration Modeling

Area Description	Slope
C-Panel Backfill	5h:1v
A and B-Panel Slopes	3h:1v
B-Panel Top	50h:1v to 25h:1v
External Dump Top	50h:1v to 25h:1v
External Dump Slope	3h:1v

The model allows input of the fill design in separate layers with different physical properties. The basic design of the overburden disposal fills from top down includes the following: 1-3 feet of topsoil; 10 feet of chert rock, the top 12 inches of which was assumed to be compacted by haul traffic while the rest of the thickness was assumed to be consolidated but not compacted; 20+ feet of shale and mixed overburden, the top 12 inches of which is compacted by haul traffic, and the rest is assumed to be consolidated but not compacted. The summary of the layers is shown in **Table 2**.

Table 2 Layer Identification and Dimensions

Layer No.	Material	Thickness (in)	HELP Layer Type
1	Topsoil	24*	Vertical Percolation
2	Compacted Chert	12	Vertical Percolation
3	Uncompacted Chert	108	Vertical Percolation
4	Compacted Shale	12	Barrier Layer
5	Uncompacted Shale	240	Vertical Percolation

- Average of the 1-3 foot topsoil thickness proposed by Simplot

To determine the physical properties of the various overburden layers, a geotechnical firm was retained to conduct field testing and sampling of these materials and layers at the Smoky Canyon Mine. The field work was conducted in September, 2000 and consisted of inspecting trenches cut through chert, shale, and mixed shale overburden materials to obtain representative sample and to measure in-place densities. These samples were tested in the laboratory in compaction conditions equivalent to their field densities. The testing provided information on the porosity, in-situ dry density, moisture content, USCS soil classification, hydraulic conductivity, and wilting point for three shale samples and one chert sample in their compacted and uncompacted but consolidated condition. Material properties for the topsoil were obtained from default conditions provided in the HELP3 model instructions (Material Texture 11). The layer characteristics are shown in **Table 3**.

Table 3 Soil Layer Properties Used in Modeling

Layer	Porosity (vol/vol)	Field Capacity (vol/vol)	Wilting Point (vol/vol)	Hydraulic Cond. (cm/sec)
1.Topsoil	0.464	0.310	0.187	6.39 E-5
2.Compacted Chert	0.238	0.162	0.056	1.99 E-2
3.Uncompacted Chert	0.266	0.181	0.063	9.99 E-3
4.Compacted Shale	0.247	0.162	0.069	8.39 E-6
5.Uncompacted Shale	0.365	0.239	0.102	2.58 E-2

The average annual precipitation for the mine site was stated in the 1982 EIS as 30-35 inches with cold winters having significant snow accumulations. Simplot uses a precipitation range of 30-33 inches in its SWP3 (Simplot Agribusiness, 2000). TRC-Mariah prepares annual Aquatic Monitoring Program reports for the surface water monitoring program at the mine and they indicate in those reports that the NRCS Slug Creek Divide precipitation station is representative of precipitation conditions at the mine. The 1982-1998 monthly and annual average precipitation data for the Slug Creek Divide station were used in the HELP model. The total annual average precipitation was 33.6 inches. Temperature data for Lander, Wyoming were used in the model. Solar radiation data was obtained from the Pocatello, Idaho data set in the HELP model. The U.S. Western Weather Climate Center, NOAA site in Palisades, Idaho was used for relative humidity in the model. Monthly weather data used is listed in **Table 4**.

Evapotranspiration (includes evaporation from soil and vegetation as well as transpiration from plants)depends on the growing season length, evaporation depth in the soil, and maximum Leaf Area Index which depends on the type and density of vegetation growing on the site. The Leaf Area Index used was 2.0 representing a fair stand of grass. The evaporation zone was set at the rooting depth determined for the reclamation vegetation to be used: 36 inches. The growing season was set at May 12 through October 2. Average wind speed of 10.1 MPH and average relative humidities ranged from 72% in the first quarter to 44% in the third quarter.

Table 4 Monthly Weather Data Used for Infiltration Modeling

Month	Mean Precipitation (inch)	Mean Temperature (°F)
January	3.76	18.2
February	3.30	24.3
March	3.56	31.8
April	3.16	42.3
May	3.06	51.8
June	1.64	61.6
July	1.51	71.0
August	1.24	68.0
September	1.91	58.2
October	1.26	47.0
November	4.04	30.7
December	4.08	21.6

The HELP3 runs were made identifying Layer 4 as a barrier layer which was thought could retard vertical percolation by nature of its relatively low hydraulic conductivity (**Table 3**). However, the model results did not show any lateral drainage occurring on top of this layer indicating that the layer was not sufficiently impermeable to retard vertical percolation at the rate it was occurring in the model. Thus, all layers acted as vertical percolation layers. Sensitivity runs were also made on the slope of layers 4 and 5 to determine if it made any difference in the vertical percolation through layer 4 and then through layer 5. There was no significant effect on the vertical percolation by modifying the slope of these layers. The model was run for a 100-year simulation period for each facility area and resulted in the annual average infiltration rates and total infiltration quantities shown in **Table 5**.

Table 5 Calculated Annual Average Seepage

Area	Seepage Rate (inches/year)	Seepage/Acre (cubic feet/year)
C-Panel Backfill, 5h:1v	4.06	14,737
A and B-Panel Slopes, 3h:1v	4.05	14,701
B-Panel Top, 50h:1v to 25h:1v	4.16	15,101
External Dump Top, 50h:1v to 25h:1v	4.10	14,883
External Dump Slope 3h:1v	4.04	14,665

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