Final

Environmental Impact Statement Rasmussen Valley Mine Volume 1

Caribou County, Idaho

Lead Agencies:

U.S. Department of the Interior
Bureau of Land Management
Pocatello Field Office

U.S. Department of Agriculture
Forest Service
Caribou-Targhee National Forest

Cooperating Agencies:

U.S. Army Corps of Engineers

Idaho Department of
Environmental Quality

September 2016

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Idaho Falls District
http://www.id.blm.gov/

Dear Reader:

Enclosed for your review is the Final Environmental Impact Statement (Final EIS) for Nu-West Industries, Inc., doing business as Agrium Conda Phosphate Operations (Agrium) proposed Rasmussen Valley Mine (Proposed Action) located approximately 18 miles northeast of Soda Springs in Caribou County, Idaho. This Final EIS was prepared jointly by the Bureau of Land Management (BLM), Pocatello Field Office, and the U.S. Forest Service (USFS), Caribou-Targhee National Forest (CTNF) in cooperation with the Idaho Department of Environmental Quality and the Walla Walla District of the U.S. Army Corps of Engineers. Other participating agencies included the Idaho Department of Lands, the Idaho Department of Fish and Game (IDFG), the Idaho Department of Water Resources, and the U.S. Fish and Wildlife Service. The Shoshone-Bannock Tribes participated in the preparation of the Final EIS. The federal agencies recognize the treaty rights and interests of the Shoshone-Bannock Tribes and will uphold and protect the important federal trust responsibility.

Agrium has proposed to develop the Rasmussen Valley Mine for the recovery of phosphate ore reserves contained within their existing Federal Phosphate Lease I-05975 (the Lease), as directed by the Mineral Leasing Act of 1920. The Proposed Action would develop a new open pit phosphate mining operation on the Lease that would include external overburden piles, a haul road, a water management plan, and other ancillary facilities. Ore would be processed off site at Agrium's Conda Phosphate Operations Fertilizer Manufacturing Plant located northeast of Soda Springs. The Final EIS evaluates alternatives, environmental protection, and mitigation measures. The Rasmussen Collaborative Alternative (RCA) has been identified as the agency preferred alternative.

There would be up to 467.8 acres of new disturbance associated with the Proposed Action, and the RCA would result in up to 540.9 total acres of new disturbance. The Federal phosphate lease held by Agrium grants them exclusive rights to develop the phosphate minerals in the Lease. Agrium is also requesting lease modifications to extend the mine pit beyond the Lease boundary to facilitate recovery of ore that exists adjacent to the current Lease. Off-lease disturbance on National Forest System lands would also require special use authorization by the USFS.

Agrium has proposed to use the quantitative results of a wildlife Habitat Equivalency Analysis (HEA) as a basis to provide funding for a third party conservation organization to implement off-site wildlife habitat mitigation. Agrium is also working with the IDFG to develop additional mitigation to offset impacts the project will have within the Blackfoot River Wildlife Management Area (WMA). This mitigation will involve enhancements for recreational use and/or wildlife on the WMA.

The Final EIS are available for public review via the BLM website at:

http://on.doi.gov/1GpGxyW

Electronic copies of the Final EIS and the Draft USFS Records of Decision (ROD) are available via the USFS website at:

http://www.fs.usda.gov/projects/ctnf/landmanagement/projects

CD-ROMs and limited quantities of print copies are available at the BLM Pocatello Field Office, 4350 Cliffs Drive, Pocatello, Idaho.

The Final EIS incorporates additions and revisions resulting from public comments received on the Draft EIS, which was published on September 18, 2015.

The BLM will decide whether to approve the mine and proposed lease modifications. The USFS will make recommendations to the BLM concerning surface management and mitigation on leased lands within the CTNF, and will make decisions on special use authorizations, grazing permit modifications for off-lease activities and the sale of mineral material both on and off lease. Agency decisions are documented in RODs. The Draft USFS ROD is available for public review and objection concurrent with the release of the Final EIS and the publishing of a legal notice in the Idaho State Journal, the newspaper of record. The BLM ROD will be released and announced separately and no sooner than 30 days after the U.S. Environmental Protection Agency's (USEPA) publishes its Notice of Availability of the Final EIS in the Federal Register.

After reviewing the Final EIS if you have information for BLM to consider in making its decision, this information should be submitted to the addresses below within 30 days of the date of publication of the USEPA Notice of Availability in the Federal Register.

Email: blm_id_rasmussenvalleyeis@blm.gov

Fax: 208-478-6376

Mail: Bureau of Land Management, Pocatello Field Office,
Attention: Rasmussen Valley Mine EIS Project Manager,
4350 Cliffs Drive, Pocatello, ID 83204

BLM's ROD will be announced via news release, letter and e-mail and available for viewing on the BLM website.

The portion of the proposed project related to special use authorizations for off-lease activities is subject to the USFS objection process pursuant to 36 CFR 218 Subparts A and B. The USFS Responsible Official who will issue a decision on this portion of the project is Garth Smelser, Forest Supervisor, CTNF. Objections will be accepted only from those who have previously submitted specific written comments regarding the proposed project either during scoping or other designated opportunities for public comment in accordance with 36 CFR 218.5(a). Issues raised in objections must be based on previously submitted, timely, and specific written comments regarding the proposed project unless based on new information arising after designated opportunities. Incorporation of documents by reference in the objection is permitted only as provided for at 36 CFR 218.8(b). Minimum content requirements of an objection are identified in 36 CFR 218.8(d).

Individual members of organizations must have submitted their own comments to meet the requirements of eligibility as an individual; objections received on behalf of an organization are considered as those of the organization only. If an objection is submitted on behalf of a number of individuals or organizations, each individual or organization listed must meet the eligibility requirement of having previously submitted comments on the project (36 CFR 218.7). Names and addresses of objectors will become part of the public record.

Written objections, including any attachments, must be filed (regular mail, fax, email, hand-delivery, or express delivery) with the Reviewing Officer within 45 days following the publication date of this legal notice in the newspaper of record. The publication date in the Idaho State Journal is the exclusive means for calculating the time to file an objection of this project. Those wishing to object to this proposed project should not rely upon dates or timeframe information provided by any other source.

The Reviewing Officer is the Regional Forester. Send objections to:

Objection Reviewing Officer,
Intermountain Region USFS,
324 - 25th Street, Ogden, Utah 84401; or

Fax: 801-625-5277; or

Email: appeals-intermtn-regional-office@fs.fed.us.

The office business hours for those submitting hand-delivered objections are: 8:00 AM to 4:30 PM Monday through Friday, excluding holidays. Electronic objections must be submitted in a format such as an email message, pdf, plain text (.txt), rich text format (.rtf), and Word (.doc or .docx). It is the responsibility of Objectors to ensure their objection is received in a timely manner (36 CFR 218.9).

For additional information, please contact Bill Volk, BLM Pocatello Field Office, 4350 Cliffs Drive, Pocatello, ID 83204, phone 208-236-7503, fax 208-478- 6376. Please reference “Rasmussen Valley Mine EIS” on all correspondence.

Thank you,

Garth Smelser
Forest Supervisor
Caribou-Targhee National Forest

Mary D’Aversa
District Manager
BLM, Idaho Falls District

FINAL
ENVIRONMENTAL IMPACT STATEMENT
RASMUSSEN VALLEY MINE

LEAD AGENCIES:	U.S. Department of the Interior Bureau of Land Management Idaho Falls District Pocatello Field Office
	U.S. Department of Agriculture Forest Service Caribou-Targhee National Forest
COOPERATING AGENCIES:	U.S. Army Corps of Engineers, Walla Walla District
	Idaho Department of Environmental Quality
PROJECT LOCATION:	Caribou County, Idaho
DATE FINAL EIS FILED WITH USEPA:	September 2016
QUESTIONS ON THE FINAL EIS CAN BE DIRECTED TO:	Bill Volk EIS Project Manager BLM Pocatello Field Office 4350 Cliffs Drive Pocatello, Idaho 83204

ABSTRACT

This Final Environmental Impact Statement (Final EIS) analyzes impacts related to mining phosphate ore at the proposed Rasmussen Valley Mine in Southeastern Idaho. The Proposed Action includes developing six mine pits, haul roads, water management structures, and overburden disposal areas. Use of the existing fertilizer plant would continue in Soda Springs. Alternatives to the Proposed Action are also analyzed and site-specific mitigation measures developed. The BLM and USFS Preferred Alternative is the Rasmussen Collaborative Alternative (RCA) because of reduced impacts compared to the Proposed Action based on revisions to overburden storage, the haul road, eliminating all impacts to wetlands, and an earthen cover design that would reduce water impacts.

RESPONSIBLE OFFICIALS FOR THE FINAL EIS:	Mary D’Aversa BLM Idaho Falls District Manager
	Garth Smelser USFS, Caribou-Targhee National Forest
EIS NUMBER:	BLM-ID-I020-2015-0032-EIS

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Appendices

Appendix A Draft EIS Comments Report
Appendix B Environmental Monitoring Plan
Appendix C Surface Water Management Plan

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EXECUTIVE SUMMARY

The following is provided as a summary of the analyses that have been conducted for the Rasmussen Valley Mine Project. This includes the Proposed Action as well as alternatives that were developed to address issues raised during public scoping. This summary is not a substitute for review of the complete Final Environmental Impact Statement (Final EIS).

ES.1 PROPOSED ACTION

This Final EIS was prepared jointly by the Bureau of Land Management (BLM), Pocatello Field Office and the U.S. Forest Service (USFS) Caribou-Targhee National Forest (CTNF), in cooperation with the Idaho Department of Environmental Quality (IDEQ) and the Walla Walla District of the U.S. Army Corps of Engineers (USACE) in response to the 2011 Mine and Reclamation Plan (Proposed Action) from Nu-West Industries, Inc., doing business as (dba) Agrium Conda Phosphate Operations (Agrium) for development of the Proposed Action (Agrium 2011). Other participating agencies include the Idaho Department of Lands (IDL), the Idaho Department of Fish and Game (IDFG), the Idaho Department of Water Resources (IDWR), and the U.S. Fish and Wildlife Service (USFWS). Agrium has proposed to develop the Rasmussen Valley Mine for the recovery of phosphate ore reserves contained within Federal Phosphate Lease I-05975 (the Lease), as directed by the Mineral Leasing Act of 1920.

The Proposed Action is located on the southeast end of Rasmussen Ridge and in adjacent portions of Rasmussen Valley in Caribou County 18 miles northeast of Soda Springs, Idaho. The Proposed Action is within known phosphate leasing area (KPLA) boundaries. Proposed mining and associated activities would occur predominantly within the Caribou portion of the Caribou-Targhee National Forest on land administered by the Soda Springs Ranger District. Portions of the Proposed Action would also occur on public land administered by the BLM, the Blackfoot River Wildlife Management Area (WMA; state land administered by the IDFG), state land administered by the IDL, and areas of private land. The mineral estate related to phosphate is owned by the United States and is administered by the BLM Pocatello Field Office. The BLM would be the lead agency for the Final EIS, with assistance provided by the USFS and other cooperating agencies. The Proposed Action (Agrium 2011) would develop a new open pit phosphate mining operation on the Lease that would include external overburden piles, a haul road, a water management plan, and other ancillary facilities. Ore would be processed off site at Agrium's Conda Phosphate Operations (CPO) Fertilizer Manufacturing Plant northeast of Soda Springs. The Lease conveys to Agrium the right and privilege, subject to the terms and conditions of the Lease, to explore and develop the federally owned mineral estate and to use the surface of the federal lease for related mine activities.

Under the Proposed Action, phosphate ore would be mined and hauled on new and existing haul roads to Agrium’s Wooley Valley Tipple and from there by rail on existing track to Agrium’s CPO 12 miles to the southwest for processing. No processing other than crushing and screening operations would occur at the mine site. The Rasmussen Valley ore to be mined under the Proposed Action is expected to be similar to that produced at other Agrium mines in the area. Agrium has proposed extending the project pit beyond the Lease boundary in several locations to recover contiguous federal phosphate mineral and place mine facilities outside the existing lease. To accommodate these extensions, Agrium would request Lease modification in portions of T7S R44E Sections 6 and 9.

The phosphate ore deposit is a portion of the phosphate-rich Meade Peak Member of the Permian-age Phosphoria Formation. The Meade Peak Member and certain strata within the Rex Chert Member of the Phosphoria Formation have the potential for releasing constituents of potential concern (COPCs) including selenium. Overburden (rock and sediments from the mine that do not contain economic ore) that may contain Meade Peak or specific Rex Chert material, and therefore may have high concentrations of selenium and other COPCs, is designated in this Final EIS as “Meade Peak-containing material" or “Meade Peak overburden”. Meade Peak overburden may have high concentrations of selenium and other COPCs, but other overburden may also have the potential to release selenium and other COPCs. Alluvium, colluvium, and growth medium (GM) are not considered to be potential sources of COPCs. Runoff and seepage from overburden piles must be contained or allowed to drain into the mine pit. Overburden piles downslope of the mine pit have a high potential of draining to surface water or groundwater, and may also be located on potentially unstable slopes. Overburden piles upslope of the mine pit would drain to the mine pit or reclaimed, previously mined areas.

The Proposed Action (**Figure 2.3-2**) would consist of:

- The Rasmussen Valley Mine open pit would be developed in six sequential phases.
- Two permanent external overburden piles would be developed and reclaimed downslope from the pit area and haul road and designated the North Overburden Pile and South-South Overburden Pile.
- Two permanent external overburden piles would be developed contiguous with and upslope from the pit and designated as the North External Overfill Pile and the South External Overfill Pile.
- Two temporary external overburden piles would be developed downslope from the pit area and haul road, designated the South Main Temporary Overburden Pile and a portion of the North Overburden Pile.
- Two temporary overburden piles would be developed within the pit boundary, designated as the North and South Temporary Overburden Piles.
- A stockpile area could be optionally developed and reclaimed downslope from the pit area and haul road for temporary storage of ore or Meade Peak-containing materials as operational demands dictate and designated as the Ore Stockpile Area.
- Three GM stockpiles would be developed, used for reclamation activities, and reclaimed.
- Access and haul roads would be constructed, operated, and reclaimed.
- Portions of Lanes Creek and Diamond Creek County Roads would be permanently realigned and the abandoned road reclaimed.
- Temporary power lines would be constructed, operated, and reclaimed.
- A staging area would be constructed, operated, and reclaimed.
- Dust suppression supply, water quality monitoring, and water supply wells would be constructed, operated, and reclaimed.
- Surface water sediment controls would be constructed, operated, and reclaimed.
- A fuel storage area would be constructed, operated, and reclaimed.

The Rasmussen Valley ore deposit would be mined from south to north over 2.4 miles. Each phase would be 1,500 to 3,500 feet long and an average of 600 feet wide with a maximum depth of 380 feet near the southern end of the pit. There would be some concurrent mining of multiple phases to maintain a constant grade of ore for processing, to maintain the appropriate stripping ratio for overburden management, and to allow large excavation equipment to continue to operate while smaller equipment is mining the narrow lower elevations. The designed ultimate pit depth is controlled by the economic strip ratio. Factors that control economic strip ratio are overburden thickness, ore quality, estimated value of phosphate ore, and access. The mining plan has been designed to maximize the recovery of the economic phosphate and to minimize any long-term effects to the environment.

The mine may be operated up to 24 hours per day year-round. Mining would occur on a series of 40-foot cuts with 30-foot catch benches for every 80 feet of depth. Overburden would either be ripped or blasted, depending on the hardness of the material. Loose material would be loaded onto haul trucks and transported to the Wooley Valley Tipple, stockpiles, external overburden piles, or pit backfill. The mining sequence would allow coordination between areas being mined and areas being backfilled. Agrium would stockpile any soils salvaged during mining that are suitable for use in reclamation

Non-Meade-Peak-containing material removed during Phase 1 would be used to construct haul roads where fill is needed and, if necessary, to build up the base for an optional Ore and Temporary Overburden Stockpile Area for ore and overburden storage before completion of the haul road to the Wooley Valley Tipple. The remaining non-Meade-Peak-containing material would be placed in the North Overburden Pile or the South-South Overburden Pile, and Meade Peak overburden would be temporarily placed in the South Main Overburden Pile or one of the temporary overburden piles. Several external haul roads would be required through the life of proposed mining activities to haul overburden, GM, and ore. All of these roads would be constructed of non-Meade-Peak-containing materials with side berms where needed for safety. All haul road disturbance would be reclaimed at the end of the project.

All Meade Peak overburden mined from the Rasmussen Valley deposit would be placed in the pit as backfill or placed in permanent external overburden piles. Meade Peak overburden would generally be placed directly in mined-out phases, but some limited temporary storage in external overburden piles may be necessary. The majority of overburden mined would be directly backfilled into the previous phases without being stockpiled. A total of five overburden piles would be used through the life of proposed mining activities, two of which would be temporary overburden piles inside the ultimate pit crest.

Backfilled areas and previously disturbed areas would be reclaimed concurrently with mining. GM that has been temporarily stored at external storage locations throughout the project would be used for this concurrent reclamation. Wherever practicable, Agrium would use GM salvage for direct placement on areas being reclaimed. Except for the cover designed for Meade Peak-containing backfill, GM would be distributed over areas to be revegetated to a thickness of 12 inches. The cover design for the backfill is topped with a minimum GM thickness of 24 inches.

The objectives of reclamation are:

- To re-establish regional drainage patterns;
- To provide vegetative cover suitable to stabilize the surface and re-establish the pre-mining multiple land uses of recreation, wildlife habitat, and livestock grazing; and
- To limit the risk of long-term, post-mining environmental impacts.

Reclamation would consist of backfilling open pits, shaping overburden piles and haul roads, cover placement, GM handling, re-establishing drainage patterns, removing project-related facilities, and re-establishing a vegetation cover. All portable equipment and facilities would be removed from the site after mining. The staging area would be ripped and regraded to approximate the natural topography and capped with a minimum of 12 inches of GM. When backfill- and overburden-shaping, cover placement, and re-vegetation are completed, the surface would approximate surrounding topography. External overburden piles would be shaped to have maximum 3H:1V slopes. All overburden areas would be shaped to eliminate ponding of meteoric waters and reduce infiltration. Haul roads would also be reclaimed when no longer needed. The planned final topography has been developed based on the current understanding of the ore body geometry, mining methods, mining rates, and overburden swell parameters.

The proposed pits would truncate existing drainage basins during mining. These drainages would need to be re-established as part of the planned final topography once backfilling of a phase reaches the existing grades. The re-established channels would be designed to accommodate the 100-year, 24-hour storm event. Channels would be constructed with 3H:1V side slopes and lined to reduce runoff infiltration into the backfill.

The pit would be backfilled up to the west crest, capped with a minimum of 3 feet of non-Meade-Peak-containing material, and covered with a minimum of 2 feet of GM. This cover system is designed to limit the amount of net infiltration of meteoric water through the Meade Peak-containing material by increasing runoff and increasing moisture storage in the cover, making the moisture available for plant uptake and evapotranspiration. No Meade Peak-containing material would be left exposed. Non-Meade-Peak-containing material would be sloped east-to-west at a 2 percent gradient to ensure that runoff of any post-mining storm would flow away from the backfilled areas and toward re-established drainages to reduce the risk of forming a post-mining pit lake. Upon completion of reclamation, pit wall exposures would remain in-place along the norther and central portion of the pit.

Surface disturbance resulting from the Proposed Action would total up to 467.8 acres. Of this total acreage, the pit and backfill footprint of the six phases would disturb a total of 195.4 acres. However, because of the progressive open pit backfilling and concurrent reclamation, the maximum unreclaimed pit disturbance at any one time would be minimized.

The mine design, sequencing, and development and the development of ancillary facilities are discussed in detail in **Section 2.3.3** of this Final EIS. Additional detail is presented in the 2011 Mine and Reclamation Plan (Agrium 2011).

As discussed in **Section 1.4.2**, if the Proposed Action or a selected Alternative is approved, the Proponent would be required to obtain a reclamation performance bond for the Rasmussen Valley Mine before conducting any land-disturbing activities. The bond calculation would be based on the selected alternative as identified in the Final EIS and Record of Decision (ROD). The reclamation bond will be calculated by Agrium and reviewed by the BLM, and IDL. The BLM has adopted an actual-cost reclamation bonding policy, *Bond Requirement for Phosphate Mining Operations, September 10, 2013*, that prescribes the procedures for ensuring that an accurate actual-cost reclamation bond is in effect for phosphate mines in Idaho. The Proponent would then post bonds with the BLM, the IDL and the USFS to ensure compliance with reclamation requirements.

Measures that would be employed to protect natural resources including surface and groundwater, livestock and wildlife, cultural resources, wetlands, soils, vegetation, air, and fisheries and aquatic resources are summarized in **Section 2.3.5.** These would include best management practices (BMPs) for mine operations, overburden handling, water management, and reclamation.

The proposed mining activities carry the potential to release pollutants that can be transported by stormwater runoff. These pollutants could enter surface water and indirectly affect other resources. Pollutants could include selenium and other COPCs from exposed Meade Peak-containing materials. Agrium would design and implement appropriate BMPs to control erosion, sedimentation, and COPCs to protect surface waters in and around the Proposed Action. In addition, Agrium would limit the quantity of Meade Peak-containing material that would be exposed throughout the life of proposed mining activities through direct backfilling, capping with a 5-foot thick cover consisting of a minimum 3-foot thickness of non-Meade-Peak-containing material overlain by a minimum 2 feet of GM. Surface water drainages would be constructed in sequence with the mining phases to minimize runon into the pit and excessive precipitation contact with exposed shales. Surface water control structures would include structures designed to reduce or eliminate the risk of surface water contamination. Basins to retain runoff water and associated silt would be constructed at strategic locations to collect and contain water exposed to mining disturbances and overburden. Conveyance ditches along the outer perimeter of the overburden piles and stockpiles would collect and carry runoff from the overburden piles and stockpiles to sediment basins.

COPCs mobilized from overburden piles by percolating precipitation infiltration events also carry the potential to enter groundwater systems through infiltration. The potential for introduction of selenium to groundwater is of particular concern at phosphate mines in southeast Idaho. Agrium would protect groundwater resources by managing all of the Meade Peak overburden at the project and through the implementation of BMPs designed to control runoff from mining features. In general, Meade Peak-containing materials would be directly backfilled to previous phases once mining at those phases is completed. If any Meade Peak-containing material is stockpiled, the residence time of the Meade Peak-containing material would be minimized. Meade Peak overburden would be used for backfill in the lower portions of the mined-out pit and covered with a minimum of 3 feet of non-Meade-Peak-containing material and 2 feet of GM. Backfill overburden piles would be graded to reduce runon and infiltration, and proper revegetation would encourage evapotranspiration of precipitation.

ES.2 ALTERNATIVES

Along with the Proposed Action, the Rasmussen Collaborative Alternative (RCA) and the No Action Alternative were evaluated in the EIS and are described in **Sections 2.5** and **2.6** respectively. Several other alternative elements were also evaluated but dismissed from further evaluation as described in **Section 2.8** of the EIS.

ES.2.1 Rasmussen Collaborative Alternative

In response to several primary issues brought forward during scoping, Agrium proposed an integrated alternative they call the RCA (**Figure 2.5-4**). This alternative addresses potential COPC impacts to surface waters and groundwater, and decreases overall wildlife habitat impacts while enhancing the reclamation at the adjacent South Rasmussen Mine.

In response to public comments, to concerns about activities on the WMA, and to small remaining areas of wetland impacts, the following changes have been made to the RCA as presented in the Draft EIS.

- The North-North and North Main GM Stockpiles, including off-lease borrow only areas, have been enlarged as GM, alluvium, and colluvium borrow and storage areas to maximize the area available for borrow and storage outside the WMA.
- Other GM stockpiles that will not be used as borrow areas would use the area between the mine pit and the West Side Haul Road, again to maximize available areas outside the WMA.
- The West Side Haul Road and the access ramp at the west end of Phase 7 have been modified to avoid impacts to wetlands.
- The realignments of the Lanes Creek, Diamond Creek, and Blackfoot River County Roads have been adjusted to avoid wetlands impacts.
- Additional surface water management features have been added, including a runon channel and access road upslope of the mine pit and water sediment basins.

These changes to the RCA have identified expanded borrow and storage areas off the WMA so that less of the South Main Borrow and Storage Area on the WMA may need to be used and have avoided all impacts to wetlands. The changes increase the overall potential surface disturbance of the RCA by almost 113 acres (73 acres more than the Proposed Action) as a worst-case scenario, but much of this area may not need to be used.

The RCA includes the following (**Figure 2.5-4**):

1. Development of a larger open pit in a sequenced manner, consisting of nine phases, beginning at the northwest and generally progressing southeast. The life of proposed mining activities would be 4.8 years, and the total project duration (including reclamation) would be 7.1 years;
2. Placement of overburden from the initial phases into P4's partially backfilled and reclaimed South Rasmussen Mine pit (located directly northwest of the proposed mining activities), thus increasing the reclaimed area at the South Rasmussen Mine pit;
3. Development and reclamation of up to six GM stockpile areas between the mine pit and the haul road;
4. Backfilling the majority of the mined-out Rasmussen Valley Mine pit;
5. Construction and reclamation of a staging area similar to that for the Proposed Action;
6. Foregoing the power line option and using only electrical generators to power mine facilities such as the staging area;
7. Realignment of portions of the Lanes Creek and Diamond Creek County Roads similar to the Proposed Action;
8. Construction and reclamation of sediment control structures;
9. Construction of two temporary overburden piles within the mine footprint;
10. Extension of the pit floor to the Lease boundary at the north end to maximize ore recovery;
11. Establishment three of GM, alluvium and colluvium borrow and storage areas within the areas proposed for external overburden piles in the Proposed Action to be used to store pit GM, alluvium, and colluvium for use in construction of a backfill cover; and
12. Reclamation with a wider variety of revegetation plant species.

The RCA eliminates the following from the Proposed Action:

1. All external overburden storage piles downslope of the mine pit, thereby eliminating piles on potentially unstable areas or areas overlying alluvial aquifers;
2. The proposed fuel storage facilities at the staging area (would use the existing Rasmussen Ridge Mine facilities);
3. The proposed power line that would have supplied power to Proposed Action facilities at the staging area, using portable generators instead;
4. Mining below the water table, resulting in less water to manage;
5. Eight stream crossings;
6. The haul road across the floor of Rasmussen Valley and the associated crossings at Rasmussen Valley Road and Angus Creek;
7. All disturbance to wetlands and waters of the U.S. (WOUS); and
8. Seventy acres of impacts to aquatic influence zones (AIZs).

The mining methods for the RCA would be the same as those for the Proposed Action. The overall pit footprint would be somewhat different, and a different set of BLM lease modifications is proposed. USFS Special Use Authorizations (SUAs), and State of Idaho Temporary Use Authorizations are also proposed to accommodate extension of the mine pit, overfill piles, borrow and storage areas, stockpiles, and ancillary mine features beyond the Lease. As in the Proposed Action, phosphate ore would be mined and hauled to Agrium's Wooley Valley Tipple and from there by rail on existing track to Agrium's CPO 12 miles to the southwest for processing. No processing other than crushing and screening operations would occur at the mine site.

Under the RCA, the ore deposit would be developed in nine phases. The phases would be developed generally from the northwest (mine north) to the southeast over 2.4 miles. The excavations required for the phases would range in length from 1,000 to 2,600 feet and would average 600 feet wide. Pit design and ultimate pit depth would be controlled by the same factors as those addressed in the Proposed Action, except in the southern portions of the pit, where the pit floor would be kept above the expected water table.

Construction of ore haul roads would begin in Phase 1 of mining. As in the Proposed Action, the West Side Haul Road would extend for 2.3 miles along the southwest side of the mine pit. Unlike the Proposed Action (which would begin mining at the southeast end and build the entire West Side Haul Road at the beginning of mining), the RCA would construct the West Side Haul Road in phases concurrent with the mine phases beginning at the northwest end of the pit. Haul Road 5 (HR-5) would be constructed between the termini of the West Side Haul Road at the northwestern extent of the Lease and the existing P4 and Agrium haul road north of South Rasmussen Mine. The existing haul road connects the Rasmussen Ridge Mines to the Wooley Valley Tipple Haul Road. HR-5 would be constructed through the previously disturbed west limb of South Rasmussen Mine and generally follow the South Rasmussen Mine haul road across the backfilled and reclaimed South Rasmussen Mine pit. Construction of HR-5 would be completed before mining of RCA Phase 1. HR-5 would not cross Rasmussen Valley, and would not result in any direct wetlands disturbance. The West Side Haul Road and HR-5 would be used to haul ore to the Wooley Valley Tipple, overburden to backfill the South Rasmussen Mine pit, haul GM and alluvium and provide access between the Rasmussen Valley Mine and the existing Rasmussen Ridge Mines shop.

The majority of overburden mined from Phases 1 and 2 and a portion from Phases 3 and 4 would be directly placed as backfill in an unreclaimed portion of P4's partially reclaimed South Rasmussen Mine. Mining ore was completed at the South Rasmussen Mine in 2013, and reclamation is ongoing. Backfill from the Rasmussen Valley Mine that is placed in P4's South Rasmussen Mine would be reclaimed using the same cover as currently approved for the South Rasmussen Mine. All overburden excavated from the Rasmussen Valley mine would be used to backfill either the South Rasmussen Mine pit or the previously mined phases of the Rasmussen Valley Mine. Two temporary internal overburden piles are incorporated into the design: the Central Temporary Overburden Pile and South Temporary Overburden Pile. These temporary overburden piles would be used to store material on backfill within the mine footprint when operations produce more overburden than available open pit volumes can accommodate. Backfill and overfill areas would be graded to a 3H:1V maximum final slope. Most of the GM from Phases 1 through 4 would be temporarily stored and used for reclamation.

Agrium would stockpile for use in reclamation any soils suitable as GM that are removed during mining operations and that are not directly placed for reclamation. Throughout the life of proposed mining activities, GM would be used in concurrent reclamation activities or temporarily stored at external stockpiles throughout the project. External stockpiles downslope of the mine pit would only contain GM. A maximum of four external stockpiles would be used throughout the life of proposed mining activities. The four external stockpiles are designated the North-North Stockpile, North Main Stockpile, Central Stockpile, and the South Main Stockpile. Material would be added to and removed from the four stockpiles throughout the life of proposed mining activities as operations and material needs dictate. These stockpiles would be fully reclaimed after the completion of mining.

The RCA would use diesel generators to provide electrical power to RCA facilities. Supplying on-site diesel power generation would eliminate the disturbance associated with constructing a power line from the existing transmission line located in Upper Valley to the proposed facility location. The necessary number of generators and horsepower of those generators may change through the life of proposed mining activities. For the purpose of the RCA, it is assumed that the generator array currently in use at the Rasmussen Ridge Mine would be sufficient to accommodate operations at the Rasmussen Valley Mine.

A store-and-release cover (Cover C) would be installed over all backfill and overburden piles at the Rasmussen Valley Mine. Cover C would consist of 3 feet of pit alluvium, overlain by 2 feet of external alluvium and GM overlain by 1 foot of pit GM. The 6 feet of cover would retain infiltrating precipitation long enough for plants to transpire a substantial portion of the water thus reducing the amount of water that percolates downward past the root zone and into the underlying overburden or backfill. The 6-foot cover thickness would separate the revegetation root zone from the underlying potentially selenium and COPC containing overburden, thus eliminating the potential for adverse accumulation selenium and COPCs in reclamation vegetation.

Agrium would employ direct placement of GM on reclaimed areas wherever practical. GM would be salvaged from a mining phase or area before mining that phase or area. Because GM is most efficiently handled in dry conditions, GM would generally be salvaged in the summer to fall.

With the exception of the 6-foot thick Cover C, which has a specific design utilizing GM and alluvium, GM would be distributed over all areas to be revegetated to a depth of 12 inches. Any excess GM would be used to supplement cover over localized disturbances. The ultimate goal would be to maximize the recovery and return to multiple use of this resource. The GM would be spread with dozers, graders, or other appropriate equipment before revegetation.

Surface disturbance resulting from the RCA would be as much as 540.9 acres. The total potential disturbance would include all potential borrow and storage areas. However, only those areas needed for borrow and storage would be used, and the total area of disturbance would be less than this maximum. Of this total acreage, the pit, backfill, and overfill footprint of the nine phases would disturb a total of 221 acres. Because of the progressive open pit backfilling and concurrent reclamation, the unreclaimed pit disturbance at any one time would be minimized.

Water management features for the RCA would be similar to those for the Proposed Action. In comparison to the Proposed Action, fewer water management features would be required for the temporary overburden piles and GM stockpiles for the RCA. Culverts and haul road sediment basins along the West Side Haul Road for the RCA would be similar to those in the Proposed Action. In contrast, where the Rasmussen Valley Haul Road portion of HR-1 would require nine culverts in Rasmussen Valley, the HR-5 would require three culverts where it climbs the slopes of Rasmussen Ridge to reach the P4 South Rasmussen Mine and the existing Rasmussen Ridge mine haul road. Each of the four GM stockpile areas would also have a group of sediment basins along its downslope side.

ES.2.2 No Action Alternative

Under the No Action Alternative, the Rasmussen Valley Mine would not be approved for mining or any associated development on the existing leases. Similarly, associated requests (such as the lease modification request) would not be approved. The No Action Alternative would not provide ore for the CPO and would leave the mineral resource unmined. Agrium would not be allowed to exercise mineral development rights granted to them in their existing federal lease and their requested lease enlargement, or modification, would not be granted at this time. The resources would not be developed under the 2011 Mine and Reclamation Plan (Agrium 2011). However, the No Action Alternative does not preclude future mine and reclamation plans for the Lease.

ES.3 AGENCY PREFERRED ALTERNATIVE

The RCA is the Agency Preferred Alternative because it eliminates potential impacts to surface water from COPCs because it eliminates all permanent external overburden piles downslope of the mine and uses an alternative ore haul road that avoids all adverse effects to wetlands and riparian areas, because it eliminates water management issues that would result from mining below the water table, because it reclaims areas of the existing South Rasmussen Mine that would have otherwise remained unreclaimed thus enhancing wildlife habitat, because it maximizes ore recovery, and because it does not use an overhead power line.

ES.4 ENVIRONMENTAL EFFECTS

The environmental effects of the Proposed Action were evaluated and compared to the alternatives described in **Chapter 2**. A summary of the primary environmental effects of the Proposed Action and alternatives is presented in **Table 2.9-1**. The environmental effects are discussed in detail in **Chapter 4** and are discussed briefly in the following narrative. Environmental effects are discussed specifically in terms of the areas of disturbance or areas of direct effects of the Proposed Action, the RCA, and the No Action Alternative. Baseline and comparative data for analysis are also discussed in terms of analysis area and, in some cases survey or sampling areas for a resource. The Study Area encompasses the Proposed Action and anticipated elements of the alternatives for which baseline studies were conducted. The Study Area is larger than the Proposed Action. In addition, individual resource sections may discuss an analysis area that is larger than the Study Area. The analysis area may include areas of indirect effect or adjoining areas that are connected by hydrology, topography, or socioeconomic factors. An attempt was made for each environmental resource to determine the extent to which the environmental effect could be reasonably detected, and then include the geographic areas of resources that would be impacted by the environmental effect. Effects or impacts are described in terms of context (site-specific, local, or regional effects), duration (short- or long-term), and intensity (negligible, minor, moderate, or major).

Durations of effects are defined as:

- Short-term - Short-term effects are defined as those effects that would not last longer than the life of the project, including initial reclamation.
- Long-term - Long-term effects are effects that would remain following completion of the project.

The thresholds of change for the intensity of an impact are defined as:

- Negligible - the impact is at the lowest levels of detection.
- Minor - the impact is slight, but detectable.
- Moderate - the impact is readily apparent.
- Major - the impact is a severe or adverse impact or of exceptional benefit.

ES.4.1 Geology, Minerals, and Paleontology

The Proposed Action would remove 34.6 million bank cubic yards (MBCY) of overburden and result in up to 467.8 acres of surface disturbance. This would pose a major, long-term, and local effect on geology and mineral resources. Geological and mineral resources would be directly affected by the removal of phosphate ore and overburden.

The Proposed Action would leave exposed pit walls extending above the reclaimed pit backfill. These pit walls would be susceptible to minor slope failures or surface weathering. Overall potential effects of pit wall instability under the Proposed Action would be short-term and negligible.

The Proposed Action would have three overburden piles (North, South Main, and South-South) and an optional ore stockpile, all downslope of the mine pit. Infiltration of meteoric water through the overburden piles and ore stockpile would generate seepage with elevated concentrations of selenium and other COPCs that could be released into groundwater or surface water. Many COPCs are likely to be mobile in seepage from the overburden and ore storage facilities at levels of regulatory concern.

The locations of two of the proposed external overburden piles in the Proposed Action overlie areas of geotechnical instability, which could contribute pile to slope failures and resulting impacts to down slope areas and to the potential for additional seepage of elevated concentrations of COPCs into shallow groundwater and nearby surface waters. Overall potential effects of slope instability under the Proposed Action would be long-term and moderate. The effect of slope failure adding COPCs to the shallow groundwater and surface waters would be long-term and moderate.

The RCA addresses instability and COPC releases to surface water issues by proposing no external overburden piles or ore stockpiles on unstable ground or overlying shallow groundwater downslope of the mine pit. GM, alluvium and colluvium stockpiles in the North Main Borrow and Storage area may be located downslope of the mine pit in the area of geotechnical instability, which could contribute to slope failures and resulting impacts to down slope areas. All overburden would be backfilled into the existing South Rasmussen Mine pit or the mined-out pit and upslope overfill piles. Infiltration of meteoric water through overburden would be confined to pit backfill and overfill.

As with the Proposed Action, overall potential effects of slope instability under the RCA would be short-term and negligible.

Under the No Action Alternative, the mine would not be developed, and there would be no overburden piles or ore stockpiles that could be affected by infiltration of meteoric water.

Paleontological resources could be affected by removal of ore and overburden. Geologic deposits that would be affected by the Proposed Action or RCA may contain scientifically significant fossils, but these formations have not been exposed in the analysis area and have not been evaluated for their potential fossil content. Under the BLM Potential Fossil Yield Classification (PFYC) system (BLM 2007), the Dinwoody and Wells Formations have been classified regionally as PFYC 3a and the Phosphoria Formation has been classified as PFYC 5a. PFYC 3a are formations considered to carry a moderate potential to contain scientifically significant fossils. In general, paleontological resources contained in these formations are invertebrate fossils not considered to be important or restricted to the analysis area. PFYC 5a are formations considered to carry a very high potential to contain scientifically significant fossils.

Construction of facilities under the Proposed Action could disturb 25 acres of the Dinwoody and Wells Formations (PFYC 3a). Construction under the Proposed Action could disturb 60 acres of the Phosphoria Formation (PFYC 5a). The Proposed Action carries a moderate to high potential to encounter and adversely affect scientifically significant but regionally common invertebrate paleontological resources. With required mitigation, effects to paleontological resources would be long-term and minor.

The RCA would remove 42.4 MBCY of overburden and result in up to 548.5 acres of surface disturbance. Like the Proposed Action, this would have a major, long-term, and local effect on geology and mineral resources. Relative to the increase in ore recovery, the RCA would result in a much smaller area of surface disturbance. The RCA would also affect paleontological resources. Under the RCA, the mine pit would be expanded, and a higher volume of PFYC Class 5a geologic units would be disturbed by excavations than under the Proposed Action. Surface disturbances in areas of the Phosphoria Formation would affect 67 acres, 7 acres more than under the Proposed Action. Surface disturbances would affect 81 acres of the Dinwoody and Wells Formations, 56 acres more than under the Proposed Action. As a result, the potential for impacts to paleontological resources would also be higher under the RCA. The RCA could offer a beneficial effect for paleontology through the discovery and documentation of previously undocumented paleontological resources. Overall, the effects to important paleontological resources would be long-term and minor.

Under the No Action Alternative, the proposed mine would not be approved, and there would be no new disturbance as a result of this mine.

ES.4.2 Air Resources, Climate, and Noise

ES.4.2.1 Air Resources

Air resource impacts for the Proposed Action include fugitive dust, and gaseous emissions that would occur during drilling, blasting, excavation, materials handling, vehicle operations, ore screening, haul road usage, wind erosion, a boiler, and other generators. The Proposed Action includes relocating equipment and operations from the North Rasmussen Ridge Mine to operate the Proposed Action. Proposed Action mining would commence as the operations at Rasmussen Ridge Mine are finalizing. Generally, the air resource impacts generated during the normal operations from the Rasmussen Ridge Mine would represent similar levels of noise and emissions for the Proposed Action. **Table 1.4-1** lists the requirements for an IDEQ Permit to Construct including air quality standards before construction and an IDEQ Tier I or Tier II Operations Permit before operations. **Section 3.2.1.2** also points out that new, modified or reconstructed facilities with the potential to emit certain quantities of hazardous air pollutants must obtain Title V Federal Operating Permits. The Proposed Action would result in effects to air quality during drilling, blasting, excavation, materials handling, ore crushing and screening, and vehicle operations. BMPs and protective measures would reduce impacts to air quality. Construction activities would result in short-term, minor effects to air quality. Activities at the Rasmussen Ridge Mine would gradually conclude as equipment is moved to develop the Rasmussen Valley Mine. The Proposed Action would replace comparable existing activities at the Rasmussen Ridge Mine. The majority of air emissions are from fugitive dust and equipment emissions. Levels similar to those currently occurring would occur during operation of the Proposed Action. The impacts from the Proposed Action to air resources would be short-term and negligible.

Air emission impacts for the RCA are similar to those for the Proposed Action for gaseous emissions but would produce higher particulate emissions. The mining equipment and operating hours for the RCA would remain the same as those for the Proposed Action; therefore, the tailpipe and stationary air emission impacts are estimated to be the same. The RCA eliminates overburden piles downslope of the pit and reduces the frequency of overburden pile disturbance. The maximum total surface disturbance of the RCA would be 73 acres more than that associated with the Proposed Action. HR-5 would be 3 miles longer than the Proposed Action HR-1, increasing vehicle emission, but the overall potential air emissions would be lower than those for the Proposed Action. Generally, the RCA would only impact differently from the Proposed Action for particulate emissions from mining operations such as hauling, material handling, and wind erosion. The impacts from the RCA to air resources would be short-term and negligible.

Under the No Action Alternative, direct impacts to air emissions from activities in the Proposed Action would not occur. Air emissions would be reduced from existing conditions as activities conclude at the Rasmussen Ridge Mine.

ES.4.2.2 Climate

Greenhouse gas (GHG) emissions are known to affect climate. Mining involves combustion of diesel and gasoline for operation of mining and support equipment, which contribute GHG emissions to the atmosphere. GHG emissions from the Rasmussen Valley Mine operations would be similar to those from the current operations at the Rasmussen Ridge Mine. These emissions are below the current U.S. Environmental Protection Agency (USEPA) reporting threshold of 25,000 metric tons in combined GHG emissions per year. The Proposed Action would not be subject to the GHG reporting program. The assessment of GHG emissions and their relationship to climate change is in its formative phase; therefore, it is not yet possible to know with confidence the net impact to climate from the Proposed Action, or the potential effect of those uncertain changes in climate on the Proposed Action. Effects of the Proposed Action on GHG emissions and climate change would not be different from existing conditions and would not continue after the mine is closed. .

Effects of the Proposed Action on GHG emissions and climate change would continue after the mine is closed, because of the long (estimated 100 years) residence time for certain GHGs released into the atmosphere by the Proposed Action. The effects of the Proposed Action on climate change would be long-term and negligible. The RCA would employ GHG-emitting stationary sources nearly identical to those associated with the Rasmussen Ridge Mine during the active mining period of 4.8 years. Potential contribution to climate change from the RCA would be the same as that described for the Proposed Action: long-term and negligible.

Under the No Action Alternative, the effects of GHG emissions to climate change from the activities in the Proposed Action or RCA would not occur. GHG emissions would be would cease as activities conclude at the Rasmussen Ridge Mine.

ES.4.2.3 Noise

Noise from equipment operation, vehicle use (both on site and on the area road system), and blasting can affect the environment for humans and wildlife (including the quality of the recreational user's experience on a given property), potentially diminishing the quality of that site for a particular endeavor. Sensitive noise receptors include residential areas, schools, and hospitals. The nearest residences are located 0.5 mile from the Study Area. Other residences are located several miles southwest, closer to Soda Springs. Current mine activities pose only minor noise impacts on any off-site human receptors because the distances to the nearest occupied areas are sufficient to attenuate the noise of the heavy equipment to near background levels.

Noise from operation of the Proposed Action would be generated by site equipment, blasting, drilling, and traffic. The overall mine generation noise profile would be minimally changed from current activities at the Rasmussen Ridge Mine. The noise profile would be unchanged from the existing conditions, and changes in the locations of noise-generating activities would be negligible at all off-site receptors. The noise effects from the Proposed Action would be short-term and negligible or minor at the closest residence as a result of the distance from the mine.

Potential impacts of noise under the RCA would be the same as those for the Proposed Action.

Under the No Action Alternative, direct impacts of noise from the activities in the Proposed Action would not occur. Mining-related noise would be reduced from existing conditions as activities conclude at the Rasmussen Ridge Mine.

ES.4.3 Water Resources

The Proposed Action may affect surface waters through changes in the volume and timing of surface runoff and flow patterns, and by the introduction of pollutants such as sediments, selenium, and other COPCs. Potential impacts to water resources were evaluated using numerical models to estimate seepage rates from the proposed mine facilities and to simulate the transport of COPCs in groundwater and determine the additive impacts to surface water. The Proposed Action would increase hydrologic disturbance in the Angus Creek-Blackfoot River sub-watersheds by 1.59 percent. This would raise the total hydrologic disturbance in the Angus Creek-Blackfoot sub-watershed to 25.18, which is lower than the USFS guideline of 30 percent. Hydrologic disturbance is defined as changes in natural canopy cover (vegetation removal) or a change in surface soil characteristics (such as compaction) that may alter natural streamflow quantities and character. There would be no hydrologic disturbance on USFS lands in the Lower Lanes Creek or Diamond Creek sub-watersheds. Impacts to watershed area disturbance would be minor, local, and long-term, lasting until vegetation has fully re-established and trees have reached the sapling/pole size class. Overall effects to water resources under the Proposed Action would be long-term and minor and would exhibit different duration and intensity between surface water and groundwater.

The RCA would result in reduced effects to water resources in comparison to the Proposed Action. The RCA would eliminate mining below the water table, thus eliminating the need to dewater and transfer thousands of gallons per minute (gpm) onto unreclaimed backfill. It would eliminate all external overburden piles downslope of the pit, thus eliminating loading of COPCs to shallow groundwater and downgradient surface waters. Based on numerical modelling and consideration for cover maturation, the average net percolation rate for the RCA store-and-release cover (Cover C) is predicted to be 0.21 inches per year. Because of the elimination of mining below the water table, use of Cover C, and the elimination of the external overburden piles downslope of the mine pit, the effects of the RCA to water resources would be much less than those of the Proposed Action. The overall effects of the RCA to water resources would be long-term and negligible.

The RCA would increase hydrologic disturbance in the Angus Creek-Blackfoot River sub-watersheds by 1.65 percent during mining. The total new hydrologic disturbance would be 0.06 percent higher than that under the Proposed Action in the Angus Creek-Blackfoot River sub-watershed, and would be the same as the Proposed Action for the Lower Lanes Creek and Diamond Creek sub-watersheds. The total hydrologically disturbed area would meet the USFS guideline of less than 30 percent in all three sub-watersheds.

ES.4.3.1 Surface Runoff and Flow

Reduction of runoff resulting from Proposed Action would be 4.14 percent in the Angus Creek-Blackfoot River and 0.03 percent in Lower Lanes Creek sub-watersheds. There would be no change in the Diamond Creek sub-watershed. Total runoff reduction to Blackfoot River would be less than 1 percent. Impacts to runoff reduction would be considered minor to negligible, local, and limited to the duration of mining. Haul roads have the potential to affect peak flows through the diversion of flow through in-slope ditches and cross-drains, and through potential constrictions of flow at stream crossings or culverts. Potential alterations to peak flow would be minor, local, and short-term. Long-term effects to streamflow from haul roads would be negligible. The permanently realigned county roads would have minor, localized impacts that would be long-term.

Construction of four overburden piles downslope of the pit would alter the natural flow patterns by diverting the flow away from the natural channels. Although the intermittent drainages affected by two of the piles would be re-established after reclamation, the drainages affected by the North and South-South Overburden Piles would be permanently diverted.

Dewatering is not predicted to measurably affect Angus Creek and Blackfoot River streamflows. Pit dewatering under the Proposed Action to facilitate mining below the regional groundwater table near the southern end of the excavation is expected to result in moderate but localized impacts to water levels in the Wells Regional Aquifer for 10 to 11 months starting during Phase 1 mining. The projected maximum drawdown in the Wells Regional Aquifer would be 60 feet. Temporary drawdown of shallow groundwater levels west of the pit near Angus Creek is predicted to be negligible. Dewatering is not predicted to measurably affect Angus Creek and Blackfoot River streamflows. However, some minor, localized, temporary stream depletions may occur at lower reach of Spring Creek.

Runoff reduction under the RCA would be 4.06 percent in the Angus Creek-Blackfoot sub-watershed; 2 percent lower than under the Proposed Action. Differences in runoff reduction to Blackfoot River between RCA and Proposed Action would be negligible. Total runoff area reduction compared to the Proposed Action would be 4.06 percent of the Angus Creek-Blackfoot River sub-watershed.

Potential impacts to alterations in peak flow under the RCA would be the same as those for the Proposed Action.

While there would be up to four external GM stockpiles constructed within intermittent drainages downslope of the mine pit, these would all be reclaimed and drainages restored after the cessation of the mining activities, and there would be no permanent diversions from original stream channels under the RCA.

There would be no impacts from dewatering under the RCA because there would be no mining below the water table. Consequently, there would be no drawdown in the aquifer, and there would be no indirect effects to streamflows.

ES.4.3.2 Groundwater

Under the Proposed Action, capping of the permanent overburden piles and pit backfill would permanently reduce the amount of recharge reporting to groundwater by 8 percent from a pre-mining 2.6 inches per year to a permanent 2.4 inches per year. Long-term decreases in shallow groundwater levels by reduced infiltration through reclaimed areas would be minor and localized, and in the Wells Regional Aquifer would be negligible. The Proposed Action would result in moderate impacts to groundwater quality in the local-, intermediate-, and regional-scale aquifers (**Figures 4.3-12, 4.3-13, 4.3-14,** and **4.3-16**). Seepage from mine facilities would result in increased loading of selenium and other COPCs to groundwater. These COPCs would be transported northwest in the Wells Regional Aquifer and southwest in the local and intermediate aquifers, forming plumes with higher COPC concentrations than the unaffected groundwater. Seepage and groundwater movement through the backfilled pit would also result in the release of COPCs into the Wells Regional Aquifer at concentrations that exceed Idaho groundwater quality standards.

Installation of the RCA cover over the backfill and overfill under the RCA would reduce seepage to the Wells Regional Aquifer to an estimated 0.21 in./yr. on average compared to the 2.4 in./yr. for the Proposed Action. The RCA cover design has a much lower infiltration rate than the Proposed Action cover, greatly reducing the extent of the COPC plumes in the Wells Regional Aquifer (**Figure 4.3-22**). Elimination of external overburden piles downslope of the pit would eliminate impacts from COPC loading to shallow and intermediate groundwater and the resulting impacts to surface water. The RCA would also result in reduced loading of COPCs to the Wells Regional Aquifer compared to the Proposed Action. The IDEQ will determine Points of Compliance beyond which groundwater is not allowed to exceed groundwater quality standards. Groundwater monitoring wells will be installed at these points to monitor for compliance.

The RCA would also have an effect on the Wells regional Aquifer underlying P4's South Rasmussen Mine (**Figures 4.3-23** and **4.3-24**). The additional overburden placed in the open portion of the South Rasmussen Mine pit would increase the loading of COPCs to the Wells Regional Aquifer. The IDEQ has determined that P4's South Rasmussen Mine existing Points of Compliance are appropriate, and it is predicted that groundwater quality standards would not be exceeded beyond P4's groundwater Points of Compliance as a result of the RCA.

ES.4.3.3 Surface Water

Under the Proposed Action, short-term effects to surface water quality that could occur from increased suspended sediment and turbidity from disturbances related to construction would be controlled by the use of BMPs, sediment control structures, and slope stabilization. There would be no long-term effects. Cover systems on the backfill and overburden piles would prevent contact of runoff with overburden, preventing direct contamination of surface water by selenium and other COPCs. Meteoric water that deep percolates through the cover and into external overburden piles downslope of the mine pit are predicted to result in COPC loading to the underlying alluvial aquifer, where the COPCs would be transported west in groundwater toward Angus Creek and the Blackfoot River, potentially introducing measurable COPCs, including selenium, to these surface waters. Segments of the Blackfoot River and Angus Creek are 303(d) listed for selenium near Rasmussen Valley requiring no measurable increase in the selenium concentrations in these listed stream segments from the mining activities. The Proposed Action would result in minor to moderate, local, and short-term and long-term impacts to surface water quality. The potential for impacts to these streams is discussed in **Section 4.3.1.1.4**. Predictive modeling does not show a measurable increase in selenium in Angus Creek or the Blackfoot River from the Proposed Action and therefore is consistent with IDEQ's interpretation of applicable water quality criteria.

Potential impacts to water quality from sedimentation and runoff under the RCA would be the same as those for the Proposed Action. Under the RCA, the potential for impacts from COPCs including measurable increases in selenium concentrations in surface waters would be essentially eliminated as a result of the elimination of the down slope external overburden piles.

Under the RCA, the lower infiltration rate through the backfill and overburden cover, compared to the pre-mining undisturbed infiltration rate, would increase the runoff, thus increasing the quantity of water reporting to surface streams during runoff events.

Under the No Action Alternative, the Rasmussen Valley Lease would not be mined, and there would be no effects to water resources beyond the existing conditions.

ES.4.4 Soils

Direct impacts to soils from mining and construction include increased erosion, soil compaction, decreased soil productivity, and potential contamination of soils from chemical spills during transport, storage, or use. Indirect impacts to soils are not expected. Except for contamination by spills, these impacts would decrease soil productivity by impacting soil structure, increasing runoff and soil loss, decreasing permeability and infiltration, and damaging soil microorganisms. Overall direct impacts from construction of the Proposed Action would be moderate, local, and long-term. The Proposed Action would create up to 467.8 acres of surface disturbance. Approximately 450.3 acres would be reclaimed. The remaining 17.5 acres would include unreclaimed pit walls and permanently realigned county roads. Reclamation would reduce the long-term impacts to minor. The majority of undisturbed soils that would be disturbed by the Proposed Action are soil types with low erosion hazards, but disruption of vegetative cover and soil aggregates would result in a short-term increase in soil erosion and sediment transport. Overall, erosion rates are expected to decrease as portions of the Proposed Action are reclaimed and vegetation cover is established.

Estimated volumes of available GM indicate that sufficient soils are present within the area to be disturbed to meet cover requirements. No soils from areas outside disturbed areas are proposed for use as GM. Salvaged GM would be stored in stockpiles. Soils salvaged for future use as GM would be mixed and would not be segregated. During reclamation, any surplus GM beyond that required for minimum thickness of reclamation would either be placed to a thicker depth (other than on a designed cover), or placed in GM stockpiles for later use. Overall, effects to soils under the Proposed Action would be long-term and moderate, but much of the impact would reduce over time with the success of reclamation.

Impacts to soils under the RCA would be greater than those described for the Proposed Action as a result of the greater area disturbed. The intensity of effects would be slightly different than the Proposed Action in response to differences in location. The total area of surface disturbance under the RCA would be as much as 540.9 acres if all potential borrow and storage areas are used. Up to 517.8 acres of this disturbance would be reclaimed. As in the Proposed Action, pit walls and permanently realigned county roads would remain unreclaimed. The RCA would also create less disturbance on soils with moderate or high erosion hazards.

Overall adverse effects to soils under the RCA would be greater than under the Proposed Action and would be long-term and minor to moderate. As under the Proposed Action, much of the impact would reduce over time with the success of reclamation.

Under the No Action Alternative, no soil would be disturbed and there would be no new impacts to soil resources.

ES.4.5 Vegetation, Riparian Areas, and Wetlands

Over the life of proposed mining activity, the Proposed Action would remove 447 acres of upland vegetation and 20.5 acres of wetlands and non-wetland WOUS. Most of the wetland impacts (17.5 acres) would occur in Category III wetlands. Impacts to vegetation would be major and long-term. Overall, effects of the Proposed Action to upland vegetation, particularly to woodland communities, would be long-term and major. Reclamation would re-establish vegetation cover, but the species composition and community structure would be different.

Impacts to vegetation from the RCA would be similar to those associated with the Proposed Action. The RCA would remove up to 540.9 acres of vegetation if all GM, alluvium, and colluvium borrow areas were used, but would have no impacts on wetlands. The maximum total disturbance to upland vegetation would be 93 acres more than that with the Proposed Action. There would be no impacts to wetlands under the RCA. Overall impacts would be major and long-term. Reclamation would eventually re-establish vegetation cover, but the species composition and community structure would differ from pre-mining conditions.

Under the No Action Alternative, the Rasmussen Valley Lease would not be developed, and there would be no new impacts to vegetation.

ES.4.6 Terrestrial Wildlife

The Proposed Action would have immediate direct effects to wildlife mortality, disturbance, and displacement; and changes in wildlife behavior and composition associated with long-term changes in land cover. Wildlife may also be affected by exposure to selenium and other COPCs. Indirect effects from habitat alteration would be localized and long-term. The Proposed Acton would result in the loss of 447 acres of forested and shrubland habitat and 20.5 acres of wetland and riparian habitat. Overall, depending on the season and species, disturbance and displacement impacts to terrestrial wildlife would be long-term and negligible to minor.

The RCA would have impacts to terrestrial wildlife similar to those associated with the Proposed Action. The maximum acreage of upland wildlife habitat affected would be 93 acres more than the Proposed Action if all potential GM, alluvium, and colluvium borrow areas were used.

However, the RCA would not disturb any wetlands. The use of an existing haul road and backfill of overburden in a previously disturbed area would also consolidate new disturbance and result in less habitat fragmentation than the Proposed Action. Overall, impacts to wildlife under the RCA would be reduced compared with the Proposed Action. Depending on the season and species, overall disturbance and displacement impacts would be long-term and would range from negligible to minor.

Under the No Action Alternative, the Rasmussen Valley Lease would not be developed, and there would be no new impacts to wildlife from the proposed mining.

For the Rasmussen Valley Mine, the residual impacts to wildlife habitat were quantified using a Habitat Equivalency Analysis (HEA) modeling methodology. The HEA quantifies the baseline wildlife habitat and predicts the permanent and interim loss and gains of wildlife habitat resulting from the mining activity and reclamation. Agrium has proposed to use the quantitative results of the HEA in the determination of a monetary fee that they will provide to a third party to implement wildlife habitat mitigation projects in the regional watersheds in lieu of performing mitigation projects themselves. The calculation of the in-lieu fee, the fee amount, and disposition will be documented as a requirement in the ROD.

ES.4.7 Fisheries and Aquatic Species

The Proposed Action would result in direct impact to 20.5 acres of wetland habitat and would also impact stream channels in the Study Area. There would also be indirect impact to aquatic habitats within and adjacent to the Study Area. Clearing of vegetation in the Study Area could contribute to increased soil erosion and sediment loading in local drainages. This could result in altered stream morphology, choking out of aquatic plants, and changes in fish and aquatic invertebrate communities. BMPs for sedimentation and capturing of surface runoff during mining would decrease the severity of these potential impacts. However, the reduced quantity of water resulting from capture of runoff could also result in the drying of some aquatic habitats downstream of the Proposed Action. The Proposed Action would also impact 80 acres of AIZ, which could result in increased water temperatures, decreases in natural sediment filtration, changes in channel morphology, loss of instream wood recruitment, and decrease in inputs of organic matter as energy. Culverts would be designed so that a minimum depth of water for fish passage is always available. BMPs and design features would be implemented to minimize sedimentation that could adversely affect fish. Under the Proposed Action, direct loss of aquatic habitat would be controlled and mitigated. Effects to these resources would be negligible to minor, but would be long-term.

Macroinvertebrates would be impacted by changes in sedimentation and changes to AIZs resulting from the Proposed Action. These impacts would change the physical characteristics of the aquatic environment. Changes in the macroinvertebrate community may include temporary increases in the abundance of some species and decreases in the abundance of other species that are less tolerant of changes in turbidity. Macroinvertebrate community composition would also be impacted by removal of vegetation in the AIZ.

Direct mortality of amphibians and reptiles may occur in wetland, riparian, and stream habitats disturbed by the Proposed Action, including 20.5 acres of wetland and riparian areas. In addition, direct mortalities may occur on haul roads when individuals move between wetland habitats. Amphibians are also susceptible to selenium toxicity and to the effects of other COPCs.

To address these issues, the RCA, in contrast to the Proposed Action, relocates or eliminates facilities to avoid impacts to any wetlands. The majority of RCA disturbance would occur in upland habitats. The RCA would also impact 70 fewer acres of AIZ than the Proposed Action. Overall, impacts to aquatic resources including fisheries would be negligible and long-term under the RCA. The RCA was developed to avoid most impacts to aquatic resources.

Impacts to macroinvertebrates under the RCA would be less than those associated with the Proposed Action. Macroinvertebrates may be affected by sedimentation and changes to the AIZ. There should be only 10 acres of impact to the AIZ under the RCA compared to 80 under the Proposed Action. The RCA would also eliminate the potential to contribute selenium and other COPCs to surface water. Overall, the impacts of the RCA on aquatic macroinvertebrates would be negligible and long-term.

The RCA does not include any crossings of fish-bearing streams. The RCA would comply with BLM and USFS guidelines for the maintenance of instream flows and would not fragment fish habitat. The potential for the bioaccumulation of selenium and other COPCs in the aquatic food chain would be lower under the RCA. Overall, impacts of the RCA on fish populations would be negligible. Most wetland, riparian, and aquatic habitat would be avoided under the RCA. Consequently, impacts on amphibians and reptiles would be negligible.

Under the No Action Alternative, the federal phosphate leases would not be developed. The No Action Alternative would result in no new impacts in the Study Area.

ES.4.8 Threatened, Endangered, or Sensitive Species

This section includes threatened, endangered, and proposed candidate species; Caribou National Forest (CNF) sensitive species and management indicator species and BLM sensitive species; and special status plants. Threatened, endangered, and proposed candidate that may occur in the analysis area are Canada lynx and North American wolverine. Sensitive species and management indicator species that may occur in the analysis area are gray wolf, greater sage-grouse, Townsend's big-eared bat, special status raptor species, Columbian sharp-tailed grouse, small birds, special status migratory and water birds, special status reptiles and amphibians, and special status fish. There are no identified threatened, endangered, and proposed candidate plant species, CNF sensitive plant species, CNF Forest Watch rare plant species, or BLM sensitive plant species in the analysis area. The potential effects of the Proposed Action and alternatives on these species varies primarily in terms of the presence or absence of optimum or critical habitat in the analysis area and whether they depend primarily on upland or wetland habitat. Overall, impacts to threatened and special status species from the Proposed Action would be long-term and negligible to moderate.

Overall, impacts of the RCA on threatened, endangered, and special status species would be less than the Proposed Action, but similar in nature. The overall impact of the RCA on threatened and special status species would be long-term and negligible to minor.

Canada lynx, gray wolf, wolverine, greater sage-grouse, and Columbian sharp-tailed grouse may range into the analysis area or may occur in limited numbers. In general, the habitat in the analysis area is marginal for these species.

Under the Proposed Action or RCA, wide-ranging species like the Canada lynx, gray wolf, and wolverine would avoid these marginal habitats. The greatest effects to these species would be from the loss of 83 acres of marginal aspen forest foraging habitat under the Proposed Action and 131 acres of this habitat type under the RCA. Given the marginal and patchy nature of the habitat and the large foraging ranges of these species, adverse impacts would be negligible.

No sage-grouse habitat management areas (Priority Habitat Management Areas [PHMAs], Important Habitat Management Areas [IHMAs], or General Habitat Management Areas [GHMAs]) occur in the Study Area or vicinity. Greater sage-grouse and Columbian sharp-tailed grouse have been observed sporadically in the analysis area. The existing sagebrush communities do not provide optimum habitat for either grouse species.

Disturbance of marginal sagebrush habitat under the Proposed Action may result in displacement of individuals, long-term habitat loss, and fragmentation of habitat. These impacts are expected to be negligible to minor.

The RCA would disturb 8 acres more sagebrush habitat than the Proposed Action, resulting in impacts to greater sage-grouse and Columbian sharp-tailed grouse greater than the Proposed Action. In addition, the Study Area is not located in designated sage grouse habitat.

Under the No Action Alternative, the federal phosphate lease would not be developed. The No Action Alternative would result in no new impacts to these species.

Townsend's big-eared bats may occupy a variety of the habitats in the Study Area. The Proposed Action would result in long-term alteration of up to 447 acres of upland woodland and wetland foraging habitat. Overall, impacts would be minor and long-term.

The RCA would not impact any wetland foraging habitat for the Townsend's big-eared bat compared to 20.5 acres impacted by the Proposed Action. Other impacts to the species would be similar to the Proposed Action. Impacts would be minor and long-term.

Under the No Action Alternative, the federal phosphate leases would not be developed. The No Action Alternative would result in no new impacts to Townsend's big-eared bats in the Study Area.

Special status raptors and small birds would be affected principally by disturbance to upland woodlands and shrubland habitat. These habitats are important for both nesting and foraging. These species also use wetland habitat for foraging.

There would be long-term loss of foraging and nesting habitat for special status raptor species and small birds. Noise and human disturbance would temporarily displace the raptors. The Proposed Action would result in permanent loss of 83 acres of aspen habitat and 20.5 acres of wetland and riparian habitat. On a landscape scale, these impacts would be minor.

In general, impacts of the RCA to special status raptor species and small birds would be similar to those associated with the Proposed Action. The RCA would result in long-term loss of 131 acres of aspen forest, 48 acres more than the Proposed Action. On the other hand, the RCA would not result in any disturbance to wetland and riparian habitat. Overall, impacts would be negligible and long-term.

Special status fish, reptiles and amphibians, and migratory and water birds are more heavily dependent on wetlands and riparian areas. These species would be directly affected by the loss or degradation of wetland habitat and are also more susceptible to potential exposure to selenium and other COPCs. Impacts to these species under the Proposed Action would be moderate and long-term.

The RCA would pose the same types of impacts to special status fish, reptiles, and amphibians, and migratory and water birds as the Proposed Action, but they would be reduced because of the elimination of impacts to wetland habitats and improved protection of downstream water quality. Overall impacts to special status water birds would be negligible and long-term

Under the No Action Alternative, the federal phosphate leases would not be developed. The No Action Alternative would result in no new impacts to special status fish, reptiles and amphibians, and migratory and water birds in the Study Area.

ES.4.9 Visual Resources

Under the Proposed Action, impacts to visual resources would include alterations of the existing visual landscape by project components. These components would contrast with the existing visual landscape character, and would remain with somewhat less contrast after reclamation. However, views of the Study Area are limited by the surrounding terrain. The area is viewed by comparatively few people for limited periods of time. The modifications would meet both the Forest Service Visual Quality Objectives (VQO) of modification and the BLM Visual Resource Management (VRM) objectives for the area. Overall, the impacts of the Proposed Action to scenic attractiveness would be long-term and minor.

Under the RCA, there would be no overburden piles on the downslope side of the mine pit, and the GM stockpiles in that area would be temporary. Although the overall mine pit of the RCA would be slightly larger than in the Proposed Action, the individual pit phases and associated stockpiles would be less noticeable than those of the Proposed Action. As in the Proposed Action, the landscape modifications would meet both the Forest Service VQO of modification and the BLM VRM management objectives for the area. The overall impacts of the RCA to scenic attractiveness would be long-term and negligible.

Under the No Action Alternative, the mine would not be developed, and there would be no new impacts to visual resources.

ES.4.10 Land Use, Access, and Transportation

ES.4.10.1 Grazing

The Proposed Action would render a total of 967 acres of the Rasmussen Valley Cattle Allotment (RVCA) unusable for grazing, including almost all of Unit 3A in the Study Area. Although impacts to some grazing units would be major, impacts to the RVCA as a whole would be minor. The grazing lands would not be displaced all at once, but progressively as mining activities proceed, and thus portions of the grazing lands within the Study Area may remain accessible during mining activities.

In contrast, only 9 acres of the Henry Olsen Sheep and Goat Allotment (HOSGA) would be unusable. This is 0.08 percent of the allotment. The impact to the HOSGA would be negligible.

When areas are reclaimed, the vegetation in the early stages of reclamation may be more favorable for forage production than the pre-mine vegetation, although the species diversity would be limited. Overall, impacts of the Proposed Action to grazing would be long-term and negligible to minor.

Impacts to grazing under the RCA would be equivalent to those under the Proposed Action. The additional acreage to be mined and the slight changes in access would not alter the effects of the RCA in comparison to the Proposed Action. The changes to acreage to be mined and sequence of mining would have little if any additional effect on land available for grazing in comparison to the Proposed Action. The overall impacts of the RCA on grazing would be long-term and negligible to minor.

Under the No Action Alternative, the mine would not be developed. There would be no impact to the availability or quality of grazing.

ES.4.10.2 Traffic

Under the Proposed Action, workforce and equipment currently being used at the Rasmussen Ridge Mine would transition to the Proposed Action. This continuation of activities equivalent to existing activities would result in little or no change to workforce or traffic. The impacts on traffic and motorist safety from the Proposed Action would be short-term and negligible.

Overall, impacts on traffic and motorist safety from the RCA would be in slightly different locations than the Proposed Action, but would also be short-term and negligible.

Under the No Action Alternative, the mine would not be developed. Traffic on public roadways would be reduced in comparison to existing conditions.

ES.4.10.3 Recreation

Approximately 1,008 acres of federal lands and 833 acres of state lands open for recreation are included in the Study Area. Of that, 410 acres are located in the Blackfoot River WMA. Given the industrial nature of the Proposed Action, recreation would be prohibited or heavily restricted on these lands during mining for safety reasons, or that recreationists would not choose to use these lands.

The acreage of lands available for recreation that would be reduced under the Proposed Action is negligible at the local and regional scales given the large acreage that would remain available.

The Proposed Action does not directly impact any developed recreational facilities in the Study Area. There are sections of some designated trails that would be lost from use. These impacts would be moderate and site-specific, but negligible at the local and regional scales.

Overall, the impacts of the Proposed Action to recreation would be long-term, moderate, and site-specific, but negligible at the local and regional scales.

The RCA would have effects to wildlife similar to those described under the Proposed Acton. Consequently, impacts to hunting and other upland wildlife-related recreation would be the same. The effects of the RCA to wetlands would be less than the Proposed Action and would have less effect on aquatic species including game fish. Overall, the impacts of the RCA to recreation (like those of the Proposed Action) would be long-term, moderate, and site-specific, but negligible at the local and regional scales.

Under the No Action Alternative, the mine would not be developed. There would be no new impacts to recreation or recreationists. Impacts affecting access to recreation and enjoyment of the rural habitat would be reduced in comparison to existing conditions.

ES.4.11 Cultural Resources

The entire area of potential effects (APE) of the Proposed Action and RCA has been inventoried for the presence of historic properties (cultural resources eligible for the National Register of Historic Places [NRHP]). The Survey Area for cultural resources included 2,793 acres on Rasmussen Ridge, in Rasmussen Valley, and in adjacent areas. This included areas surveyed for alternative elements that were not analyzed in detail. The survey found or revisited 28 cultural resource sites. All of these sites have been recommended to be not eligible for the NRHP. The CTNF and the Idaho State Historic Preservation Office (SHPO) have concurred with these recommendations. Therefore, no historic properties have been identified in the Survey Area. The results of cultural resources studies have been considered in the development of the Proposed Action and RCA.

There are no historic properties in the APE of the Proposed Action. The Proposed Action would have no adverse effect to historic properties.

There are no historic properties in the APE of the RCA. The RCA would have no adverse effect to historic properties.

Under the No Action Alternative, the Rasmussen Valley Mine would not be developed, and there would be no adverse effect to historic properties.

ES.4.12 Tribal Treaty Rights and Interests

The 1868 Fort Bridger Treaty, between the United States and the Shoshone and Bannock Tribes, reserves the Tribes right to hunt, fish, gather, and exercise other traditional uses and practices on unoccupied federal lands. In addition to these rights, the Shoshone Bannock have the right to graze tribal livestock and cut timber for tribal use on those lands of the original Fort Hall Reservation that were ceded to the federal government under the Agreement of February 5, 1898, ratified by the Act of June 6, 1900. Under this treaty and those agreements, the federal government has a unique trust relationship with the Shoshone-Bannock Tribes. BLM has a responsibility and obligation to protect Tribal treaty rights and trust resources, and to consider and consult on potential effects to natural resources related to the Tribes' treaty rights or cultural use.

There would be no changes to land status associated with the Proposed Action, and those portions of the Proposed Action that are currently unoccupied public lands would retain that status. There would be substantial areas of disturbance from mining and associated activities on those public lands. The Shoshone and Bannock Tribes would experience short-term loss of access to those public lands to exercise treaty rights and traditional uses. That access would be restored at the completion of mining, although landscapes and habitats will be transformed as a result of impacts from mining. Other short-term effects would be associated with the disturbance or displacement of plant and wildlife species that are used for subsistence and traditional purposes. Effects of the Proposed Action to known treaty rights and interests would be long-term and negligible. Overall impacts to traditional resources would be long-term and minor.

Under the RCA, the nature and locations of disturbance would be similar to those associated with the Proposed Action, with less extensive disturbance in Rasmussen Valley. The maximum short-term and long-term impacts under the RCA would be 73 acres more than the impacts under the Proposed Action, and none of this impact would be to wetlands and related resources. Adverse effects to tribal treaty rights, interests, or traditional concerns have not been identified for the RCA. Overall, impacts to traditional resources would be long-term and minor.

Under the No Action Alternative, the Rasmussen Valley Mine would not be developed, and there would be no adverse effects to known tribal treaty rights and interests.

ES.4.13 Social and Economic Conditions

The Proposed Action would replace Agrium's Rasmussen Ridge and Lane's Creek mines. It would take effect before and during the shutdown of these mines. The existing work force and associated services would transfer to the new mine. Effects to population, housing, community services, employment, income to local and regional businesses, taxes and other revenues, and property values would be negligible. Effects to tourism and recreation from restricted access to mine property during operations would also be negligible. Over the four year life of the mine, the Proposed Action would support 1,700 direct, indirect, and induced jobs, generate $724 million in personal income throughout Idaho ($260 million in personal income in Caribou County), $6.5 million in Caribou County property taxes, $20 million in federal mineral royalty payments, and other payments/tax receipts. Overall, impacts of the Proposed Action to social and economic conditions would be positive, short-term and major.

Effects of the RCA to social and economic conditions would be the same as the proposed Action.

Under the No Action Alternative, the mine would not be developed. There would be major effects to employment, income to local and regional businesses, taxes and other revenues, and property values in Caribou County and lesser effects in neighboring counties. There would also be moderate effects to population and housing resulting from unemployment. Overall, impacts of the No Action Alternative to social and economic conditions would be negative, long-term and major.

ES.4.14 Environmental Justice

There are no communities in the vicinity of the Proposed Action that are minority as a whole, and none would be exposed to high and adverse environmental effects. Because the Shoshone-Bannock Tribes of the Fort Hall Reservation, 30 miles from the Study Area, have treaty rights and interests in public lands in the region, the Proposed Action could have disproportionate impacts on the population of the Reservation. These potential effects are addressed in Tribal Treaty Rights and Interests. Impacts of the Proposed Action to remaining populations using the analysis area would be long-term and negligible.

The environmental justice effects of the RCA would be the same as the Proposed Action.

Under the No Action Alternative, the mine would not be developed, and there would be no new environmental justice effects.

ES.4.15 Hazardous Materials and Solid Waste

Appropriate BMPs, storage, and secondary containment would be used for all hazardous materials and wastes, similar to those currently used at the Rasmussen Ridge Mine. In the event of any inadvertent spills or releases, Agrium would implement its Spill Prevention, Control, and Countermeasure (SPCC) Program. Effects of the Proposed Action on hazardous materials and wastes would be short-term and negligible.

The RCA storage area for fuels and hazardous materials would be at the existing Rasmussen Ridge Mine shop. Management practices for fuels, hazardous materials, and wastes would continue in the same manner as currently implemented at the Rasmussen Ridge Mine. As with the Proposed Action, effects associated with fuels, hazardous materials, and wastes would be short-term and negligible.

Under the No Action Alternative, the proposed mine would not be developed, and there would be no new effects associated with fuels, hazardous materials, and wastes.

ES.4.16 Public Health and Safety

The Proposed Action carries the potential to impact surface waters by introducing pollutants (such as sediment, selenium, and other COPCs) via stormwater runoff and spills and by surface runoff contacting exposed overburden. Agrium would design and implement BMPs to control erosion, sediment, and to minimize the potential for a release of COPCs to protect surface waters in and around the analysis area. In addition, active mining areas would be restricted from public access for security and safety reasons. To avoid damage to and from livestock, Agrium personnel would visually survey the mine areas for livestock daily.

Inadvertent spills and releases of fuels and hazardous materials or wastes may occur. An SPCC Plan would be developed before construction and operations, providing direction for preventing and controlling potential spills and describing BMPs for handling the COPCs.

No adverse effects to public health and safety would occur from implementation of the Proposed Action. The impacts of the Proposed Action to public health would be short-term and negligible.

Under the RCA, potential impacts to public health and safety would be similar to those described for the Proposed Action; however, this alternative would carry less potential for selenium and other COPCs to be released to surface water or to bioaccumulate in the aquatic food chain. No adverse effects to public health and safety are anticipated to occur from implementation of the RCA. The impacts of the RCA to public health and safety would be short-term and negligible.

Under the No Action Alternative, the facilities would not be constructed or operated; therefore, there would be no project-related impacts to public health and safety.

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CHAPTER 1
INTRODUCTION/PURPOSE AND NEED

1.1 INTRODUCTION

This Final Environmental Impact Statement (Final EIS) was prepared jointly by the Bureau of Land Management (BLM), Pocatello Field Office and the U.S. Forest Service (USFS) Caribou-Targhee National Forest (CTNF), in cooperation with the Idaho Department of Environmental Quality (IDEQ) and the Walla Walla District of the U.S. Army Corps of Engineers (USACE), in response to the 2011 Mine and Reclamation Plan (Agrium 2011) submitted by Nu-West Industries, Inc., doing business as (dba) Agrium Conda Phosphate Operations (Agrium; the Proponent) for development of the Rasmussen Valley Mine Project Proposed Action (the Proposed Action). Other participating agencies include the Idaho Department of Lands (IDL), the Idaho Department of Fish and Game (IDFG), U.S. Environmental Protection Agency (USEPA), the Idaho Department of Water Resources (IDWR), and the U.S. Fish and Wildlife Service (USFWS). Lead, cooperating, and participating agencies are collectively known herein as Agencies. Agrium has proposed to develop the Rasmussen Valley Mine for the recovery of phosphate ore reserves contained within Federal Phosphate Lease I-05975 (the Lease), as directed by the Mineral Leasing Act of 1920. The Lease conveys to Agrium the exclusive right and privilege, subject to the terms and conditions of the Lease, to explore and develop the federally owned mineral estate and to use the surface within the Lease for related mining activities. As part of the Proposed Action, Agrium also requests to modify and enlarge the Lease area. The Proposed Action is summarized in **Chapter 2**.

The Proposed Action is located within known phosphate leasing area (KPLA) boundaries. Proposed mining and associated activities would occur within the Caribou portion of the CTNF on National Forest System (NFS) land administered by the Soda Springs Ranger District and also on public land administered by the BLM, the Blackfoot River Wildlife Management Area (WMA; state land administered by the IDFG), state land administered by the IDL, and areas of private land. The mineral estate is administered by the BLM Pocatello Field Office. The Proposed Action is development of a new open pit phosphate mining operation on the federal Lease that would include external overburden piles, a haul road, a water management plan, and other ancillary facilities associated with operations (Agrium 2011). Ore would be processed off site. Mining would also employ best management practices (BMPs) for control of releases of sediment and constituents of potential concern (COPCs; such as selenium) to nearby surface water and groundwater.

1.2 LOCATION AND ACCESS

The geographic area considered for the National Environmental Policy Act (NEPA) analysis for this Final EIS is a 2,567-acre area (Study Area) and is located in Caribou County 18 miles northeast of Soda Springs, Idaho, on the southwestern flank of the southern end of Rasmussen Ridge and adjacent to portions of Rasmussen Valley (**Figure 1.2-1**).

The Proposed Action consists of all areas of proposed surface disturbance including the mine pits, temporary or permanent overburden and overfill piles, growth medium (GM) stockpiles, other stockpiles, access roads, new haul roads from the mine pits to the existing Wooley Valley Tipple Haul Road, and ancillary mine facilities. The mine footprint refers to the area within the

Proposed Action that would be affected by the mine pits and mine access roads, not including the West Side Haul Road, storage piles, stockpiles, or ancillary facilities. The Study Area shown in **Figure 1.2-2** encompasses the Proposed Action and anticipated elements of the alternatives for which baseline studies were conducted. The Study Area is larger than the Proposed Action. In addition, individual resource sections in this document may discuss an analysis area larger than the Study Area.

The Study Area is located on private lands, State of Idaho lands, IDFG lands, public lands administered by the USFS, and public lands administered by the BLM within and outside of the Lease (**Figure 1.2-2**). Proposed mining would occur on the Lease in portions of Township 7 South (T7S), Range 44 East (R44E) Sections 4, 5, 6, 8, and 9. In addition, haul roads, stockpiles, loading areas, and other ancillary facilities would be located in T6S R43E Sections 34, 35 and 36; T7S R43E Section 1; and T7S R44E Section 6.

Near the Study Area, surface waters include the Blackfoot River to the south, Lanes Creek to the east at the headwaters of the Blackfoot River, and Angus Creek to the west and southwest. The Blackfoot River is located immediately south of the southern boundary of the Study Area. The Blackfoot River begins where Lanes Creek and Diamond Creek join at the east end of the Study Area. The Blackfoot River bends around the southeast end of the Study Area and then flows south through the Narrows. Angus Creek is located along the western boundary of the Study Area and flows southeast through Rasmussen Valley to the Blackfoot River.

Primary access to the Study Area is along the southwest portion of the Study Area by way of Blackfoot River Road (Forest Road [FR] 095) and Rasmussen Valley Road (FR 121), which branches to the northwest from Blackfoot River Road. Blackfoot River Road (by way of Lanes Creek Road) connects the USFS roads in the Study Area with State Route 34 to the north, and also connects to State Route 34 to the west near the physiographic features called China Cap and China Hat. These roads also connect to other USFS, local, county, and state roads in the area. The Study Area motorized access (as depicted on the Soda Springs Ranger District Motor Vehicle Use Map [USFS 2014a]), includes Trail #322, a trail that branches east from FR 121 (Rasmussen Valley Road) in the NW of T7S R44E Section 6 (**Figure 1.2-2**). This trail is open only to vehicles less than 50 inches wide.

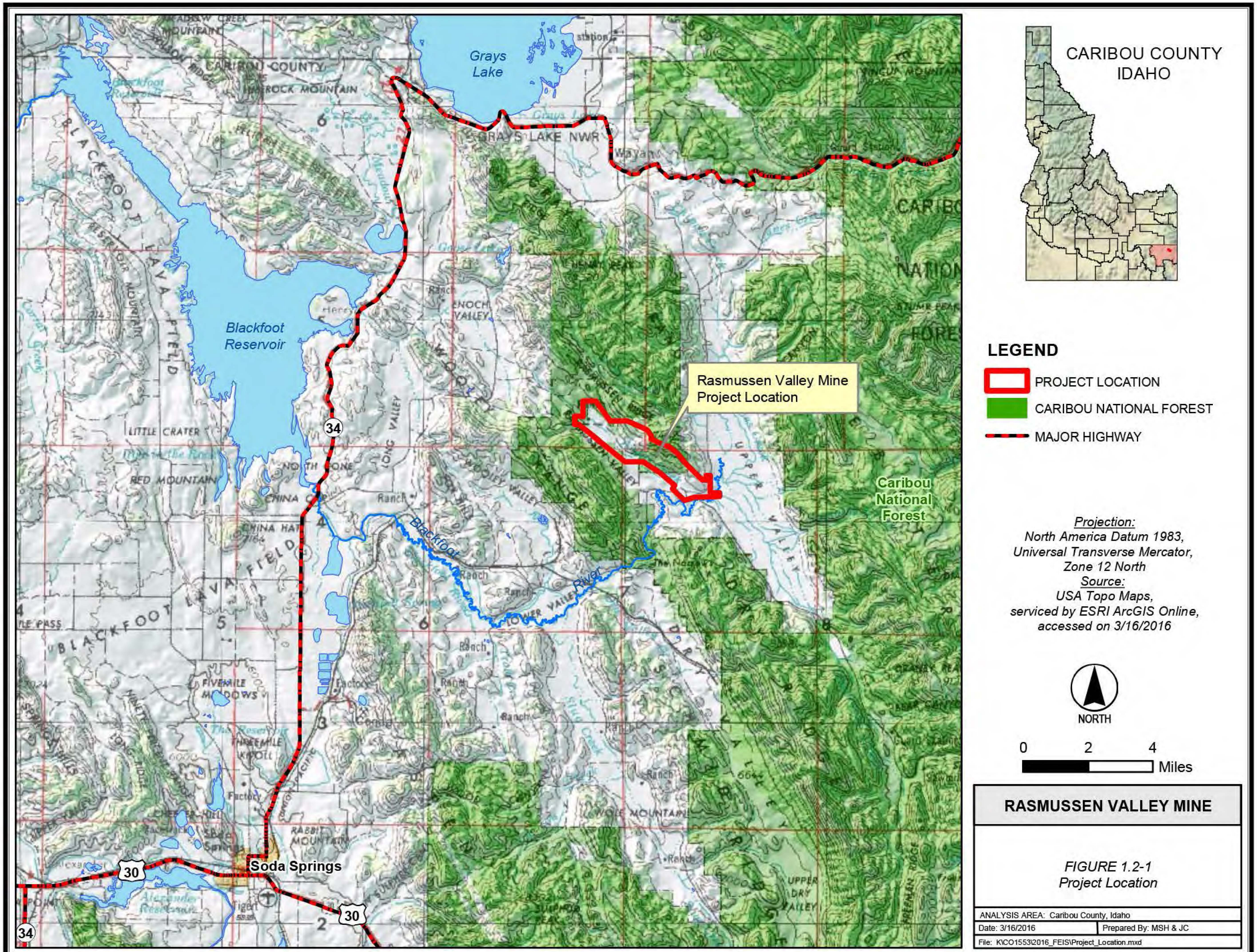
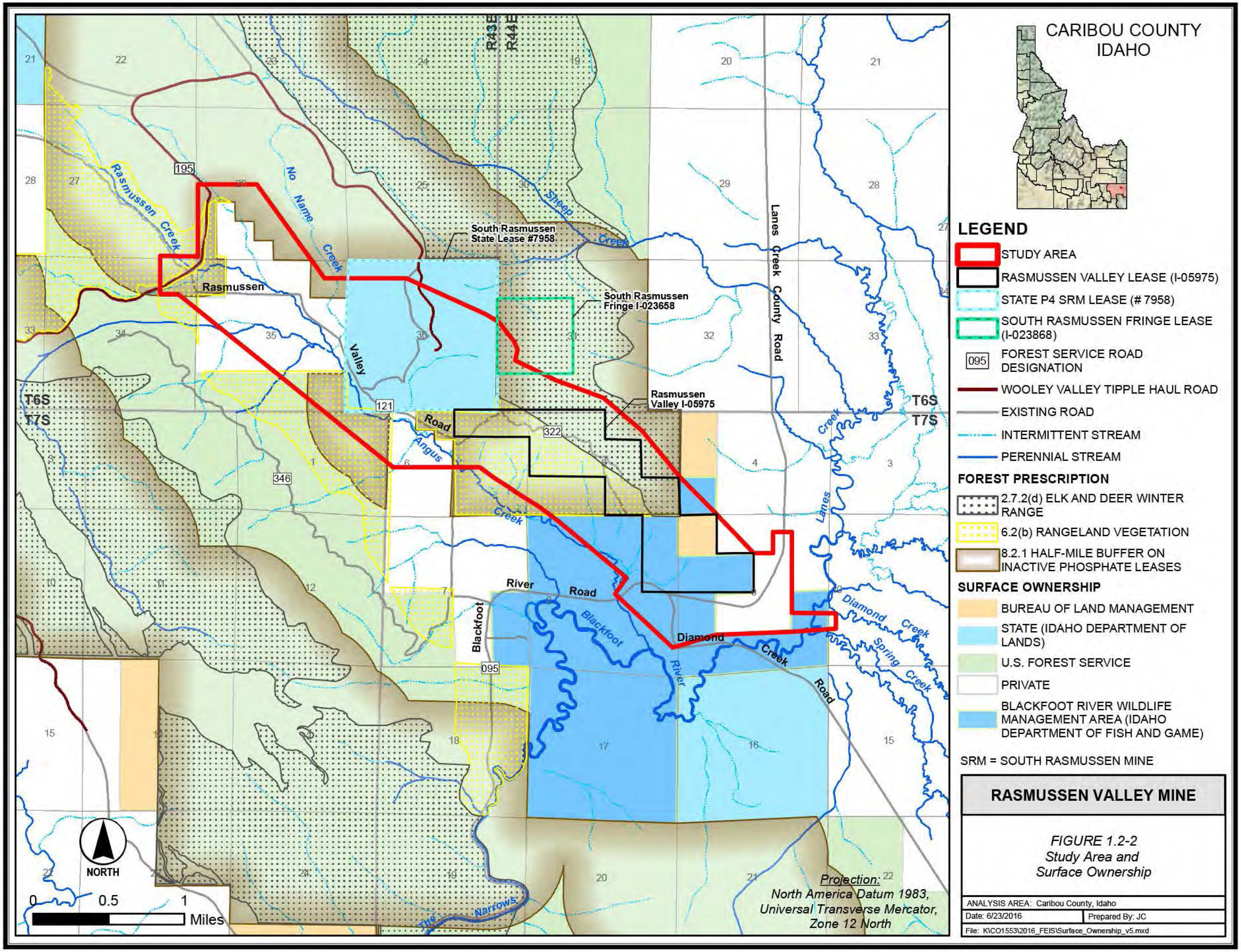


FIGURE 1.2-1
Project Location


CARIBOU COUNTY
IDAHO
LEGEND
STUDY AREA
RASMUSSEN VALLEY LEASE (I-05975)
STATE P4 SRM LEASE (# 7958)
SOUTH RASMUSSEN FRINGE LEASE (I-023868)
095 FOREST SERVICE ROAD DESIGNATION
WOOLEY VALLEY TIPPLE HAUL ROAD
EXISTING ROAD
INTERMITTENT STREAM
PERENNIAL STREAM
FOREST PRESCRIPTION
2.7.2(d) ELK AND DEER WINTER RANGE
6.2(b) RANGELAND VEGETATION
8.2.1 HALF-MILE BUFFER ON INACTIVE PHOSPHATE LEASES
SURFACE OWNERSHIP
BUREAU OF LAND MANAGEMENT
STATE (IDAHO DEPARTMENT OF LANDS)
U.S. FOREST SERVICE
PRIVATE
BLACKFOOT RIVER WILDLIFE MANAGEMENT AREA (IDAHO DEPARTMENT OF FISH AND GAME)
SRM = SOUTH RASMUSSEN MINE
RASMUSSEN VALLEY MINE
FIGURE 1.2-2
Study Area and
Surface Ownership
ANALYSIS AREA: Caribou County, Idaho
Date: 6/23/2016
Prepared By: JC
File: K:\CO1553\2016_FEIS\Surface_Ownership_v5.mxd
R43E
R44E
T6S
T7S
South Rasmussen
State Lease #7958
South Rasmussen
Fringe I-023658
Rasmussen
Valley I-05975
Rasmussen Creek
No Name Creek
Sheep Creek
Rasmussen
Valley Road
Angus Creek
Lanes Creek County Road
Lanes Creek
River Road
Blackfoot River
Blackfoot
Diamond Creek
Diamond Creek Road
Spring Creek
The Narrows
195
121
322
346
095
NORTH
0
0.5
1
Miles
Projection:
North America Datum 1983,
Universal Transverse Mercator,
Zone 12 North

1.3 PURPOSE AND NEED

The purpose of the proposed federal undertaking for the BLM and USFS is to evaluate and respond to Agrium's proposed 2011 Mine and Reclamation Plan to recover phosphate ore reserves contained within the Lease IDI-05975 and proposed lease modifications to enlarge the Lease area, as directed by the Mineral Leasing Act of 1920. This effort is called the Proposed Action. The Lease grants Agrium the exclusive right and privilege to explore for, drill for, mine, extract, remove, beneficiate, concentrate, or otherwise process and dispose of the phosphates or phosphate rock and associated or related minerals, also called the "leased deposits." The Lease gives Agrium the right to construct works, buildings, plants, structures, equipment, and appliances, as well as the use of on-lease rights-of-way, which may be necessary and convenient to exercise the rights and privileges granted by the Lease. To ensure that Agrium's Proposed Action meets the requirements of the applicable BLM and USFS land use plans and applicable laws and regulations, the Agencies are required to evaluate the Proposed Action and issue decisions related to the method of development of the Lease, including alternative mining approaches and decisions to modify or enlarge the existing Lease, while otherwise authorizing the Proposed Action.

The need for the proposed federal undertaking is to ensure economically viable development of the phosphate resources, in accordance with federal laws and regulations governing federal leases, and to allow Agrium to exercise its right to develop the Lease. The Proposed Action would assure ultimate maximum recovery as required by 43 Code of Federal Regulations (CFR) 3594.1 and the lease modifications would enlarge the lease area to recover additional ore outside the current Lease. The recovered ore would supply phosphate to the Agrium Conda Phosphate Operations (CPO) fertilizer manufacturing plant, located northeast of Soda Springs, Idaho. The BLM authorization is required for operations within the lease boundaries. The BLM is required to evaluate mining proposals and issue decisions related to the phosphate leases.

Because portions of the on-lease operations would also occur on NFS lands, the USFS is a joint lead agency in the analysis of potential effects on those lands, and the BLM has consulted with the USFS in completing the analysis for on-lease operations. USFS Special Use Authorizations (SUAs) are required for operations related to the Proposed Action located on NFS-managed lands outside the phosphate lease boundaries, such as roads, stockpiles, mineral material borrow areas, grazing permit modifications and water management features. If GM or fill material is to be borrowed from NFS-managed lands, the USFS would also need to issue a mineral material permits. A free use permit would be issued for material to be used on federal or state lands and a negotiated sale contract for material used on private lands. The USFS must determine whether and how to authorize the mineral material permits both on and off lease.

1.4 AUTHORIZING ACTIONS

1.4.1 Decisions to be Made

This section outlines key decisions and authorizing actions that may be required for this project. As stated in the **Section 1.1**, the BLM, the USFS, and cooperating and participating Agencies would respond to the Proposed Action and associated applications for authorizations based in part on the impact analysis in which they have participated or on which they have consulted for this EIS. The officials responsible for authorizing on-lease and off-lease mining activities and lease modifications are the BLM Idaho Falls District Manager and the USFS CTNF, Forest Supervisor, or a designated officer acting on their behalf. The BLM, in consultation with the surface manager, would decide whether or not to issue the lease modifications and approve the 2011 Mine and Reclamation Plan or an alternative to the 2011 Mine and Reclamation Plan. The BLM and the USFS would consider the following: comments and responses generated during the scoping and other opportunities for public comment; the Proponent's rights to recover leased mineral resources; anticipated environmental and socioeconomic consequences discussed in the Final EIS; and applicable laws, regulations, and policies. The BLM, using this Final EIS, would sign a Record of Decision (ROD) to approve or disapprove the proposed 2011 Mine and Reclamation Plan or alternatives within a Lease. The BLM District Manager would also recommend to the Idaho BLM State Office whether or not to approve the proposed phosphate lease expansion modifications.

The USFS authorization is required for all off-lease project-related operations on NFS lands, requiring the USFS to evaluate the Proposed Action and alternatives and issue decisions regarding the terms and conditions for any SUAs, mineral materials permits and grazing permit modifications or other USFS permits for any mine features or activities. These activities may include construction, maintenance, and use of haul roads, access roads, and power lines; vegetation removal; reclamation; use of GM, alluvium, and colluvium borrow and storage areas; or use of GM stockpiles located outside of the phosphate lease boundaries on NFS lands. The USFS would also make decisions regarding the use of mineral materials not associated with ore recovery both on and off lease on NFS lands and off-lease grazing permit modifications. The USFS would decide whether and how to authorize these actions pursuant to applicable laws and regulations. Based on the review of the Final EIS, the USFS would also prepare and sign a ROD to approve or disapprove the proposed 2011 Mine and Reclamation Plan or alternatives on any off-lease SUAs and mineral material permits.

1.4.2 Permits and Approvals

The proposed mining operations must comply with all laws and regulations for mining on public lands. In addition to the BLM, USFS, IDEQ, IDL, IDFG, and USACE, other federal, state, and local agencies and private landowners have independent and unique authorities or ownership over specific elements of the mining operations and certain aspects of the Proposed Action and Alternatives. **Table 1.4-1** lists the Agencies and identifies the authorizing responsibilities of each. This table includes regulatory requirements and authorizations that could affect project implementation under any action alternative. This list is not exhaustive, and additional approvals, permits, and authorizing actions could be necessary as the project develops.

Agrium would be required to obtain the appropriate permit(s) for discharges of stormwater from the project. Discharge of stormwater to surface water requires the operator to obtain a permit under Section 402 of the Clean Water Act (CWA). As authorized by the CWA, the National Pollutant Discharge Elimination System (NPDES) permit program controls water pollution by regulating point sources that discharge pollutants into waters of the U.S. (WOUS). In Idaho, the USEPA is the permitting authority for NPDES permits. Stormwater discharges associated with mining would require Agrium to obtain coverage under the NPDES Multi-Sector General Permit for Industrial Activities (MSGP).

The USACE may also require a Section 404 of the CWA (33 United States Code [U.S.C.] 1344) permit. The USACE would provide independent and separate decisions in response to any application the Proponent submits. At the end of the permit review, the USACE would issue a permit, issue a permit with required modifications, or deny the application for permit. Any decision to issue a permit would include approving measures to mitigate impacts to affected WOUS including wetlands.

Table 1.4-1 Major Permits, Approvals, and Authorizing Actions Potentially Required

Issuing Agency - Permit/Approval Name	Nature of Permit/Approval	Authority	Applicable Project Component	Timing of Submittal of Permit/Approval	Status of Permit/Approval
Bureau of Land Management (BLM)					
Mine and Reclamation Plan	Compliance with 43 CFR 3590.2(a), 3592.1(a); and the Pocatello BLM Approved Resource Management Plan (ARMP)	43 CFR 3590.2(a), 3592.1(a)	Activities affecting federal leased mineral resources	Required before beginning operations.	Pending signing of BLM ROD.
Mine Plan Modification – P4, LLC (P4)/South Rasmussen Mine	Compliance with 43 CFR 3590.2(a), 3592.1(a); and the Pocatello BLM ARMP	43 CFR 3590.2(a), 3592.1(a)	Activities affecting federal leased mineral resources. The Mine Plan for P4's South Rasmussen Mine on Federal Phosphate Lease IDI-23658 would need modification approval under the Rasmussen Collaborative Alternative (RCA)	Required before beginning operations.	Pending implementation of RCA.
Lease Modification	Authorize expanding existing lease boundaries	Mineral Leasing Act of 1920 (30 U.S.C. 181 et seq.); 43 CFR 3510	Boundary expansion of existing Federal Phosphate Lease I-05975	Approval must be obtained before commencement of mining activities on land covered by lease modification.	Pending Final EIS and District Manager recommendation.
U.S. Forest Service (USFS)					
Special Use Authorizations (SUAs)	Surface disturbance or activities on USFS managed lands	Organic Act; 36 CFR 251	Use and occupancy of NFS land including roads, stockpiles, and water management systems	Approval must be obtained before commencement of mining associated activities on USFS managed lands.	Pending issuance of the USFS ROD.

Table 1.4-1 Major Permits, Approvals, and Authorizing Actions Potentially Required

Issuing Agency - Permit/Approval Name	Nature of Permit/Approval	Authority	Applicable Project Component	Timing of Submittal of Permit/Approval	Status of Permit/Approval
Use Permits	Removal of mineral materials such as GM, alluvium, colluvium, or aggregate from USFS managed lands for use on federal or state lands	36 CFR Part 228, subpart C – Disposal of Mineral Materials	Removal of mineral materials such as GM, alluvium, colluvium, or aggregate from borrow areas on USFS managed lands for use on federal or state lands	Approval must be obtained before commencement of borrow of material from USFS managed lands.	Pending issuance of the USFS ROD.
Negotiated Sale Contract	Removal of mineral materials such as GM, alluvium, colluvium, or aggregate from USFS managed lands for use on private lands	36 CFR Part 228, subpart C – Disposal of Mineral Materials	Removal of mineral materials such as GM, alluvium, colluvium, or aggregate from USFS managed lands for use on private lands	Approval must be obtained before commencement of borrow of material from USFS managed lands.	Pending issuance of the USFS ROD.
U.S. Army Corps of Engineers (USACE)					
CWA Section 404 Permit	Authorizes placement of dredged or fill materials into WOUS, including adjacent wetlands	Section 404 of the CWA of 1972 (33 U.S.C. Part 1344)	Disturbances to WOUS including wetlands	Permit must be obtained and approved before commencement of construction.	Pending Final EIS. A permit would be obtained before the project commences, if required.
U.S. Fish and Wildlife Service (USFWS)					
Endangered Species Act (ESA) Compliance (Section 7)	Protects threatened and endangered species	Section 7 of the ESA of 1973, as amended (16 U.S.C. et seq.)	Any activity, such as displacement or habitat disturbance, that may affect listed or proposed threatened and endangered species	Federal agencies must ensure that actions would not jeopardize the continued existence of listed species or destroy or adversely modify designated critical habitat. Mitigation measures will be developed before commencement of construction.	No designated critical habitat is present in the Study Area. Analysis and mitigation measures for listed species are addressed in the Threatened, Endangered, and Sensitive Species sections of Chapters 3, 4, and 5.

Table 1.4-1 Major Permits, Approvals, and Authorizing Actions Potentially Required

Issuing Agency - Permit/Approval Name	Nature of Permit/Approval	Authority	Applicable Project Component	Timing of Submittal of Permit/Approval	Status of Permit/Approval
Migratory Bird Treaty Act	Protects migratory birds	Migratory Bird Treaty Act (16 U.S.C. 703-711)	All surface-disturbing activities	Impacts to migratory birds must be analyzed and, if applicable, mitigation measures developed before commencement of construction.	Analysis and mitigation measures are addressed in the Wildlife sections of Chapters 3, 4, and 5.
Bald and Golden Eagle Protection Act	Protects bald and golden eagles	Bald and Golden Eagle Protection Act (16 U.S.C. 668)	All surface-disturbing activities	Impacts to eagles must be analyzed and mitigation measures developed before commencement of construction.	Analysis and mitigation measures are addressed in the Wildlife sections of Chapters 3, 4, and 5.
U.S. Environmental Protection Agency (USEPA)					
NPDES Permit	Authorizes the discharge of stormwater or water generated from mining activities including pit dewatering	Section 402 of the CWA of 1972 (33 U.S.C. Part 1342)	Exploration, construction, active mining, and reclamation activities	Permit must be obtained and approved before discharge of stormwater or project-generated water.	Pending. Agrium would submit a Notice of Intent (NOI) for coverage under an MSGP Stormwater Permit for Industrial Activity or an individual NPDES Permit if required by the USEPA.
Spill Prevention Control and Countermeasures (SPCC) Plan	Provides management direction for potential spills	SPCC Rule (40 CFR 112)	Bulk petroleum products storage	Must be prepared and implemented before beginning operations that require bulk storage of petroleum products.	Pending. SPCC Plan would be developed and implemented before storage of regulated quantities of petroleum products.
Bureau of Alcohol, Tobacco, and Firearms (ATF)					
High Explosives Permit	Possession of Explosives	18 U.S.C. 40; 27 CFR 555	Blasting in open pits	Must be obtained before acquiring and storing explosives on site.	Pending. Required high explosives permit would be obtained before commencement of storage of regulated high explosives.

Table 1.4-1 Major Permits, Approvals, and Authorizing Actions Potentially Required

Issuing Agency - Permit/Approval Name	Nature of Permit/Approval	Authority	Applicable Project Component	Timing of Submittal of Permit/Approval	Status of Permit/Approval
Mine Safety and Health Administration (MSHA)					
MSHA Registration Notice of Legal Identity Notice of Mine Opening or Closing MSHA Approval Mine Health & Safety Training Plan	Filings required	30 CFR Part 41; 30 CFR Part 46	Mine installation	No formal permitting requirements; however: – Notification is required to establish legal identity and mine opening and closing. – Notice must be filed within 30 days after mine opening. Mine Health and Safety Training Plan must be developed and approved before operation. Mandatory federal regulations for work safety must also be met (assumes that the Revised Mine Plan is approved). Routine mine inspections must be established.	Pending. MSHA notification for legal identity to be submitted to the MSHA before commencement of construction. Mine opening notification would be made to the MSHA before commencement of operations. Mine Health and Safety Training Plan to be developed and implemented before commencement of operations. Mandatory federal regulations for worker safety would be complied with during construction and operations.
Idaho Department of Environmental Quality (IDEQ)					
Air Quality Permit(s)	Controls release of air pollutants	Idaho Administrative Procedures Act (IDAPA) 58 – Department of Environmental Quality 58.01.01 - Rules for the Control of Air Pollution in Idaho	Elements that contribute to air quality issues such as blasting, hauling, or crushing	Permit to construct must be obtained before commencement of construction, unless requirements of IDAPA 58.01.01 Section 213 are met. Tier I or Tier II Operating Permit may be required before beginning operations depending on emissions levels.	Pending. Required permits would be obtained before commencement of construction.

Table 1.4-1 Major Permits, Approvals, and Authorizing Actions Potentially Required

Issuing Agency - Permit/Approval Name	Nature of Permit/Approval	Authority	Applicable Project Component	Timing of Submittal of Permit/Approval	Status of Permit/Approval
Resource Conservation and Recovery Act program (adopted federal standards) Generator Status: Conditionally Exempt Small Quantity Generator	Management of hazardous waste	Idaho Hazardous Waste Management Act, Idaho Code Title 39 Chapter 44 (39-4401) and IDAPA 58.01.05, Rules and Standards for Hazardous Waste	Temporary storage and off-site disposal of hazardous wastes No treatment, disposal, and storage facilities would be required	Waste generator status must be determined before generation of hazardous wastes on site.	Pending. Waste generator status would be determined before generation of hazardous wastes.
Certification of Water Quality (CWA, Section 401)	Protects quality of navigable waters from discharges	Section 401 of the CWA of 1972; 33 U.S.C. Part 1341; Idaho Code Parts 39-101 et seq.; Idaho Code Parts 39-3601 et seq.	Required for any permit issued by a federal agency for any activity that may result in a discharge to navigable waters to ensure state water quality standards would be met	Certification must be received before approval of a federal permit that may result in discharge to navigable waters. Federal permit and certification required before commencement of construction.	Pending. The Certification of Water Quality will be obtained before issuance of a USACE 404 Permit and an USEPA NPDES Permit, if required.
Ground Water Quality Rules, Point of Compliance (POC) determination	Protects beneficial uses of groundwater	IDAPA 58.01.011 Ground Water Quality Rule	Excavation and disposal of mining overburden and the potential for percolating precipitation to leach deleterious constituents into groundwater	Based on EIS analysis of groundwater impacts, the mine operator has a POC which requires that BMPs must be used throughout the life of the mine to the maximum extent practical.	IDEQ has issued POC determinations for the proposed Rasmussen Valley Mine and P4's South Rasmussen Mine in accordance with the Ground Water Quality Rule.
Individual/Subsurface Sewage Disposal Rules	Protects human health and the environment	IDAPA 58.01.03 Individual/Subsurface Sewage Disposal Rules	Construction of a septic system	Permit application must be filed at least 60 days before commencement of construction, and permit must be obtained before construction.	Pending. To be obtained before commencement of construction.

Table 1.4-1 Major Permits, Approvals, and Authorizing Actions Potentially Required

Issuing Agency - Permit/Approval Name	Nature of Permit/Approval	Authority	Applicable Project Component	Timing of Submittal of Permit/Approval	Status of Permit/Approval
Idaho Department of Water Resources (IDWR)					
Stream Channel Alteration Permit	Protection of perennial stream channels	Idaho Code Part 42-3803; IDAPA 37.03.07, Stream Channel Alteration Rules	Haul road crossings	Permit application must be filed at least 60 days before commencement of construction, and permit must be obtained before construction.	Pending. Required permits would be obtained before construction activities affecting perennial stream channels (e.g., haul roads).
Water Rights	Rights to surface water and groundwater rights of appropriation	Idaho Code Parts 42-201 et seq.; IDAPA 37.03.08, Water Appropriation Rules and 37.03.11 Conjunctive Management of Surface and Ground Water.	Mine dewatering, evaporation, and dust suppression	Water rights must be obtained before commencement of regulated consumptive use.	Pending. To be obtained before commencement of regulated consumptive use.
Idaho Department of Lands (IDL)					
Reclamation Plan Approval for Rasmussen Valley Mine	Approval and bonding for reclamation of Rasmussen Valley Mine	Idaho Code Parts 47-1501 et seq., IDAPA 20.03.02.070, 20.03.02.120, 20.03.02.140	Reclamation Plan	Reclamation Plan must be submitted and approved before beginning operations.	Pending. Approval will be obtained before commencement of mining activities.
Operations and Reclamation Plan Modification – P4, LLC (P4) South Rasmussen Mine	Authorizes the P4 South Rasmussen Mine to accept Rasmussen Valley Mine overburden in their South Rasmussen Mine pit, revises the cover for the overburden, and adds haul road	Idaho Code Parts 47-1501 et seq., IDAPA 20.03.02.070, 20.03.02.120, 20.03.02.140	Backfill to the P4 South Rasmussen Mine pit	Reclamation Plan must be submitted and approved before beginning operations.	Pending. Approval would be obtained before commencement of mining activities.

Table 1.4-1 Major Permits, Approvals, and Authorizing Actions Potentially Required

Issuing Agency - Permit/Approval Name	Nature of Permit/Approval	Authority	Applicable Project Component	Timing of Submittal of Permit/Approval	Status of Permit/Approval
Lease Agreement	Authorizes Agrium to build and operate an ore haul road across P4's state lease for the South Rasmussen Mine (Idaho State Lease #7958; the State Lease) and to install POC wells and associated well access roads on the State Lease	Idaho Code Part 47-708, Rights and Liabilities of Lessees	Haul Road and POC wells on the State Lease	Lease agreement must be approved before construction of the wells and/or access roads	Pending. Approval would be obtained before commencement of mining activities.
Idaho Department of Fish and Game (IDFG)					
Agreement for activities on Blackfoot River WMA	Surface owner agreement; temporary use permit	Surface owner rights	Mine activities, water management structures, and access roads	Surface owner agreement must be finalized before the ROD is signed.	Pending. Approval for activities would be obtained before signing of the ROD.
Idaho State Historic Preservation Office (SHPO)					
National Historic Preservation Act (NHPA) Compliance, Section 106	Protects cultural and historical resources	NHPA, Section 106; Idaho Code Parts 67-4113 et seq.; 36 CFR 800 Protection of Historic Properties	All ground-disturbing activities	Consultation with the SHPO required before decision on the Revised Mine Plan.	SHPO approval on the expanded Study Area including alternatives has been obtained.
Caribou County					
Conditional Use Permit	Approval of facilities within an approved land use	Caribou County Zoning Ordinance, Chapter 13	Required if landfill or petroleum remediation pad is constructed	Permit must be obtained before commencement of construction.	Any required conditional use permit will be obtained before commencement of construction.
County Road Realignment Approval	Compliance with the Caribou County Comprehensive Plan, Element 3	Caribou County Zoning Ordinance	Required for modifications to county roads	Must be approved before construction.	Any required permit or approval will be obtained before construction.
Other					
Surface landowner agreement	Land use agreement	Surface owner rights for any non-proponent owned land	Mine activities, water management structures, haul roads, and access roads	Surface owner agreement must be finalized before the ROD is signed.	Agreement will be finalized before issuing the ROD.

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If Agrium's Mine and Reclamation Plan is approved, the Proponent would be required to obtain a reclamation performance bonds for the Rasmussen Valley Mine before conducting any land-disturbing activities. The bond calculation would be based on the Selected Alternative as identified in the BLM and USFS RODs. The reclamation bond will be calculated by Agrium and approved by the BLM, the USFS, and the IDL, after both the BLM and USFS RODs are signed.

This estimate would be refined as a condition of the ROD when all conditions of approval are known. At that time, Agrium would post actual-cost bonds in accordance with the BLM and the USFS policy to ensure compliance with reclamation requirements.

The BLM has adopted a performance bond guidance policy (Bond Requirement for Phosphate Mining Operations, September 10, 2013) that prescribes the procedures for ensuring that an accurate actual-cost reclamation bond is in effect for phosphate mines in Idaho. The policy prescribes that a bond will be required after the ROD has been signed and an alternative selected. This ensures that the bond is based on an accurate bond scenario from which to calculate the cost of reclamation. It is only then that the final mine and reclamation plan is known, and that the environmental monitoring and other details would be known upon which to calculate a reclamation bond.

The policy ensures that the bond:

- Covers an appropriate reclamation scenario that meets the requirements in the ROD or Decision Record (DR) and approved reclamation plan or plan modification.
- Uses unit costs, production factors, quantity take-off, tasks, and calculation methods that are reasonable and appropriately accurate to support development of an "actual-cost" estimate. Quantity take-off consists of using engineering drawings and figures to determine the quantities and types of materials that need to be handled or procured.
- Is equitable among operators (i.e., that one operator does not gain a competitive advantage by using more favorable, but unsupported unit costs, factors, or methodologies to calculate their bond).

The status of planned and actual mining and reclamation would be formally reviewed every 3 years by the BLM, and as required by policy by the USFS, or more often if there are substantive changes to the mine plan. These reviews, and information provided by Agrium, would provide the BLM and the USFS with a basis to revise the required reclamation bond amounts if necessary. As reclaimed areas are approved for release by the BLM and the USFS, or as actual-cost calculations demonstrate, Agrium may request a lower bond amount for these areas. Thus, it is not necessary for the federal government to require a bond for the entire life-of-mine reclamation scope of work; rather, there should always be enough bond in place to cover the maximum reclamation liability for the time period used for the bond calculation, but not less than 3 years unless the remaining mine reclamation obligation period is shorter. The bond would be reviewed and adjusted at any point in time where unanticipated impacts might be predicted to occur. The bond would be increased in order to ensure adaptive measures are implemented to comply with established requirements.

1.5 LAND USE PLAN CONFORMANCE

The Proposed Action must comply with agency policies, plans, and programs. The Revised Forest Plan (RFP) for the Caribou National Forest (CNF; USFS 2003) and the BLM Pocatello Field Office (PFO) ARMP (BLM 2012a) guide land use development on federal lands where the

Proposed Action is occurring. The BLM ARMP also applies to “split-estate land” (non-federally owned surface where the mineral estate is federally owned). The CNF RFP includes desired future conditions (DFCs), goals, objectives, standards, and guidelines for mineral operations, including reclamation and hazardous substance management, and lists a management prescription specific to phosphate mine areas. The PFO ARMP specifically addresses goals, objectives, actions, standards, and guidelines that aim to develop mineral resources consistent with other resources and uses. Goal ME-2 of the PFO ARMP for minerals and energy specifies that mineral resources are to be developed "as part of an ecologically healthy ecosystem." Goals and management direction for other resources in the PFO ARMP also emphasize management as part of an ecologically healthy system. CNF RFP forest-wide standards and guidelines for general mining, drastically disturbed lands, and phosphate mine areas, and PFO ARMP operational standards and guidelines for minerals and energy, would apply during implementation of the ROD-approved action as appropriate. The Proposed Action has been reviewed for compliance with forest-wide goals, objectives, standards, and guidelines stated in the CNF RFP and with the PFO ARMP for specific resources. The compliance review is discussed in appropriate resource sections in **Chapter 4** of the Final EIS.

Management prescriptions have been developed and are applied to specific areas of the NFS lands to attain multiple-use and other goals and objectives. The Study Area includes three management prescriptions (**Figure 1.2-2**): Prescription 2.7.2 (d) – Elk and Deer Winter Range, Prescription 6.2 (b) – Rangeland Vegetation Management, and Prescription 8.2.1 – Inactive Phosphate Leases (USFS 2003).

Almost all the Study Area is within the 8.2.1 Management Prescription. This management prescription area is shown on Map 11 of the RFP (USFS 2003). It is basically a 0.5 mile buffer around KPLAs and inactive leases that existed at the time the RFP was prepared, and it was intended to include phosphate mining operations and ancillary facilities needed for development of mines within the 8.2.1 management prescription area. This same area is also covered by other management prescriptions shown on Map 8 of the RFP. Those are the prescriptions that guide USFS management until a site-specific, phosphate mine development plan is submitted to the USFS. Then the area of the specific mine plan is intended to only be managed under prescription 8.2.2, Phosphate Mine Areas. Thus, the RFP management prescription that applies to this Study Area is 8.2.2, with the exception of components that occur outside the 0.5-mile buffer area (e.g. haul road segments). In these areas, the appropriate prescription would be in effect.

The management prescriptions are not designed to stand alone and are part of the management direction package presented in the RFP. Where a management prescription allows an activity, such as the development of existing phosphate leases, the standards and guidelines in the prescription in the Forest-wide direction (explained below) would provide specific parameters within which the activity must be managed. In land areas where prescriptions are applied, direction provided under each prescription would override Forest-wide direction if there were a conflict. Under Prescription 8.2.2 (USFS 2003), site-specific mining and reclamation plans developed by the mining industry will be jointly reviewed and evaluated by the USFS, BLM, and other regulatory agencies with jurisdiction through the environmental analysis process. One of the goals of this prescription is to “Provide for phosphate resource development with consideration given to biological, physical, social, and economic resources” (USFS 2003).

The RFP also provides Forest-wide guidance for DFCs for each resource. From these DFCs, Forest-wide goals have been formulated, and, for some resources, objectives have been developed to help measure the progress in meeting these goals and achieving DFCs. Standards and guidelines, by resource, are presented in the RFP and are used to promote the achievement of the DFCs and to assure compliance with laws, regulations, executive orders

(EOs), or policy direction established by the USFS. Disclosure of and compliance with these Forest-wide Standards and Guidelines and the applicable prescriptions listed above are discussed within this EIS (**Chapter 4**).

The CNF RFP specifically addresses the requirements of the National Forest Management Act. The PFO ARMP conforms to the planning regulations and guidance of the Federal Land Policy and Management Act (FLPMA) and the BLM's Land Use Planning Handbook, H-1601-1. However, both the CTNF and the BLM planning and actions must also comply with other applicable state and federal laws, EOs, and the associated implementing regulations including but not limited to: FLPMA, the Multiple Use and Sustained Yield Act, the NEPA, the ESA, the CWA, the Clean Air Act, EOs 11988 (Floodplain Management) and 11990 (Protection of Wetlands), and Idaho Air and Water Quality Standards. In addition, as part of the CTNF and the BLM responsibility in the management of unoccupied public lands in Idaho, these agencies must comply with the conditions and responsibilities of the Fort Bridger Treaty of 1868.

1.6 PUBLIC INVOLVEMENT

Public involvement is an important requirement of the NEPA process. Regulations published by the Council on Environmental Quality (CEQ), the BLM, and the USFS provide several opportunities for the public to participate. These include public and internal scoping of the Proposed Action, a comment period for the Draft EIS, and comments and objection periods for the Final EIS and BLM and USFS RODs.

1.6.1 Scoping

Public scoping for the Draft EIS formally began on March 1, 2011. On that date, the BLM published a NOI to prepare an EIS in the *Federal Register* (Vol. 76, No. 40, page 11,259). The notice announced the Agencies' intent to conduct an environmental analysis of phosphate ore mining at the proposed Rasmussen Valley Mine.

On March 4, 2011, the BLM and the USFS issued a public notice in the Caribou County Sun and the Idaho State Journal. The public notice announced the Agencies' intent to conduct an environmental analysis of phosphate ore mining at the Rasmussen Valley Mine and the dates and locations of three public meetings scheduled to solicit and receive comments on the Proposed Action. The public notice also announced that the period for submitting written comments for public scoping would end on March 31, 2011. A public mailing list was also compiled, and scoping letters were sent to federal, state, tribal, and local government agencies and members of the interested public. This Proposed Action was placed into the ePlanning database for the BLM and the Schedule of Proposed Actions (SOPA) database for the USFS at the beginning of the NEPA impact assessment and will remain in the database until after the ROD is signed. This database is updated quarterly and is accessible to the general public. Scoping is detailed in **Chapter 6** of this Final EIS.

Three public meetings were held on consecutive evenings (March 21, 22, and 23, 2011) in Soda Springs, Pocatello, and Fort Hall, Idaho, to discuss the proposal and receive comments from the public. The meetings were conducted in an open house format, with representatives of the Agencies, Agrium, and the third-party EIS contractor (Arcadis) in attendance. Public comments were solicited and then compiled to help define the key issues and alternatives for evaluation in the environmental analysis. Key issues identified from the public scoping process include potential effects of the Proposed Action on water resources; socioeconomic conditions; livestock grazing; reclamation and restoration; wildlife and vegetation; soils; threatened, endangered, and sensitive species; air quality; aesthetics; land use; scenic resources; hazardous and solid wastes; and public health as identified in **Section 1.6.5**.

1.6.2 Draft EIS Comments

On September 18, 2015, the Draft EIS was published and was sent to government agencies, the Shoshone-Bannock Tribes (Tribes), educational institutions, public media, organizations and businesses, and interested individuals. The public was allowed 45 days to respond with their comments on the Draft EIS. The 45-day comment period was scheduled to end November 2, 2015. In addition, public meetings were held on October 6 and 7, 2015 at the BLM PFO and at the USFS Soda Springs Ranger District in Soda Springs, Idaho.

A total of 1,010 comment letters were received, many of which contained more than one comment, which represented a total of 1,295 comments on the Draft EIS. A list of these comments and associated letters, emails, and handwritten comments received at the public meetings was distributed to Agrium, the Agencies, and subject matter experts for responses. Arcadis processed all of the comments on the Draft EIS received by the close of the comment period on behalf of the BLM. Public input on the Draft EIS was compiled, documented, categorized, and analyzed to ensure capture of the full range of public viewpoints and concerns regarding a plan or project. In addition, in response to public comments, project alternatives were modified and portions of the EIS were revised to clarify issues or add important details. These comments and responses are incorporated into the Final EIS (**Appendix A**).

1.6.3 Final EIS and RODs

This Final EIS will be available for public review after the USEPA publishes its Notice of Availability (NOA) of the Final EIS in the *Federal Register*. The USFS Draft ROD will be available for objection after publication of a legal notice in the newspaper of record (Idaho State Journal) to coincide with the release of the Final EIS. A legal notice of the Final USFS ROD will be published in the newspaper of record no sooner than 5 business days following the end of the 45-day objection period after the Draft USFS ROD has been announced and made available. The BLM ROD will be released and announced separately, and no sooner than 30 days after the Final EIS NOA.

1.6.4 Tribal Treaty Rights and Native American Consultation

The 1868 Fort Bridger Treaty between the United States and the Shoshone and Bannock Tribes reserves the Tribes' right to hunt, fish, gather, and exercise other traditional uses and practices on unoccupied federal lands. In addition to these rights, the Tribes have the right to graze tribal livestock and cut timber for tribal use on those lands of the original Fort Hall Reservation that were ceded to the federal government under the Agreement of February 5, 1898, ratified by the Act of June 6, 1900. Under this treaty and those agreements, the federal government has a unique trust relationship with the Shoshone-Bannock Tribes. BLM has a responsibility and obligation to consider and consult on potential effects to natural resources related to the Tribes' treaty rights or cultural use.

Federal agencies, including the BLM, the USFS, and the USACE, have the responsibility and obligation to consider and consult on potential effects to tribal treaty rights, uses, and interests. Government-to-government or informal staff-to-staff consultation with the Shoshone-Bannock Tribal Council (the Council) is undertaken as requested by the Council or their staff on land management activities and land uses that could affect the exercise of these rights. The PFO ARMP (BLM 2012a) includes goals and actions that recognize tribal treaty rights and tribal involvement in resource and resource use decisions including lands and realty, soil and water, vegetation, and fish and wildlife. Coordination with tribal staff is ongoing among the Agencies and the Tribes.

BLM staff met several times with tribal staff over the years beginning on January 10, 2011, when they presented an overview of this project. The tribal staff expressed interest in following the project and requested updates on project progress. Consequently, subsequent meetings have been held as discussed in **Section 6.3**, including meetings on October 9, 2015; February 26, 2016; and March 3, 2016, to discuss the Draft EIS. To ensure a thorough assessment of issues and potential impacts to American Indian tribal rights and interests, including reserved treaty rights, coordination with the Tribes will continue throughout the NEPA process. Because the treaty rights are related to surface management and not the mineral estate, the BLM also relies on coordination with the USFS and compliance with the CNF RFP (USFS 2003) to ensure sufficient protection of those resources to which the Shoshone-Bannock people have certain rights.

As managers of unoccupied federal lands, the USFS managers are responsible for managing resources that are essential for the Tribes to exercise their treaty rights. Concerns and objections that the Tribes have with this project are discussed in this Final EIS. The USFS consultation procedures and intergovernmental agreements with the Tribes to guide future cooperative efforts shall comply with the protocols set forth in the CNF RFP (USFS 2003).

The goal of consultation with the Tribes on the part of both the BLM and the USFS is to ensure that tribal governments, Native American communities, and individuals whose interests might be affected have sufficient opportunity for productive participation in NEPA process decisions. Both agencies have made numerous contacts with the Tribes at various levels that have included public meetings and meetings with tribal technical staff. Tribal and community contacts and encouragement of productive participation will continue throughout the NEPA process.

1.6.5 Issues and Indicators

The issues of concern for the Draft EIS were identified during the public and internal scoping process via input from the Agencies and public and from experience with other similar projects in the general area. The issues identified through this process and carried through the EIS analysis are summarized in **Table 1.6-1** and discussed in greater detail at the beginning of each resource section included in **Chapter 4**. This table also provides references to the resource sections in **Chapters 3, 4,** and **5** of this Final EIS that contain the analysis of each issue.

In **Table 1.6-1**, the defined issues are presented under components of the human and natural environment (e.g., water resources, air quality, noise, and other issues) that are customarily addressed in impact analysis. The indicators are typically the quantifiable criteria used to judge the intensity, extent, and timing of the impact, although some indicators rely on a discussion evaluation of effects instead of quantifiable indicators to compare impacts or actions. Indicators are based on regulatory requirements, baseline data, trends, and best management technology. A description of the issues and indicators by topic is provided in **Table 1.6-1**.

No issues were identified for the following elements or resources.

- Areas of Critical Environmental Concern (ACECs) or Research Natural Areas (RNAs):
  - There are no ACECs in the general area of the Study Area.
  - The RNA closest to the Study Area is the Horse Creek RNA, 8 miles east of the Study Area.

- Designated Wilderness:
  - There is no Designated Wilderness near the Study Area.
  - The closest Designated Wilderness is the Bridger Wilderness, 73 miles to the east in Wyoming.
- Inventoried Roadless Areas (IRAs):
  - There are no IRAs in the Study Area.
  - The nearest IRA is the Stump Creek IRA, 2 miles east of the Study Area.
- Wild and Scenic Rivers (WSRs):
  - There are no designated WSRs near the Study Area.
  - The nearest WSRs to the Study Area are the Bear River WSR (which is in a different watershed) and the Blackfoot River WSR (which is downstream of the Blackfoot Reservoir).
- Floodplains:
  - No designated floodplains occur in the Study Area.
  - The closest designated floodplain to the Study Area is at the Snake River near the City of Blackfoot, Bingham County, Idaho, 85 miles downstream. The Blackfoot Reservoir, the Equalizing Reservoir near Blackfoot, and the Cove would mitigate any potential effects to the floodplain from the upper Blackfoot River.
- Prime and Unique Farmlands:
  - No Prime and Unique Farmland were identified in the Study Area.
- Wild Horses and Burros:
  - No wild horses or burros occur within the Study Area.

Consequently, these resources are not analyzed in this Final EIS because they are not present or do not occur near the Study Area.

Table 1.6-1 Summary of Issues Carried through for Impact Analysis

Issues	Indicators	Final EIS Resource Sections in Chapters 3, 4, and 5
Geotechnical		
How does apparent geotechnical instability of portions of the Study Area affect the stability of the proposed external overburden piles, GM stockpiles, haul roads, and other mine facilities?	Quantifiable geotechnical stability safety factors or equivalent stability analysis for overburden piles Predicted slope stability Delineation of areas of unstable landforms and soil map units containing unstable landforms	Geology, Soils, Minerals, and Paleontology
How would slope stability downslope of the external overburden piles be affected by the overburden piles?	Predicted slope stability Delineation of areas of unstable landforms and soil map units containing unstable landforms	Geology, Soils, Minerals, and Paleontology
Paleontology		
What are the potential effects on paleontological resources?	Disturbance of significant fossil-producing deposits or covering of potential fossil-bearing areas, and removing them from access for research	Geology, Minerals, and Paleontology
Air Quality		
What is the potential for emission of air pollutants, including those associated with airborne particulate matter from mining operations and mine traffic on haul roads and access roads?	Increased emissions of fugitive dust (airborne particulate matter) from proposed mining activities	Air Resources, Climate, and Noise
Climate Change		
What is the potential to increase emissions from construction and operation and release greenhouse gas (GHG) emissions, which have been implicated in climate change?	Levels of carbon dioxide (CO_2), nitrous oxide (N_2O), and methane (CH_4) emissions from proposed mining activities; predicted cumulative effects Changes in global climate affecting operations and reclamation including cover performance	Air Resources, Climate, and Noise

Table 1.6-1 Summary of Issues Carried through for Impact Analysis

Issues	Indicators	Final EIS Resource Sections in Chapters 3, 4, and 5
Noise		
What is the potential for noise impacts at sensitive receptors as a result of mine operations, mine traffic on haul and access roads, and blasting?	Predicted noise levels from mining operations, haul truck traffic related to mining, and access road traffic that are experienced 1) at sensitive receptors and residences, and 2) at outdoor areas where people spend widely varying amounts of time.	Air Resources, Climate, and Noise
Water Resources		
What is the potential for changes to the volume and timing of surface water runoff and flow patterns to impact the Lanes Creek, Angus Creek, and Blackfoot River drainages and local intermediate and regional aquifers?	Changes in volume, rates, or timing of runoff; flow patterns; base and peak flows; recharge rates or volume or rates to local, intermediate, and regional aquifers	Water Resources
What is the potential for changes in sediment, turbidity, and COPC loading to impact Lanes Creek, Angus Creek, Blackfoot River, wetlands, ponds, and springs, and the impacts of those changes to surface water quality accessed by humans, wildlife, and aquatic organisms or cause non-compliance of the water bodies with applicable water quality standards?	Predicted changes in sediment loads, turbidity, and concentrations of COPCs in springs, wetlands, and WOUS; ponds; Lanes Creek; Angus Creek; and Blackfoot River	Water Resources
What is the potential for changes in concentrations of COPCs downgradient of the proposed mine facilities to impact the quality of groundwater accessed by humans and create non-compliance of the groundwater with applicable water quality standards?	Changes in concentrations of COPCs in groundwater	Water Resources
What is the potential that reductions in groundwater discharge to Lanes Creek, Angus Creek, Blackfoot River, ponds, springs, and wetlands would affect water availability for humans, wildlife, and aquatic organisms?	Estimated changes to baseflow in streams, pond water levels, spring flows, and wetland areas Increased depth to groundwater	Water Resources

Table 1.6-1 Summary of Issues Carried through for Impact Analysis

Issues	Indicators	Final EIS Resource Sections in Chapters 3, 4, and 5
Soils		
What are the potential impacts to soil services and resources?	Acres of soil disturbance by soil type resulting from mining • Estimated volumes of topsoil or other suitable material available for reclamation • Estimated quality of soil salvaged for reclamation • Acres of disturbance not reclaimed at the conclusion of mining • Compliance with PFO ARMP, CNF RFP, and other applicable federal and state management plan direction	Soils
What is the potential for soil erosion and sediment delivery resulting from mining activity to impact soil quality and surface water?	Acres of soil disturbance with moderate to high erosion hazard	Soils
What are the impacts on soil chemical and physical properties, specifically those related to selenium and other COPCs, and vegetative productivity?	• Estimated change in plant-available selenium and other COPCs • Estimated change in soil depth between baseline conditions and final reclamation with GM • Estimated changes in soil loss because of erosion • Changes in soil productivity properties affecting potential vegetative success	Soils

Table 1.6-1 Summary of Issues Carried through for Impact Analysis

Issues	Indicators	Final EIS Resource Sections in Chapters 3, 4, and 5
Vegetation		
What is the potential for impacts to vegetative productivity?	Changes in the local vegetation communities and relative success of reclamation as related to changes in cover percent and richness	Vegetation, Riparian Areas, and Wetlands
What is the potential for impacts to vegetation patterns?	Acres of disturbed area that are planned for reclamation, the types of vegetation that would be restored, and the number of years it would take for restoration to be completed and mature Potential for bioaccumulation of COPCs (including selenium) in the reclamation vegetation in excess of stated PFO ARMP guidance or CNF RFP prescriptions for phosphate lease areas Acres of vegetation conversion from forest to non-forest cover and predicted re-establishment potential to return to forested condition over time Changes in grassland fuel load related to conversion to non-forest cover and resulting changes in fire regimes Acres of snag habitat and old growth forest removed	Vegetation, Riparian Areas, and Wetlands
What is the potential for the introduction or spread invasive, non-native, or noxious plant species?	Acres of disturbed land potentially subjected to invasive plant species	Vegetation, Riparian Areas, and Wetlands

Table 1.6-1 Summary of Issues Carried through for Impact Analysis

Issues	Indicators	Final EIS Resource Sections in Chapters 3, 4, and 5
What is the potential for impacts on pollinators?	Acres of disturbance to vegetation types favorable to pollinators Vegetation types that would be re-established by reclamation and balance of plant species in the reclamation seed mixes that would benefit pollinator populations Delay time for complete reclamation of habitat favorable to pollinator populations	Vegetation, Riparian Areas, and Wetlands
Wetlands and Riparian Areas		
What is the potential for construction and surface disturbance to impact WOUS including wetlands?	Acres of direct impact to WOUS, or change in function and value of wetlands disturbed by the mine and related facilities Change in water balance entering and leaving wetlands Changes in the concentrations of contaminants or sediments to WOUS, including wetlands	Vegetation, Riparian Areas, and Wetlands
Wildlife		
What is the potential to impact wildlife through mortality and displacement?	Increase in mining and transportation-related noise levels in wildlife habitat Increased wildlife mortality through vehicle and power line collisions Disruption and displacement of wildlife from high value habitats (e.g., movement corridors, wintering areas, calving areas, nest sites, wetland and riparian habitats)	Terrestrial Wildlife

Table 1.6-1 Summary of Issues Carried through for Impact Analysis

Issues	Indicators	Final EIS Resource Sections in Chapters 3, 4, and 5
What is the potential to impact wildlife through habitat removal and alteration?	Acres of different wildlife habitats physically disturbed and reclaimed Changes in predator/prey interactions and species composition of wildlife community	Terrestrial Wildlife
What is the potential for toxicity to wildlife from selenium or other COPCs?	Wildlife exposure through uptake of selenium or other COPCs in vegetation Wildlife exposure through release of selenium or other COPCs into surface waters	Terrestrial Wildlife
What is the potential to impact migratory birds?	Reduction in the quality or quantity of habitats used by migratory birds Direct mortality of migratory birds Disturbance to migratory birds from noise and mining activity	Terrestrial Wildlife
Fisheries and Aquatic Species		
What is the potential to impact aquatic habitats and aquatic species?	The length of intermittent and perennial stream channels directly affected by road fill and associated culverts, and comparison with the undisturbed lengths of these stream channels in the analysis area Quantities of suspended sediment and COPCs in fishery resources in the area, with emphasis on compliance with applicable aquatic life water quality standards	Fisheries and Aquatic Resources

Table 1.6-1 Summary of Issues Carried through for Impact Analysis

Issues	Indicators	Final EIS Resource Sections in Chapters 3, 4, and 5
	High selenium or other COPC levels in macroinvertebrates, amphibians, and fish Compliance with the applicable PFO ARMP and CNF RFP Standards and Guidelines	
What is the potential for impacts to the aquatic influence zone (AIZ)?	Reduction in the size of AIZ (acres) Reduction in the quality of the AIZ such that there is a detrimental effect on aquatic resources	Fisheries and Aquatic Resources
Threatened, Endangered, or Sensitive Species		
What is the potential impact to threatened, endangered, or sensitive species through mortality and displacement?	Disruption of movement corridors between habitat areas Disruption and displacement of threatened, endangered, or sensitive species at lek, nest, or roost sites Disturbance to threatened, endangered, or sensitive species from noise and mining activity Mortality of threatened, endangered, and sensitive species through vehicle and power line collisions	Threatened, Endangered, or Sensitive Species
What is the potential to impact threatened, endangered, or sensitive species through habitat removal and alteration?	Acres of habitats for threatened, endangered, or threatened species physically disturbed and reclaimed Changes in predator/prey interactions for threatened, endangered, or sensitive species	Threatened, Endangered, or Sensitive Species

Table 1.6-1 Summary of Issues Carried through for Impact Analysis

Issues	Indicators	Final EIS Resource Sections in Chapters 3, 4, and 5
	Impacts to culturally significant plant species	
What is the potential exposure to toxic substances (such as selenium or other COPCs) to threatened, endangered, or sensitive species?	Expected concentration of selenium or other COPCs in vegetation and surface waters	Threatened, Endangered, or Sensitive Species
Visual Resources		
What are the potential visual impacts on the scenic landscape?	Change in scenic attractiveness from various public and occupied points within the analysis area including post-reclamation changes Compliance with the Visual Quality Objectives of the CNF RFP Compliance with the objectives of Visual Resource Management system per the PFO ARMP Use of mining BMPs regarding light pollution	Visual Resources
Land Use, Grazing		
What are the potential effects to approved range allotments for livestock grazing within and adjacent to the Study Area?	Estimated short- and long-term displacement of range allotments by mine facilities (reduced number of grazing allotments) Calculated changes in forage production, carrying capacity, or rangeland condition of grazing allotments Estimated reduction in acreage suitable for range allotments as a result of insufficient water availability (changes to the number	Land Use, Access, and Transportation

Table 1.6-1 Summary of Issues Carried through for Impact Analysis

Issues	Indicators	Final EIS Resource Sections in Chapters 3, 4, and 5
	of watering points and locations) or unsuitable water quality (high levels of selenium or other COPCs) Reduction in diversity of vegetation or forage value as a result of reclamation species mix (increased occurrence of invasive or noxious species) within grazing allotments Potential for vegetative uptake of COPCs to exceed action levels	
Land Use, Transportation		
What are effects of increased traffic on public roads used for mine access and associated increased potential for traffic accidents?	Estimated increase in average daily traffic on public roads in the analysis area as a result of proposed mining activities Estimated increased number of heavy-duty vehicles and heavy equipment traveling on public roads	Land Use, Access, and Transportation
Land Use, Recreation		
What are the potential effects to existing recreational uses (hunting, fishing, hiking, wildlife viewing, winter recreation, and the Blackfoot River WMA) or other land uses, including effects on public access to recreational areas?	Acres of temporary and long-term impacts to land uses Indirect effects to the Blackfoot River WMA, including displacement of game during hunting seasons and changes to the quality of the recreational experience Displacement of recreational or other land uses by mine-related activities Diminished quality of the recreational experience or indirect	Land Use, Access, and Transportation

Table 1.6-1 Summary of Issues Carried through for Impact Analysis

Issues	Indicators	Final EIS Resource Sections in Chapters 3, 4, and 5
	effects to other land uses Restricted public access to recreational areas or other land use areas	
Cultural Resources		
What are the potential impacts to important cultural resources in the disturbed area?	Number of historic properties (cultural sites eligible for the National Register of Historic Places [NRHP]) impacted by the Proposed Action	Cultural Resources
Tribal Treaty Rights and Interests		
What are the potential impacts on the Shoshone-Bannock Tribal members to exercise their treaty rights in the Study Area?	Changes in the quality and quantity of culturally valued resources on unoccupied public land, including ground and surface water, culturally significant plant species, grazing resources, and wildlife Acres of traditional use areas that would be available or unavailable during mining activities	Tribal Treaty Rights and Interests
What are the potential impacts to natural resources and resources of cultural significance to Shoshone-Bannock Tribal members?	Changes in uptake of COPCs by wildlife and vegetation in mining disturbed areas and areas that are reclaimed Visibility of disturbances to adjoining areas Known historic properties affected Changes in the natural setting of the traditional resources that would diminish their value to traditional	Tribal Treaty Rights and Interests

Table 1.6-1 Summary of Issues Carried through for Impact Analysis

Issues	Indicators	Final EIS Resource Sections in Chapters 3, 4, and 5
	practices Rendering of culturally important natural resources including culturally significant plant species unfit for harvest or consumption	
Socioeconomic Resources		
What are the potential adverse or beneficial socioeconomic impacts including employment, ancillary businesses, agriculture, and tax base?	Changes in employment and personal income; distribution of jobs within industrial sectors Payments to local and regional businesses providing goods and services to current operation/projections of payments Economic value of land in agricultural use (employment, tax, and other revenue) Corporate contributions to local/state tax and other revenues over time Relative change in property values	Social and Economic Conditions
What are the potential impacts on tourism and recreation economy?	Estimated changes in acres open to recreation compared to acres closed to recreation Tourism/recreation value per acre Estimated changes in economic contribution of tourism and recreation in area and changes over time	Social and Economic Conditions
What are the potential impacts of the closure of the mine, resulting in decreased domestic phosphate	Percentage of U.S. phosphate fertilizer market derived from	Social and Economic Conditions

Table 1.6-1 Summary of Issues Carried through for Impact Analysis

Issues	Indicators	Final EIS Resource Sections in Chapters 3, 4, and 5
production; effect of reduced fertilizer supply; increased price on national agriculture; and increased foreign natural resource dependence?	Agrium CPO Plant production and ability of other domestic and foreign sources to satisfy this demand, if necessary	
Environmental Justice		
What disproportionately high and adverse human health or environmental effects on people of race, color, religion, or income (including the Shoshone-Bannock Tribes' population, who exercise treaty rights on federal lands) could be realized?	High or adverse human health effect High or adverse environmental effect Disproportionately high or adverse human health or environmental effect on people of a specific race, color, religion, or income group, including Shoshone-Bannock Tribal members	Environmental Justice
Hazardous Materials and Solid Waste		
What is the potential for accidental spills from generation, handling, use, and storage of fuels, hazardous materials, and wastes?	Compliance with appropriate local, state, and federal standards for handling of fuels and hazardous materials	Hazardous Materials and Solid Waste
Public Health and Safety		
Would the project result in potentially adverse effects to public health and safety?	Changes in levels of dust, selenium, or other COPCs in transport media (air, water, fish, wildlife) and in wild harvestable natural resources that exceed appropriate local, state, and federal standards for public health and safety	Public Health and Safety

CHAPTER 2
PROPOSED ACTION AND ALTERNATIVES

This chapter describes the Proposed Action and alternatives considered for the National Environmental Policy Act (NEPA) environmental impact assessment and details the differences among alternatives, providing a clear basis for choice among options by the decision-makers and the public. Comparison of the alternatives is based on the design of the alternatives and the environmental, social, and economic effects of implementing each alternative. **Section 2.7** presents the Agency-Preferred Alternative and the rationale used to select it. Alternatives or alternative elements considered but eliminated from detailed study are also discussed in **Section 2.8**.

As specified in 40 Code of Federal Regulations (CFR) 1502.14(a), only reasonable alternatives need be considered in detail. Reasonable alternatives must be feasible, and such feasibility must focus on the accomplishment of the underlying purpose and need that would be satisfied by the proposed federal action. This Final Environmental Impact Statement (Final EIS) considers three alternatives in depth:

- The Proposed Action
- A group of alternatives packaged together as the Rasmussen Collaborative Alternative (RCA)
- The No Action Alternative

After the discussion of the alternative elements considered in detail, alternative elements considered but eliminated from detailed analysis are discussed briefly.

2.1 BACKGROUND

The Rasmussen Valley phosphate deposit addressed in this Final EIS is located in Caribou County, Idaho, 18 miles northeast of Soda Springs, Idaho (**Figure 1.2-1**). It is a portion of the phosphate-rich Meade Peak Member of the Permian-age Phosphoria Formation. In the Study Area, the Phosphoria Formation consists of chert, phosphatic mudstone, phosphorite, carbonaceous and cherty mudstones, and carbonate rock. In general, the thickness of the formation ranges from 250 to 450 feet at the Study Area location. The mineable phosphate rock occurs in two ore zones within the Meade Peak Member. About 60 to 100 feet of non-economic phosphatic shales separate the upper ore zone and the lower ore zone.

A federal phosphate lease that included the Rasmussen Valley deposit was originally issued to J.A. Terteling & Sons in 1955. Subsequently, the Lease was transferred to the Stauffer Chemical Company, then to the FMC Corporation in 1968, to Astaris Production LLC in 2000, and (most recently) to Agrium in 2004.

The Bureau of Land Management (BLM) and U.S. Forest Service (USFS) have prepared this Final EIS to consider approval of Agrium's Proposed Action for mining on the Lease and the construction and operation of mine-related facilities outside the Lease. Agrium has submitted a Mine and Reclamation Plan (Agrium 2011) to the BLM for the development of this Lease that includes both on-lease and off-lease activities. This Final EIS evaluates the impacts of the Proposed Action and alternatives to the Proposed Action to the human environment and impacts on area natural resources.

2.2 DISTURBANCE FROM PAST EXPLORATION

Exploration in the Rasmussen Valley deposit began in 1912, when the U.S. Geological Survey (USGS) excavated two exploratory trenches. Additional exploratory trenching occurred in 1948 as part of a study of the Western Phosphate Field. Exploratory drilling in the deposit has been conducted intermittently since 1969.

In 2008, Agrium began systematic exploration drilling and conducted geotechnical boring and water monitoring as part of the planning and development for the Proposed Action. From 1969 through 2015, 203 documented exploration drill holes were completed in the Rasmussen Valley deposit. Precise locations and extent of exploration are not available for all of the early exploration; however, all of the exploration activity over the years has disturbed 28 acres of the Study Area.

2.3 PROPOSED ACTION

This description of the Proposed Action is a summary of Agrium's 2011 Mine and Reclamation Plan (Agrium 2011). The following sections describe proposed mining operations, environmental protection measures and best management practices (BMP's) including management of water, the reclamation plan, environmental monitoring, and conceptual mitigation approach. They also discuss modifications to the lease boundaries proposed by Agrium. The 2011 Mine and Reclamation Plan provides additional details.

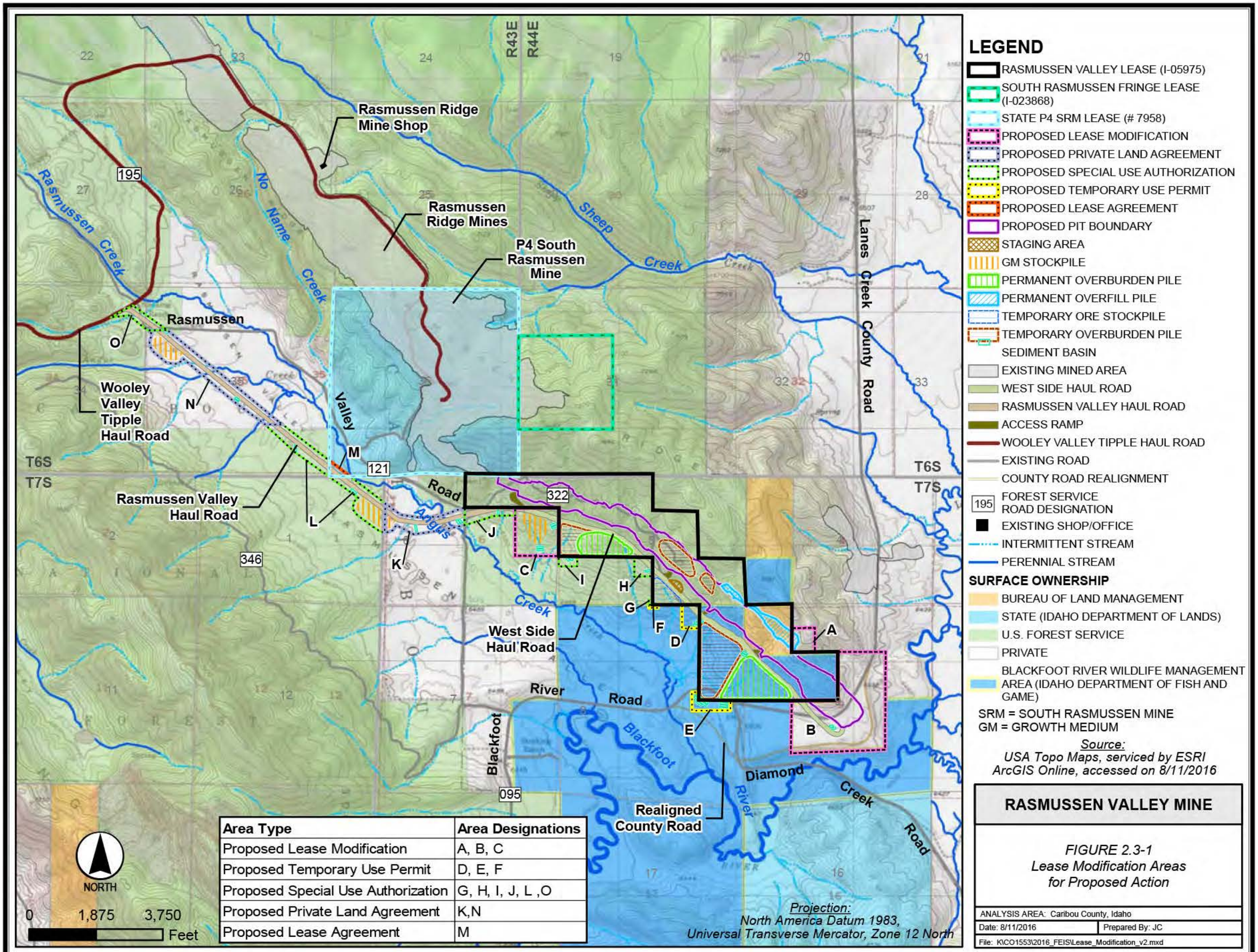
2.3.1 Lease Modifications

Mine disturbances outside the BLM lease boundary are sometimes proposed to allow the recovery of additional phosphate ore outside the Lease or the expansion of pit backfill and external overburden piles onto National Forest Lands. The following describes specific areas in which Agrium has requested lease modifications for activities outside of the lease boundary on National Forest System land, and discusses how those activities could be authorized in accordance with 43 CFR 3503.20 (**Table 2.3-1**). The lease modifications have been proposed by Agrium to extend the current lease boundary in two locations (Areas B and C, **Figure 2.3-1**), specifically in portions of T7S R44E, Sections 6 and 9, totaling 166.3 acres. An additional lease modification was proposed on private land (see next paragraph).

A portion of the pit wall and ultimately backfill, backfill cover, a runon diversion ditch, and access road would extend outside the Lease on private property with no federal minerals. Agrium proposed a lease modification (Area A [10.0 acres], **Figure 2.3-1**). This disturbance on private land would need to be authorized by an agreement between Agrium and the private landowner, and could not be authorized by a lease modification because it has no federal mineral estate.

Exploratory drilling indicates that the federal phosphate deposit continues southeast beyond the currently defined lease boundaries. To mine this area and maximize economic recovery, Agrium proposes to expand the lease boundary (Area B [128.3 acres], **Figure 2.3-1**) to include this area. This expansion would require a lease modification to recover the federal phosphate under the private land.

A portion of the southwestern pit wall and associated backfill would extend outside of the Lease on National Forest Land (Area C [38.0 acres], **Figure 2.3-1**). This activity would need to be authorized with a lease modification to allow waste to be stored on National Forest Land.



Area Type	Area Designations
Proposed Lease Modification	A, B, C
Proposed Temporary Use Permit	D, E, F
Proposed Special Use Authorization	G, H, I, J, L ,O
Proposed Private Land Agreement	K,N
Proposed Lease Agreement	M

FIGURE 2.3-1
Lease Modification Areas for Proposed Action

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Table 2.3-1 Proposed Lease Modifications and Use Permits for the Proposed Action

Map ID*	Type	Acreage
A	Modification (BLM; Private Land Agreement)**	10.0
B	Modification (BLM)	128.3
C	Modification (BLM)	38.0
D	Temporary Use (State - IDFG)	7.3
E	Temporary Use (State - IDFG)	8.2
F	Temporary Use (State - IDFG)	0.5
G	Special Use (USFS)	0.3
H	Special Use Authorization (USFS)	6.3
I	Special Use Authorization (USFS)	3.4
J	Special Use Authorization (USFS)	10.1
K	Private Land Agreement	23.8
L	Special Use Authorization (USFS)	39.3
M	Lease Agreement (State - IDL)	3.0
N	Private Land Agreement	41.2
O	Special Use Authorization (USFS)	8.3
	Total	**328.2**

Notes:

* ID number from **Figure 2.3-1**

** The Mine Plan refers to this as a BLM Lease Modification. However, it is on private land and does not involve federal minerals. Therefore, a private land agreement must be developed.

2.3.2 Other Permits and Agreements

In addition to the BLM lease modifications, other agreements would be needed with the landowners for activities outside the Lease. Three areas south of the Lease located on the WMA (Areas D, E, and F) would be needed for sediment basins and a portion of the West Side Haul Road. These areas would require temporary use permits from IDFG. To the west, in Rasmussen Valley, the Rasmussen Valley Haul Road crosses a small area of state land (Area M) and would require a lease agreement from IDL.

The Rasmussen Valley Haul Road would also cross two areas of private land (Areas K and N) and three areas of USFS land (Areas J, L, and O). The use of private land would require agreements with the private land owners. The haul road across USFS land would require special use authorizations (SUAs). Additional USFS SUAs would be required for small areas of USFS land for a portion of the West Side Haul Road and water control features including sediment basins (Areas G, H, and I).

2.3.3 Proposed Rasmussen Valley Mine

The Proposed Action consists of:

- Developing the Rasmussen Valley Mine in six sequential pit phases
- Once the mining in each phase is completed, that phase would be backfilled using material from subsequent phases being mined or from temporary overburden piles.

Once a phase has been backfilled and shaped, it would be covered and reclaimed (the concurrent backfilling and reclamation are referred to jointly as concurrent reclamation).

Initial stages of mine development include salvaging topsoil and other suitable surface material to be used as reclamation growth medium (GM) and then removing overburden to reach the ore.

Overburden is non-economic geologic materials that must be removed or segregated from the ore to obtain an adequate ore grade and quality for processing at Agrium's Conda fertilizer plant. The overburden that has been removed can be backfilled to a previously mined area or stored temporarily or permanently outside the mine pit.

Several identifiable geologic layers or strata comprise the overburden that would be excavated from the mine pits. At various phosphate mines in Southeast Idaho, some of these strata express a potential for releasing higher concentrations of selenium and other constituents of potential concern (COPCs). The selenium and other COPCs released from overburden need to be limited to a level that will prevent contamination of surface water and groundwater (at concentrations above regulatory standards), and maintain beneficial uses and concentrations in soils as determined by concentrations in vegetation that are maintained below action levels. Historically, in the Southeast Idaho Phosphate District, strata within the Rex Chert Member geological formations have contained higher levels of selenium. Conversely, other strata express a lower potential for releasing selenium and other COPCs. Each mine also has its own unique profile of how much selenium and other COPCs are released based on the presence and ratios of the various strata. Consequently, the overburden material for each mine proposal must be evaluated independently.

Agrium's 2011 Mine and Reclamation Plan (Agrium 2011) uses the terms "seleniferous" material and "non-seleniferous" material to describe how Agrium proposes to segregate overburden for different disposal locations to lessen the potential for exceeding water quality standards and vegetation standards for COPCs. In subsequent documents, Agrium replaced the term "non-seleniferous" with "low-seleniferous" to be more accurate because some of the materials slated to be placed in "non-seleniferous" overburden piles may contain some selenium or other COPCs that could be released.

During their review, the Agencies (BLM, USFS, and Idaho Department of Environmental Quality [IDEQ]) determined that the terms "seleniferous" and "low-seleniferous" do not provide enough information to prepare an appropriately informative affects analysis and disclosure. In addition, the site-specific samples Agrium provided for each of the strata cannot be differentiated in accordance with this terminology, thus requiring the site-specific leachability tests performed for this impacts analysis. Consequently, the Agencies have taken a more descriptive approach to defining the overburden materials that would be segregated and placed in the different overburden piles and backfill. Overburden that does not include Meade Peak strata or specific Rex Chert strata is referred to by Agrium as "low-seleniferous." In the EIS, these materials are referred to more descriptively as "non-Meade Peak-containing material" or "non-Meade Peak overburden". Overburden that may contain Meade Peak or specific Rex Chert material, which is referred to by Agrium as "seleniferous" or "SeW", is designated in this EIS as "Meade Peak-containing material" or "Meade Peak overburden."

Agrium proposed to avoid placing Meade Peak overburden in certain permanent external overburden piles. This would reduce, but not eliminate, the potential risk of selenium and other COPCs being released from these locations and exceeding surface water and groundwater quality standards. Again, the impacts were analyzed by performing material-specific leach tests to determine the expected release of COPCs from this material.

The proposed mine pit would be on the southwest slope of Rasmussen Ridge. Available areas for overburden storage near the pit are upslope around the crest of Rasmussen Ridge or downslope on the steep slopes below the mine pit. Runoff from overburden piles upslope of the mine pit would drain into the mine pit or be diverted to water management features such as sediment basins. Runoff from overburden piles downslope of the mine pit would be managed by collection ditches and sediment basins, but would still carry the potential to drain to nearby surface water (such as Angus Creek) or reach groundwater. In addition, portions of the steep slopes downslope of the mine pit are potentially unstable, and storage of overburden on these slopes could result in slope failure.

The Proposed Action would include the following features:

- Two permanent external piles containing non-Meade Peak overburden would be developed and reclaimed downslope from the pit area and haul road and designated the North Overburden Pile and South-South Overburden Pile.
- Two permanent external piles containing Meade Peak overburden would be developed contiguous with and uphill from the pit and designated as the North External Overfill Pile and the South External Overfill Pile.
- Two temporary external piles containing Meade Peak and non-Meade Peak overburden would be developed downslope from the pit area and haul road, including the South Main Temporary Overburden Pile and a portion of the North Main Overburden Pile.
- Two temporary piles containing Meade Peak overburden would be developed within the pit boundary, designated as the North and South Temporary Overburden Piles.
- A stockpile area could be optionally developed and reclaimed downslope from the pit area and haul road for temporary storage of ore or Meade Peak-overburden as operational demands dictate and designated as the Ore Stockpile Area.
- Three GM stockpiles for use in reclamation activities would be developed and reclaimed.
- Access and haul roads would be constructed, operated, and reclaimed.
- Portions of the Blackfoot River, Lanes Creek, and Diamond Creek County Roads would be permanently realigned and the abandoned road reclaimed.
- Temporary power lines would be constructed, operated, and reclaimed.
- A staging area would be constructed, operated, and reclaimed.
- Dust suppression supply, water quality monitoring, and water supply wells would be constructed, operated, and reclaimed.
- Surface water sediment controls would be constructed, operated, and reclaimed.
- A fuel storage area would be constructed, operated, and reclaimed.

Figure 2.3-2 shows the distribution of these facilities within the Proposed Action. **Table 2.3-2** lists the surface disturbances estimated for these activities. Agrium currently has approval to perform additional exploratory drilling within the Study Area. Based on the results of this additional exploratory drilling and potential changed conditions that might be encountered during mining, the areas to be disturbed and the quantities of material to be handled could minimally increase or decrease relative to what is shown in the table.

Agrium proposes to mine phosphate ore from the open pit and haul it by truck to their Wooley Valley Tipple. The pit would be mined in six phases starting at the south end of the Proposed Action and progressing north. Ore would be mined using methods and equipment similar to those used at Agrium's Rasmussen Ridge Mines. From the tipple, ore would be hauled by rail on existing track to the Agrium Conda Phosphate Operations (CPO) fertilizer plant for processing. Agrium's Rasmussen Ridge Mine currently uses the tipple, railroad, and CPO, and their use would continue for the Rasmussen Valley Mine without change or modification.

Table 2.3-2 Total Project-related New Surface Disturbance from Proposed Action by Surface Ownership, including Areas Outside the Lease

Facility or Activity	Maximum Disturbance (acres)					
	Private	USFS	BLM	IDFG	IDL	Total[1]
Open Pit and Backfill[2]	22.6	102.2	27.4	43.2	0	195.4
Overburden and Overfill Piles	1.5	29.2	8.2	70.7	0	109.6
Optional Ore Stockpile	0	8.5	0	0	0	8.5
Haul Roads	23.0	38.3	1.3	14.9	0.4	77.9
Groundwater Monitoring Wells and Access Roads	2.6	3.5	1.0	1.4	0	8.5
Facilities	0	1.4	0	0	0	1.4
Water and Sediment Control Structures	1.2	2.9	0	3.1	0	7.2
Realigned Portions of County Roads	3.1	0	0	3.0	0	6.1
GM Stockpiles	8.0	17.2	0	0	0	25.2
Total[1]	62	203.2	37.9	136.3	0.4	439.8
POC Monitoring Well and Access Roads[3]						8.0
Potential Pit Layback Areas[4]						20.0
Grand Total[1,5]						**467.8**

Notes:

1 Totals are based on more precise numbers (more decimal places) than are shown in the table, and because of rounding conventions, the totals may appear to be lower than the sum of the numbers in a row or column.

2 Total acreage includes temporary access ramps and also includes 11.2 acres of pit wall that would not be reclaimed.

3 The monitoring well network has not been finalized by the IDEQ. Therefore, the locations of these wells and the associated access road network cannot be represented on the figures. The Point of Compliance (POC) was not included in the original Mine and Reclamation Plan (Agrium 2011), but would be needed if the Proposed Action were approved.

4 The potential pit layback areas have not been determined. This category was not included in the original Mine and Reclamation Plan (Agrium 2011), but would be needed if the Proposed Action were approved.

5 Up to 28 acres of additional disturbance in the Study Area are being considered for POC monitoring wells and access roads (8 acres) and potential pit layback areas (20 acres). However, the locations have not been determined and are not included in the impact assessment for specific resources. Baseline conditions are known so that the impacts can be assessed when locations are determined. These locations will be finalized after the approval of the Final EIS.

IDFG = Idaho Department of Fish and Game

IDL = Idaho Department of Lands (Does not include already disturbed area at P4's South Rasmussen Mine)

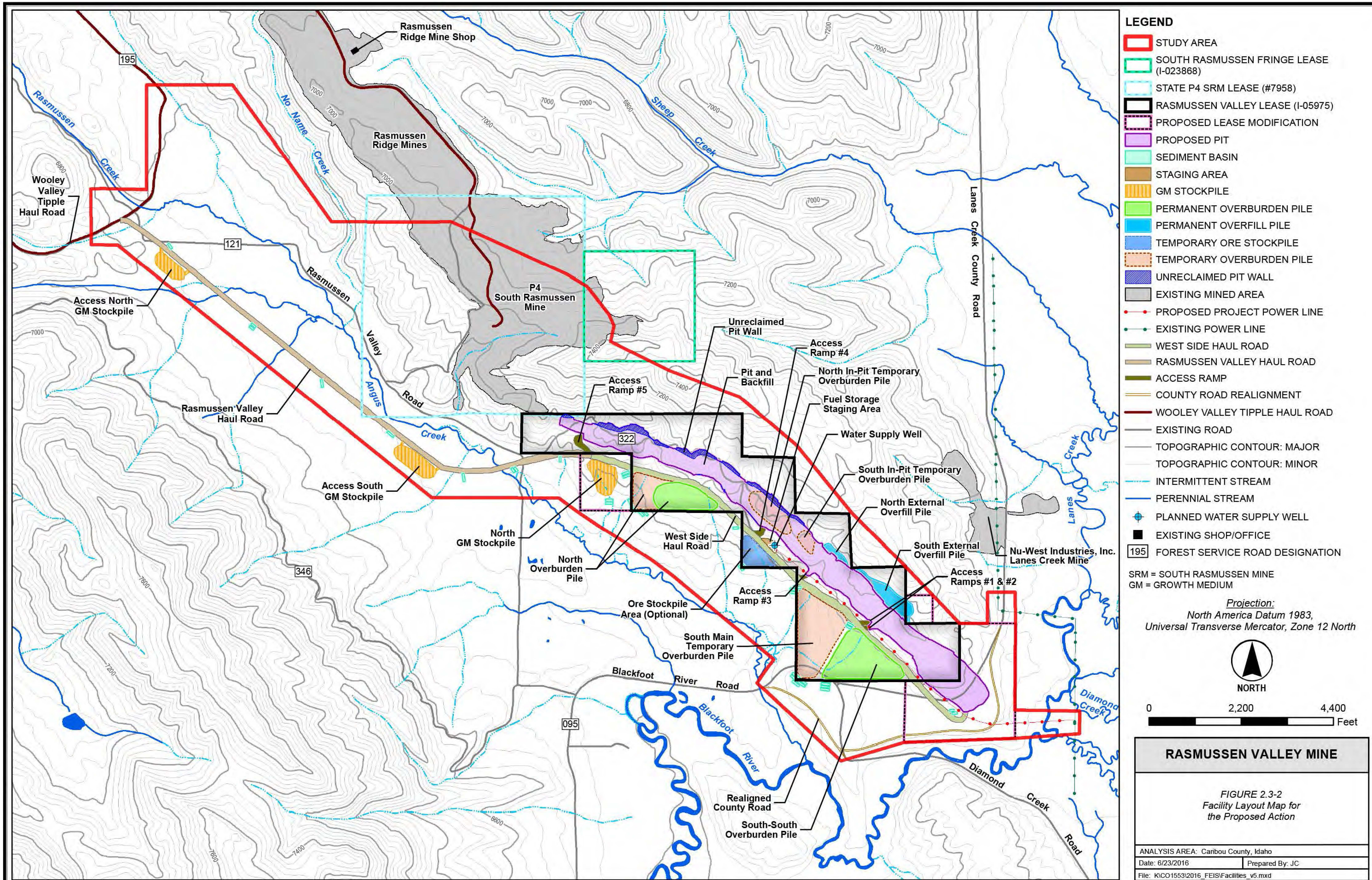
Mining involves the removal of the available ore down to an economically feasible limit. This economic limit is based on mining capabilities, processing capabilities, costs, and ore value. It generally coincides with a pit depth that is at or below the "alteration floor." The alteration floor is the depth at which less weathered or unaltered ore is encountered. Below the depth of the alteration floor, the unaltered ore typically is more difficult or prohibitively costly to retrieve and process.

2.3.4 Mining Operations

2.3.4.1 Mine Design

2.3.4.1.1 Mine Phasing and Reclamation

Under the Proposed Action, the deposit would be mined as an open pit in six phases (**Figure 2.3-3**) from south to north, a distance of approximately 2.4 miles. The phases would range from 1,500 to 3,500 feet long, and the pit crest would average 600 feet wide. The ore recovery would take 3.9 years, and the overall life-of-mine project duration (from stripping and infrastructure development through initial reclamation) would be 5.8 years. Constraints on the pit's design include economic strip ratios; access requirements; slope stability assumptions and requirements; design restrictions, such as slope angles, roads, and pit benches that may affect the pit's cross-sectional geometry for the ultimate pit design; and balancing phase volumes with available storage and backfill volumes.


Rasmussen Ridge Mine Shop
Rasmussen Ridge Mines
P4 South Rasmussen Mine
Wooley Valley Tipple Haul Road
Access North GM Stockpile
Rasmussen Valley Haul Road
Access South GM Stockpile
North GM Stockpile
North Overburden Pile
Access Ramp #5
Unreclaimed Pit Wall
Pit and Backfill
Access Ramp #4
North In-Pit Temporary Overburden Pile
Fuel Storage Staging Area
Water Supply Well
South In-Pit Temporary Overburden Pile
North External Overfill Pile
South External Overfill Pile
Access Ramps #1 & #2
West Side Haul Road
Access Ramp #3
Ore Stockpile Area (Optional)
South Main Temporary Overburden Pile
Realigned County Road
South-South Overburden Pile
Nu-West Industries, Inc. Lanes Creek Mine
Rasmussen Creek
No Name Creek
Sheep Creek
Rasmussen Valley Road
Angus Creek
Lanes Creek County Road
Lanes Creek
Blackfoot River Road
Blackfoot River
Diamond Creek
Diamond Creek Road
195
121
322
346
095
LEGEND
STUDY AREA
SOUTH RASMUSSEN FRINGE LEASE (I-023868)
STATE P4 SRM LEASE (#7958)
RASMUSSEN VALLEY LEASE (I-05975)
PROPOSED LEASE MODIFICATION
PROPOSED PIT
SEDIMENT BASIN
STAGING AREA
GM STOCKPILE
PERMANENT OVERBURDEN PILE
PERMANENT OVERFILL PILE
TEMPORARY ORE STOCKPILE
TEMPORARY OVERBURDEN PILE
UNRECLAIMED PIT WALL
EXISTING MINED AREA
PROPOSED PROJECT POWER LINE
EXISTING POWER LINE
WEST SIDE HAUL ROAD
RASMUSSEN VALLEY HAUL ROAD
ACCESS RAMP
COUNTY ROAD REALIGNMENT
WOOLEY VALLEY TIPPLE HAUL ROAD
EXISTING ROAD
TOPOGRAPHIC CONTOUR: MAJOR
TOPOGRAPHIC CONTOUR: MINOR
INTERMITTENT STREAM
PERENNIAL STREAM
PLANNED WATER SUPPLY WELL
EXISTING SHOP/OFFICE
195 FOREST SERVICE ROAD DESIGNATION
SRM = SOUTH RASMUSSEN MINE
GM = GROWTH MEDIUM
Projection:
North America Datum 1983,
Universal Transverse Mercator, Zone 12 North
NORTH
0 2,200 4,400 Feet
RASMUSSEN VALLEY MINE
FIGURE 2.3-2
Facility Layout Map for the Proposed Action
ANALYSIS AREA: Caribou County, Idaho
Date: 6/23/2016
Prepared By: JC
File: K:\CO1553\2016_FEIS\Facilities_v5.mxd

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The economic strip ratio and quality of the ore ultimately control the designed pit depth. Factors that control the economic strip ratio are cost to remove the overburden and estimated value of the phosphate ore. Costs to remove overburden are controlled by equipment costs, access, haul distances, slope stability safety, and water management considerations. Although the proposed pit design is based on site-specific geotechnical data and experience with similar phosphate mines in southeast Idaho, pit wall stability is not a certainty; thus, the potential exists for minor pit wall laybacks beyond the proposed pit boundary that may require up to 20 acres of additional disturbance.

The pit and backfill footprint of the six phases would disturb a total of 195.4 acres. As mining progresses, concurrent reclamation would start on the mined out areas using overburden material and GM from the newly mined area. Through progressive open pit backfilling, shaping, and concurrent reclamation, the unreclaimed pit disturbance at any one time would be minimized. The backfill will be covered with a minimum of 3 feet of non-Meade Peak-containing material and overlain with 2 feet of GM from the pit area. The backfill and cover would be sloped to direct surface water off the reclaimed pit and onto native ground. No backfill would be left exposed. Upon completion of backfilling, pit wall exposures would remain in place above some portions of the backfilled pit.

During mining, a small road would be constructed along the crest of the pit to provide access to lighting stations and for pit wall inspections. This road would be 20 feet wide to accommodate light vehicles, a bulldozer, or other equipment. Trees, boulders, or other potential hazards that may fall into the pit would be removed during construction of this road.

2.3.4.1.2 Haul Roads

The ore haul road from the mine would be constructed 2.3 miles along the southwest side of the pit (the West Side Haul Road) and 2.4 miles across Rasmussen Valley (the Rasmussen Valley Haul Road) to the existing Wooley Valley Tipple Haul Road (**Figure 2.3-4**). The design of the Rasmussen Valley Haul Road minimizes curves and follows the most direct route between the mine pit and the Wooley Valley Tipple Haul Road. The proposed Rasmussen Valley Haul Road (identified in the alternatives as HR-1) would cross Rasmussen Valley County Road at two locations, cross Angus Creek at two locations, and cross three minor tributary drainages. This route would disturb 12.6 acres of wetlands.

The Wooley Valley Tipple Haul Road would provide access to the shop and maintenance facilities currently in use at the Rasmussen Ridge Mines. These facilities would remain operational for the duration of the Proposed Action. The West Side and Rasmussen Valley Haul Roads would connect mining operations in the pit with the staging area, GM stockpiles, overburden piles, and other mine facilities (**Figure 2.3-4**). Five access ramps (Access Ramps 1 through 5) would provide access to the active mining and backfilling areas from the West Side Haul Road. These ramps would be required throughout the life-of-mine to haul overburden, GM, and ore. Access ramps would be reclaimed concurrently with their associated pits, and new roads would be built as the sequence of mining progresses.

Widths of the haul roads would vary depending on location and localized physical constraints. Proposed Action haul roads not within the mine pit are designed with an 80-foot running width and a 10-foot safety berm on each side for a total top width of 100 feet. This contrasts with the pit ramps, which have safety berms on only one side. The 80-foot running width allows for a safe running surface for two-way haul truck traffic 3.5 times the width of the haul trucks. On average, haul road disturbance widths adjacent to the mine pit (principally the West Side Haul Road) would be 140 feet. All of these roads would be constructed of non-Meade Peak-containing materials with fill side berms where necessary for safety. Culverts would be used to convey natural drainage ways under the haul road as described in the Surface Water Control Design Plan (Agrium 2011, Appendix F).

Access ramps to the open pit would accommodate 150-ton-capacity haul trucks. Initial ramp widths have been designed with 90-foot overall widths, allowing for a running surface and a safety berm. Ramps in the lower portions of the pit have been designed to be narrower where it is deemed reasonable to operate using one-way traffic. All ramps were designed at a maximum 10 percent gradient with the exception of areas close to the pit floor.

All roads located outside of the pit boundary have been designed to minimize surface impacts and ensure maximum efficiency and safety. Design features include:

- GM would be salvaged from the proposed road areas before construction and placed in stockpiles along the length of the road for use in reclamation.
- Road surfaces would be graded and sloped to minimize standing water.
- BMPs, such as silt fencing, straw wattles, and erosion mats, would be used to minimize impacts to surface water.
- If necessary, large fill or cut slopes may be stabilized by hydro-mulching, seeding, or use of other BMPs to prevent excessive erosion from runoff.

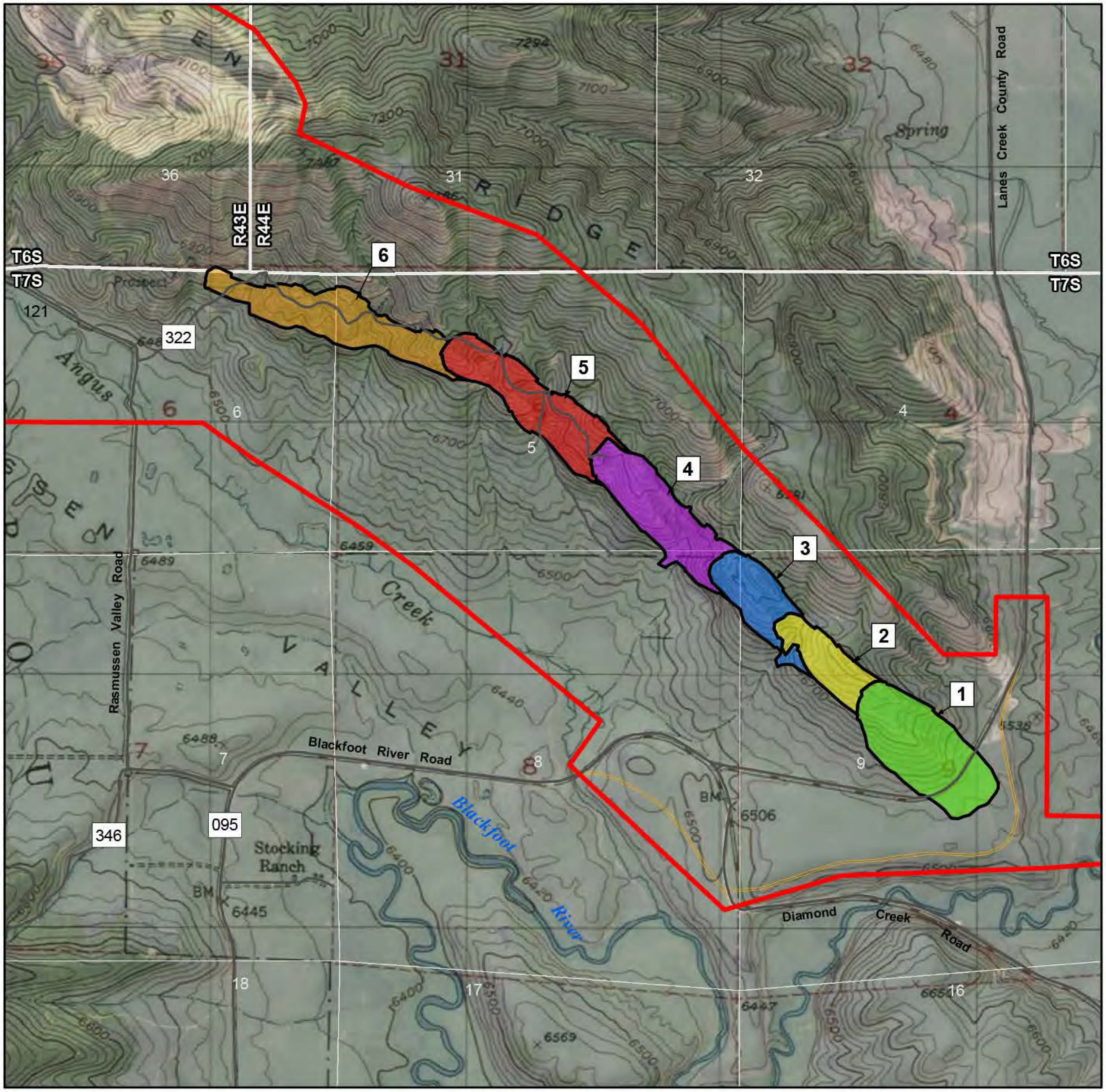
Surface water runoff reaching the haul roads and the relocated county roads from areas uphill would be conveyed along the toe slope of the road to culverts or pipes that cross under the roads. Culverts and pipes would be designed to pass a 50-year storm event in accordance with the Federal Lands Highway Project Development and Design Manual (FHWA 2014).

Agrium would use BMPs to control surface water runoff, sediment, and erosion from roads. These could include straw wattles, silt fencing, erosion matting, straw bales, brush barriers, diversion ditches, berms, and sediment basins. Specific measures would be identified in a site-specific Stormwater Pollution Prevention Plan (SWPPP).

2.3.4.1.3 Overburden and GM Management

Overburden mined from the Rasmussen Valley deposit would be placed directly in the pit as backfill, temporarily stored in external overburden piles for later use as backfill, or permanently stored in external overburden piles. Most of the overburden mined from the pits would be transported directly from the active phase of mining and placed as backfill in the previous mined out phases, but some limited temporary storage may be necessary. Backfill would be placed in mined out areas by dumping at the pit crest and using a bulldozer to push it into the pit or by dumping in lifts and spreading by bulldozer. Several factors would influence the decision on which method would be used for placing backfill in specific areas. They include the need for backfill ramps, the stability of the material as it is placed, availability of equipment to maintain truck-dumping areas, haul distance, haul grade, and stage of the backfilling process.

Seven external overburden piles would be used throughout the life-of-mine; three would be temporary and four would be permanent. The North Temporary and South Temporary Overburden Piles would be located inside the yet to be mined Phase 5 pit area (**Figure 2.3-2**) and used to store overburden from Phase 1 until it could be used as backfill in other phases before mining Phase 5. The North and South Main Temporary Overburden Piles would be located on the pediments downslope of the pit area and haul road (**Figure 2.3-2**) and would contain Meade Peak overburden. All Meade Peak overburden from these piles would be re-handled into Phases 5 and 6 backfill areas.



LEGEND

- STUDY AREA
- PIT OUTLINE BY PHASE
- 6 PIT PHASE NUMBER
- 095 FOREST SERVICE ROAD DESIGNATION
- COUNTY ROAD REALIGNMENT
- EXISTING ROAD

MINE PIT/PHASE

- PIT/PHASE 1
- PIT/PHASE 2
- PIT/PHASE 3
- PIT/PHASE 4
- PIT/PHASE 5
- PIT/PHASE 6

NOTE:
PHASES ARE DESIGNED TO ACCOMMODATE PIT ACCESS AND ORE QUALITY, AND DO NOT NECESSARILY REPRESENT EQUAL TIME PERIODS. MORE THAN ONE PHASE MAY BE ACTIVE AT ANY ONE TIME.

Projection:
North America Datum 1983, Universal Transverse Mercator, Zone 12 North
Source:
USA Topo Maps, World Imagery, both serviced by ESRI ArcGIS Online, accessed on 6/23/2016

NORTH

0 1,000 2,000 Feet

RASMUSSEN VALLEY MINE

FIGURE 2.3-3
Proposed Mining Phases for the Proposed Action

ANALYSIS AREA: Caribou County, Idaho
Date: 6/23/2016 | Prepared By: JC
File: K:\CO1553\2016_FEIS\Pit_Phases_v2.mxd

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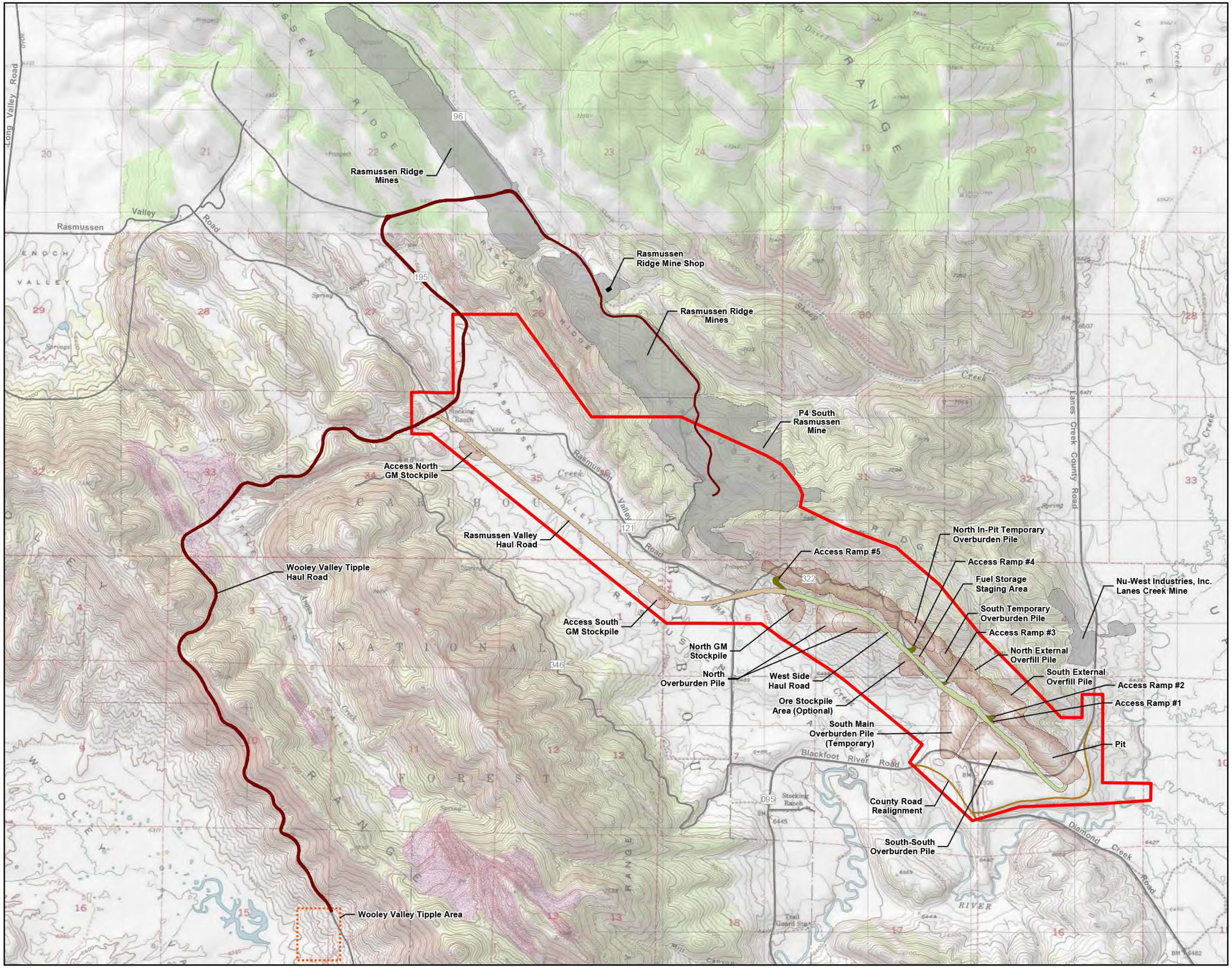

LEGEND

- STUDY AREA
- 195 FOREST SERVICE ROAD DESIGNATION

EXISTING INFRASTRUCTURE

- EXISTING MINED AREA
- WOOLEY VALLEY TIPPLE AREA
- WOOLEY VALLEY TIPPLE HAUL ROAD
- EXISTING ROAD
- EXISTING SHOP/OFFICE

PROPOSED INFRASTRUCTURE

- PROPOSED MINE FOOTPRINT
- WEST SIDE HAUL ROAD
- RASMUSSEN VALLEY HAUL ROAD
- ACCESS RAMP
- COUNTY ROAD REALIGNMENT

Projection:
North America Datum 1983, Universal Transverse Mercator, Zone 12 North
Source:
USA Topo Maps, serviced by ESRI ArcGIS Online, accessed on 6/23/2016

NORTH

0 3,250 6,500 Feet

RASMUSSEN VALLEY MINE

FIGURE 2.3-4
Existing and Proposed Infrastructure

ANALYSIS AREA: Caribou County, Idaho
Date: 6/23/2016 Prepared By: JC
File: K:\CO1553\2016_FEIS\Existing_n_Proposed_Infrastructure.mxd

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The North and South-South External Overburden piles would be composed of non-Meade Peak-containing material. Two permanent external overburden piles (the North and South External Overfill Piles) are located uphill of and contiguous with the pit backfill, outside the pit crest. The overfill piles contain Meade Peak overburden and will be reclaimed with the adjacent backfill. The overfill piles provide added disposal space and reduce the risk that percolating water would express as seeps at the toe of the backfill, or impact shallow groundwater. Estimated external overburden pile volumes, excluding stockpiled GM, are listed in **Table 2.3-3**.

Table 2.3-3 Estimated Volume Balances of External Overburden Piles and Backfill Locations

Overburden Pile	Capacity (loose yd^3)	Added (loose yd^3)	Removed to Backfill (loose yd^3)	Balance (loose yd^3)
North (Temporary)	1,589,000	1,443,000	1,443,000	0
North* (Permanent)	758,000	689,000	0	689,000
South Main	4,112,000	4,052,000	4,052,000	0
South-South	2,842,000	2,842,000	0	2,842,000
North Temporary	490,000	490,000	490,000	0
South Temporary	66,000	66,000	66,000	0
North External Overfill	61,000	61,000	0	61,000
South External Overfill	1,085,000	1,085,000	0	1,085,000
Total	11,003,000	10,728,000	6,051,000	4,677,000

Notes:

* On **Figure 2.3-2**, the permanent portion of the North Overburden Pile has a larger footprint than the temporary portion, but the capacity of the temporary pile is much greater than the permanent pile. This is because the temporary footprint partially overlies the permanent pile.

In addition to the overburden piles, Agrium has designated an optional ore stockpile area for temporary storage of ore or Meade Peak-containing material, if necessary. This optional stockpile would be located between the North and South Main Overburden Piles immediately southwest of the staging area (**Figure 2.3-2**). This location would require a base of non-Meade Peak-containing material that does not release selenium or other COPCs at concentrations higher than acceptable levels. The base would have a level surface and 3H:1V side slopes. Approximately 160,000 loose cubic yards of non-Meade Peak-containing material would be required to build the base for this stockpile area, should it be required. This stockpile would provide 177,000 loose cubic yards of temporary storage capacity.

During mining, Agrium would strip approximately 1,719,000 loose cubic yards of soils suitable for use as GM for reclamation. Three locations adjacent to the West Side and Rasmussen Valley Haul Roads would be used for stockpiling GM. They are the Access North GM Stockpile, Access South GM Stockpile, and North GM Stockpile (**Figure 2.3-2**). Stormwater would be diverted around the GM stockpiles where needed to prevent erosion, and runoff from the stockpiles would be diverted through temporary sediment basins.

GM removed during construction of the haul road and other infrastructure would be temporarily stored in the Access North and Access South GM Stockpiles. The Access North GM Stockpile would store approximately 331,000 loose cubic yards and occupy 8.0 acres. The Access South GM Stockpile would store approximately 347,000 loose cubic yards and occupy 8.6 acres. GM removed from the Haul Road, Phase 1, external overburden pile areas, and ancillary areas would be temporarily stored in the North GM Stockpile. The North GM Stockpile would contain varying amounts of GM over time and would occupy 8.6 acres. GM removed during construction of the subsequent pit phases, in order of preference, would be either directly placed for concurrent reclamation or temporarily stored for later use in reclamation.

Mining operations would dictate the timing of the use of salvaged GM for reclamation. The preferred method is direct placement. If operational constraints do not permit direct placement, the salvaged GM would be temporarily stored before placement. The salvaging and placing of GM is a dynamic process; therefore, the stockpile volumes would constantly change. Over the life-of-mine, a cumulative total of approximately 1,103,000 loose cubic yards may be temporarily stored and removed from the stockpiles.

2.3.4.2 Ancillary Facilities

Ancillary facilities include an area to stage personnel and equipment, an area to store fuel, power lines or generators to provide electricity, and a well to supply water. The staging area is where miners would meet, receive operational instruction, and discuss safety items. A temporary structure at the staging area would contain restrooms and at least one emergency shower. The staging area also would provide storage and parking for emergency response and rescue equipment and vehicles. Finally, the staging area would have a “ready-line” for parking equipment that is not in use.

Fuel storage would be located near the staging area. Fuel would be dispensed at this facility directly or by fuel trucks dispatched from it. Fuel would be stored in multiple aboveground tanks.

The Proposed Action would require electrical power. This power would be supplied to the various facilities through power lines or generators. The ultimate source of electrical power would depend on the cost-effectiveness of the options available.

A well would be drilled to supply water for operations. Water from the well would be applied to haul roads and other areas to suppress dust from operations. In addition, water from the well would be used for emergency showers and restrooms at the staging area. The showers and restrooms would also require a septic system.

The Rasmussen Ridge Mines would be completing operations while operations at the Rasmussen Valley Mine were starting up, but the shop and maintenance facilities at Rasmussen Ridge Mines would remain open and would be used for the Proposed Action. The shop and maintenance facilities would be accessed by way of the Wooley Valley Tipple Haul Road (**Figure 2.3-4**).

2.3.4.3 Mining Sequence

Factors affecting the economic recovery of the phosphate resource include strip ratio, ore quality and cutoff grades, and the safe slope angle of the pit walls. Mining would begin at the south end of the Rasmussen Valley deposit and move north. This sequence was developed with the following strategies to address issues and concerns:

- Backfilling to prevent ponding of water in the pit to reduce potential environmental impacts to surface and groundwater and, with the exception of some exposed pit wall, to limit visual impacts
- Maintaining close proximity between areas being mined and areas being backfilled to minimize backfill and reclamation material haul distance
- Minimizing the extents and heights of remaining pit walls.

Mining is divided into Phases 1 through 6 (**Figure 2.3-3**). Each phase was designed to allow construction of pit ramps for safe ingress and egress and provide available volume in previous phases to accommodate short haul distances for overburden disposal as backfill. Each phase would be from 1,500 to 3,500 feet long and average 600 feet wide. Because no previous phase would be available for the disposal of overburden from Phase 1, most of the overburden from this phase would be placed in external permanent or temporary overburden piles. Overburden of subsequent phases would be placed directly into previously mined phases. Mining would typically occur in concurrent multiple phases to allow blending of ores to maintain an overall consistent quality of ore for processing, maintain the appropriate stripping ratio to ensure available space to dispose of overburden, and allow continuous operation of large excavation equipment in the wider upper portions of the pit while smaller equipment is mining the narrower, deeper portions of the pit.

New roads would be constructed or existing roads relocated as they are needed. The Rasmussen Valley Haul Road, connecting with the existing Wooley Valley Tipple Haul Road at the northwest end of the Study Area, and the West Side Haul Road, along the west side of the Rasmussen Valley deposit, would be constructed at the beginning of mining. Portions of Lanes Creek and Diamond Creek County Roads and Blackfoot River Road would be relocated permanently at the beginning of mining to make room for the Phase 1 Pit and for the South-South and South Main Overburden Piles. Lanes Creek County Road, Diamond Creek County Road, and Blackfoot River Road would not be returned to their original alignments after final reclamation because the post-mining topography of the pit backfill would require steep grades or side hill cuts in the backfill material that would be unacceptable for a county road.

A power line may be constructed from the existing power line southeast of the Proposed Action to the staging area unless generators are found to be more cost-effective. It may be constructed before mining begins or during the first stages of mining. If the power line is not constructed before mining begins, generators may be used until the power line is in place.

Non-Meade Peak overburden from mining Phase 1 would be used to construct haul roads. If necessary, it also would be used to build the base for the Optional Ore Stockpile Area. Ore would be stored on this area until the haul road is completed, and ore could be hauled to the Wooley Valley Tipple directly. The remaining non-Meade Peak-containing material not used for constructing facilities would be placed either in the North or South-South Overburden Piles.

Meade Peak-containing material would not be used for constructing facilities. It would be placed temporarily in the South Main Temporary, North Temporary, or South Temporary Overburden Piles. Operational demands may at times require that Meade Peak overburden be stored temporarily in the Optional Ore Stockpile Area.

As mining proceeds into Phases 2 through 6, overburden from the current phase would be directly backfilled into previously mined phases. Non-Meade Peak overburden that would not fit into a previous phase would be permanently placed into an external overburden pile.

Agrium would generally salvage GM in the summer and fall, avoiding working in wet soil conditions. Wherever practicable, Agrium would use freshly salvaged GM for direct placement on areas being reclaimed. GM would be salvaged from a mining phase or area before mining. A minimum of 24 inches of GM would be used over backfilled areas. A minimum of 12 inches of GM would be placed over all other disturbed areas. The GM would be shaped to final configuration with bulldozers, graders, or other equipment before revegetation.

2.3.4.4 Mining Operations

The mine may be operated up to 24 hours per day, year-round, with overlapping shifts. Mining would occur using a series of 40-foot cuts with 30-foot-wide catch benches on the pit walls at every 80 feet of depth. Overburden would be either ripped or blasted to aid excavation depending on the hardness of the material. Blasting would be performed with ammonium nitrate-fuel oil (ANFO), blasting emulsions, or other standard blasting agents placed in drilled blast holes. Excavated material would be loaded into haul trucks and transported to the Wooley Valley Tipple, the Optional Ore Stockpile Area, previous phase pit, or external overburden piles depending on the type of material and available space.

2.3.5 Natural Resource Protection and BMPs

The following paragraphs briefly address Agrium's proposals to protect natural resources, including surface water and groundwater, livestock and wildlife, cultural resources, wetlands, soils, vegetation, air, and fisheries and aquatic resources as part of the Proposed Action. Subsequent sections present discussions that are more detailed on overburden handling and management, water management, and reclamation.

2.3.5.1 Surface Water

The mining activities described in the 2011 Mine and Reclamation Plan (Agrium 2011) have the potential to impact surface waters by introducing pollutants, such as sediment, selenium, and other COPCs, via precipitation runoff, snowmelt and spills, and by surface runoff contacting exposed overburden. Surface waters may also be impacted by changes in natural canopy cover (vegetation removal) or a change in surface soil characteristics (such as compaction) that may alter natural streamflow quantities and character. These impacts are collectively termed "hydrologic disturbance" and are specifically regulated in portions of watersheds that occur within USFS land.

Agrium would design and implement BMPs to control erosion, sediment, and the release of COPCs to protect surface waters in and around the mine. In addition, Agrium would limit the surface area of Meade Peak-containing material that would be exposed at any given time through direct backfilling and the Proposed Action backfill cover consisting of a minimum of 3 feet of non-Meade Peak overlain by a minimum of 2 feet of GM.

Water control structures may be constructed before initiating each mining phase to intercept and divert surface water runon before it reaches the pit crest. Otherwise, runon water would enter the pit. The operator would decide between these two options based on safety and operational concerns. Control structures would include several types of designs to reduce or eliminate the risk of surface water contamination. Sediment basins for runoff water and silt would be constructed at strategic locations before mining activities occur in the associated area to collect and contain water exposed to mining disturbances or overburden materials. Collection ditches constructed along the outer perimeters of the overburden pile and stockpile sites would convey surface water runoff from these sites to runoff sediment basins.

2.3.5.2 Stormwater Pollution Prevention Plan

Agrium would implement a SWPPP in accordance with the National Pollutant Discharge Prevention and Elimination System (NPDES) program. The SWPPP would identify all potential sources of pollutants that precipitation could mobilize and transport to surface waters in or near the Proposed Action via runoff. The SWPPP would also outline the control measures and BMPs that Agrium would implement to prevent or reduce the discharge of pollutants in stormwater. As part of the SWPPP, Agrium would comply with U.S. Environmental Protection Agency (USEPA) and IDEQ requirements for monitoring storm-event-related surface water. The SWPPP would remain a living document throughout the life-of-mine and would accommodate changing mining operations through each mining phase.

2.3.5.3 Spill Prevention Control and Countermeasures Plan

Agrium would also implement a Spill Prevention Control and Countermeasure (SPCC) Plan to meet the requirements in Title 40 CFR 112. The SPCC Plan would be implemented before placement of any petroleum products on site and would be reviewed by Agrium's Spill Prevention Coordinator or other qualified personnel every 3 years. As required by regulation, the SPCC Plan and all subsequent amendments would be reviewed and certified by a Professional Engineer (PE).

2.3.5.4 Groundwater

Groundwater quality impacts from selenium and other COPCs are a documented concern at phosphate mines in southeast Idaho. Constituents mobilized by water from precipitation events, snowmelt, and other surface runoff events percolating through overburden storage piles carry the potential to introduce selenium and other COPCs to groundwater at concentrations above regulatory standards. The backfill and overfill overburden would be covered with a minimum of 3 feet of non-Meade Peak-containing material overlain by 2 feet of GM. The cover is intended to limit infiltration of precipitation and snowmelt and reduce pore-space water in the GM by transpiration from the reclamation vegetation. Subsequent modeling of the Proposed Action cover found that the percolation rate, and thus the leached COPC impact to groundwater, could be reduced with an improved cover design. The residence time of any temporarily stockpiled overburden would be minimized to limit potential surface water infiltration and subsequent percolation to groundwater. Runon diversion ditches would divert surface runoff originating from uphill areas so that it would not infiltrate into overburden. The permanent external overburden piles were considered by Agrium to not have the potential to release COPCs into vegetation, groundwater, or surface waters because they would only contain non-Meade Peak overburden. Thus, they were not designed with a soil cover that purposely restricts infiltration and percolation.

2.3.5.5 Protection of Livestock

Livestock grazing would be restricted in areas of mining and related activities. The areas would be fenced, but fencing may not be entirely effective. Agrium personnel would periodically visually survey the mine areas for livestock during mining and related activities. Livestock would be immediately removed from any areas of risk. Wildlife movement into or out of the Proposed Action would not be controlled. To minimize impacts to wildlife, any fencing constructed would be designed to be wildlife-friendly. This would include the use of smooth wire (non-barbed wire) and ensuring spacing of the wires that allows wild ungulates to cross over or under.

2.3.5.6 Cultural and Paleontological Resources

Any cultural or significant paleontological resources identified at the Proposed Action by baseline surveys and during operation would be avoided and protected. If vertebrate fossils are exposed during mining, the locations would be recorded and, if possible, the fossil(s) may be provisionally classified. The BLM, State Historic Preservation Office (SHPO), landowner, or USFS would be notified depending on the location of the find. Any previously unknown cultural resource sites discovered during mining would be cordoned off and left as found until an appropriate agency or qualified representative can examine, document, and evaluate the find.

2.3.5.7 Wetlands and Riparian Areas

The development and mining of the Lease could disturb wetlands. Agrium would implement all necessary BMPs to minimize impacts to wetlands and riparian areas outside of the proposed disturbed areas.

2.3.5.8 Soil Erosion

Soil erosion would be controlled through the implementation of BMPs. BMPs may include, but are not limited to, straw wattles and silt fencing to control water and soil movement from mining disturbances. Where appropriate, erosion matting would be used on haul road fill slopes to control soil movement into drainages. Brush barriers would be used to control runoff from overburden piles and GM stockpiles. Regular monitoring would be conducted to evaluate the effectiveness of the BMPs. If any BMPs are found to be inadequate, erosion control techniques would be adjusted to correct the inadequacy.

2.3.5.9 Existing and Reclaimed Vegetation

Existing vegetation would be protected to the extent practicable by limiting surface disturbance to those areas needed for operations. Concurrent reclamation would be employed. As soon as GM is removed from its original location, it would be placed directly atop reclamation areas if they are available. The immediate use of GM in reclamation promotes regrowth of vegetative matter and preserves existing seeds in the GM. Some GM would need to be stockpiled because reclamation areas would not always be available at the time that GM must be removed.

Agency-approved seed mixes that include native seeds would be applied. Two seed mixes would be used: one for drier sites and one for moister sites (**Table 2.3-4**). The reclaimed areas would be managed to control invasive and noxious species and prevent their introduction.

Table 2.3-4 Revegetation Seed Mixes

Southwest Aspects (drier sites)	Pounds per Acre	% of Seed Type	Northeast Aspects (moister sites)	Pounds per Acre	Percentage of Seed Type
[1]					
Wheatgrass	6.75	15	Mountain Brome	9.00	20
Western Wheatgrass	2.25	5	Bluejoint Grass	6.75	15
Great Basin Wildrye	4.50	10	Redtop Bentgrass	2.25	5
Idaho Fescue	4.50	10	Timothy	2.25	5
Mountain Brome	6.75	15	Pine Reedgrass	4.50	10
Big Bluegrass	4.50	10	Bluebunch Wheatgrass	6.75	15
Green Needlegrass	5.40	12	Slender Wheatgrass	4.50	10
Slender Wheatgrass	4.50	10	June Grass	4.50	10
Sterile Annual Rye (Quick Guard)	2.25	5			
Forbs			**Forbs**		
	0.90	2		0.90	2
Lewis Blue Flax	0.90	2	Lewis Blue Flax	0.90	2
Brush			**Brush**		
	0.90	2	Mountain Snowberry	0.90	2
	0.90	2	Cinquefoil	0.90	2
				0.90	2
Total	**45.0**	**100**	**Total**	**45.0**	**100**

Notes:

1 Highlighted species are native species in Rasmussen Valley that are listed on the Shoshone-Bannock Tribes' 2016 Culturally Sensitive Plants list (Shoshone-Bannock Tribes 2016). The 2016 list includes grasses, but does not list individual species. Therefore, the heading for grasses is highlighted.

2.3.5.10 Air Emissions and Noise

Project-related air emissions would predominantly consist of fugitive dust and combustion emissions from mining operations. Major sources of fugitive dust may include mining, drilling, blasting, material hauling, and traffic on the access and ore haul roads. Dust would be mitigated or minimized by the application of water or supplementary dust suppressants, such as magnesium chloride or calcium chloride, as necessary to seal roads chemically. Liquid dust suppressants would be used on all blast hole drilling operations.

Control of dust on haul roads is a safety concern as well as an environmental concern, especially during the dry season. If necessary, Agrium would install a water production well to ensure an adequate supply of water for dust suppression.

The layout of haul roads was designed to maximize haulage efficiencies and reduce combustion emissions. Steep grades and greater haul distances decrease haulage efficiency and increase combustion emissions.

2.3.5.11 Hazardous Materials and Wastes

Hazardous materials and wastes associated with the Proposed Action would be stored in the fuel storage area at the staging area and at the existing Rasmussen Ridge Mines shop area. The hazardous materials anticipated to be used and stored on-site for the Proposed Action are listed in **Table 2.3-5**.

The Proposed Action would comply with applicable federal hazardous materials laws and regulations. They include the Resource Conservation and Recovery Act of 1976 (RCRA); the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA or “Superfund”); the Superfund Amendments and Reauthorization Act of 1986 (SARA); the Clean Air, Clean Water, and Clean Drinking Water Acts; and other applicable federal and state laws and regulations.

Table 2.3-5 Hazardous Materials Inventory

Material	Purpose for Use	Storage Location	Quantity Used/Day	On-Site Storage Quantity/Week	Waste Management
Diesel	Fueling heavy equipment	Staging Area and Rasmussen Ridge Mines Shop Area	10,000 gallons	37,120 gallons	Not Applicable
Gasoline	Fueling pickups and mechanics trucks	Staging Area and Rasmussen Ridge Mines Shop Area	100 gallons	3,000 gallons	Not Applicable
Solvents	Parts cleaning	Rasmussen Ridge Mines Shop Area	5 gallons	50 gallons	Spent Solvents Recycled Off Site
Used Oil	Used motor oil	Rasmussen Ridge Mines Shop Area	Varies	5,000 gallons	Used Oil Recycled Off Site
Antifreeze	Cooling for mining equipment	Rasmussen Ridge Mines Shop Area	100 gallons	8,000 gallons	Not Applicable

Table 2.3-5 Hazardous Materials Inventory

Material	Purpose for Use	Storage Location	Quantity Used/Day	On-Site Storage Quantity/Week	Waste Management
Used Antifreeze	Used antifreeze	Rasmussen Ridge Mines Shop area	Varies	2,000 gallons	Used Antifreeze Recycled Off Site
Mining Overburden	Phosphate ore recovery	Mine area	20,000 tons	120,000 tons	Not Applicable
Explosives-Emulsion	Overburden removal	Rasmussen Ridge Mines Shop Area	Varies	20 tons	Not Applicable
Kerosene	Fueling portable heaters	Rasmussen Ridge Mines Shop Area	Varies	2,500 gallons	Not Applicable
Methanol	Keeps air systems on heavy equipment from freezing	Rasmussen Ridge Mines Shop Area	Varies	110 gallons	Not Applicable

All hazardous materials and wastes would be stored and shipped in appropriate containers and labeled according to the U.S. Department of Transportation regulations for hazardous materials as provided in 40 CFR Parts 171 through 180. Hazardous materials would be transported via regulated transporters. The primary route for transporting hazardous materials from Soda Springs to and from the mine would be via State Highway 34, Blackfoot River Road, and the existing haul road to the new West Side Haul Road to the mine site. Transportation of hazardous materials and wastes associated with the Proposed Action would comply with federal regulations.

The term “hazardous wastes” designates materials defined in 40 CFR Part 261.3 and regulated under RCRA. Hazardous wastes are regulated from the point of generation to the point of disposal. The Proposed Action is anticipated to be a conditionally exempt small-quantity generator because Agrium would generate less than 100 kilograms (220 pounds) of hazardous waste per month.

2.3.5.12 Aquatic Habitats

Stream crossings would be constructed to maintain water flows at adequate depths to allow fish passage consistent with adjacent portions of the stream to mitigate potential impacts to existing fisheries and aquatic habitats. Sediment control BMPs would also be implemented to prevent sediment from entering the streams at crossings and other project areas with sediment release potential to streams.

2.3.6 Water Management

The goal of the surface water management system is to prevent exceedances of water quality standards. The methods proposed to obtain that goal for the Proposed Action are summarized in the following sections and set forth in detail in Appendix F of the 2011 Mine and Reclamation Plan (Agrium 2011), Surface Water Control Design for the Rasmussen Valley Mine. Groundwater and surface water management in the pit is described below and summarized in the 2011 Mine and Reclamation Plan.

Small amounts of water that accumulate in the pits from snowmelt, rain, or groundwater seepage and interfere with mining or create a workplace hazard would be disposed on backfill areas that have yet to be covered and reclaimed. Water removed from open pits would not be discharged into surface waters or allowed to percolate into groundwater that connects to nearby surface waters. If any sediment basin is found to be holding water for an extended period, the design and operation of the basin would be adapted to minimize use by wildlife.

If water accumulation in the operational pit areas needs to be remove for operational or safety concerns, it would be transferred from the pit to unreclaimed backfill areas located within the pit crest such that no surface runoff or sediment would leave the backfill area.

Snow that needs to be removed from Proposed Action roads and facilities areas would generally be plowed and stored along roadside berms or within reclaimed areas of the mine that feed runoff into the various installed BMPs (such as silt fences) and appropriate sediment retention structures. This would ensure that surface runoff is kept within acceptable standards for sediments in surface waters. Hauling and handling of snow in areas identified as sensitive (e.g., near wetlands or stream channels) may be subject to other practices to avoid impacts to these areas.

Water from well PW-1W or the well at the Rasmussen Ridge Mine shop may be used for dust suppression. Runoff from the areas where dust suppression water is applied would be contained in stormwater sediment basins and only released if testing found that the water met surface water quality standards.

2.3.6.1 Surface Water Control Design

The goal of the Surface Water Control Design in the 2011 Mine and Reclamation Plan is to prevent exceedances of water quality standards. The following strategies would be employed to achieve that goal:

- Intercept and manage surface runoff from disturbed and undisturbed areas that could affect activities or impact resource to include:
  - Manage runoff from the haul roads.
  - Collect and manage runoff from unreclaimed and reclaimed overburden storage piles and GM stockpiles.
  - Manage drainage at road crossings of natural drainages and streams.
  - Re-establish pre-mining drainages after mining.

These objectives would be accomplished by constructing diversion structures, culverts, or ditches to collect water and divert it to mine pits or sediment basins, or by constructing features such as culverts to convey natural drainages or streams under potential linear obstructions, such as haul roads or the county road.

2.3.6.2 Surface Water Control Structures

Agrium has designed surface water control structures to divert and handle surface runoff in the mine operations area. The structure design strategy, criteria, and results are included in the following sections.

2.3.6.2.1 Surface Runon

As shown in **Figure 2.3-5**, there are 12 drainage areas upslope (north and northeast) of the mine pit, numbered sequentially from southeast to northwest. Surface water runoff from these areas (referred to as runon because it would potentially run onto the mine pit and backfill) drains to the mine pit and backfill areas. Surface runon in the Proposed Action occurs primarily from snowmelt. Runon diversion ditches would be sized to accommodate this snowmelt. Surface water runon would be allowed to flow into the pits, and would be controlled as part of the mine dewatering plan included in the 2011 Mine and Reclamation Plan. Water removed from open pits would not be discharged into surface drainages. Diversion ditches would be used for drainage areas 1 through 4 to reduce potential runon into mining Phases 2, 3, and 4 (**Figure 2.3-5**).

2.3.6.2.2 Runoff from Haul Roads

Culverts and ditches would be used to collect water from haul road surfaces and route the water to sediment basins. The culverts, ditches, and sediment basins would be constructed to convey and hold runoff and prevent discharge of runoff that does not exceed the design storm rainfall event (100-year, 24-hour storm event). Agrium's Multi-Sector General Permit (MSGP) allows for release of stormwater that meets water quality standards or exceeds the approved design storm event.

Runoff sediment basins would be located at Runoff Basin Locations A through L (**Figure 2.3-5**). They would be positioned downgradient of the West Side and Rasmussen Valley Haul Roads to collect the runoff from these roads. Each location may comprise a group of individual basins. **Table 2.3-6** lists the number of individual sediment basins and basin sizes at each location and the resulting excess capacity as a percentage of the total volume. The design volume for some locations may include portions of runoff from adjacent stockpiles.

Table 2.3-6 Haul Road Runoff Sediment Basins

Runoff Basin Locations	Size	Road Length (ft.)	Runoff Volume (cu. ft.)*	Number of Sediment Basins	Basin Volume (cu. ft.)	Excess Capacity (%)
A	50'x140'x10'	1,410	38,129	1	40,833	7
B	50'x135'x10'	2,784	75,284	2	78,417	4
C	50'x190'x10'	1,999	54,056	1	57,083	5
D	50'x190'x10'	1,995	53,948	1	57,083	5
E	50'x190'x10'	2,020	54,624	1	57,083	4
F	50'x120'x10'	2,393	64,711	2	68,667	6
G	50'x130'x10'	1,297	35,073	1	37,583	7
H	50'x180'x10'	2,082	102,650	2	107,667	5
I	50'x135'x10'	1,381	37,345	1	39,208	5
J	50'x180'x10'	3,486	152,578	3	161,500	6
K	50'x150'x10'	1,334	83,520	2	88,167	5
L	50'x115'x10'	1,991	61,515	2	65,417	6

Notes:

* Based on a 100-year, 24-hour storm event

2.3.6.2.3 Overburden Storage Piles and GM Stockpiles

Stockpile sediment basins and diversion structures are part of the water management plan (**Section 2.3.5**) and are designed to prevent or mitigate impacts to surface water resources. Runoff from overburden and GM stockpiles would be collected by ditches at the toe of each stockpile and routed to sediment basins. The collection ditches and runoff sediment basins would be constructed to hold and prevent discharge of runoff that does not exceed the design. Agrium's MSGP would allow for release of stormwater that meets water quality standards or a stormwater event that exceeds approved design volume.

Six external overburden piles and three GM stockpiles are planned (**Figure 2.3-2**). Sediment basins are proposed for four of the six proposed external overburden piles and one of the three GM stockpiles. All of the GM stockpiles would be stabilized with vegetation, straw wattles, and silt fences, and two of the three would not have associated sediment basins. The North and South External Overfill Piles are contiguous with and uphill from the pit backfill. Runoff from the North and South External Overfill Piles would be handled in the same manner as runoff from the pit backfill.

The runoff sediment basins for stockpiles are designed to hold 100 percent of the 100-year, 24-hour storm event. **Table 2.3-7** lists the specifications of the overburden piles and GM stockpile sediment basins to meet the design parameters.

Table 2.3-7 External Stockpile and Overburden Pile Sediment Basins

Basin #	Basin Name	Size	Runoff Volume (cu. ft.)	Number of Basins	Basin Volume (cu. ft.)	Excess Capacity (%)
3	North GM Stockpile	50’x180’x10’	81,581	2	82,292	1
4	North External Overburden Pile	50’x170’x10’	152,914	4	155,083	1
5	Rasmussen Valley Ore Stockpile (Optional)	50’x145’x10’	65,191	2	65,667	1
6	Main South External Overburden Pile	50’x205’x10’	231,931	5	235,417	1
7	South-South External Overburden Pile	50’x215’x10’	196,299	4	197,833	1

2.3.6.2.4 Drainage Control

Surface water from undisturbed areas would be conveyed under the Rasmussen Valley Haul Road, the West Side Haul Road, and the County Road realignment through culverts at 18 locations (**Figure 2.3-5**). Culverts 1 through 8 along the Rasmussen Valley Haul Road would direct water under the Rasmussen Valley Haul Road. Culverts 9 through 14 and 16, along the West Side Haul Road, would drain areas between the mine pit and the haul road. Culverts 15, 17, and 18 would direct drainages under the county roads. The runoff routed through these culverts would be from undisturbed drainages and would not be retained. Culverts under the haul roads and the county roads would follow the requirements of the Federal Lands Highway Project Development and Design Manual for high-standard roads on federal lands (FHWA 2014). **Table 2.3-8** lists proposed surface water drainage structures to be used during mining and reclamation. During reclamation, pre-mining drainage across the mine pit would be re-established along Drainage Channels 4, 6, 7, 8, 10, and 12 (**Section 2.3.6.5**).

Table 2.3-8 Surface Water Drainage Structures

Structure #	Project Stage	Location	Drainage	Design Basis
Culvert 1	Mining	Rasmussen Valley Haul Road	Angus Creek	100-year, 24-hour
Culvert 2	Mining	Rasmussen Valley Haul Road	Unnamed tributary	100-year, 24-hour
Culvert 3	Mining	Rasmussen Valley Haul Road	Unnamed tributary	100-year, 24-hour
Culvert 4	Mining	Rasmussen Valley Haul Road	Unnamed tributary	100-year, 24-hour
Culvert 5	Mining	Rasmussen Valley Haul Road	Unnamed tributary	100-year, 24-hour
Culvert 6	Mining	Rasmussen Valley Haul Road	Unnamed tributary	100-year, 24-hour
Culvert 7	Mining	Rasmussen Valley Haul Road	Unnamed tributary	100-year, 24-hour
Culvert 8	Mining	Rasmussen Valley Haul Road	Angus Creek	100-year, 24-hour
Culvert 9	Mining	West Side Haul Road	Drainage 13	50-year, 24-hour
Culvert 10	Mining	West Side Haul Road	Drainage 14	50-year, 24-hour
Culvert 11	Mining	West Side Haul Road	Drainage 15	50-year, 24-hour
Culvert 12	Mining	West Side Haul Road	Drainage 16	50-year, 24-hour
Culvert 13	Mining	West Side Haul Road	Drainage 17	50-year, 24-hour

Table 2.3-8 Surface Water Drainage Structures

Structure #	Project Stage	Location	Drainage	Design Basis
Culvert 14	Mining	West Side Haul Road	Drainage 18	50-year, 24-hour
Culvert 15	Mining	County Road realignment	Drainage 18	50-year, 24-hour
Culvert 16	Mining	West Side Haul Road	Drainage 19	50-year, 24-hour
Culvert 17	Mining	County Road realignment	Drainage 19	50-year, 24-hour
Culvert 18	Mining	County Road realignment	Drainage 20	50-year, 24-hour
Drainage Channel	Mining	Drainage 18	Culvert 14 to 15	100-year, 24-hour
Channel* 4	Reclamation	Pit 4	Drainage 4 to 17	100-year, 24-hour
Channel* 6	Reclamation	Pit 5	Drainage 6 to 15	100-year, 24-hour
Channel* 7	Reclamation	Pit 5	Drainage 7 to 15	100-year, 24-hour
Channel* 8	Reclamation	Pit 5	Drainages 8 to 15	100-year, 24-hour
Channel* 10	Reclamation	Pit 6	Drainage 10 to 14	100-year, 24-hour
Channel* 12	Reclamation	Pit 6	Drainage12 to 13	100-year, 24-hour

Notes:
* Final re-established channels

2.3.7 Reclamation Plan

The objectives of reclamation are to provide vegetative cover suitable to stabilize the surface; to re-establish the pre-mining multiple land uses of recreation, wildlife habitat, and livestock grazing where authorized; and to limit the risk of post-mining environmental impacts. Reclamation would consist of backfilling open pits, grading backfill and overburden piles and haul roads, placing a cover on backfill and overburden piles, handling GM, re-establishing drainage patterns, removing project-related facilities including power lines, and planting vegetation for reclamation of disturbed areas. Approximately 96 percent of the total disturbance would be reclaimed and revegetated. The remaining 4 percent would comprise exposed unrevegetated limestone pit walls and portions of the realigned county roads.

2.3.7.1 Backfill and Overfill

Approximately 89 percent of overburden excavated would be either returned to the open pits as backfill or permanently placed in the two external overfill piles, which are contiguous with the pit backfill. The remaining excavated overburden would remain permanently in two external overburden piles. All Meade Peak-containing material would be backfilled directly into the previous phase open pits or external overfill piles. When backfill space is not available, material would be stored temporarily in external piles until it can be placed in appropriate backfill locations.

All pit backfill would be shaped, covered, and reclaimed so that runoff could drain off the reclaimed backfill onto undisturbed ground. A small area of unreclaimed pit wall (11.2 acres) would be left exposed. No Meade Peak strata in the pit walls would be left exposed. Meade Peak overburden from the initial mining of Phase 1 would be transported to the temporary external overburden piles and to the two temporary overburden piles located within the pit footprint (**Table 2.3-2**). Non-Meade Peak overburden from Phase 1 would be transported for storage in the permanent external overburden piles. As mining progresses, open pits would become available to receive excavated overburden from the subsequent mining phase as backfill.

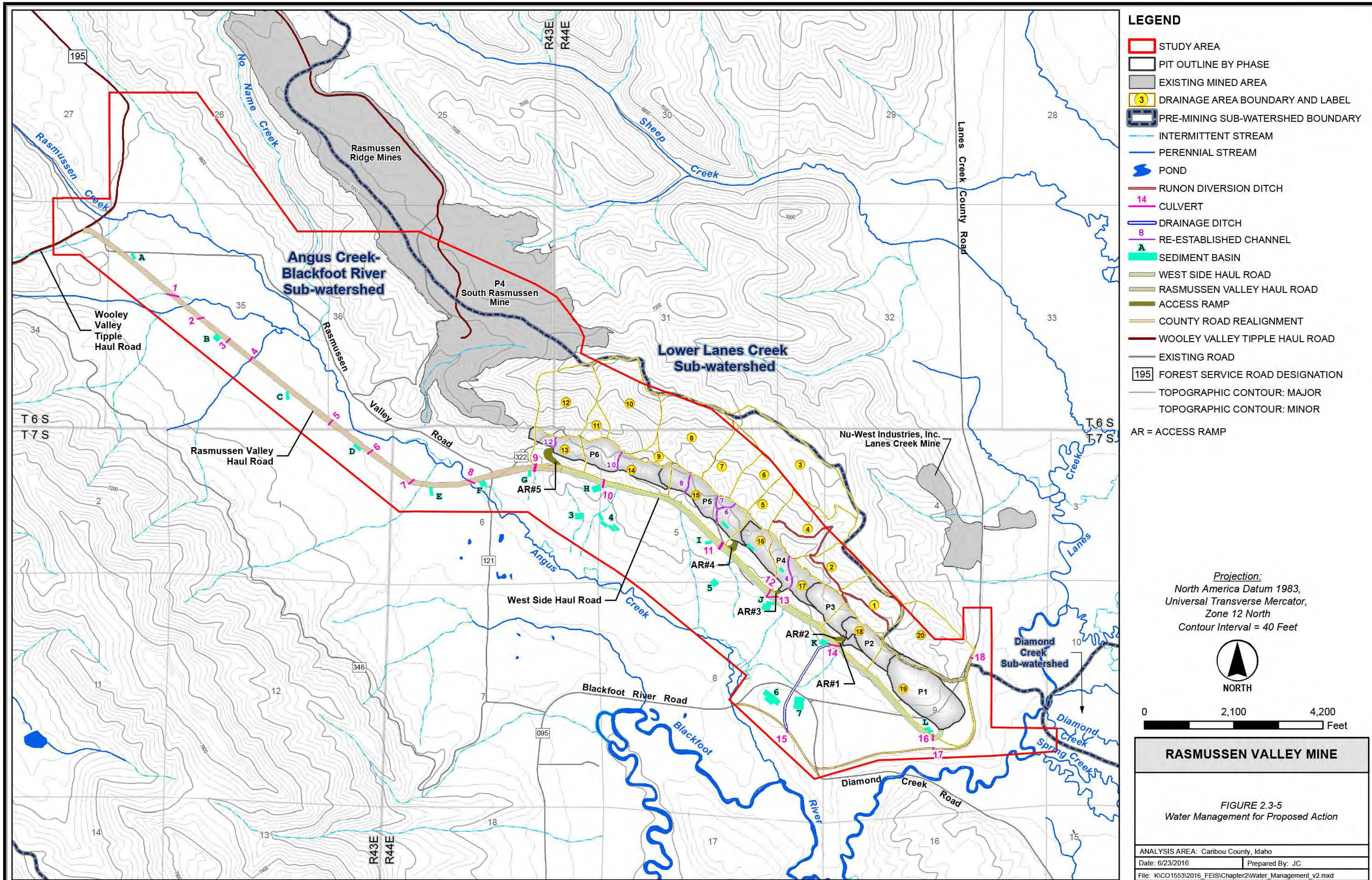

FIGURE 2.3-5
Water Management for Proposed Action

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Phases 1 through 5 and a portion of Phase 6 would be backfilled to a final reclaimed surface slope of no more than 3H:1V. The remainder of Phase 6, the last phase to be mined, would be backfilled to a final reclaimed surface sloping northeast-to-southwest at a 2 percent gradient. Runoff would flow off the reclaimed backfill and onto undisturbed ground or toward re-established drainages. The backfill would be shaped to prevent standing water or formation of a pit lake.

The Proposed Action would cover the backfill and overfill with a store-and-release earthen cover consisting of a minimum of 3 feet of non-Meade Peak-containing material overlain by 2 feet of GM salvaged from within the pit area. The Proposed Action cover is a store-and-release design to reduce the percolation rate in the root zone until a portion of the water can be transpired to the atmosphere. The non-Meade Peak-containing material layer separates the underlying Meade Peak-containing material from the GM, while the GM supports vegetation.

2.3.7.2 Overburden Piles

The final slopes of external overburden piles would be graded or re-contoured to have maximum 3H:1V slopes and to prevent ponding of meteoric waters on the pile surface, thus reducing infiltration. The final height of the permanent overburden piles would range from 180 feet to 260 feet high from toe to top. The South Main Temporary Overburden Pile and a portion of the North Overburden Pile would not be reclaimed because they would be placed back into the pit as backfill at the end of mining. Once removed, the area occupied by the temporary piles would be reclaimed. The permanent external overburden piles would not include Meade Peak-containing material to reduce the potential for leaching COPCs. When the permanent external overburden piles are final graded, they would be covered with a minimum of 12 inches of GM and revegetated.

2.3.7.3 GM Direct Placement and GM Storage Management

GM would be salvaged, placed on available areas, or stored in GM stockpiles for use as soon as areas are available for reclamation, thereby reducing long-term GM storage. GM would generally be salvaged and used during the summer and fall when wet or frozen soil conditions do not restrict soil salvage or use operations.

2.3.7.4 Re-establishment of Drainages

All of the drainage areas would be re-established after mining, including those on backfill, overfill, and permanent overburden piles. Six of these drainages (4, 6, 7, 8, 10, and 12; **Table 2.3-8**) would be re-established with channels lined with compacted GM or alluvium and riprap. The remaining six drainages are small and would be re-established as swales during final grading.

The six re-established channels would be designed to accommodate the peak discharge from the 100-year, 24-hour storm event with a minimum of 6 inches of freeboard (**Table 2.3-8**). The channels would be constructed as flat-bottomed, trapezoid-shaped channels with a bottom width of 8 feet and 3H:1V side slopes. Channel depths would vary depending on the design peak flow. The channels would be lined with a layer of compacted alluvium or GM to reduce infiltration into backfill, then lined with riprap as needed to protect against erosion. The slopes of the channels would follow the ground slopes of the backfill, and thus would be not greater than 3H:1V.

2.3.7.5 Haul Roads

The West Side Haul Road, the Rasmussen Valley Haul Road, and smaller connecting roads in the Proposed Action would be reclaimed when no longer needed. The existing Wooley Valley Tipple Haul Road would be reclaimed under the Rasmussen Ridge Mines Reclamation Plan when no longer needed.

All reclamation would be designed to meet the vegetation COPC concentrations established in the BLM Pocatello Field Office (PFO) Approved Resource Management Plan (ARMP; BLM 2012a). For all haul roads, the first stage of road reclamation would be to remove safety berms as necessary, particularly in areas where selenium contamination from transported material may have occurred. Removed haul road material would be placed as backfill within the mine. Road material would be removed beginning with the outside edges and working inward to the centerline. Maximum practical effort would be made to not increase the road footprint during reclamation. Reshaping of the road would leave a reclaimed surface that has maximum slopes of 3H:1V, with the edges blending into the natural topography and having no ledge where the reclaimed edge meets the original grade. Reshaping would be achieved by removal of material to the specified dimensions and contours, not by spreading material out beyond the original road footprint. Once shaped, all reclaimed surfaces would be covered with a minimum of 12 inches of GM and revegetated.

Haul road culverts and all road fill materials overlying the culverts would be removed. A minimum of 8 feet of fill on either side of the original drainage would be removed. GM would be placed in areas where it had been removed for haul road construction. BMPs would be implemented to address erosion until vegetation is re-established. Any associated nearby water management structures, such as sediment ponds, would also be reclaimed as part of haul road reclamation. Water management structures would be cleaned of any materials found to contain selenium or other COPCs before the originally excavated materials are used to fill in the structures. Any Meade Peak-containing material from haul roads, berms, or water management structures would be disposed of as backfill within the mine.

2.3.7.6 Facilities

After mining, all equipment and facilities would be removed from the site. The drinking water system and septic system would be abandoned in accordance with applicable state laws. The staging area fill would be analyzed for total petroleum hydrocarbons (TPHs) that may have resulted from petroleum releases. If unacceptable levels of TPH concentrations are detected, the materials would be treated or removed in accordance with the current applicable regulations (Idaho Administrative Procedures Act [IDAPA] 58.01.24). The staging area would then be ripped and regraded to approximate the natural topography. GM would be placed over the area as needed to a minimum depth of 12 inches, seeded, and fertilized.

Fuel tanks would be emptied, cleaned, and hauled off site. Any products removed from the tanks during decommission or resulting from cleaning would be recycled or hauled off to an agency-approved disposal area. Secondary containment structures would be cleaned and demolished. Resulting rubble would be tested for petroleum. Contaminated rubble would be transported off site to a licensed landfill for disposal in accordance with current applicable regulations. Uncontaminated rubble would be hauled off site. The area underneath the secondary containment and surrounding disturbance would be tested for petroleum. If unacceptable levels of contamination are detected, the extent of the contamination would be delineated, and impacted soils would be treated or removed based on current applicable regulations (IDAPA 58.01.24). The areas would then be ripped, regraded in a manner that blends with the natural topography, capped with GM as needed, and seeded.

Power lines at the Proposed Action and all fencing and warning signs would be removed when no longer needed and all materials would be taken off site.

Existing office and maintenance facilities located at Agrium's Rasmussen Ridge Mines would be used for mine administration, operation personnel, and equipment storage and maintenance.

When no longer needed, the office, shop, and maintenance facilities would be demolished and reclaimed under the agency-approved reclamation plan for the Rasmussen Ridge Mines.

2.3.7.7 Revegetation

The objective of revegetation is to provide a self-regenerating cover that controls erosion, is easily established, and meets the vegetation COPC concentration action levels documented in the PFO ARMP (BLM 2012a). In addition, Agrium proposes to establish a plant cover suitable for post-mining land uses of grazing and wildlife habitat and to enhance the evapotranspiration function of the backfill and overfill cover system. Revegetation would be of two types: interim revegetation on areas that would be subject to future re-disturbance and final revegetation. Proposed seed mixes are presented in **Table 2.3-4**.

Interim revegetation would be conducted as needed on cuts and fills, road fills, and other areas that would be re-disturbed as part of final reclamation using the same seed mix as that used for permanent reclamation or a mixture of grasses and forbs selected solely to stabilize the surface against erosion. Agrium would use agency-approved seed mixes for species and application rates for interim revegetation. Interim seeding would typically occur in the fall.

Final revegetation, like interim revegetation, would be to stabilize the ground surface as well as to establish a plant cover suitable for post-mining land uses of grazing and wildlife habitat and to enhance the evapotranspiration function of the cover system. A mixture of grasses, forbs, and shrubs is proposed. All reclamation would be designed to meet the vegetation COPC concentrations established in the PFO ARMP.

The areas to be revegetated would be prepared to receive seeds through placement, grading, and smoothing of GM. Seeds would be drilled or broadcast onto the area. GM would be augmented with fertilizer based on soil analysis of the area. Revegetation would take place typically in the fall. Appropriate BMPs to control invasive and noxious species would be implemented throughout the life-of-mine and for a period post-mining. As reclamation techniques and philosophies change, Agrium would work with appropriate agencies to revise the seed mix and revegetation objectives.

2.3.7.8 Wetlands Mitigation or Replacement

Disclosing potential impacts to wetlands is a key issue for the EIS. Addressing potential wetland impacts and associated mitigation is the responsibility of the U.S. Army Corps of Engineers (USACE) through the Clean Water Act (CWA) Section 404 permitting process. Because of the wetlands existing within the Study Area, the USACE is a cooperating agency. The USACE would use data and analysis from this EIS to process any Section 404 permit application Agrium may need to submit for the project. The USACE's Final Decision on Agrium's Section 404 permit application, should a permit be required, would incorporate Compensatory Mitigation for Losses of Aquatic Resources in compliance with 33 CFR Parts 523 and 332 and 40 CFR Part 230.

2.3.7.9 Wildlife Habitat Mitigation Approach and Habitat Equivalency Analysis

The residual impacts to wildlife habitat for the Rasmussen Valley Mine were quantified using a Habitat Equivalency Analysis (HEA) model. The HEA uses habitat baseline information to evaluate the different wildlife habitats impacted in the Study Area and determines a value for the wildlife services lost as a result of ground disturbance and a value for the wildlife services gained through reclamation and on-site mitigation. The acres and services lost or gained as a result of mining activities, reclamation, and mitigation are expressed quantitatively as Discounted Service Acre Years (DSAYs).

The HEA addresses impacts to upland wildlife habitats. Jurisdictional wetlands that occur in the Study Area are addressed in the USACE 404 permitting process, not through the HEA. The USACE has determined that all wetlands in the Study Area are jurisdictional (USACE 2014); therefore, no wetlands are included in the assessment of habitat service loss in the HEA.

The analysis process and results of the HEA are documented in several reports. The Wildlife Habitat Equivalency Analysis Baseline Metrics Report (Arcadis 2014a) describes baseline (pre-mining) conditions for the habitats on the mine site. The conditions are expressed in terms of two values called metrics: (1) richness cover wetness (RICHCOVWET) and (2) within aspen overstory (WAO). The RICHCOVWET metric quantifies wildlife service habitat losses and gains for areas containing shrubs, forbs, and grasses; and the WAO metric quantifies losses and gains for habitat with an aspen forest type overstory (Arcadis 2014a).

A second report, the Wildlife Habitat Equivalency Analysis Predictive Metrics Report (Arcadis 2015a) describes how on-site baseline conditions for the Proposed Action are expected to change as a result of reclamation that is expected to restore wildlife habitat services. The report then identifies two hypothetical mitigation projects (a Stream Project and an Aspen Project) to illustrate how the methods and results of the HEA can be used to quantify mitigation projects that offset lost wildlife habitat services. A third report, the Wildlife Habitat Equivalency Analysis Predictive Metrics Report Addendum (Arcadis 2015b), describes how conditions are expected to change following reclamation under the Preferred Alternative, the RCA.

The HEA Report (Arcadis 2015c) combines the information from the Baseline Metrics and Predictive Metrics Reports (Arcadis 2014a, 2015a, 2015b) and presents the quantified impacts to habitat services under the Proposed Action and alternatives using DSAYs as the measure. The HEA and the calculated DSAYs, take into account not only the wildlife services lost and gained as a result of impacts and reclamation, but also the timing of when the services are lost and when they return to maturity. The HEA Report also explains how mitigation projects would offset the on-site services lost.

Agrium has proposed to use the quantitative results of the HEA to determine the funding of a third party to implement wildlife habitat mitigation projects in the regional watersheds in lieu of Agrium implementing an actual project. To do this, Agrium would use four hypothetical mitigation projects to calculate and arrive at a cost of mitigating the lost (residual) wildlife habitat services (in terms of DSAYs) from the selected alternative. Because the selected alternative would not be known until after publication of the Final EIS, the project and cost estimate would be described in a Wildlife Habitat Mitigation Plan prepared by Agrium before the Record of Decision (ROD) is signed. This document would include five components: (1) details of the hypothetical mitigation project(s); (2) the gain in DSAY values from the hypothetical project and the assumptions used in the calculations; (3) a calculation of the total cost to offset the lost DSAYs of the Proposed Action and selected alternative using hypothetical mitigation projects as a basis; (4) description of the provisions of the corresponding in-lieu fee to a third party; and (5) fulfillment of the mitigation. The selection of the hypothetical mitigation projects and the cost of the projects would be calculated in coordination with the Agencies. The BLM, Agrium, and other stakeholders would identify a third-party recipient of the in-lieu fee and confirm that the fee would be spent in accordance with the wildlife habitat mitigation objectives. The calculation of the in-lieu fee amount and the disposition of the money will be documented as a requirement in the ROD. After the ROD is signed, Agrium would provide the in-lieu fee to the third party.

2.3.8 Environmental Monitoring Plan

The Environmental Monitoring Plan (EMP; **Appendix B**) identifies the environmental monitoring activities that would be undertaken at the mine to ensure compliance with environmental standards, regulations, and land use plans and the effectiveness of BMPs and mitigation measures. The EMP identifies which resources will be monitored and describes monitoring and sampling locations, approved monitoring and sampling methods, duration and frequency of sampling, and data reporting requirements. Some of the environmental monitoring, such as groundwater monitoring, began during baseline data collection to establish baseline conditions. The EMP will include monitoring water quality, reclamation success, overburden cover construction and presence of noxious weeds. A final EMP will be prepared and approved after the ROD has selected an alternative and before activities that impact resources begin.

2.4 ALTERNATIVES DEVELOPMENT PROCESS

The primary goal of alternatives development is to identify and describe acceptable ways to address unresolved conflicts with the Proposed Action identified during scoping while meeting the purpose of and need for the Proposed Action. The NEPA process requires that alternatives evaluated in detail be reasonable, as discussed in the regulations implementing NEPA (40 CFR 1500.1[e] and 1502.14). In addition, the Council on Environmental Quality's (CEQ's) 40 Most Asked Questions about NEPA (Question 2a) states, in part, "reasonable alternatives include those that are practical or feasible from the technical and economic standpoint and using common sense…" (CEQ 1981).

Alternatives development began with the compilation of a list of issues and indicators identified in public and agency scoping (**Table 1.6-1**). The Agencies and Arcadis evaluated these issues to identify modifications to project features, facilities, or operations that would eliminate or reduce anticipated environmental effects to acceptable levels while fulfilling the purpose of and need for the Proposed Action. A suggested list of these elements was provided to Agrium in a letter (BLM 2012b) requesting that they assist the Agencies by considering the feasibility of these elements for the development and operation of the Proposed Action. Agrium developed a technical memorandum (Brown and Caldwell [BC] 2015c) discussing the feasibility of alternative elements. In the technical memorandum, alternative elements were organized into the following seven categories:

- Overburden storage and management
- Infrastructure elements
- Ore transport and access routes
- Cover systems
- Wetlands mitigation
- Mine sequencing and material handling
- GM management and seed mix

Overburden storage and management during and after mining operations were identified as potential sources of COPCs that could contaminate surface water and groundwater. Runoff and drainage from in and around the overburden piles could also increase the potential release of COPCs. In addition, some of the locations for overburden piles in the Proposed Action carried a potential for geotechnical instability which could lead to slope failure and exacerbate the release of COPCs. The release of COPCs could affect surface water and groundwater quality and in turn could affect wetlands and riparian areas; vegetation; wildlife; fisheries and aquatic species; and threatened, endangered, or sensitive species. Overburden piles on the ridge slopes would also affect the visual character of the landscape. Alternative elements that would contain and manage runoff and leaching were considered. These included alternative locations for temporary or permanent overburden piles, including the use of previously disturbed areas, and backfilling directly to mined out areas to minimize storage. Several different locations for overburden piles near the lease and several previously mined areas were considered for the disposal or storage of overburden. As discussed in **Section 2.8**, some of these alternative elements did not reduce adverse effects in comparison to the Proposed Action. Some may have reduced one adverse effect at the cost of increasing others.

Aspects of mine infrastructure, such as the locations of facilities and the construction and maintenance of power lines, were evaluated for environmental issues. As with overburden storage and management, a key issue for location and construction of infrastructure was potential effects to groundwater, surface water, and wetlands. Power lines identified in the Proposed Action were identified as a potential source of issues. One issue was the disturbance of natural drainages and indirect effects to wetlands in Rasmussen Valley. Another issue for overhead power lines was the potential for electrocution or collisions for birds.

The primary elements of ore transport and access are the ore haul roads. The existing Wooley Valley Tipple was identified as the preferred loading point for transport of the ore to the CPO fertilizer plant, and all haul road alternatives were designed to link to the existing Wooley Valley Tipple Haul Road. The Rasmussen Valley segment of the Proposed Action Haul Road was identified as having several issues. This haul road would cross the floor of Rasmussen Valley, would cross Rasmussen Valley County Road, would disturb 10.3 acres of wetlands and other waters of the U.S. (WOUS), would impair public access and recreation, and would disturb public and private grazing land. Alternative haul road routes were considered for their potential to reduce these potential impacts, particularly the impacts to wetlands and riparian areas. An alternative to avoid a new crossing of Rasmussen Valley and connect with existing haul roads at the Rasmussen Ridge Mines, originally identified as HR-4, depended on reaching an agreement with P4, LLC (P4) to cross through their South Rasmussen Mine. HR-5 in the RCA is a variation of this alternative.

As with overburden storage and management during mining, overburden and backfill after mining were identified as potential sources of COPCs that could contaminate surface water and groundwater. Many of the potential effects of the long-term management of overburden and backfill are the same as those for overburden storage and management during mining. A key element for the long-term management of overburden and backfill is the cover design. Objectives of the cover design are to establish a healthy vegetative ground cover to stabilize the ground surface from erosion and mass failure, limit deep percolation (thus limiting the leaching and transport of COPCs into groundwater), and provide a diverse vegetative cover for wildlife forage and cattle grazing.

Mine sequencing and material handling affect the extent of surface disturbance at any given time, the amount of Meade Peak overburden that must be managed, and the potential for mine pit water or the contamination of groundwater and surface water. This includes the sequencing of backfilling and overlaps to some extent with overburden storage and management. Aspects of mine sequencing and material handling may also reduce or eliminate the need for mining below the water table.

The combined alternatives feasibility analysis (BC 2013a) does not directly address alternative elements for wetlands mitigation. Other alternative elements, such as alternative haul roads and alternative overburden pile and GM stockpile locations that would avoid impacts to wetlands were considered.

Alternative elements for GM management and seed mixes are addressed in the alternatives analysis. Alternatives that included GM storage in Rasmussen Valley for haul road reclamation were eliminated with the haul road alternatives in the valley. Alternative GM stockpile locations included locations for overburden piles that were considered and eliminated, and locations that were incorporated into the RCA. The chosen alternative elements for GM storage eliminate potential impacts to wetlands. The alternative seed mixes emphasize diversity and reclamation of wildlife habitats.

Favorable alternative elements were combined into the RCA. Some elements that had initially been considered problematic (such as disposal of overburden in the partially reclaimed South Rasmussen Mine and a haul road route through the South Rasmussen Mine to link to the existing Rasmussen Ridge Mine haul road) became feasible with the cooperation of P4.

Agrium was requested to consider recovering the ore reserves located at the north end of the Lease to satisfy the BLMs CFR directive of “ultimate maximum recovery” of resources on leasable lands. This led to a variation in the alternative elements including an additional lease modification and revised pit footprint.

2.5 ALTERNATIVES CONSIDERED

The process described above resulted in the development of several alternatives that specifically responded to one or more of the issues. Although a number of alternatives were developed, they were not all analyzed in detail. Some were deemed unreasonable early in the process. Others were eliminated after initial analysis indicated that they were not reasonable.

The alternatives developed for this NEPA analysis are described in two overall groups. The alternatives analyzed in detail are described first. The alternatives considered but eliminated from detailed analysis are described subsequently (**Section 2.8**).

2.5.1 Rasmussen Collaborative Alternative and BMPs

Alternatives to several features of the Proposed Action were considered to be significantly more effective than the Proposed Action and are considered BMPs. These alternative components were combined together in a single alternative referred to as the RCA. The RCA is so called because it was developed by Agrium in collaboration with P4, the operator of the South Rasmussen Mine operating on State Lease #7958 and Federal Phosphate Lease IDI-23658 (Fringe Lease). The RCA alternative includes the following components considered BMPs:

- Placement of Rasmussen Valley Mine overburden into the P4’s partially backfilled South Rasmussen Mine pit on the State Lease and extending into the federal Fringe Lease to the east (**Figure 2.5-1**). The use of P4’s South Rasmussen Mine would eliminate the need for external overburden piles on the pediments downslope of the Rasmussen Valley Mine pit. It would also cover and reclaim portions of the South Rasmussen Pit that had not previously been identified for reclamation, and provide additional stability for backfill in the pit. Eliminating the external overburden piles down slope of the Rasmussen Valley Mine pit eliminates the source of potential COPC impacts to Angus Creek and Blackfoot River.
- Placement of an enhanced cover on the Rasmussen Valley Mine overburden piles and backfill and on the South Rasmussen Mine RCA backfill to reduce the predicted

percolation of meteoric water through the overburden, thus reducing the COPC loading to the groundwater to protect beneficial uses.

- Reducing the amount of water requiring management by avoiding mining below the regional water table, thus reducing the amount of water percolating through overburden and leaching COPCs into the groundwater, or the need for a water treatment alternative.
- Rerouting the haul road up the southeast slope of Rasmussen Ridge and onto P4's South Rasmussen Mine. The haul road would extend through the South Rasmussen Mine and onto Agrium's existing Rasmussen Ridge Mine haul road and next to their shop area. This route, designated HR-5, avoids all wetland impacts; allows the transport of overburden to the South Rasmussen Mine pit; eliminates the need for a new fuel facility at the staging area near the Rasmussen Valley Mine pit, and routes mine traffic past existing fuel facilities at the Rasmussen Ridge Mines shop area. Ore would also be hauled to the Wooley Valley Tipple by this route.
- Selection of a seed mix for reclamation that provides more native species for enhanced wildlife habitat vegetation.
- Avoidance of all wetlands impacts by repositioning several mine facilities.

The RCA addresses concerns and issues raised in public and agency scoping. In the following sections, the RCA will be compared to the Proposed Action, followed by a discussion of other alternative elements considered but not carried forward for full analysis. The comparison begins with a description of proposed mining operations in relation to **Section 2.3.3**.

In response to public comments, to concerns about activities on the IDFG Blackfoot River Wildlife Management Area (WMA), and to small remaining areas of wetland impacts, the following modifications have been made to the RCA as presented in the Draft EIS (**Figure 2.5-1**).

- The North-North and North Main GM, alluvium and colluvium borrow and storage areas, for obtaining material for backfill cover construction have been combined and enlarged on NFS land both on and off lease to potentially reduce the area on the WMA that might need to be disturbed for borrow material. The RCA North-North and North Main GM, alluvium, and colluvium storage areas coincidentally overlap the locations of the eliminated Proposed Action North GM Stockpile and North Overburden Pile. The similar names should not be confused.
- The area between the mine pit and the West Side Haul Road on NFS land would be used to store GM and alluvium in GM stockpiles for use in reclamation and backfill cover construction, again to minimize the need to disturb the WMA.
- The footprints of the West Side Haul Road and the access ramp at the west end of Phase 7 (Access Ramp 5) have been modified to avoid impacts to wetlands.
- The realignments of the county roads have been adjusted to avoid wetlands.
- Additional surface water management features have been added, including runon diversion ditches and an access road upslope of the mine pit, and sediment basins to reduce the amount of water potentially contacting overburden and pit walls.
- P4 will use mineral materials borrow from the Rasmussen Valley Mine external borrow areas to improve the cover placed on the overburden stored in the South Rasmussen Mine pit to protect beneficial uses of groundwater in the Wells Regional Aquifer.
- The avoidance of all wetlands by the RCA means that a Section 404 CWA permit may not be needed and will be evaluated and processed if needed.

These changes to the RCA have identified expanded borrow and storage areas off the WMA, have avoided all impacts to wetlands, and allowed flexibility so that less of the South Main Borrow and Storage Area on the WMA may need to be used. All of these changes together increase the overall potential surface disturbance by almost 141 acres for the RCA as described in the Draft EIS or 73 acres more than the Proposed Action. However, it is unlikely that all of these borrow areas will be needed.

The RCA also enlarges the extent of the mine pit to the northwest to recover additional ore thus delaying when additional mines may need to be brought into operation to continue supplying phosphate ore to the CPO fertilizer plant in Soda Springs.

2.5.1.1 Lease Modifications

Mine disturbances outside the BLM lease boundary are often proposed to allow activities such as additional phosphate ore recovery, pit wall lay back for safety, establishment of overburden backfill and external piles, and construction of ancillary facilities such as roads and stockpiles. The following describes specific areas in which Agrium has requested activities outside of the lease boundary, and how those activities could be authorized (**Table 2.5-1**).

The RCA expands the pit and associated backfill to the northwest and adds external overburden disposal north of the Lease on the north end of the pit (**Figure 2.5-2**, **Table 2.5-1**). The pit wall, pit backfill, and a smaller portion of external overburden would extend onto state land (**Figure 2.5-2**) and would need to be approved by IDL. The remainder of the external overburden outside the Lease (permanent overfill pile) would be placed on National Forest Land and would require a BLM lease modification (**Figure 2.5-2**, Area D; **Table 2.5-1**).

Table 2.5-1 Proposed Lease Modifications and Use Permits for the RCA

Map ID[1]	Type	Acreage
A	Private Land Agreement	10.2
B	Modification (BLM/Private)	55.9
C	Modification (BLM/USFS)	20.7
D	Modification (BLM)	19.6
E	Temporary Use (State - IDFG)	3.4
F	Temporary Use (State - IDFG)	10.0
G	Special Use (USFS)	0.6
H	Special Use (USFS)	1.0
I	Special Use (USFS)	0.6
J	Special Use (USFS)	0.6
K	Special Use (USFS)	0.6
L	Special Use (USFS)	0.6
M	Special Use (USFS)	0.1
N	Special Use (USFS)	0.3
O	Special Use (USFS)	0.2
P	Special Use (USFS)	0.3
R	Minerals Material (USFS)	104.4
T	Temporary Use (State - IDFG)	49.6
U	Lease Agreement (State - IDL)	18.4
V	Mine and Reclamation Modification (State - IDL)	52.5
W	Mine and Reclamation Modification (BLM)	5.5
	Total	**355.1**

Notes:
1 ID number from **Figure 2.5-2**

In the Proposed Action, Agrium requested a lease modification on the southeast end of the Lease to allow the recovery of additional ore in the area. The RCA has reduced the area of this lease modification (**Figure 2.5-2, Table 2.5-1**, Area B) to more closely conform to the location of the ore and pit informed by more recent exploration data.

A portion of the pit wall, backfill, haul road, and a section of monitoring well access road are proposed on the WMA (**Figure 2.5-2**, Areas E and F; **Table 2.5-1**). Authorization for these activities would be via an agreement between Agrium and the IDFG. The optional South Main External Borrow and Storage Area in Area T, if needed, would also be authorized via a use agreement between Agrium and the IDFG.

The lease modification identified in the Proposed Action and RCA (Area A in **Figure 2.3-1** and **Figure 2.5-2; Table 2.5-1**) on privately owned land is not an option because there is no federal phosphate mineral on the land. For this activity, Agrium would arrange an agreement with the private landowner (Bear Lake Grazing).

The Proposed Action lease modification to place backfill in the portion of the pit on National Forest Land outside the phosphate lease boundary (**Figure 2.3-1**, Area C) has been reduced from 40 acres in the Proposed Action to 20 acres in the RCA (**Figure 2.5-2**, Area C).The external borrow and storage areas in Area R would require a USFS minerals materials permit.

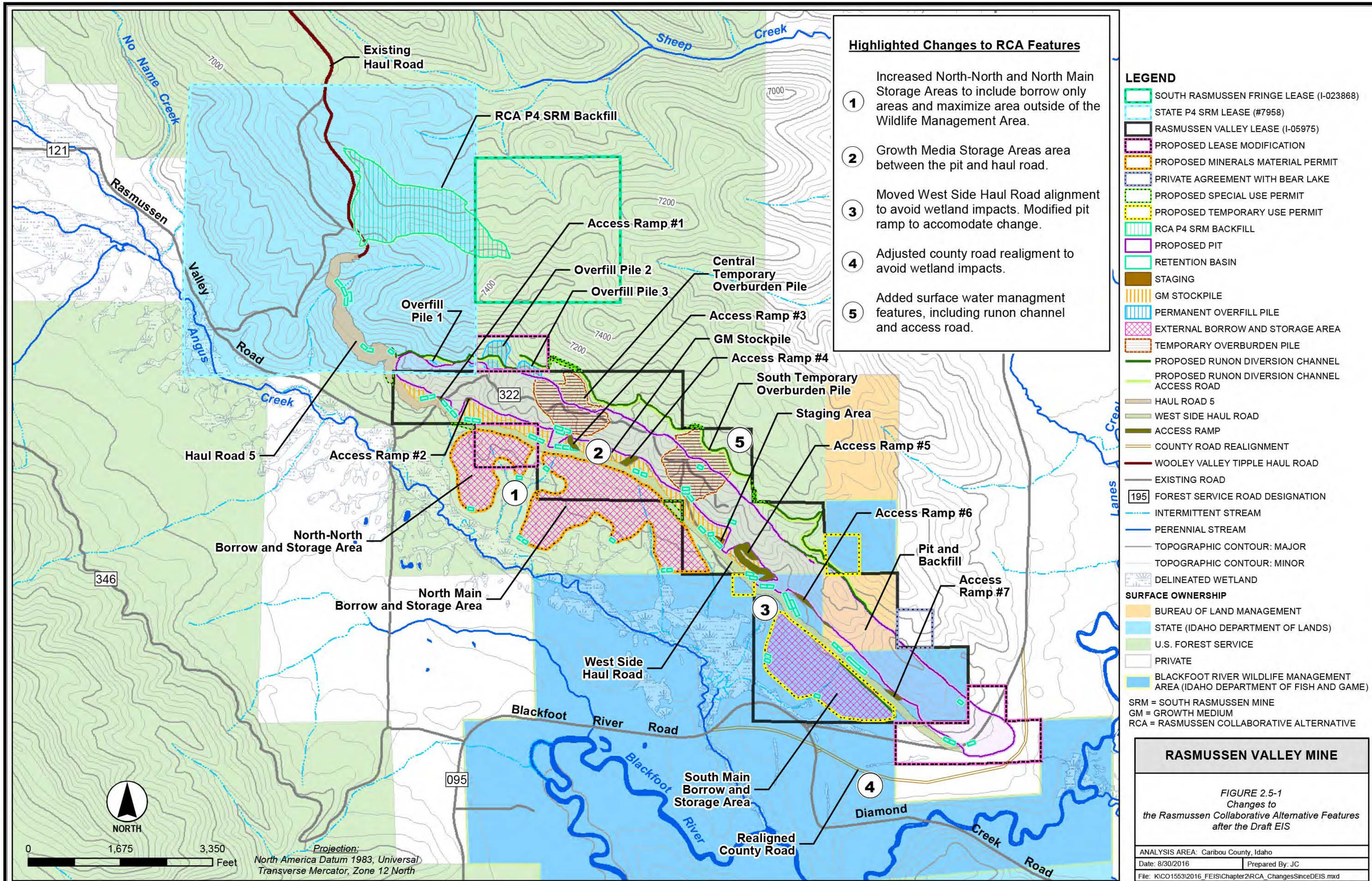
Several other areas on public land administered by the USFS would require SUAs. Areas G, H, I, and J would be required for the West Side and HR-5 Haul Roads and associated features, and Areas K through P would be required for the runon diversion ditch and associated access road.

Without the authorization of these areas, ore would be left behind at the boundary between the Lease and the lease managed by the IDL in Section 36 of T6S, R44E, and on the southeast end of the deposit.

2.5.1.2 Other Use Authorizations

Additional use authorizations have been proposed in the RCA (**Figure 2.5-2**, Areas G through P). They consist of SUAs on National Forest Lands, agreements with landowners on the WMA, and agreements with private landowners (**Table 2.5-1**). Proposed activities include a portion of a GM stockpile (Area G), portions of the ore haul road (Areas H through J), and segments of the runon diversion ditch and associated access road (Areas K through P).

There would also be changes on the P4 South Rasmussen Mine leases. The RCA would use haul road HR-5 on state land through the South Rasmussen Mine state lease, requiring a lease agreement between Agrium and IDL (Area U). Proposed Agrium POC and indicator wells on state land will also need to be authorized through a lease agreement with IDL. The RCA would add backfill from the Rasmussen Valley Mine to the P4 South Rasmussen Mine backfill on the P4 state lease (Area V) and on the BLM Fringe lease (Area W). The additional backfill on the South Rasmussen Mine state lease (Area V) would need to be authorized by an approved mine and reclamation plan modification with IDL. Similarly, the placement of additional backfill on the federal Fringe lease portion of the South Rasmussen Mine (Area W) would need to be authorized by and approved mine and reclamation plan modification with the BLM.



Highlighted Changes to RCA Features
1 Increased North-North and North Main Storage Areas to include borrow only areas and maximize area outside of the Wildlife Management Area.
2 Growth Media Storage Areas area between the pit and haul road.
3 Moved West Side Haul Road alignment to avoid wetland impacts. Modified pit ramp to accomodate change.
4 Adjusted county road realigment to avoid wetland impacts.
5 Added surface water managment features, including runon channel and access road.
LEGEND
SOUTH RASMUSSEN FRINGE LEASE (I-023868)
STATE P4 SRM LEASE (#7958)
RASMUSSEN VALLEY LEASE (I-05975)
PROPOSED LEASE MODIFICATION
PROPOSED MINERALS MATERIAL PERMIT
PRIVATE AGREEMENT WITH BEAR LAKE
PROPOSED SPECIAL USE PERMIT
PROPOSED TEMPORARY USE PERMIT
RCA P4 SRM BACKFILL
PROPOSED PIT
RETENTION BASIN
STAGING
GM STOCKPILE
PERMANENT OVERFILL PILE
EXTERNAL BORROW AND STORAGE AREA
TEMPORARY OVERBURDEN PILE
PROPOSED RUNON DIVERSION CHANNEL
PROPOSED RUNON DIVERSION CHANNEL ACCESS ROAD
HAUL ROAD 5
WEST SIDE HAUL ROAD
ACCESS RAMP
COUNTY ROAD REALIGNMENT
WOOLEY VALLEY TIPPLE HAUL ROAD
EXISTING ROAD
195 FOREST SERVICE ROAD DESIGNATION
INTERMITTENT STREAM
PERENNIAL STREAM
TOPOGRAPHIC CONTOUR: MAJOR
TOPOGRAPHIC CONTOUR: MINOR
DELINEATED WETLAND
SURFACE OWNERSHIP
BUREAU OF LAND MANAGEMENT
STATE (IDAHO DEPARTMENT OF LANDS)
U.S. FOREST SERVICE
PRIVATE
BLACKFOOT RIVER WILDLIFE MANAGEMENT AREA (IDAHO DEPARTMENT OF FISH AND GAME)
SRM = SOUTH RASMUSSEN MINE
GM = GROWTH MEDIUM
RCA = RASMUSSEN COLLABORATIVE ALTERNATIVE
Existing Haul Road
RCA P4 SRM Backfill
Access Ramp #1
Overfill Pile 2
Overfill Pile 3
Overfill Pile 1
Central Temporary Overburden Pile
Access Ramp #3
GM Stockpile
Access Ramp #4
South Temporary Overburden Pile
Staging Area
Access Ramp #5
Access Ramp #6
Pit and Backfill
Access Ramp #7
Haul Road 5
Access Ramp #2
North-North Borrow and Storage Area
North Main Borrow and Storage Area
West Side Haul Road
South Main Borrow and Storage Area
Realigned County Road
No Name Creek
Sheep Creek
Rasmussen Valley Road
Angus Creek
Blackfoot River Road
Blackfoot River
Diamond Creek Road
Lanes Creek
121
322
346
095
7000
7200
7400
NORTH
0 1,675 3,350 Feet
Projection: North America Datum 1983, Universal Transverse Mercator, Zone 12 North
RASMUSSEN VALLEY MINE
FIGURE 2.5-1
Changes to the Rasmussen Collaborative Alternative Features after the Draft EIS
ANALYSIS AREA: Caribou County, Idaho
Date: 8/30/2016
Prepared By: JC
File: K:\CO1553\2016_FEIS\Chapter2\RCA_ChangesSinceDEIS.mxd

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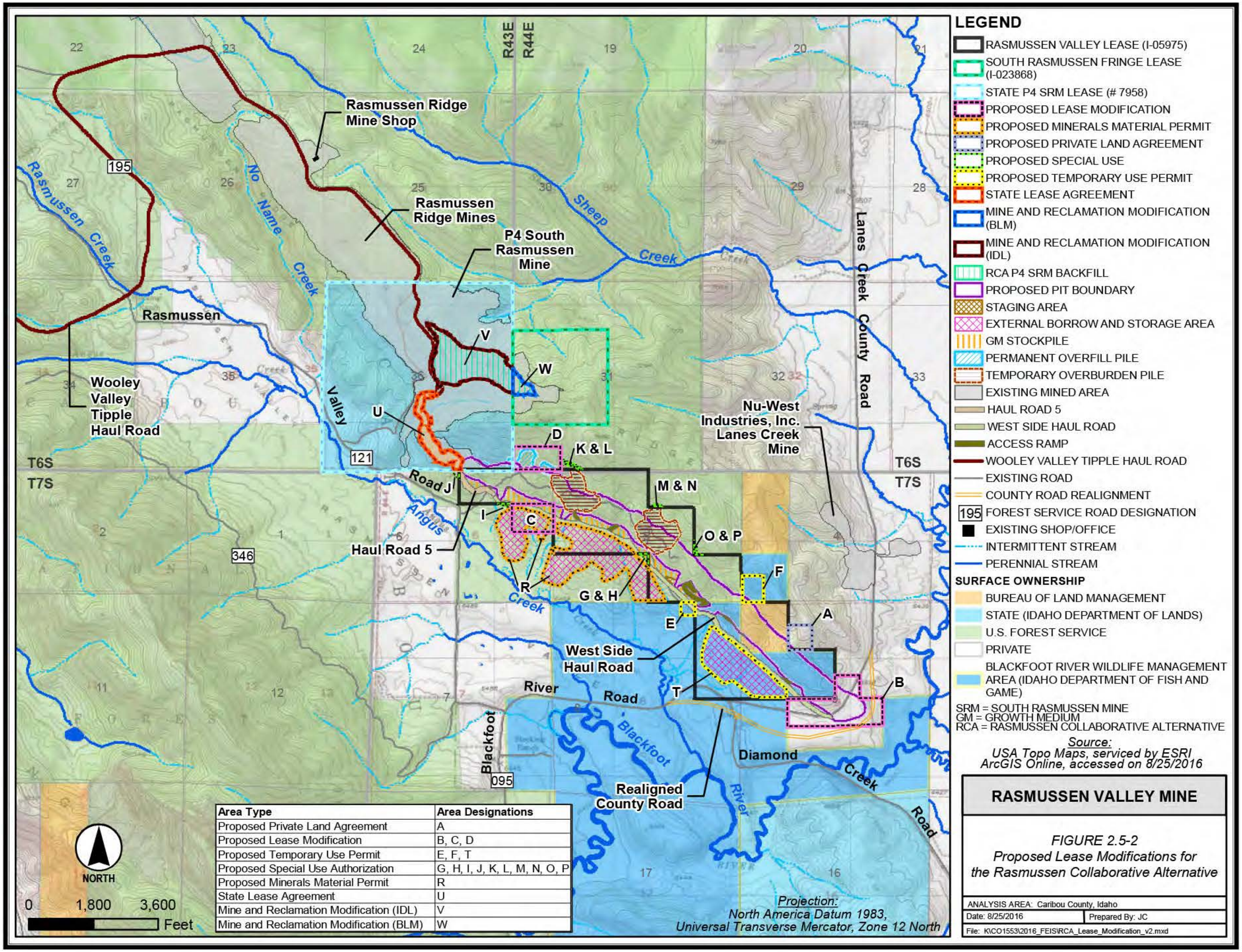

Area Type	Area Designations
Proposed Private Land Agreement	A
Proposed Lease Modification	B, C, D
Proposed Temporary Use Permit	E, F, T
Proposed Special Use Authorization	G, H, I, J, K, L, M, N, O, P
Proposed Minerals Material Permit	R
State Lease Agreement	U
Mine and Reclamation Modification (IDL)	V
Mine and Reclamation Modification (BLM)	W

FIGURE 2.5-2
Proposed Lease Modifications for the Rasmussen Collaborative Alternative

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2.5.1.3 Mining Operations

The RCA reflects Agrium's objectives to maximize the recovery of the economic phosphate resource and reduce environmental impacts compared to the Proposed Action. Some of the factors that influence these objectives include the economic strip ratio, ore quality and cutoff grades, and the safe angle of pit wall slopes. The considerations for long-term impacts to the environment include potential groundwater or surface water impacts, wetland impacts, visual impacts, and final reclamation objectives. Final reclamation objectives are to ensure a return to multiple uses of the public lands, protect any used resources, and continued productive use of private lands. These objectives and factors determined the ultimate design of the open pit, external storage facilities, haul road design, and the mining sequence.

The RCA includes the following:

- Development of a larger open pit in nine phases beginning at the northwest and generally progressing southeast. The ore recovery would take 4.8 years, and the total life-of-mine project duration including reclamation would be 7.1 years (**Figure 2.5-3**). As was the case with the Proposed Action, the potential exists for minor pit wall laybacks beyond those proposed that may require up to 20 acres of additional disturbance.

Overburden from the initial phases of the Rasmussen Valley Mine would be placed into P4's partially backfilled South Rasmussen Mine pit, thus avoiding the need for three external overburden piles.

- The reclamation of the Rasmussen Valley Mine backfill at the South Rasmussen Mine would increase the reclaimed area at the South Rasmussen Mine pit beyond that originally planned by P4.
- A haul road would be constructed from the north end of the West Side Haul Road up the side of Rasmussen Ridge onto P4's South Rasmussen Mine in order to haul overburden to the South Rasmussen Mine and to haul ore to the Wooley Valley Tipple.
- Up to four areas between the mine pit and the West Side Haul Road would be used to store GM for reclamation.
- The mined out Rasmussen Valley Mine pit would be backfilled to allow precipitation to run off onto undisturbed ground rather than ponding within the pit.
- The depth of mining would be reduced in the southern portion of the pit to avoid the need for active dewatering.
- A staging area similar to that of Proposed Action, but without fueling facilities would be constructed and reclaimed.
- Electrical generators would be used to power mine facilities such as the staging area.
- Portions of the Blackfoot River, Lanes Creek, and Diamond Creek County Roads would be realigned similar to the Proposed Action, but avoiding all wetlands.
- A pit ramp location would be revised to avoid wetlands.
- Sediment control structures similar in design to those of the Proposed Action would be constructed and reclaimed.
- Two areas within the mine footprint would be used for temporary storage of overburden until space becomes available in a mined out phase.

- Mining would be extended to the northern lease boundary to maximize ore recovery.
- Northern pit wall would be laid back onto state land in order to recover ore within federal lease.
- Three areas would be established down slope of the West Side Haul Road where GM, alluvium, and colluvium can be borrowed and stored.
- Overfill piles would be constructed at the north end of the pit.
- GM, alluvium, and colluvium from the borrow areas would be used for construction of a cover over the backfill.
- Reclamation would be accomplished with a larger variety of revegetation species.

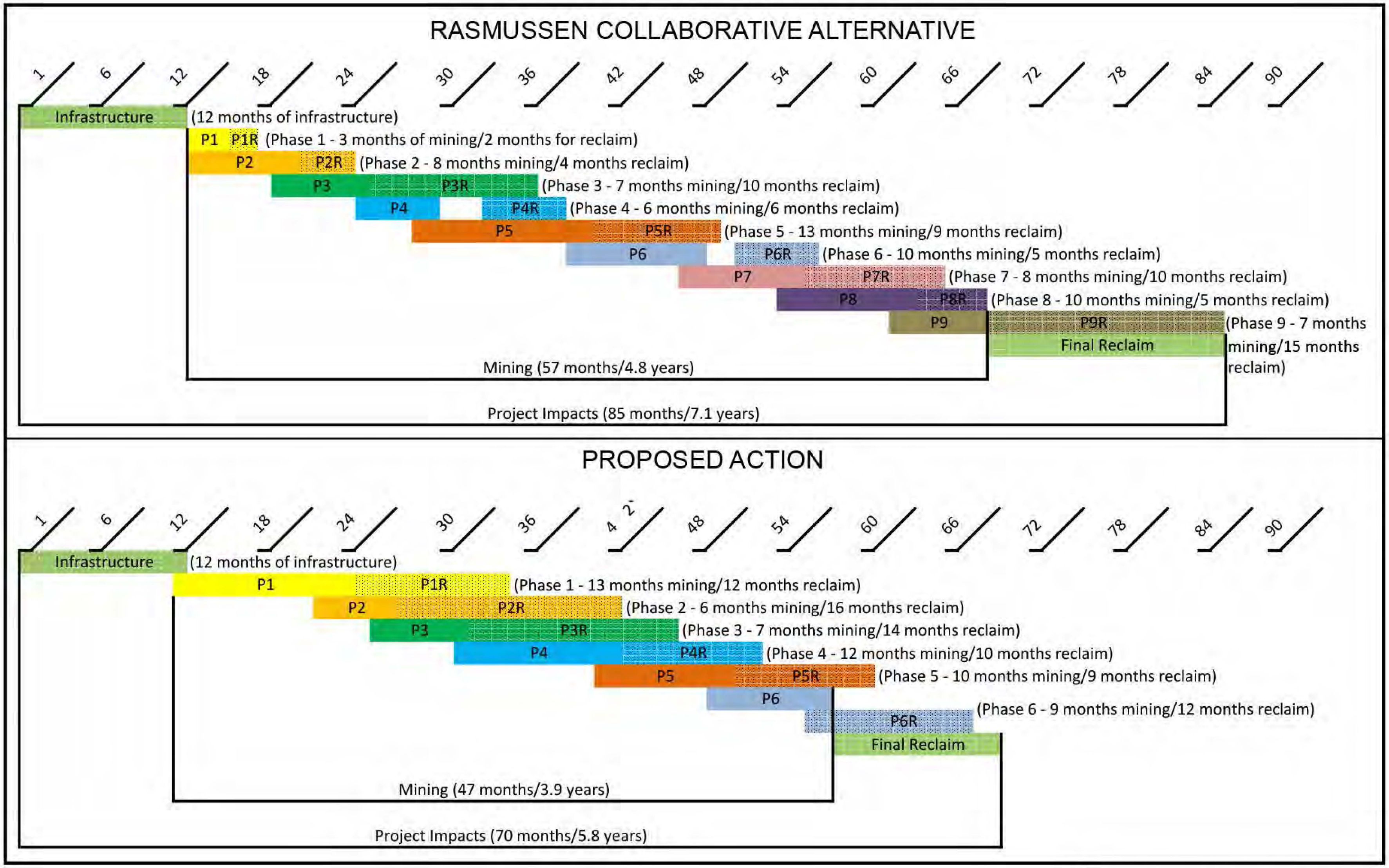
The RCA eliminates the following from the Proposed Action:

- All external overburden storage piles on potentially unstable areas or areas overlying shallow aquifers connected to surface waters
- Fueling at the staging area
- The power line to the staging area
- Mining below the water table
- Eight stream crossings
- The haul road across the floor of Rasmussen Valley and the associated crossings at Rasmussen Valley Road and Angus Creek
- Disturbance to any wetlands and WOUS
- Impacts to 70 acres of aquatic influence zones (AIZs)

If all potential borrow and storage areas for the RCA were used, the RCA would result in 73 acres more overall disturbance than the Proposed Action. However, none of that disturbance would be to sensitive areas such as wetlands. The expanded mine pit, developed in nine phases, would require a longer life-of-mine (**Figure 2.5-3**) to facilitate maximum ore recovery.

Natural resource protection measures, water management measures, and reclamation for the RCA would be similar to those for the Proposed Action with the exception that surface water runon from areas upslope of the pit would be intercepted and conveyed by ditches to sediment basins and around the mine pit and reclamation areas rather than being allowed to enter the pit, as was proposed under the Proposed Action.

Figure 2.5-4 shows the distribution of the RCA's facilities. **Table 2.5-2** lists the surface disturbances estimated for these activities.



RASMUSSEN VALLEY MINE

FIGURE 2.5-3
Comparison of Mining Phases

ANALYSIS AREA: Caribou County, Idaho
Date: 6/17/2016 | Prepared By: JC
File: K:\CO1553\Images\2016_FEIS\Comparison of Mining Phases.ai

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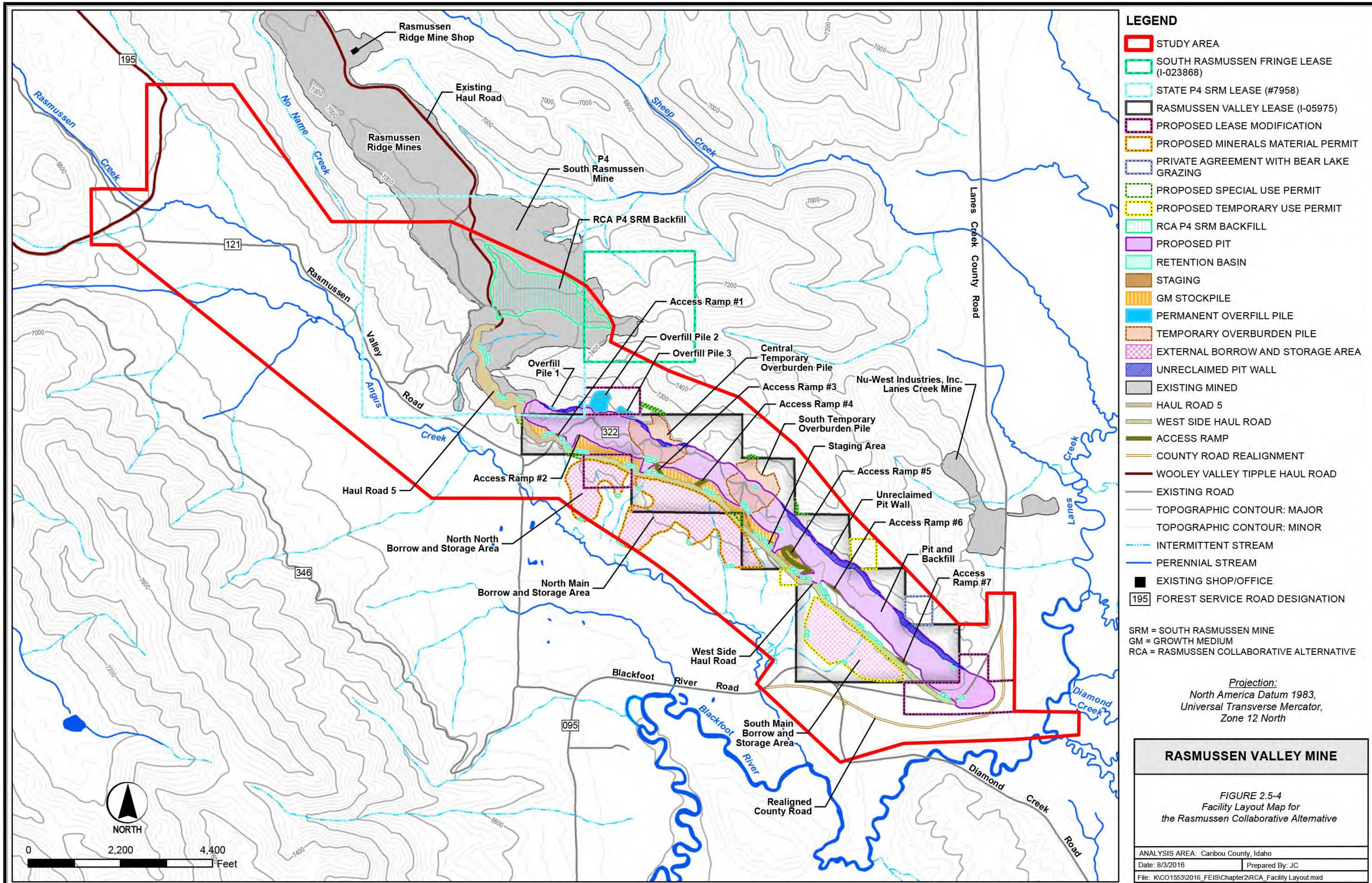
Rasmussen Ridge Mine Shop
Existing Haul Road
Rasmussen Ridge Mines
P4 South Rasmussen Mine
RCA P4 SRM Backfill
Access Ramp #1
Overfill Pile 2
Overfill Pile 3
Overfill Pile 1
Central Temporary Overburden Pile
Access Ramp #3
Nu-West Industries, Inc. Lanes Creek Mine
Access Ramp #4
South Temporary Overburden Pile
Staging Area
Access Ramp #5
Unreclaimed Pit Wall
Access Ramp #6
Pit and Backfill
Access Ramp #7
Access Ramp #2
Haul Road 5
North North Borrow and Storage Area
North Main Borrow and Storage Area
West Side Haul Road
South Main Borrow and Storage Area
Realigned County Road
Rasmussen Creek
No Name Creek
Sheep Creek
Rasmussen Valley Road
Angus Creek
Lanes Creek County Road
Lanes Creek
Blackfoot River Road
Blackfoot River
Diamond Creek
Diamond Creek Road
195
121
322
346
095
NORTH
0
2,200
4,400
Feet
LEGEND
STUDY AREA
SOUTH RASMUSSEN FRINGE LEASE (I-023868)
STATE P4 SRM LEASE (#7958)
RASMUSSEN VALLEY LEASE (I-05975)
PROPOSED LEASE MODIFICATION
PROPOSED MINERALS MATERIAL PERMIT
PRIVATE AGREEMENT WITH BEAR LAKE GRAZING
PROPOSED SPECIAL USE PERMIT
PROPOSED TEMPORARY USE PERMIT
RCA P4 SRM BACKFILL
PROPOSED PIT
RETENTION BASIN
STAGING
GM STOCKPILE
PERMANENT OVERFILL PILE
TEMPORARY OVERBURDEN PILE
EXTERNAL BORROW AND STORAGE AREA
UNRECLAIMED PIT WALL
EXISTING MINED
HAUL ROAD 5
WEST SIDE HAUL ROAD
ACCESS RAMP
COUNTY ROAD REALIGNMENT
WOOLEY VALLEY TIPPLE HAUL ROAD
EXISTING ROAD
TOPOGRAPHIC CONTOUR: MAJOR
TOPOGRAPHIC CONTOUR: MINOR
INTERMITTENT STREAM
PERENNIAL STREAM
EXISTING SHOP/OFFICE
195 FOREST SERVICE ROAD DESIGNATION
SRM = SOUTH RASMUSSEN MINE
GM = GROWTH MEDIUM
RCA = RASMUSSEN COLLABORATIVE ALTERNATIVE
Projection:
North America Datum 1983,
Universal Transverse Mercator,
Zone 12 North
RASMUSSEN VALLEY MINE
FIGURE 2.5-4
Facility Layout Map for
the Rasmussen Collaborative Alternative
ANALYSIS AREA: Caribou County, Idaho
Date: 8/3/2016
Prepared By: JC
File: K:\CO1553\2016_FEIS\Chapter2\RCA_Facility Layout.mxd

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Table 2.5-2 Total Project-Related New Surface Disturbance from the RCA Alternative, including Areas Outside of the Lease

Facility/Activity	Maximum Disturbance (acres)[1]					
	Private	USFS	BLM	IDFG	IDL	Total[4]
Open Pit and Backfill[2]	18.5	120.8	23.3	43.5	7.6	213.6
Permanent External Overfill Piles	0	6.8	0	0	0.7	7.4
External GM and Alluvium Borrow and Storage Areas[3]	0	120.1	0.1	49.6	0	169.8
Haul Roads	2.6	29.2	1.0	13.7	2.4	48.7
Groundwater Monitoring Wells and Access Roads	0.9	2.2	0.2	1.2	3.4	8.0
Facilities	0	0.9	0	0	0	0.9
Water and Sediment Control Structures (est.)	0.6	15.0	1.3	3.5	2.9	23.2
Realigned Portions of the County Roads	5.4	0	0	4.5	0	9.9
GM Stockpiles	0	31.2	0	0	0	31.2
Total[4]	**27.9**	**326.3**	**25.8**	**115.9**	**16.9**	**512.9**
POC Monitoring Well and Access Roads[5]	0.9	2.2	0.2	1.2	3.4	8.0
Potential Pit Layback Areas[6]						20.0
Grand Total[4,7]						**540.9**

Notes:

1 Disturbance acres are for comparison with the disturbance acreages listed for the Proposed Action (**Table 2.3-2**). Some elements described in the RCA may be combined to be comparable with elements of the Proposed Action.

2 Includes temporary pit access ramps and 13.2 acres of unreclaimed pit wall.

3 This includes borrow areas, storage piles, temporary overburden piles, and those portions of the Central and South Temporary Overburden Piles outside of the mine pit. This is a maximum area of disturbance if all identified areas are used. In practice, the extent of borrow areas and storage areas will be limited to only those areas needed, and may be much less than the area listed.

4 Row and column totals are based on more precise numbers (more decimal places) than those shown in the table, and because of rounding conventions, the totals may appear to be lower than the sum of the numbers in a row or column.

5 The monitoring well network has not been finalized by the IDEQ. Therefore, the locations of these wells and the associated access road network cannot be represented on the figures.

6 The potential pit layback areas have not been determined.

7 Up to 28 acres of additional disturbance in the Study Area are being considered for POC monitoring wells and access roads (8 acres) and potential pit layback areas (20 acres). However, the locations have not been determined and are not included in the impact assessment for specific resources. Baseline conditions are known so that the impacts can be assessed when locations are determined. These locations will be finalized after the approval of the Final EIS.

2.5.1.3.1 Mine Design

The larger pit footprint of the RCA would be mined from north to south in nine smaller phases in contrast to south to north in six larger phases for the Proposed Action. Pit design would be subject to the same constraints as those for the Proposed Action. The nine phases together would form a pit 2.4 miles long, averaging 600 feet wide. The phases would range in length from 1,000 to 2,600 feet. However, each phase may be operated in multiple locations within and between phases at the same time. Ultimate pit depth would be controlled by the same factors as the Proposed Action, except in the southern portion of the pit, the pit floor would be kept high enough to not intersect the regional groundwater, thus avoiding the need for active dewatering.

The open pit and backfill would disturb a total of 221 acres. Pit backfill would cover 207.8 acres, which would be reclaimed, leaving 13.2 acres of exposed limestone pit wall. Use of the South Rasmussen Mine for permanent overburden placement, in combination with temporary overburden storage within and upslope of the active mine footprint, would eliminate the need for the Proposed Action external North, South-Main Temporary, and South-South Overburden Piles and the Ore Stockpile downslope of the mine footprint (compare **Figure 2.3-2** and **Figure 2.5-4**). The enlarged GM, alluvium, and colluvium borrow and storage areas for the RCA would be temporary features in roughly the same areas. As in the Proposed Action, as mining progresses, the mined out areas would be backfilled, covered, and reclaimed. Through progressive open pit backfilling and concurrent reclamation, the unreclaimed pit disturbance at any one time would be minimized. Upon completion of mining operations, 13.2 acres of pit wall (limestone) exposures would remain unreclaimed, and the pits would be backfilled to cover the exposure of all Meade Peak strata in the pit walls. The pit backfill and overfill areas would be capped with the RCA cover system.

A small road would be constructed near the crests of the pit to provide access to lighting stations and to conduct pit wall inspections. This road would be 20 feet wide to accommodate a bulldozer or equivalent and light vehicles. The Mine Safety and Health Administration (MSHA) requires the removal of potential fall hazards from around the pit crest. While establishing this proposed road, trees, tree roots, boulders, or other potential fall hazards would be removed from the pit crest area.

2.5.1.3.2 Haul Roads

As in the Proposed Action, the West Side Haul Road would extend for 2.3 miles along the southwest side of the mine pit. Unlike the Proposed Action, which would begin mining at the south end and require building the entire West Side Haul Road at the beginning of mining, in the RCA, the West Side Haul Road would be constructed piecemeal from north to south, concurrent with the mine phases as they progress south.

HR-5 would be constructed between the terminus of the West Side Haul Road at the north extent of the Lease and the existing joint Agrium-P4 haul road north of South Rasmussen Mine, extending through the reclaimed West Limb Pit of the South Rasmussen Mine and across the mine's backfilled main pit. The existing joint Agrium-P4 haul road continues northwest, passing by the Rasmussen Ridge Mines shop area, connecting to the Wooley Valley Tipple Haul Road. The haul road would be completed before the start of mining Phase 1 at Rasmussen Valley Mine. HR-5 would not cross Rasmussen Valley and would avoid any wetlands. Agrium would implement all necessary BMPs to protect any adjacent wetlands.

In addition to providing a route for hauling ore, the West Side Haul Road would connect mining operations in the pit with the staging area and GM stockpiles. HR-5 would connect the mine, borrow area, and staging area with the South Rasmussen Mine, existing shop facilities at the Rasmussen Ridge Mines, and Wooley Valley Tipple. Design parameters for the haul roads would be the same as those for the Proposed Action.

2.5.1.3.3 Material Management

Material management includes the storage and handling of backfill, GM, unconsolidated alluvium and colluvium, overburden, and non-Meade Peak-containing material. All overburden volumes have been designed based on a net 15 percent swell factor. This accounts for swelling of overburden during the mining process and incidental equipment and natural compaction during and after the placement of the overburden. This swell factor is assumed to be conservative based on current Agrium operations. All soil, alluvium, and colluvium volumes assume a 10 percent swell factor.

<u>Backfill and Overburden</u>

Approximately 42.4 million bank cubic yards (MBCY; 48.7 million loose cubic yards [MLCY]) of overburden would be excavated during the life-of-mine. Overburden would be placed as backfill in the South Rasmussen Mine pit or in previously mined phases of the Rasmussen Valley Mine pit. Some overburden would be stored in temporary overburden piles on and upslope of the pit area until there was space in the pit to backfill. Some overburden would be placed in permanent external overburden overfill piles located upslope and contiguous with the Rasmussen Valley Mine backfill at the northern end of the Lease. Some limestone material removed from the pits would be used in the construction of the West Side Haul Road.

Mining was completed at the South Rasmussen Mine in 2013. At the completion of mining, a partially backfilled open pit remained at the southern end of the mine. Topographic data and analysis indicate that the remaining pit could accommodate up to 12.7 MBCY of material, leaving enough space to place the 6.6 MBCY (7.6 MLCY) of the overburden mined from Phases 1 and 2 and a portion from Phases 3 and 4 (or 15.6 percent of the total overburden) to be excavated from Rasmussen Valley Mine. The overburden would be placed over previously disturbed and mined areas and would not create any new area of disturbance. The Rasmussen Valley overburden would be directly placed at the South Rasmussen Mine. The overburden would be covered and reclaimed in accordance with the South Rasmussen Mine Reclamation Plan Modification (P4 2014), except that the cover would consist of 3 feet of limestone; overlain by 2 feet of combined GM, alluvium, and colluvium from the Rasmussen Valley Mine borrow area; overlain by 1.5 feet of GM from the South Rasmussen Mine area to further reduce infiltrated water percolating through the overburden.

At the Rasmussen Valley Mine, the remaining 35.8 MBCY (41.1 MLCY; 84.4 percent) of overburden would be placed as backfill in the pit or in external overburden overfill piles located up slope from and contiguous with pit backfill at the northern end of the pit in three locations. The external overfill piles would total 7.4 acres and are designated Overfill Piles 1, 2, and 3 (**Figure 2.5-4**). The overall backfill and overfill piles would cover 214.5 acres. In addition, 13.2 acres of limestone pit wall would be left exposed.

Three methods would be used to place backfill in mined out areas (pits). Overburden may be dumped or pushed from the pit crest, placed in lifts, and plug or butt dumped. Placement from the pit crest may be used in backfill areas that do not require the construction of in-pit backfill ramps for access and where material slope stability characteristics are suitable to support the long repose slopes of dumped backfill. Alternatively, backfill lifts might be used in areas where the backfill slope stability characteristics do not allow long repose slopes without crest failures or toe mounding into active mining areas. Backfill lifts may also be used during wet weather conditions, which allow the mining operation multiple backfill dumping locations to use if a particular backfill area becomes muddy and difficult to maintain. Lift heights would be determined based on safety considerations and the overburden material repose slope stability characteristics. The backfill placement method would be determined for specific areas based on factors including the need for backfill ramps, stability of the material as it is placed, availability of equipment to maintain truck working areas, and the stage of the backfilling process.

On occasion, plug or butt dumping may be used if equipment failure causes the loss of support equipment to maintain the area. Plug or butt dumping may also be used in areas needing more control for final contouring, areas receiving final cover materials, or to place material on a backfill lift.

All backfill and overfill areas would be final graded to not exceed a 3H:1V slope. The minimum slope allowed in the backfill areas would be 2 percent in order to promote runoff and not allow standing water. No areas that could pond water on the cover would be allowed. The Rasmussen Valley Mine backfill would slope up from the western pit crest to the eastern pit wall. Portions of exposed limestone pit wall would remain along the eastern pit crest. All temporary overburden piles and reclaimed haul road materials would be placed in the Phases 8 and 9 backfill. Total re-handle of material from temporary overburden piles and haul roads would be 4.68 MBCY (5.38 MLCY).

Temporary Overburden Storage

Two temporary overburden piles are incorporated into the design. They are identified as the Central Temporary Overburden Pile and South Temporary Overburden Pile. These temporary piles would be used when operations produce more overburden than space is currently available for permanent disposal.

The Central Temporary Overburden Pile would be an overfill pile within and upslope of Phases 3 and 4. The available storage volume would be 2.19 MBCY (2.52 MCLY). There would be 6.3 acres of new disturbance outside of the pit crest associated with this pile. This overburden pile would consist predominantly of material from Phases 5 and 6. Operational constraints may require some flexibility in these estimates as mining occurs.

The South Temporary Overburden Pile would be an overfill pile within and upslope of Phase 4 and 5. The available storage volume would be 1.53 MBCY (1.76 MCLY). There would be 8.5 acres of new disturbance outside of the pit crest associated with this pile. This overburden pile would consist predominantly of material from Phase 7. Operational constraints may require some flexibility in these estimates as mining occurs.

GM Storage and Alluvium Borrow

Throughout the life-of-mine, GM would be salvaged from disturbed areas for reclamation activities. The GM would either be used for reclamation elsewhere on the project immediately after salvage or temporarily stored in stockpiles for later use. Volumes of available and required GM, alluvium, and colluvium are based on soil depths identified in the baseline soils surveys (AECOM 2012, 2015), suitability for use as GM (Arcadis 2015d), and volumetric calculations (Arcadis 2015e, BC 2015a, Guedes 2016). It is anticipated that 1.15 MBCY (1.27 MLCY) of topsoil would be removed from the disturbed areas for use as GM, and an additional 0.84 MBCY (0.92 MLCY) of topsoil would be available from the borrow areas. This is based on the soil depths identified in the baseline soils surveys (AECOM 2012, 2015) and suitability for use as GM (Arcadis 2015d, 2015e). Reclamation of all project disturbances, including the borrow areas, and reclamation of the South Rasmussen Mine backfill would require approximately 0.90 MBCY (0.99 MLCY) of topsoil for use as GM.

GM and unconsolidated alluvium and colluvium would be used in the construction of the cover over the pit backfill. Three areas have been proposed for the borrowing of GM, alluvium, and colluvium for the construction of the cover over the pit backfill, and for GM storage for use throughout the life-of-mine. These areas are designated as the North-North Borrow and Storage Area, North Main Borrow and Storage Area, and South Main Borrow and Storage Area (**Figure 2.5-4**). These areas were identified as the maximum area needed for borrowing GM, alluvium, and colluvium for use in constructing the backfill cover and as areas where there would be minimal disturbance to sensitive resources. These borrow and storage areas include locations identified for external overburden piles in the Proposed Action, but the external overburden piles are eliminated in the RCA. GM, alluvium, and colluvium would be borrowed from or stored at the three storage areas throughout the mine operations as needed. The area would also be used for temporary storage of GM from the pit area that would be used for reclamation. The maximum potential disturbance of the North-North Borrow and Storage Area and the North Main Borrow and Storage Area would be 104.4 acres, and for the South Main Borrow and Storage Area would be 49.6 acres. None of the borrow and storage areas would impact wetlands.

If all of the identified borrow areas were used, and material was removed to a depth of 10 feet, they could yield 2.5 MBCY of GM of GM, alluvium, and colluvium. Approximately 0.88 MBCY would be needed for backfill cover, including 0.19 MBCY for the South Rasmussen Mine backfill. Approximately 0.39 MBCY of GM would be required for final reclamation of the borrow areas (0.25 MBCY, if the maximum extent of the borrow areas are used) and South Rasmussen Mine backfill area (0.14 MBCY). Up to 0.84 MCBY of GM would be available within the borrow areas for these purposes. Therefore, there is flexibility in the choice of borrow areas to be used, allowing the disturbance in the WMA to be minimized. Disturbance from these borrow and storage areas would be graded to drain naturally without any ponding and fully reclaimed with a minimum of 12 inches of GM and revegetation after they are no longer needed.

Most of the GM and unconsolidated alluvium and colluvium from Phases 1 through 4 would be temporarily stored and used for reclamation. Alluvium from the footprints of Phases 5 through 9 would be used as needed. It is anticipated that 3.70 MBCY (4.07 MLCY) of unconsolidated alluvium and colluvium would be removed from all disturbed areas both within the pit boundary and from the borrow and storage areas.

2.5.1.4 Ancillary Facilities

Proposed RCA facilities include a staging area, an existing off-site fuel storage area, diesel generators, and dust suppression and water supply tanks.

2.5.1.4.1 Staging Area

As in the Proposed Action, a staging area would be constructed as a place for miners to meet, receive operational instructions, and discuss safety items as needed. A temporary structure would be constructed or transported to the staging area, fitted with showers for emergency needs, and would have portable restrooms as required by applicable regulations. In addition, the staging area would support emergency response and rescue equipment and vehicles. A wastewater holding tank would be needed to accommodate the emergency showers. The staging area would also have a "ready-line" or place to temporarily keep equipment when not in operation. The ready-line may be used for minor maintenance. Electrical power would be required for each component of the staging area. The staging area would be constructed during the mining of Phase 4 while the West Side Haul Road is developed to this location.

2.5.1.4.2 Fuel Storage

Rather than maintaining fuel storage at the staging area, fuel would be distributed from existing tankage at the Rasmussen Ridge Mines Shop Area or through the use of fuel trucks that comply with relevant federal and state regulations. The total fuel storage capacity at the Rasmussen Ridge Mines Shop facility is 40,000 gallons. This quantity is deemed sufficient to maintain project-related operations for 96 hours. Fuel is stored in multiple aboveground tanks to reduce the risk of spillage and containment requirements. Barriers exist under and around fuel tanks that meet applicable requirements for secondary containment of petroleum products.

2.5.1.4.3 Diesel Generators

Agrium anticipates that diesel generators would provide electrical power to RCA facilities. Supplying on-site diesel power generation would eliminate the disturbance associated with constructing a power line from the existing transmission line located in Upper Valley to the proposed facility location. The necessary number of generators and horsepower of those generators may change through the life-of-mine. For the purpose of the RCA, it is assumed that the generator array currently in use at the Rasmussen Ridge Mines would be sufficient to accommodate operations at the mine. Operation of the generators would continue through the life-of-mine. The current array includes:

- One - 1,093-horsepower (hp) diesel generator (main generator)
- One - 67 hp diesel generator (mine shovel)
- One - 388 hp diesel generator (support generator)
- One - 100 hp diesel generator (dust suppression well pump)
- Three - 126 to 315 hp diesel generators (seasonal runoff control)
- Fifteen - 67 hp diesel-fired light plants (night shift lighting)

- One - 98 hp diesel generator (dust suppression well pump)
- One - 90 hp diesel generator (contractor building)
- One - 52 hp diesel generator (mine pit equipment)

2.5.1.4.4 Dust Suppression and Water Supply Tanks

Water for operations, principally dust suppression, would be supplied from both the existing well at the Rasmussen Ridge Mines Shop and the existing well designated PW-1W, located near the south end of the lease. The tanks, if constructed, may be filled by tanker trucks or by pumping from either the Rasmussen Ridge Mines Shop well or PW-1W. Water stored in the tanks would be used for operations.

Options for obtaining the dust suppression water could include:

- Construction of a small road between the existing PW-1W well and active portions of mining operations to facilitate transport of the water by water truck to the active mine phases. This road would be built along the alignment of the West Side Haul Road.
- Installation of a pump/pipe system to move water from the PW-1W well to the active mine phases along the upslope runon diversion ditch.
- Installation and use of a pipeline to transport water from well PW-1W along the West Side Haul Road alignment. This alignment has better access than the diversion ditch alignment and could include a service road running the length of the pipeline.

All of these options would be located within disturbance footprints that have already been proposed and analyzed for impacts.

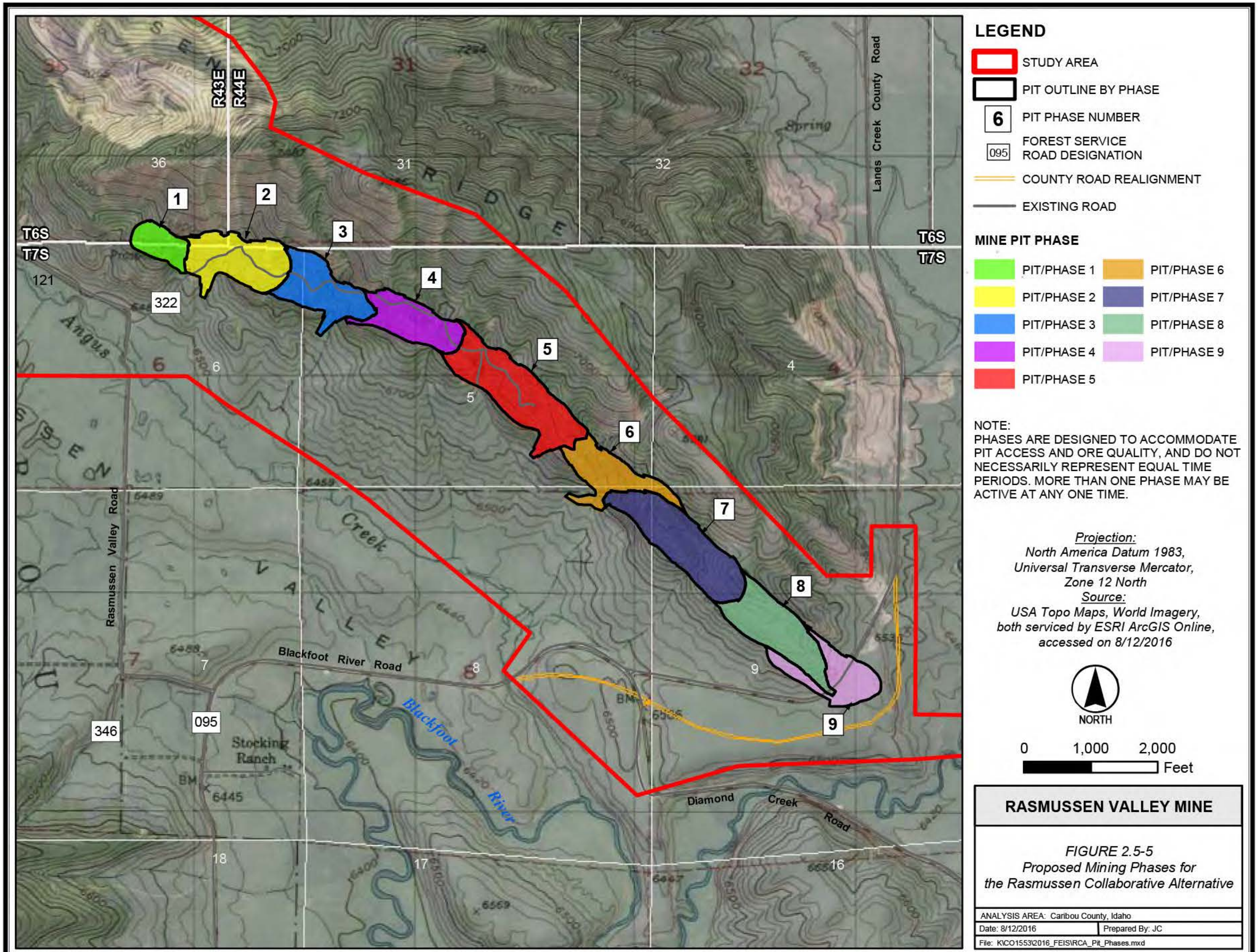
It is estimated that Agrium would use from 30,000 to 80,000 gallons of water per day for dust suppression through the months of April to November. The quantity of water required would depend on the haul road length required to transport ore for a given phase of mining.

2.5.1.5 Mining Sequence

The development of the open pit has been designed in a phased manner to achieve complete mining of the ultimate pit. A total of nine mining phases were designed. Phases are identified as RCA Phase 1 through Phase 9 (**Figure 2.5-5**).

The mining sequence was developed based on several assumptions and concerns including maintaining a transportation connection between areas being mined and areas being backfilled, and permanent disposal of overburden as backfill in South Rasmussen Mine and mined out phases of the RCA. Individual phases have been designed to maintain access for equipment, personnel, and supplies and to facilitate stormwater control.

Mining would begin from the north end (RCA Phase 1) and proceed generally southward. Phase 6 would be mined out of spatial order to facilitate minimizing the disturbance time in the deep draw that crosses the phase. This drainage is within sub-watershed 4 and is also the drainage for sub-watersheds 2 and 3. The total sub-watershed acreage collected through the drainage in Phase 7 is 129.9 acres. It is an important geomorphic feature that should be disturbed for the shortest duration operationally possible.



RASMUSSEN VALLEY MINE

FIGURE 2.5-5
Proposed Mining Phases for the Rasmussen Collaborative Alternative

ANALYSIS AREA: Caribou County, Idaho
Date: 8/12/2016
Prepared By: JC
File: K:\CO1553\2016_FEIS\RCA_Pit_Phases.mxd

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In an effort to balance pit materials with available backfill volume, each phase was designed to be between 1,000 and 2,600 feet long and 600 feet wide. Most of a phase would be mined before commencing mining in the next phase. However, there would be some concurrent mining of multiple mine phases to maintain a constant grade of ore for processing purposes, to maintain the appropriate stripping ratio for waste management purposes, and to allow large excavation equipment to continue to operate while the narrow lower elevations of another phase are mined with smaller equipment.

2.5.1.6 Natural Resources Protection and BMPs

Natural resources protection issues and measures for the RCA would be the same as those discussed for the Proposed Action. Largely because of the HR-5, no areas of wetlands and riparian areas would be affected, and there would be less potential for effects to surface water, requiring fewer or less extensive measures to protect surface water, wetlands and riparian areas, and aquatic habitat.

2.5.1.7 Water Management

Water management features for the RCA would be similar to those for the Proposed Action, but there would be fewer culverts, and all surface water runon from upslope areas would be diverted around the mine pit and reclamation areas using ditches to prevent it from entering the pit. Construction of the upslope diversion ditches would begin at the start of mining and proceed from north to south concurrent with the development of mining phases (**Appendix C**). Water intercepted by the ditches would be routed to sediment basins. Non-contact water would be routed around active mining and reclamation areas to culverts under the West Side or HR-5 Haul Roads. In addition, overburden piles would be less extensive compared to the Proposed Action.

The HR-5 alternative would be much shorter than the HR-1 alternative, and would not cross drainages and wetlands in Rasmussen Valley. The Proposed Action included nine culverts for the Rasmussen Valley Haul Road (HR-1; Culverts 1 through 9) and six culverts for the West Side Haul Road (Culverts 10 through 14 and 16). In contrast, the RCA includes only four culverts for the HR-5 (Culverts 1 through 4) and seven culverts for the West Side Haul Road (Culverts 5 through 11). Therefore, HR-5 has five fewer culverts than the HR-1 Haul Road. The culverts for the West Side Haul Road for the RCA drain the same drainage areas as the Proposed Action culverts for the West Side Haul Road (**Table 2.5-3**, **Figure 2.5-6**). While there would be active mining upslope of haul road culverts, those culverts would receive water from only a small area between the mine pit and the haul road, which would contain GM stockpiles.

Table 2.5-3 RCA Surface Water Drainage Structures

Structure #	Project Stage	Location	Drainage[1]	Design Basis
Culvert 1	Mining	HR-5	Drainage 23	50-year, 24-hour
Culvert 2	Mining	HR-5	Drainage 23	50-year, 24-hour
Culvert 3	Mining	HR-5	Drainage 22 (21)	50-year, 24-hour
Culvert 4	Mining	HR-5	Drainage 22 (21)	50-year, 24-hour
Culvert 5	Mining	West Side Haul Road	Drainage 13 (12)	50-year, 24-hour
Culvert 6	Mining	West Side Haul Road	Drainage 9, 10, 11 (14)	50-year, 24-hour
Culvert 7	Mining	West Side Haul Road	Drainage 6, 7, 8 (15)	50-year, 24-hour
Culvert 8	Mining	West Side Haul Road	Drainage 5 (16)	50-year, 24-hour
Culvert 9	Mining	West Side Haul Road	Drainage 2, 3, 4 (17)	50-year, 24-hour
Culvert 10	Mining	West Side Haul Road	Drainage 1 (18)	50-year, 24-hour
Culvert 11	Mining	West Side Haul Road	Drainage 19	50-year, 24-hour

Notes:
1 The drainage areas in parentheses are re-established drainage areas across the reclaimed mine pit.

2.5.1.8 Reclamation

2.5.1.8.1 Backfill Sequence

Mining and initial construction of the West Side Haul Road would begin with Phase 1. The portion of HR-5 that would be on the P4 state lease would be constructed from material taken from the P4 state lease. Mixing of road-building materials between the Rasmussen Valley Mine and the South Rasmussen Mine is not anticipated. Final determination of HR-5 material needs would be controlled by material availability, material properties, and operational constraints. All overburden would be placed either in the Rasmussen Valley Mine pit or in South Rasmussen Mine pit.

Most of the overburden from Phases 1, 2, and 3 would be directly placed in South Rasmussen Mine. Material from these three phases would be transported by haul truck along the West Side Haul Road and HR-5 and placed by end dumping or butt dumping in the open pit at the south end of South Rasmussen Mine. Under the RCA, after completion of backfill operations, the backfill at South Rasmussen Mine would be reclaimed following P4's state-approved Reclamation Plan Modification (P4 2014), except with the revised cover as outlined in the RCA. The final slopes for the South Rasmussen Mine reclaimed backfill would not exceed 3H:1V. The additional backfill and expanded reclamation under the RCA would require IDL approval.

After mining is complete in Phases 1, 2, and 3, direct placement of overburden as pit backfill from phase to phase would be conducted to the extent possible, reducing the need for additional storage piles. Backfilling with overburden would continue in this fashion for the remainder of mining activities in the open pit. When mining is completed, no portion of the mine pit would remain open. Small portions of the limestone pit wall would remain exposed along the eastern crest of the mine. Final overburden surfaces would have a maximum slope of 3H:1V and a minimum slope of 2 percent to promote runoff. No depressions that could result in ponding would remain, and the cover system would be placed over all overburden surfaces.

2.5.1.8.2 Haul Road Reclamation

Haul road reclamation would follow a procedure similar to that described for the Proposed Action. Any material removed during the reclamation of haul roads would be treated as Meade Peak overburden and re-handled to the pit as backfill.

All reclamation has been designed to meet the acceptable vegetation COPC concentrations documented in the PFO ARMP. For all haul roads, the first stage of road reclamation would be to remove safety berms as necessary, particularly in areas of potential selenium contamination. Removed haul road material would be placed as backfill within the mine. Road material would be removed beginning with the outside edges and working inward to the centerline. Maximum practical effort would be made to not increase the footprint of the road during reclamation. The haul road would be reclaimed to the original ground slope or 3H:1V, whichever is less, with the edges blending into the natural topography and having no ledge where the reclaimed edge meets the original grade. Reshaping would be achieved by removal of material to the specified dimensions and contours, not by spreading material out beyond the original disturbance area. There may be areas where the haul road is built through terrain steeper than 3H:1V. In these areas, the road prism would be reconstructed to a 3H:1V slope because steeper slopes would encourage more erosion. Once shaped, all surfaces would be reclaimed with a minimum of 12 inches of GM and revegetated.

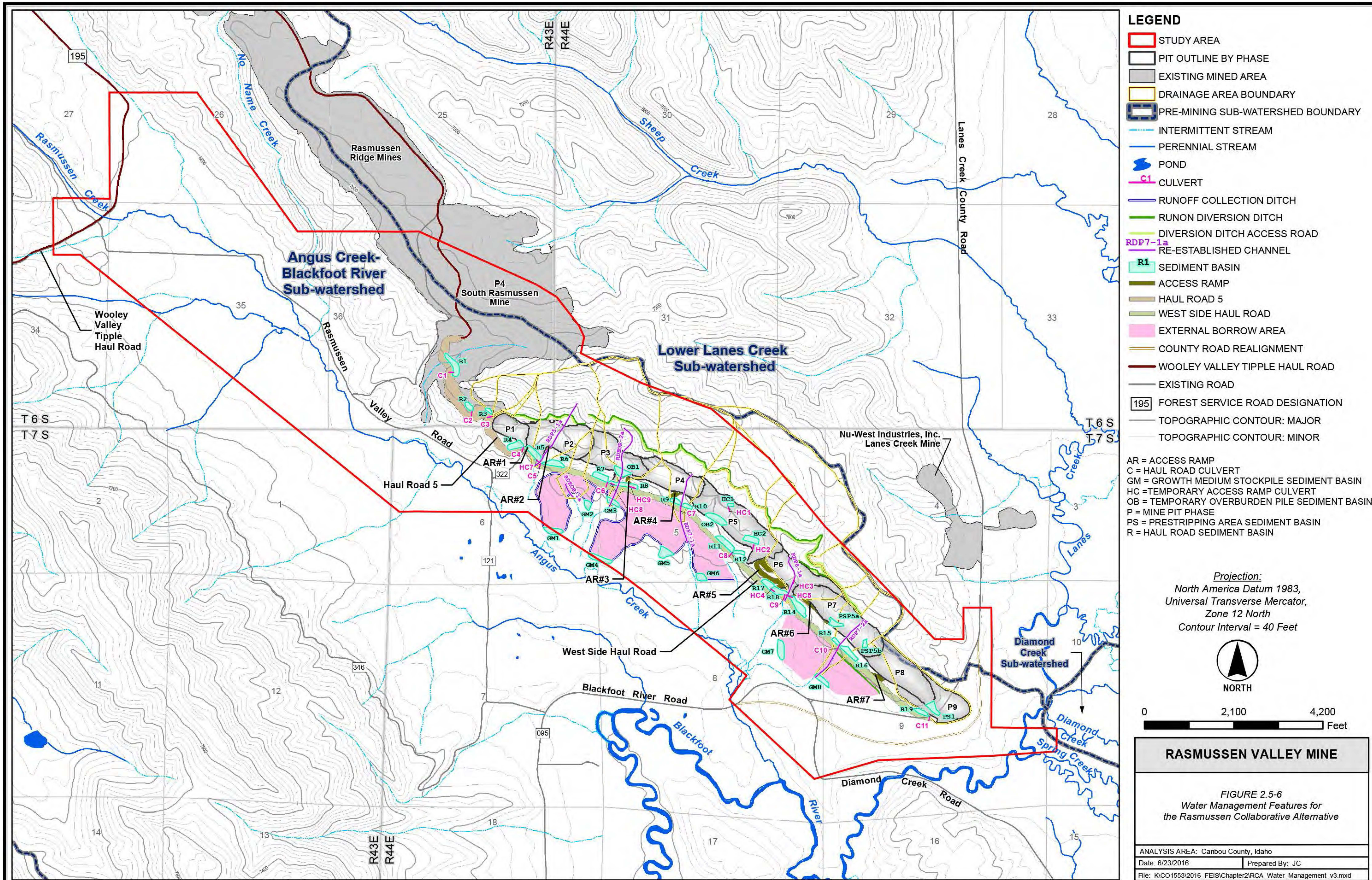

FIGURE 2.5-6
Water Management Features for
the Rasmussen Collaborative Alternative

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Haul road culverts and all road fill materials overlying the culverts would be removed when the road is reclaimed. A minimum of 8 feet of fill on either side of the original drainage would be removed. GM would be placed in areas where it had been removed for haul road construction. BMPs would be implemented to address erosion until vegetation is re-established. Any associated nearby water management structures, such as sediment ponds, would also be reclaimed as part of haul road reclamation. Water management structures would be cleaned of any materials potentially containing selenium or other COPCs before the originally excavated materials are used to fill the structures. Any Meade Peak-containing material from haul roads, berms, or water management structures would be disposed of in the mine pit as backfill.

Reclamation at the South Rasmussen Mine would differ from that at the Rasmussen Valley Mine. The portions of HR-5 crossing the South Rasmussen Mine State Lease would be reclaimed according to the current state-approved South Rasmussen Mine Reclamation Plan Modification. Most of HR-5 on the South Rasmussen Mine State Lease crosses existing overburden backfill or overburden piles. Where the road crosses overburden, it would be reclaimed by filling in the road prism to original contours including a minimum of 5 feet of limestone followed by 18 inches of GM and the approved seed mix in accordance with the current South Rasmussen Mine Reclamation Plan Modification. A short section of the road disturbs natural ground. Where the haul road is built through terrain steeper than 3H;1V, the road prism would be backfilled to the extent practical, but slopes greater than 3H:1V may remain. Once shaped, all reclaimed surfaces would be covered with a minimum of 12 inches of GM and revegetated.

2.5.1.8.3 RCA Store-and-Release Cover C

The RCA proposes an alternative store-and-release cover for all overburden at the Rasmussen Valley Mine to provide additional protection of water quality resulting from any deep percolation of precipitation into and through the overburden. The store-and-release cover, called Cover C, would consist of three layers. The bottom layer would consist of 3 feet of alluvium salvaged from within the mine footprint (pit alluvium). The middle layer would consist of 2 feet of combined GM alluvium and colluvium salvaged from the external borrow sites (external GM). The top layer would consist of 1 foot of GM salvaged within the mine footprint (pit GM). **Table 2.5-4** compares the materials that would be used in each layer of the Proposed Action and RCA Cover C. **Figure 2.5-7** shows schematic profiles of each of the RCA and South Rasmussen Mine Backfill covers.

2.5.1.8.4 South Rasmussen Mine Covers

The South Rasmussen Mine is currently approved to cover backfill with a minimum of 5 feet of limestone and 18 inches of GM followed by revegetation with an IDL approved seed mix. P4 has proposed using the same external GM, alluvium, and colluvium material obtained from the Rasmussen Valley Mine external borrow areas to augment the cover on the RCA backfill at South Rasmussen Mine. The RCA South Rasmussen backfill cover would consist of 3 feet of South Rasmussen Mine limestone; overlain by 2 feet of RCA external combined GM, alluvium, and colluvium; overlain by 1.5 feet of GM obtained from the South Rasmussen Mine area. **Table 2.5-4** shows the materials that would be used in each layer of the Proposed Action cover, RCA cover, the currently approved P4 South Rasmussen Mine backfill cover, and the RCA South Rasmussen backfill cover, along with the saturated permeability of each layer used in the model simulation of each cover and the resultant average net annual percolation rate predicted out of the bottom of the cover and into the backfill or overburden. **Figure 2.5-7** shows schematic profiles of each of the RCA and South Rasmussen Mine Backfill Covers.

Table 2.5-4 Comparison of Cover Alternatives

Cover	Layer Description[a]			Net Percolation (in/yr)[b]
	Thickness (feet)	Material Type	Ksat (cm/sec)	
Proposed Action Cover	2	Pit Growth Medium	3.59 E-05	2.40
	3	Non-Meade Peak	7.00 E-04	
RCA Cover C	1	Pit Growth Medium	3.59 E-05	0.21
	2	External Area Combined Growth Medium and Alluvium/Colluvium	2.51 E-06	
	3	Pit Alluvium/Colluvium	9.96 E-05	
P4 South Rasmussen Mine Approved Backfill Cover	1.5	SRM Growth Medium	6.90 E-06	0.87
	5	Limestone Fill	1.00 E-04	
RCA South Rasmussen Mine Backfill Cover	1.5	SRM Growth Medium	6.9 E-06	0.21[c]
	2	External Area Combined Growth Medium and Alluvium/Colluvium	2.51 E-06	
	3	SRM Limestone Fill	1.00 E-04	

Notes:
a From the top down.
b With mature roots.
c Based on performance of similar RCA Cover C
cm/sec = centimeter per second.
in/yr = inch per year.
Ksat = saturated hydraulic conductivity.
SRM = South Rasmussen Mine

A variety of alternative covers were analyzed for performance along with Cover C. Among all the covers, Cover C has the second lowest net percolation rate (0.21 in/yr) after the geosynthetic clay laminated liner (GCLL; 0.04 in/yr) and a much lower net percolation rate than the Proposed Action cover (2.4 in/yr). Much of the improved performance for Cover C is a result of having the highest transpiration rate (6.41 in/yr) of the alternatives considered and a higher runoff (3.5 in/yr) compared to the Proposed Action (1.4 in/yr). Cover C has the second lowest need for external borrow material, greater than that for the Proposed Action but lower than that for most other alternatives. Like the Proposed Action, all of the required materials are available on or near the site. The GM top layer for Cover C would exhibit lower erodibility because of its coarser grain size.

2.5.1.8.5 GM Salvage and Placement

GM would be salvaged from any areas that are disturbed. Because GM is most efficiently handled in dry conditions, it would generally be salvaged during the typically drier summer and fall. Areas not containing backfill and overburden would have 12 inches of GM cover placed once these areas have been shaped. After placement of the GM, the areas would be revegetated.

Cover C would require 0.33 MBCY (0.36 MLCY) of GM from the pit area for the top 12 inches in accordance with the cover design (BC 2015a).

Approximately 2.00 MBCY (2.20 MLCY) of GM would be available from the disturbed and borrow areas for all reclamation (Arcadis 2015d). Any excess salvaged GM would be used to supplement cover over other disturbances.

Additional GM, alluvium, and colluvium could be recovered from the borrow and storage areas if needed. The ultimate goal would be to maximize the soil recovery to return reclaimed areas to multiple use. The GM would be graded and prepared with bulldozers, graders, or other equipment suitable to this purpose before revegetation.

GM salvaged on the South Rasmussen Mine would remain segregated from GM salvaged on the Rasmussen Valley Mine and would be used for reclamation on their respective mines. Commingling of GM materials between mines is not anticipated other than the use of Rasmussen Valley Mine external GM, alluvium, and colluvium for the South Rasmussen Mine RCA Cover component. Final determination of cover material needs would be controlled by material availability, material properties, and operational constraints.

2.5.1.8.6 Revegetation

Public scoping in March 2011 identified a possible alternative seed mix to be considered instead of or in addition to the seed mix specified in the Proposed Action. Public comments pointed out that there were reasons to consider several different seed mixes for different settings within the Study Area to re-establish vegetative diversity and post-mining multiple land use goals. The seed mix identified in the Proposed Action (**Table 2.3-4**) considers differences in aspect and the associated differences in moisture regime. Subsequent vegetation baseline studies conducted in the Study Area further evaluated elevation, soil characteristics, and slope as controlling factors in existing plant communities (BC 2012a). The alternative seed mix proposed for the RCA is shown in **Table 2.5-5**. This seed mix includes species that are suited to several aspects and elevations, and would be used on the Rasmussen Valley Mine portion of the RCA. The South Rasmussen Mine would be reclaimed in accordance with the IDL-approved seed mix.

Table 2.5-5 Alternative Seed Mixes (Rasmussen Valley Mine)

Scientific Name**	Common Name	Recommended lbs/acre	% of Seed Mix
Bromus marginatus	Mountain Brome	2.00	5.3
Elymus elymoides	Bottlebrush Squirrel Tail	2.00	5.3
Elymus lanceolatus ssp *lanceolatus*	Thickspike Wheatgrass	1.00	2.6
Elymus lanceolatus ssp *psammophilus*	Streambank Wheatgrass	1.00	2.6
Elymus trachycaulus	Slender Wheatgrass	2.00	5.3
Festuca *I*dahoensis	Idaho Fescue	1.00	2.6
Festuca ovina	Sheep Fescue	1.00	2.6
Koeleria macrantha	Prairie Junegrass	0.25	0.7
Leymus cinereus	Great Basin Wildrye	2.00	5.3
Pascopyrum smithii	Western Wheatgrass	1.50	4.0
Poa secunda ssp ampla	Big Bluegrass	0.75	2.0
Pseudoroegneria spicata	Bluebunch Wheatgrass	2.00	5.3
Triticum aestivum x Secale cereale	Quickguard	3.00	7.9
	Grass Totals	**19.50**	**51.7**
Forbs			
	Western Yarrow	0.50	1.3
Heliomeris multiflora	Showy Goldeneye	0.50	1.3
Linum lewisii	Lewis Blue Flax	1.00	2.6
Lupinus argenteus	Silver Lupine	4.00	10.6
Penstemon palmeri	Palmer Penstemon	1.00	2.6
Penstemon strictus	Rocky Mountain Penstemon	1.00	2.6
	Forb Totals	**8.00**	**21.2**

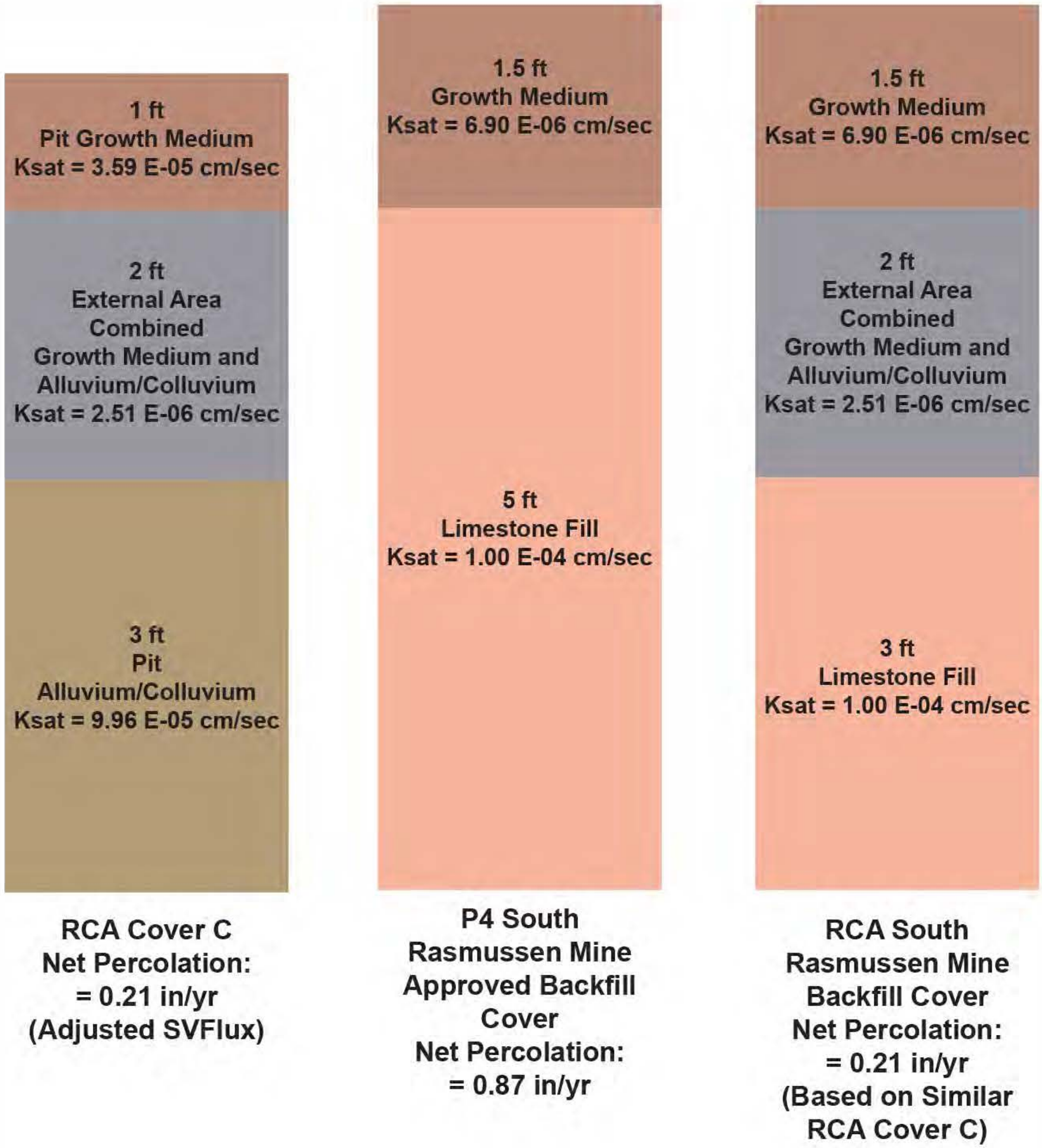
Table 2.5-5 Alternative Seed Mixes (Rasmussen Valley Mine)

Scientific Name**	Common Name	Recommended lbs/acre	% of Seed Mix
Shrubs			
Artemisia cana	Silver Sagebrush	0.15	0.4
[illegible]	Mountain Big Sagebrush	0.10	0.3
Ceanothus velutinus	Snowbrush Ceanothus	1.00	2.6
Krascheninnikovia lanata	Winterfat	0.50	1.3
[illegible]	Bitterbrush	4.50	11.9
[illegible]	Wood's Rose	1.00	2.6
Symphoricarpos oreophilus	Mountain Snowberry	3.00	7.9
	Shrub Totals	**10.25**	**27.2**
	Overall Totals	**37.75**	**100.0**
Alternate Species for Rasmussen Valley Mine Project Seed Mix*			
[illegible]			
Bouteloua curtipendula	Sideoats Grama		
Nassella viridula	Green Needlegrass		
Forbs			
Artemisia frigida	Fringed Sagewort		
[illegible]	Arrowleaf Balsamroot		
Gaillardia aristata	Blanket Flower		
Hedysarum boreale	Northern Sweetvetch		
Sphaeralcea coccinea	Scarlet Globemallow		
Penstemon cyaneus	Blue Penstemon		
Penstemon eatonii	Firecracker Penstemon		
Shrubs			
[illegible]	Saskatoon Serviceberry		
Potentilla fruticosa	Cinquefoil		
Rubus idaeus	American Red Raspberry		
Ribes cereum	Wax Current		
Ribes aureum	Golden Current		

Notes:

* If alternate species are selected to replace species on the approved list, the species would be replaced at an equal percentage of the overall mix as the removed species. Recommended seeding rate would be calculated accordingly. Changes to the seed mix would consider culturally sensitive plant species.

** Highlighted species are native species in Rasmussen Valley that are listed on the Shoshone-Bannock Tribes' 2016 Culturally Sensitive Plants list (Shoshone-Bannock Tribes 2016). The 2016 list includes grasses, but does not list individual species. Therefore, the heading for grasses is highlighted.



cm/sec = centimeters per second
in/yr = inches per year
Ksat = saturated hydraulic conductivity
RCA = Rasmussen Collaborative Alternative
SVFlux = A software package used to calculate saturated flow

RASMUSSEN VALLEY MINE

FIGURE 2.5-7
Comparison of Profiles of RCA Cover C, P4 South Rasmussen Mine Approved Backfill Cover, and RCA South Rasmussen Mine Backfill Cover

ANALYSIS AREA: Caribou County, Idaho
Date: 4/12/2016 | Prepared By: JC
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2.6 NO ACTION ALTERNATIVE

CEQ regulations require that an EIS include a No Action Alternative. The phosphate Lease grants the lessee the exclusive right and privilege to explore for and mine the phosphate deposit on the leased land, subject to the conditions provided in the Lease. It also gives the lessee the right to use such surface of the leased land as may be necessary for the development of the phosphate resource. Phosphate leases are not cancellable by the U.S., except by due process where the lessee does not meet the terms and conditions of the Lease. Thus, the No Action Alternative does not imply that the Lease would never be developed, only that it would not be developed under the 2011 Mine and Reclamation Plan (Agrium 2011) or alternatives evaluated in this Final EIS.

Under this alternative, the project would not be approved for mining on the existing Lease or any associated development. Similarly, the lease modification request would not be approved. Under the No Action Alternative, the Agency-Preferred Alternative and the RCA would not be approved, and no overburden from the Rasmussen Valley Mine lease would be backfilled to the South Rasmussen Mine. P4 would continue with the currently approved reclamation plan for the South Rasmussen Mine (P4 2014). The southern portion of the South Rasmussen Mine pit would be been partially backfilled with limestone to cover the exposed ore section. The backfill would be covered with 5 feet of run-of-mine limestone from the West Dump area of the South Rasmussen Mine overlain with 1.5 feet (18 inches) of topsoil, then seeded with the approved seed mix. There would be no additional backfill from the Rasmussen Valley Mine, and the RCA South Rasmussen Mine backfill cover would not be constructed (**Section 2.5.1.8**).

As a result, the No Action Alternative would not provide ore for the CPO and could result in reduced output or closure of the plant and loss of lease production royalties until another mine plan is approved. Ore for the CPO would have to be obtained from other sources, and environmental effects might be greater or less than those associated with the Proposed Action. Because the rights to mine the leased phosphate deposits have been acquired, if the No Action Alternative were selected, another Mine and Reclamation Plan for this Lease could be submitted in the future.

2.7 AGENCY-PREFERRED ALTERNATIVE

The Agency-Preferred Alternative is the RCA because it employs measures to satisfy regulatory requirements and reduce potential environmental impacts, particularly addressing water quality and its beneficial uses. The RCA addresses concerns communicated by the public where practical. The RCA was selected because of:

- Reduced impacts from COPCs to groundwater to protect beneficial uses by constructing a more effective cover over backfill and overburden;
- Elimination of external overburden piles on the pediments of Rasmussen Ridge that have the potential for impacting shallow groundwater connected with nearby surface water that has been and is currently impacted by nearby historical mining. Portions of these overburden piles were also proposed to be located on potentially unstable slopes that could fail causing additional impacts to water, soils and vegetation;
- Elimination of wetland impacts across the entire project;
- Use of previously disturbed ground at P4's South Rasmussen Mine and existing infrastructure at the Rasmussen Ridge Mine shop area to the maximum extent

practicable including reclamation of 58 acres that would not otherwise have been reclaimed;

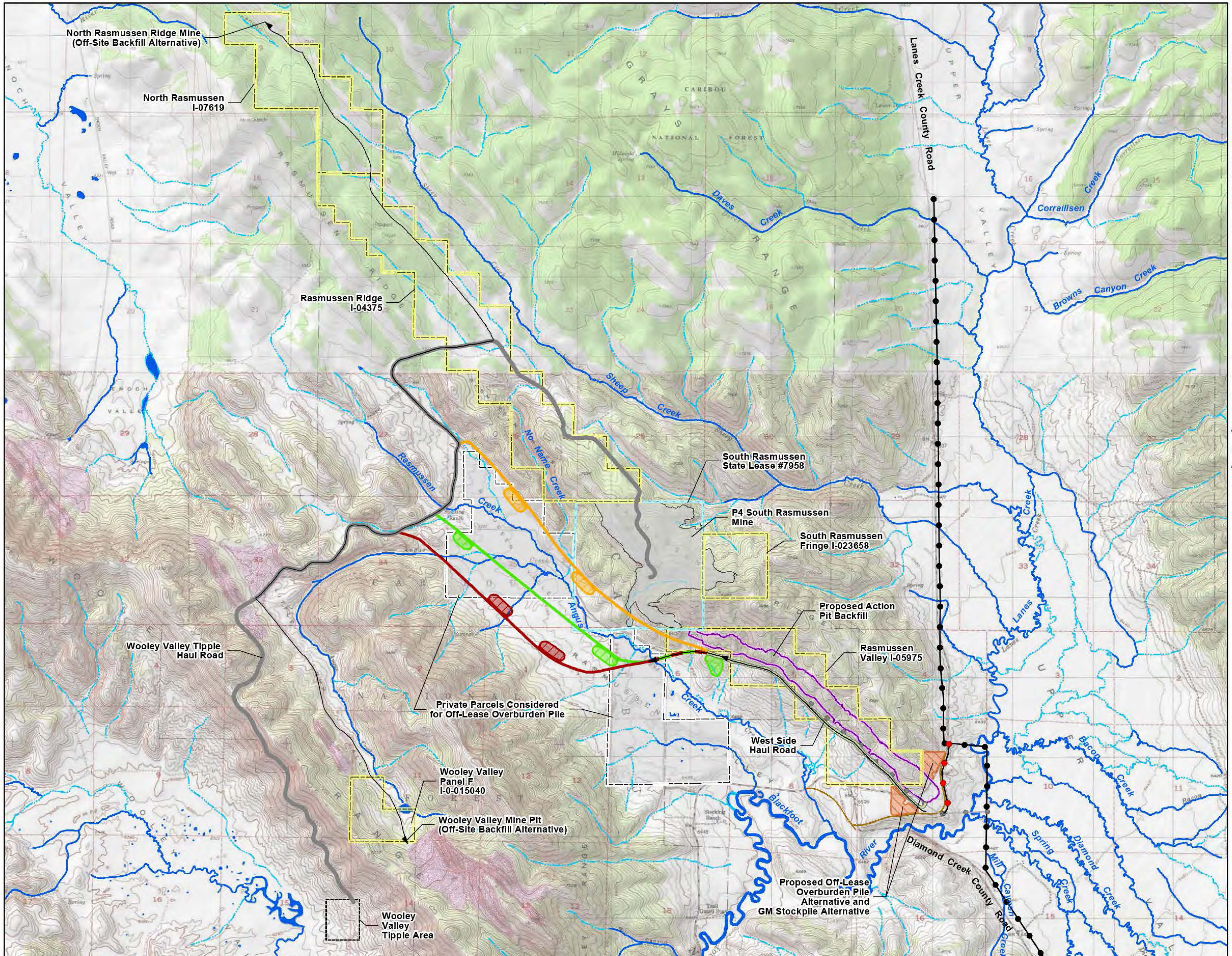
- Reduced water crossings and impacts to wetlands, AIZs, and aquatics;
- Elimination of a proposed power line segment; and
- Increased public safety on the county roads as a result of the elimination of new road crossings.

The RCA would reasonably accomplish the purpose and need for the federal action, while considering environmental, economic, and technical factors. The RCA would allow access to additional ore that would not be recovered by the Proposed Action. The RCA, with the lease modifications, would enable the extraction of 5.7 percent more ore, which would generate 5.7 percent additional royalties and extend the mine life, including initial reclamation by 7.1 percent. This would contribute to increased yield, increased royalty benefits to the economy and prolonged employment at the mine, at the CPO fertilizer plant and indirectly in the surrounding communities. The existing lease would not be economical to mine without these lease modifications. The Agencies identified the RCA as the Agency-Preferred Alternative for the Draft EIS. In response to public comments on the Draft EIS and review of the potential impacts, modifications to the RCA were incorporated into the Final EIS (**Figure 2.5-1**) and it continues to be the Agency-Preferred Alternative.

The USACE is a cooperating agency, but is neither an opponent nor a proponent of the applicant's Proposed Action or alternatives. The USACE uses the analysis in the EIS to inform their decision regarding issuing a Section 404 permit as applied for, issue the permit with modifications or conditions, or deny the permit. Because the RCA as revised in the Final EIS avoids all jurisdictional wetlands, the USACE may decide that a Section 404 permit for wetlands disturbance is not required. The intent of the USACE is to ensure that the analysis of alternatives is thorough enough to use for the public interest review outlined in USACE regulations at 33 CFR 320 et seq. and the 404(b)(1) guidelines (40 CFR part 230).

2.8 ALTERNATIVES CONSIDERED BUT ELIMINATED FROM DETAILED ANALYSIS

Several potential alternatives were considered for this analysis but were eliminated from detailed study for various reasons. These alternatives are listed below, and the reasons they were excluded from further consideration are described. **Figure 2.8-1** illustrates those alternatives considered but dismissed that have footprints differing substantially from the Proposed Action or RCA, including external overburden piles, external overburden backfill locations, GM stockpiles, ore haul roads, and power line corridors. Differences in design of features, such as cover alternatives and underground vs. overhead power lines, are not shown on this figure. In addition, the ore conveyor system was evaluated as following the route of HR-1. No alternative corridor was considered because the HR-1 route was determined to have the least impact for a conveyor. Several alternative elements that were initially eliminated were subsequently incorporated into the design of the RCA and are therefore not listed in this section. These include off-site backfill of overburden in the South Rasmussen Mine, HR-4, and use of generators to supply power to the mine operations and facilities.



RASMUSSEN VALLEY MINE

FIGURE 2.8-1
Proposed Action and Alternatives Not Carried Forward

ANALYSIS AREA: Caribou County, Idaho
Date: 6/23/2016
Prepared By: JC
File: K:\CO1553\2016_FEIS\Alternatives_NotCarriedForward.mxd

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2.8.1 Store Meade Peak-Containing Material in External Overburden Piles

Alternative Considered: Under this alternative, Meade Peak-containing material would be placed in permanent external overburden piles instead of directly into the pit as backfill or re-handling the material from temporary external overburden piles to the backfill areas. Placing this material in permanent external overburden piles directly as it is removed from the pits would reduce the number of times the material is handled and transported.

Reasons Considered: This alternative was considered in response to issues about potential release of selenium and other COPC loading to surface water and groundwater. Handling 4.6 million cubic yards of Meade Peak-containing material multiple times could increase the potential for releases of selenium and other COPCs into the environment.

Reasons Dropped: This alternative was eliminated from detailed consideration because it would also introduce unnecessary additional risks of selenium release into the surrounding environment and increase potential post-mining liabilities. The RCA provided an alternative location to store the overburden.

2.8.2 Alternate On-Lease External Overburden Storage

Alternative Considered: Under this alternative, alternate external overburden storage would be developed in other areas of Agrium's Lease. This development would relocate the external overburden storage to areas potentially less vulnerable to geotechnical issues or farther away from areas sensitive to release of COPCs.

Reasons Considered: This alternative was considered in response to issues about geotechnical pile stability, potential release of selenium, and other COPC loading to surface water and groundwater from overburden material stored in the external overburden piles in the Proposed Action.

Reasons Dropped: This alternative was eliminated from detailed consideration because no suitable alternative locations could be made available on the Lease without reducing or eliminating currently identified mine features. In addition, there are potential issues with geotechnical stability at the potential sites for the additional external overburden storage piles. The RCA provided an alternative location to store the overburden.

2.8.3 Off-Lease External Overburden Storage in Rasmussen Valley

Alternative Considered: Under this alternative, the permanent external overburden storage piles would be located lower in Rasmussen Valley near Angus Creek. Areas considered included Agrium's private land in the southeast portion of the mine area, which has also been identified as a lease modification, and two parcels of private land in Rasmussen Valley near the proposed haul road alignments. In addition, the two potential permanent external overburden storage sites on the lease modification were also considered for placement of temporary overburden piles.

Reasons Considered: This alternative was considered in response to concerns about the potential geotechnical stability of on-lease locations for the permanent external overburden piles and the potential water impacts.

Reasons Dropped: This alternative was eliminated from detailed consideration because the two private land parcels in Rasmussen Valley that are large enough to accommodate overburden piles and located near proposed haul road alignments include extensive areas of delineated wetlands, would require crossing Angus Creek to transport the overburden to the overburden piles, and would permanently alter the land use in Rasmussen Valley. These overburden locations would increase the area of disturbance, including disturbance to wetlands or AIZs, increase dust emissions and fuel consumption, and would provide no reduction in environmental effects. Overburden storage in any of these locations would alter the visual landscape, affect grazing, and affect recreation. This would be a long-term change to land use and could affect other nearby resources.

The two potential permanent external overburden storage sites on the lease modification that were considered for placement of the temporary overburden pile would affect 0.65 acre of wetlands. In addition, these locations would be on a basalt bench close to the Blackfoot River, would require additional water management and protective measures, and would introduce additional risks of selenium release into the environment.

The RCA provided a closer off-lease alternative location to store the overburden at the South Rasmussen Mine.

2.8.4 Relocate External Overburden to Off-site Backfill Locations

Alternative Considered: Under this alternative, the permanent external overburden storage piles would be eliminated. Instead, the overburden material would be placed in areas of previous mine disturbance outside of the areas of disturbance delineated in the Proposed Action. Areas considered for off-site storage of overburden included Rasmussen Ridge Mines and Wooley Valley Mine. These alternatives differ from the permanent external overburden piles in the Proposed Action because they would use previously disturbed (mined) areas for overburden storage and would involve longer haul cycles to transport the overburden off site.

Reasons Considered: This alternative was considered in response to concerns about the potential geotechnical stability of proposed locations for the permanent external overburden piles.

Reasons Dropped: This alternative was eliminated from detailed consideration because permanent storage of overburden at the North Rasmussen Ridge or Wooley Valley Mines is not reasonable.

At the Rasmussen Ridge Mines, an open pit would remain at the end of mining in 2016 that could accommodate all of the proposed external overburden from the project. Haul cycles, however, would be greater than for Wooley Valley Mine. The additional truck traffic, including traffic on shared segments of the haul road, would add to fuel consumption, air emissions, traffic hazards, and safety issues.

Mining at Wooley Valley occurred from 1974 to 1989, and an open pit remains in Panel F on BLM land. Haul Roads HR-1, HR-2, HR-3, and HR-4 all connect the proposed mine to the Wooley Valley Tipple Haul Road, which passes by the north entrance of the former Wooley Valley Mine. Like the other two mines, use of the Wooley Valley Mine would add haulage for overburden disposal. The additional truck traffic, including traffic on shared segments of the haul road, would add to fuel consumption, air emissions, traffic hazards, and safety issues.

The RCA provided a closer off-lease alternative location to store the overburden at the South Rasmussen Mine.

2.8.5 Store-and-Release Cover A

Alternative Considered: Store-and-Release Cover A would consist of 1 foot of external area GM over 2 feet of pit GM over 4 feet of pit alluvium and colluvium. The layers of pit and external area GM store water to enhance evapotranspiration and support vegetation. The thick layer of alluvium and colluvium would reduce the risk of plant uptake of harmful constituents from the overburden. Cover A would use the most accessible external borrow material. Construction would be somewhat more technical for Cover A than for the Proposed Action Cover because of the layered system. This cover would use fine-grained external area GM as the uppermost layer. This top layer would initially reduce infiltration into the soil profile, but would increase runoff and the risk of soil erosion. Therefore, the timely implementation of adequate erosion control measures and post-construction monitoring would be essential to establishing a healthy vegetative cover necessary for long-term effectiveness and durability of the cover.

Reasons Considered: This alternative was considered to address concerns about percolation of meteoric water through the backfill and potential effects to surface water and groundwater.

Reasons Dropped: Cover A was dropped because it was determined that the initial low permeability of the top 12 inches would weather to a more permeable layer, allowing additional infiltration, which would not be able to be transpired by the revegetation. The result would be net percolation rates and subsequent groundwater impacts similar to those associated with the Proposed Action. The RCA Cover C provides a more protective and durable cover.

2.8.6 Store-and-Release Cover B

Alternative Considered: Store-and-Release Cover B would consist of 2 feet of pit GM over 4 feet of low hydraulic conductivity external area alluvium and colluvium. The pit GM at the surface would provide storage and support vegetation, while the external area alluvium and colluvium was intended to impede deep percolation and provide hydraulic storage and sequestration of the backfill. The use of coarse-grained pit GM at the surface would result in a less erodible surface than Cover A.

Reasons Considered: This alternative was considered to address concerns about percolation of meteoric water through the backfill and potential effects to surface water and groundwater.

Reasons Dropped: Cover B would have a higher net percolation and a lower efficacy-to-cost ratio than Cover A. Constructability would be similar to that of Cover A; however, this cover would require the largest quantity of external borrow material (double to quadruple the amount associated with other alternatives) and would result in the largest borrow disturbance area (about double the area of the other alternatives) and haul volumes. Because this cover would use the coarser-grained pit GM as the uppermost layer, it would be less prone to erosion than Cover A. This alternative was eliminated from detailed evaluation because it was determined that the 2 feet of pit GM and 4 feet of external alluvium and colluvium would not retard the percolation in the root zone enough for the vegetation to transpire sufficient amounts of water before the water passed beyond the root zone and into the overburden. The result was a relatively high net percolation rate. The RCA Cover C provides a more protective cover.

2.8.7 Capillary Break Cover

Alternative Considered: The Capillary Break Cover is a store-and-release cover with the addition of a coarse-grained layer immediately below the root zone. The interface between the upper fine layer and the lower coarse layer increases the storage capacity of the upper layer by increasing the saturation level required for drainage. The greater moisture storage in the GM layer allows plants more time to transpire soil moisture, thus preventing it from continuing down as deep percolation. This alternative was initially included in the analysis as 2 feet of pit GM over 1 foot of non-Meade Peak-containing material over 4 feet of pit alluvium and colluvium.

Reasons Considered: This alternative was considered to address concerns about percolation of meteoric water through the backfill and potential effects to surface water and groundwater.

Reasons Dropped: This alternative was not analyzed in initial percolation modeling because no on-site borrow material was found with the appropriate coarse particle size properties that would provide an effective capillary break. Consequently, this cover could not be constructed with on-site materials. This alternative also would have a lower efficacy-to-cost ratio than other covers considered if off site material needed to be imported or a substantial volume of onsite materials needed to be processed for the capillary break.

2.8.8 Compacted Alluvium Barrier Layer Cover

Alternative Considered: The Compacted Alluvium Barrier Layer Cover (Compacted Barrier Cover) would consist of 2 feet of pit GM over a filter fabric over 1 foot of non-Meade Peak-containing material over a 2-foot layer of compacted external area alluvium and colluvium. The compacted alluvium and colluvium layer would act as a low-permeability barrier. The compacted barrier layer would reduce percolation into the underlying overburden. The more permeable non-Meade Peak-containing material would serve as a drainage layer above the barrier layer and provide lateral drainage to prevent oversaturation of the GM. Without the drainage layer, oversaturation could result in increasing pore water pressures that could compromise the stability of the cover soil, causing it to slide. The layer of pit GM would provide water storage and support vegetation.

Reasons Considered: This alternative was considered to address concerns about percolation of meteoric water through the backfill and potential effects to surface water and groundwater.

Reasons Dropped: Infiltration modeling of the Compacted Barrier Cover predicted it would have the highest net percolation rate of the alternative covers considered (2.48 inches per year). This alternative also would have the lowest efficacy-to-cost ratio and most complicated construction of the native material alternatives. This alternative also ranked poorly because of the large volume of external borrow material that would be needed, the necessary crushing and screening of non-Meade Peak-containing material from the pit for a drain layer, and the infeasibility of installing the cover system in phases consistent with the concurrent reclamation because of the use of internal stockpiles. The drainage layer and overlying filter fabric that would be needed to prevent plugging of the drainage layer would complicate the long-term durability of this cover. This alternative was eliminated from detailed evaluation because of its high net percolation rate and concerns about the long-term stability and performance of the filter fabric and drainage layer. The RCA Cover C provides a more protective cover.

2.8.9 Geosynthetic Clay Liner Laminate Synthetic Cover

Alternative Considered: The GCLL Cover would use a bentonite synthetic barrier to reduce percolation of water through the cover system into the underlying backfill. It would consist of 2 feet of pit GM over a filter fabric over a drainage layer of 1.5 feet of non-Meade Peak-containing material over a GCLL over a bedding layer of 1 foot of compacted external area alluvium and colluvium. The GCLL barrier layer consists of a layer of sodium bentonite contained between two geotextile fabrics with a high-density polyethylene (HDPE) flexible membrane adhered to the upper side. The HDPE layer ensures that desiccation and adverse cation exchange do not occur and provides for a substantial reduction in percolation rates beyond the simple bentonite alone. GCLLs are considered to provide enhanced resistance to penetration by plant roots or burrowing animals by providing an extra layer of protection in addition to its self-sealing qualities provided by the integrated bentonite clay layer. The non-Meade Peak-containing material would provide lateral drainage to prevent slab failure of the cover that can result from oversaturation of the GM. The compacted alluvium and colluvium would provide a bedding layer under the GCLL to prevent damage. The layer of pit GM would provide hydraulic storage and support vegetation.

Reasons Considered: This alternative was considered as an option to address concerns about percolation of meteoric water through the backfill and potential effects to surface water and groundwater and to establish a reclaimed vegetative environment supporting healthy multiple land use.

Reasons Dropped: Although infiltration modeling predicted the GCLL Cover would have the lowest net percolation, it would have a very low efficacy-to-cost ratio and would be the most technically challenging to construct. This cover would require substantially more complex construction associated with the haulage and compaction of external borrow material for the bedding layer, installation of the GCLL on steep slopes, crushing and screening of non-Meade Peak-containing material from the pit for a drain layer or installation of a synthetic drainage layer, and installation of the cover system in phases consistent with the concurrent reclamation. The synthetic materials and potential plugging of the drainage layer could complicate the long-term performance and durability of this cover The ability to maintain a diverse vegetative cover, given the relatively thin root zone, is also a concern with this type of cover. This alternative was eliminated from detailed evaluation because of its technical challenges for construction, very high costs to construct, and maintain and impact on post-mining multiple uses. Also, IDEQ considered it, but felt that Cover C sufficiently met the need to protect future groundwater uses adjacent to the site with less long term maintenance and at a lower cost, thus dropping the GCLL from further consideration in the Final EIS.

2.8.10 Alternative Overhead Power Line

Alternative Considered: The alternative overhead power line would have connected with the existing power line east of the mine and west of Lanes Creek County Road. The alternative overhead power line would have been 1,183 feet longer than the Proposed Action power line, but would not cross the Blackfoot River or wetlands in the floodplain of the Blackfoot River. The west end of the power line would have paralleled the West Side Haul Road and would have been constructed at the same time.

Reasons Considered: This alternative was considered in response to concerns about effects of the Proposed Action power line to wetlands, riparian areas, and AIZs along the upper Blackfoot River.

Reasons Dropped: This alternative power line element would offer minimal benefit by itself and would not have the flexibility of relocation that would be provided by portable generators. The power line would also pose more extensive physical impacts than portable generators and would cross several small drainages. No other alternative elements are currently being proposed that would combine with the alternative overhead power line to make a reasonable alternative. This alternative was eliminated from detailed consideration because the reduction of effects to wetlands in the floodplain of Blackfoot River for this alternative in comparison to the Proposed Action power line was not sufficient to consider it a reasonable alternative for detailed evaluation.

2.8.11 Underground Power Line along the Proposed Corridor

Alternative Considered: Under this alternative, a temporary underground power line would be constructed instead of an overhead power line. It would follow the same corridor as the proposed overhead power line. The underground line would require a continuous corridor of disturbance for construction and an 80-foot-wide cleared and maintained corridor for maintenance.

Reasons Considered: This alternative was considered in response to concerns raised about the potential for the overhead power line to adversely affect terrestrial and avian wildlife.

Reasons Dropped: This alternative was eliminated from detailed consideration because installation of the underground power line would result in greater adverse effects than construction of the overhead power line or use of generators. Disturbance of the required 80-foot-wide corridor would adversely affect biological resources present in the corridor where an overhead line could span small sensitive areas, such as drainages and wetlands. Particular problem areas for an underground line would be crossing small drainages, crossing wetlands, crossing the Blackfoot River, and installation in areas where basalt flows are at or near the ground surface. Crossing the Blackfoot River would require either directional drilling under the river or spanning the river with a segment of overhead line. Installation of the underground line across the basalt flow would require drilling and blasting. Finally, underground lines are less reliable, more difficult and costly to construct and maintain, and potentially dangerous to public safety.

2.8.12 Underground Power Line along the Alternative Corridor

Alternative Considered: Under this alternative, a temporary underground power line would be constructed instead of an overhead power line. The underground line would require a continuous corridor of disturbance for construction and an 80-foot-wide cleared and maintained corridor for maintenance.

Reasons Considered: This alternative was considered in response to concerns raised about the potential for the overhead power line to affect terrestrial and avian wildlife adversely.

Reasons Dropped: This alternative was eliminated from detailed consideration because installation of the underground power line would result in greater adverse effects than construction of the overhead power line or use of generators. Disturbance of the 80-foot-wide corridor would adversely affect biological resources present in the corridor, where an overhead line could span small sensitive areas, such as drainages and wetlands. Although the line would not cross any substantial areas of wetlands, the Blackfoot River, or areas where basalt flows are at or near the ground surface, it would cross a number of small intermittent drainages. This alternative would avoid some of the potential effects of the buried line along the proposed alignment, but would still result in additional environmental effects in comparison to an overhead power line along the same corridor. Finally, underground lines are less reliable, more difficult and costly to construct and maintain, and potentially dangerous to public safety.

2.8.13 Generation of Renewable Energy

Alternative Considered: Under this alternative, geothermal and wind generation were considered as potential options for supplying power to the mine facilities. Use of geothermal and wind generation would eliminate the need for the power line to the mine.

Reasons Considered: This alternative was considered in response to concerns raised about the potential for the overhead power line to adversely affect terrestrial and avian wildlife.

Reasons Dropped: This alternative was eliminated from detailed consideration because operations would be conducted 24 hours per day and would require a constant source of power. No potential sources of renewal energy exist that could provide the required continuous power required for the project. Sufficiently sized geothermal power facilities are available, but they require natural geothermal resources. Although some evidence of water with elevated temperatures has been noted in groundwater monitoring wells near the south end of the Study Area, the temperature and extent is not sufficient to be considered for geothermal resources for a mine. In addition, wind generation would require the installation of at least one wind turbine generator. Climatological data for the Study Area suggest that the average velocities of wind may be adequate, but that winds are too intermittent to meet the project requirements for continuous power. Given the short life-of-mine, the life cycle energy costs to develop renewable energy at the site could require more energy than would be gained.

2.8.14 Ore Conveyor System

Alternative Considered: Under this alternative, a conveyor would be constructed to transport ore across Rasmussen Valley from the north end of the proposed mine pit to the existing ore haul road. The conveyor could be constructed along the alignment of HR-1. The alignment would be approximately 15,000 feet long, running from the north end of the proposed mine pit to the existing ore haul road. The conveyor system would consist of a maintenance road along the conveyor system; ore stockpile, staging, loading, and unloading areas at each end of the conveyor; and GM stockpiles and sediment basins along the area of disturbance. Haul trucks would still be necessary at both ends of the conveyor to move ore from the mine to the conveyor and from the conveyor to the Wooley Valley Tipple. Following the same corridor as HR-1, the conveyor would cross Rasmussen Valley Road, Angus Creek, and the same areas of wetlands. The corridor of disturbance would be approximately 40 feet wide.

Reasons Considered: This alternative was considered in response to concerns about adverse effects of the haul road on wetlands and on surface water at stream crossings and segmentation of grazing allotments along the proposed haul road.

Reasons Dropped: Construction of the conveyor would not eliminate the effects to wetlands because of the required maintenance road; it would disturb 10.3 acres (BC 2013a) of wetlands along HR-1 (compared to 20.5 acres for the haul road). The conveyor, however, would cross large areas of private land (4,400 feet along HR-1 and 6,600 feet along HR-2) and disrupt the landowners' use of these areas. In addition, the conveyor would be a constant source of noise and fugitive dust, would disrupt wildlife, fragment wildlife habitats, and be a barrier to the movement of wildlife and livestock. Finally, the conveyor system would be unduly expensive to construct and operate considering the short life-of-mine. The shorter new haul road (HR-5) in the RCA addresses the same issue as the conveyor would and avoids the impacts that would be incurred by the conveyor, the Proposed Action or other alternative haul roads.

2.8.15 Ore Haul Road HR-2

Alternative Considered: Under this alternative, the Rasmussen Valley Haul Road would be moved to the south edge of Rasmussen Valley. The alternative would cross the same two privately owned parcels as HR-1 (eastern [7S/44E] and western [6S/43E]), but for a shorter distance on the western parcel. This alternative haul road also would cross Rasmussen Valley Road at just one location, compared to the two locations where HR-1 crosses the road.

Reasons Considered: This alternative was considered in response to concerns about the extent of potential adverse effects to wetlands.

Reasons Dropped: This alternative was eliminated from detailed consideration because the reduction of impacts for this alternative in comparison to HR-1 was not sufficient to consider it a reasonable alternative. It does not provide sufficient additional environmental benefit compared to other alternative haul road routes. Although the impacts on wetlands would be less than those for HR-1, they would still be considered significant. The cycle time for hauling ore from the mine to the Wooley Valley Tipple would be nearly the same, which eliminates any operational benefits of reduced fuel consumption or associated air emissions for this haul road alignment. Crossing of a public road by a haul road would create public safety concerns. The shorter new haul road (HR-5) in the RCA avoids the impacts that would be incurred by HR-2, the Proposed Action, or other alternative haul roads.

2.8.16 Ore Haul Road HR-3

Alternative Considered:	HR-3 would have followed the lower slopes of Rasmussen Ridge northwest to the Wooley Valley Tipple Haul Road. It would have avoided the wetlands along Angus Creek as well as avoiding crossing Rasmussen Valley Road. It would also cross less private land than the Proposed Action Haul Road, but would cross more state lands managed by the IDL.
Reasons Considered:	This alternative haul road was considered in response to concerns about the extent of potential adverse effects to wetlands along Angus Creek.
Reasons Dropped:	This alternative would not reduce the travel distance to the existing Agrium mine facilities at the Rasmussen Ridge Mines, and would increase the haul cycle to the Wooley Valley Tipple in comparison to the Proposed Action. This alternative would generate more dust emissions, and would result in higher fuel consumption and air emissions in comparison to HR-1. This alternative element does have fewer potential effects on wetlands in comparison with the Proposed Action, and does not cross Rasmussen Valley Road, reducing potential effect on public roads. However, it does not address other issues such as effects on air quality, water resources, soils, wildlife, and visual resources. This alternative was eliminated from detailed consideration because the reduction of impacts for this alternative in comparison to HR-1 and HR-5 was not sufficient to consider it a reasonable alternative for detailed evaluation. The shorter new haul road (HR-5) in the RCA avoids the impacts that would be incurred by HR-3, the Proposed Action, or other alternative haul roads.

2.9 ALTERNATIVE COMPARISON AND EFFECTS SUMMARY

Table 2.9-1 provides a summary and comparison of potential effects from the Proposed Action and alternatives by resource. Detailed descriptions of potential effects for specific resources are presented in **Chapter 4**.

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Table 2.9-1 Alternative Comparison and Effects Summary

Resource	Proposed Action	RCA	No Action Alternative
Geology, Minerals, and Paleontology			
Geotechnical Stability	The North and South Main Overburden Piles could be affected by slope instability. An indirect effect of slope failure would be exposure of Meade Peak overburden. In addition, 30.6 acres of haul roads constructed on soil map units HAX and PCM may be susceptible to minor cut slope failure. Overall potential effects of slope and pit wall instability under the Proposed Action were predicted to be short-term and minor.	Under the RCA, there would be no permanent external overburden piles on potentially unstable slopes downslope of the mine pit. Borrow and storage areas may be located on unstable slopes downslope of the mine pit and could be affected by slope instability. The West Side Haul Road and HR-5 would be constructed on 31 acres of soil map units HAX and PCM and may be susceptible to minor cut slope failure. Portions of HR-5 would carry a higher potential for minor failure than the Rasmussen Valley HR-1. Overall potential effects of slope and pit wall instability under the RCA would be negligible.	The mine would not be developed, and there would be no potential for geotechnical effects from this action.
Paleontology	Geological strata that would be mined are classified under the BLM Potential Fossil Yield Classification (PFYC) system (BLM 2007) as PFYC 5a and PFYC 3a. PFYC 5a deposits have a very high potential to contain scientifically significant fossils. PFYC 3a deposits have a moderate potential to contain scientifically significant fossils. However, the paleontological resources in these formations are mostly commonly occurring invertebrate fossils not generally considered to be important or	The RCA would disturb 67 acres of PFYC Class 5a deposits and 81 acres of PFYC Class 3a deposits. With required mitigation, effects to paleontological resources would be minor. The RCA could have a beneficial effect for paleontology through the discovery and documentation of previously undocumented paleontological resources. Overall, the effects to important paleontological resources would be long-term and minor.	The mine would not be developed, and there would be no potential for effects to paleontological resources from this action.

Table 2.9-1 Alternative Comparison and Effects Summary

Resource	Proposed Action	RCA	No Action Alternative
	restricted to the analysis area. The Proposed Action was predicted to disturb 60 acres of PFYC Class 5a deposits and 25 acres of PFYC Class 3a deposits. With required mitigation, effects to paleontological resources would be minor. Mitigation would be developed on a case-by-case basis and may include salvage of important specimens. The RCA could have a beneficial effect for paleontology through the discovery and documentation of previously undocumented paleontological resources. Overall effects to paleontology under the Proposed Action would be long-term and minor.		
Air Resources, Climate, and Noise			
Air Emissions	Activities at the Rasmussen Ridge Mine would gradually conclude as equipment is moved to develop the Rasmussen Valley Mine. The Proposed Action would replace comparable existing activities at the Rasmussen Ridge Mine. The majority of air emissions are from fugitive dust and equipment emissions. Similar levels to those currently occurring would occur during operation of the Proposed Action. The impacts from the Proposed Action to air resources would be negligible.	The RCA eliminates overburden piles downslope of the pit and reduces the frequency of overburden pile disturbance. The total potential surface disturbance of the RCA would be approximately 73 acres more than the Proposed Action. HR-5 would be approximately 3 miles longer than the Proposed Action HR-1, increasing vehicle emissions, but the overall potential air emissions would be lower than those for the Proposed Action.	Under the No Action Alternative, direct impacts to air emissions from the activities in the Proposed Action would not occur. Air emissions would be reduced from existing conditions as activities conclude at the Rasmussen Ridge Mine.

Table 2.9-1 Alternative Comparison and Effects Summary

Resource	Proposed Action	RCA	No Action Alternative
		The impacts from the RCA to air resources would be negligible.	
Climate Change	Greenhouse gas (GHG) emission from the Rasmussen Valley Mine operations would be similar to those from the current operations at Rasmussen Ridge Mine. These emissions are lower than the current USEPA reporting threshold of 25,000 metric tons in combined GHG emissions per year. Effects of the Proposed Action on GHG emissions and climate change would continue after the mine is closed. As a result of the long residence time of GHG in the atmosphere, the effects of the Proposed Action on climate change would be long term and negligible. Trends in climate change may affect the rate of long-term reclamation success and succession, but the effects would be negligible over the 5.8-year life-of-mine of the Proposed Action.	Potential contribution to climate change from the RCA would be greater than those described for the Proposed Action as a result of the addition of additional GHGs because of the longer mine life. As with the Proposed Action, the effects of the RCA on climate change would be long term and negligible. Trends in climate change may affect the rate of long-term reclamation success and succession, but the effects would be negligible over the 7.1-year life-of-mine of the RCA.	Under the No Action Alternative, direct impacts to climate change from the activities in the Proposed Action would not occur. GHG emissions would be reduced from existing conditions as activities conclude at the Rasmussen Ridge Mine.
Noise	Noise from operation of the Proposed Action would be generated by site equipment, blasting, drilling, and traffic. The overall mine generation noise profile would be minimally changed from current activities at the Rasmussen Ridge Mine. The noise profile would be unchanged from existing conditions, and changes in the locations of noise generating	Potential impacts of noise under the RCA would be the same as those for the Proposed Action. The noise impacts from the RCA are expected to be negligible or minor at the closest residence as a result of the distance from the mine.	Under the No Action Alternative, direct impacts to noise from the activities in the Proposed Action would not occur. Mining-related noise would be reduced from existing conditions as activities conclude at the Rasmussen Ridge Mine.

Table 2.9-1 Alternative Comparison and Effects Summary

Resource	Proposed Action	RCA	No Action Alternative
	activities would be negligible at all off-site receptors. The noise effects from the Proposed Action would be negligible or minor at the closest residence as a result of the distance from the mine.		
Water Resources			
Groundwater Quantity	Pit dewatering under the Proposed Action to facilitate mining below the regional groundwater table near the southern end of the excavation would be expected to result in moderate but localized impacts to water levels in the Wells Regional Aquifer for 10 to 11 months starting during Phase 1 mining. The projected maximum drawdown in the Wells Regional Aquifer would be approximately 60 feet. Capping of the permanent overburden piles and pit backfill would permanently reduce the amount of recharge reporting to groundwater by approximately 8 percent from a pre-mining 2.6 inches per year to a predicted permanent 2.4 inches per year. Long-term decreases in shallow groundwater levels by reduced infiltration through reclaimed areas would be minor and localized, and in the Wells Regional Aquifer would be negligible.	The RCA would result in reduced effects to groundwater quantity in comparison to the Proposed Action. The RCA would eliminate mining below the water table, reduce the pumping of pit water through unreclaimed backfill, and would eliminate external overburden piles downslope of the pit, thus eliminating the reduced infiltration to shallow groundwater. The RCA would also use a cover system over the backfill and overfill that has lower infiltration characteristics. Numerical infiltration and seepage modelling of the RCA cover calculated a net percolation of 0.21 inch per year. Because of the elimination of mining below the water table, the elimination of the overburden piles downslope of the mine pit, the effects of the RCA to groundwater quantity would be negligible and less than the Proposed Action and would protect groundwater beneficial	Under the No Action Alternative, the Rasmussen Valley Lease would not be mined, and there would be no effects to water resources beyond the existing conditions.

Table 2.9-1 Alternative Comparison and Effects Summary

Resource	Proposed Action	RCA	No Action Alternative
		uses.	
Surface Runoff and Flow	The Proposed Action may affect surface waters by changing the volume and timing of surface runoff and flow patterns. The Proposed Action was predicted to increase hydrologic disturbance in the Angus Creek-Blackfoot River sub-watersheds by 1.59 percent. This would temporarily raise the total hydrologic disturbance in the Angus Creek-Blackfoot sub-watershed to 25.18, which is below the USFS guideline of 30 percent. There would be no disturbance on USFS lands in the Lower Lanes Creek or Diamond Creek sub-watersheds. Impacts to watershed area disturbance would be minor, local, and long-term, lasting until vegetation has fully re-established and trees have reached the sapling/pole size class. Reduction of runoff resulting from the Proposed Action was predicted to be 4.14 percent in the Angus Creek-Blackfoot River and 0.03 percent in the Lower Lanes Creek sub-watersheds. There would be no change in the Diamond Creek sub-watershed. Total runoff reduction to Blackfoot River would be less than 1 percent. Impacts to runoff reduction would be considered minor to negligible, local, and limited to the duration of mining. Haul roads carry	The RCA would temporarily increase hydrologic disturbance in the Angus Creek-Blackfoot River sub-watershed by 1.65 percent during mining. The total new hydrologic disturbance would be 0.06 percent higher than that under the Proposed Action in the Angus Creek-Blackfoot River sub-watershed, and would be the same as for the Proposed Action for the Lower Lanes Creek and Diamond Creek sub-watersheds. The total hydrologically disturbed area would meet the USFS guideline of less than 30 percent in all three sub-watersheds. Runoff reduction under the RCA would be 4.06 percent in the Angus Creek-Blackfoot sub-watershed; 2 percent lower than under the Proposed Action. Differences in runoff reduction to Blackfoot River between RCA and the Proposed Action would be negligible. Total runoff area reduction compared to the Proposed Action would be 4.06 percent of the Angus Creek-Blackfoot River sub-watershed. Potential impacts to alterations in peak flow under the RCA would be the same as those for the	Under the No Action Alternative, the Rasmussen Valley Lease would not be mined, and there would be no effects to water resources beyond the existing conditions.

Table 2.9-1 Alternative Comparison and Effects Summary

Resource	Proposed Action	RCA	No Action Alternative
	the potential to affect peak flows through the diversion of flow through in-slope ditches and cross-drains, and through potential constrictions of flow at stream crossings or culverts. Potential alterations to peak flow would be minor, local, and short-term. Long-term effects to streamflow from haul roads would be negligible. The permanently realigned county roads would have minor, localized impacts that would be long-term. Construction of four overburden piles downslope of the pit would alter the natural flow patterns by diverting flow away from the natural channels. Although the intermittent drainages affected by two of the piles would be re-established after reclamation, the drainages affected by the North and South-South Overburden Piles would be permanently diverted. Pit dewatering under the Proposed Action to facilitate mining below the regional groundwater table near the southern end of the excavation is expected to result in moderate but localized impacts to water levels in the Wells Regional Aquifer for 10 to 11 months starting during Phase 1 mining. The projected maximum drawdown in the Wells Regional Aquifer would be approximately 60 feet. Temporary drawdown of shallow groundwater levels west of the pit near Angus Creek is predicted to be	Proposed Action. While there would be up to four external GM stockpiles constructed within intermittent drainages downslope of the mine pit, these would all be reclaimed after the cessation of the mining activities, and there would be no permanent diversions from original stream channels under the RCA. There would be no impacts from dewatering under the RCA because there would be no mining below the water table. Consequently, there would be no drawdown in the aquifer, and there would be no indirect effects to streamflows.	

Table 2.9-1 Alternative Comparison and Effects Summary

Resource	Proposed Action	RCA	No Action Alternative
	negligible. Dewatering is not predicted to measurably affect Angus Creek and Blackfoot River streamflows. However, some minor, localized, temporary stream depletions may occur at lower reach of Spring Creek.		
Groundwater Quality	The Proposed Action was predicted to affect groundwater quality by leaching pollutants, including selenium and other COPCs, from pit backfill, external overburden piles, and the optional ore stockpile into the Wells Regional Aquifer and shallow groundwater flow system. Leachate generated by the percolation of infiltrated through the North, South Main Temporary, and South-South Overburden Piles and the optional ore stockpile would be the primary source of chemical loading to shallow groundwater in alluvium. COPCs leaching into shallow groundwater would be transported southwest toward Angus Creek and Blackfoot River, and may discharge into surface water. Percolation of infiltrated meteoric water through backfilled overburden in the mined out pit would be the primary source of chemical loading to the Wells Regional Aquifer. COPCs released into the Wells Regional Aquifer would be transported northwest, but would not discharge to surface water near the Proposed Action.	The RCA would eliminate downslope external overburden piles and the optional ore stockpile, which would remove sources of chemical loading to the shallow aquifer system and reduce impacts to shallow groundwater quality to negligible levels. Under the RCA, no impacts to the chemistry of surface water would occur by the transport and discharge of COPCs in groundwater to Blackfoot River and Angus Creek. The RCA would result in the permanent disposal of all overburden in either the existing South Rasmussen Mine pit or in the Rasmussen Valley Mine pit and overfill piles. It would also result in the construction of protective covers over the backfill at both locations, which would reduce the percolation of meteoric water through the backfill from 0.87 in/yr at the South Rasmussen Mine pit and 2.4 in/yr at the Rasmussen Valley Mine pit to 0.21 in/yr at both locations. The	Under the No Action Alternative, the Rasmussen Valley Lease would not be mined, and there would be no effects to water resources beyond the existing conditions.

Table 2.9-1 Alternative Comparison and Effects Summary

Resource	Proposed Action	RCA	No Action Alternative
	The Proposed Action was predicted to result in impacts to groundwater quality in the shallow and regional aquifers that would exceed numerical groundwater standards. Seepage from the mine facilities would form contaminant plumes with higher concentrations than in unaffected groundwater. The impacts to groundwater quality under the Proposed Action would be long-term and moderate.	reduction of percolation through the backfill would reduce chemical loading to the Wells Regional Aquifer at the Rasmussen Valley Mine compared to the Proposed Action. Seepage out of the backfill under the RCA would result in the formation of groundwater contaminant plumes from the Rasmussen Valley Mine and South Rasmussen Mine in the Wells Regional Aquifer that have higher concentrations than in unaffected or existing groundwater. The concentration of contaminant plumes from the Rasmussen Valley Mine would be lower than those that would occur under the Proposed Action. The concentrations of contaminant plumes from the South Rasmussen Mine would be lower and higher than concentrations that would occur under the Proposed Action depending on the constituent considered. The Rasmussen Valley Mine groundwater plumes would have smaller extents than those predicted under the Proposed Action, and would be transported to the northwest, where they would merge with the South Rasmussen Mine plume. COPCs transported in the Wells Regional	

Table 2.9-1 Alternative Comparison and Effects Summary

Resource	Proposed Action	RCA	No Action Alternative
		Aquifer would not discharge at the surface. Impacts to shallow groundwater quality under the RCA would be negligible. Impacts to groundwater in the Wells Regional Aquifer would be long-term and moderate but meet beneficial uses.	
Surface Water Quality	Short-term effects to surface water quality could occur from increased sediment yield from disturbances related to construction, resulting in increased suspended sediment and turbidity. These sources of sediment would be controlled by the use of BMPs, sediment control structures, and slope stabilization. There would be no long-term effects. Cover systems on the backfill and overburden piles would prevent contact of runoff with overburden, preventing direct contamination of surface water by selenium and other COPCs. The Proposed Action would result in negligible, local, and short-term impacts to surface water quality. Numerical infiltration and seepage modeling of the Proposed Action cover calculated a net percolation of 2.4 inches per year. Although substantially mitigated by the cover system, meteoric water that infiltrates the pit backfill and overburden piles may result in moderate COPC loading	Potential impacts to water quality from sedimentation and runoff under the RCA would be the same as those for the Proposed Action.	Under the No Action Alternative, the Rasmussen Valley Lease would not be mined, and there would be no effects to water resources beyond the existing conditions.

Table 2.9-1 Alternative Comparison and Effects Summary

Resource	Proposed Action	RCA	No Action Alternative
	to the alluvial aquifer, where the COPCs would be transported west in groundwater toward Angus Creek. However, gain-loss studies and surface water monitoring data indicate that the lower sections of Angus Creek lose flow to groundwater under most flow conditions. The COPCs transported in groundwater from the facility may be attenuated by dilution, precipitation, or adsorption. The Proposed Action was predicted to result in the release of COPCs into the Wells Regional Aquifer at concentrations that exceed Idaho groundwater quality standards. Impacts to surface water quality would be considered minor to moderate and long-term.		
Soils			
	Direct impacts to soils from mining and construction include increased erosion; soil compaction; decreased soil productivity; and potential contamination of soils from chemical spills during transport, storage, or use. Indirect impacts to soils are not expected. Except for contamination by spills, these impacts would decrease soil productivity by impacting soil structure, increasing runoff and soil loss, decreasing permeability and infiltration, and damaging soil microorganisms. Overall direct impacts from construction of the Proposed Action would be moderate,	Impacts to soils under the RCA would be similar to those described for the Proposed Action. The intensity of effects would be slightly different than the Proposed Action in response to differences in location and extent of disturbances. The total area of surface disturbance under the RCA would be up to 540.9 acres, 73 acres more than the Proposed Action. In all, 517.8 acres of this disturbance would be reclaimed. As in the Proposed Action, unreclaimed areas would include unreclaimed pit walls and	Under the No Action Alternative, existing soil resource trends would continue, and there would be no new impacts to soil resources.

Table 2.9-1 Alternative Comparison and Effects Summary

Resource	Proposed Action	RCA	No Action Alternative
	local, and long-term. The Proposed Action would create 467.8 acres of surface disturbance. Approximately 450.5 acres would be reclaimed. The remaining 17.3 acres would include unreclaimed pit walls and permanently realigned county roads. Reclamation would reduce the long-term impacts to minor. The majority of undisturbed soils that would be disturbed by the Proposed Action are soil types with low erosion hazards, but disruption of vegetative cover and soil aggregates would result in a short-term increase in soil erosion and sediment transport. Disturbances would occur on 62 acres of soils with high erosion hazard and 230 acres of soils with moderate erosion hazard. Overall erosion rates are expected to decrease as portions of the Proposed Action are reclaimed and vegetation cover is established. Based on lab analysis, COPCs are not expected to be released from soils used for reclamation. Use of salvaged soils for GM is not expected to cause adverse impacts on plant selenium concentrations or downstream water quality. Estimated volumes of available GM indicate that sufficient soils are present within the area to be disturbed to meet cover requirements. No soils from outside disturbed areas	permanently realigned county roads. . The RCA would create less disturbance on soils with moderate (120 acres) or high (31 acres) erosion hazards. Specific areas outside the mine pit, overburden stockpiles, and roads would be used as borrow areas for GM and alluvium to construct the RCA Cover C. Overall adverse effects to soils under the RCA would be greater than under the Proposed Action and would be long-term and minor to moderate. As under the Proposed Action, much of the impact would reduce over time with the success of reclamation.	

Table 2.9-1 Alternative Comparison and Effects Summary

Resource	Proposed Action	RCA	No Action Alternative
	would be needed for use as GM. Salvaged GM would be stored in stockpiles. During reclamation, any surplus GM beyond that required for minimum thickness of reclamation would either be placed to a thicker depth or placed in stockpiles for later use. Overall effects to soils under the Proposed Action would be long-term and moderate, but much of the impact would reduce over time with the success of reclamation.		
Vegetation, Riparian Areas, and Wetlands			
Upland Vegetation and Pollinators	Over the life-of-mine, the Proposed Action would remove up to 447 acres of upland vegetation. This would include the effectively permanent loss of 83 acres of aspen forest. Reclamation would eventually re-establish vegetation cover, but the species composition and community structure would be different. Proposed seed mixes are pollinator-friendly, and no threatened, endangered, or USFS sensitive pollinator species are known to occur in the Caribou-Targhee National Forest (CTNF). Overall impacts to vegetation and pollinators would be minor and long-term.	Impacts to vegetation from the RCA would be similar to the Proposed Action. The RCA would remove up to 540.9 acres of upland vegetation. Reclamation would eventually re-establish vegetation cover, but the species composition and community structure would be different. No threatened, endangered, or USFS sensitive pollinator species are expected to be impacted under the RCA, and proposed seed mixes are pollinator-friendly. Overall impacts to vegetation and pollinators would be minor and long-term.	Under the No Action Alternative, the Rasmussen Valley Lease would not be developed, and there would be no new impacts to vegetation.
Wetlands and Riparian Areas	The Proposed Action would remove 20.5 acres of wetlands and non-wetland WOUS. Most wetland	The RCA would have no impact on wetlands or riparian areas. Under the RCA, there would be no measureable loading of	Under the No Action Alternative, the Rasmussen Valley Lease would not be developed, and

Table 2.9-1 Alternative Comparison and Effects Summary

Resource	Proposed Action	RCA	No Action Alternative
	impacts (17.5 acres) would occur in Category III wetlands. As a result of project design, use of BMPs, acreage, and similar functionality of wetlands not impacted in the assessment areas, the wetland impacts would be local, long-term, and moderate. Reclamation and establishment of new wetlands would eventually compensate for much of this loss. Potential impacts from COPCs in shallow alluvial aquifers may occur and would be long-term and moderate.	selenium or other COPCs to wetlands and riparian areas.	there would be no new impacts to wetlands.
Noxious Weeds	There is a low occurrence of noxious weeds in the analysis area, and BMPs would be implemented to minimize their potential spread. The effects of noxious weeds from the Proposed Action would be short-term and minor.	Noxious weed control methods for the RCA are unchanged from those presented in the Proposed Action. The RCA would disturb approximately 73 more acres of vegetation than the Proposed Action. The effects of noxious weeds from the RCA are expected to extend several years past the end of mining, but are considered short-term and minor because reclamation species and native vegetation will ultimately predominate. Should any weed issues arise post-mining, control methods would be adapted to alleviate such issues.	Under the No Action Alternative, the Rasmussen Valley Lease would not be developed, and there would be no new impacts from noxious weeds as a result of the undertaking.

Table 2.9-1 Alternative Comparison and Effects Summary

Resource	Proposed Action	RCA	No Action Alternative
Terrestrial Wildlife			
	The Proposed Action would have immediate direct effects to wildlife mortality, disturbance, and displacement and changes in wildlife behavior and composition associated with long-term changes in land cover. Overall, depending on the season and species, disturbance and displacement impacts to terrestrial wildlife would be long-term and negligible to minor. Wildlife may also be affected by exposure to selenium and other COPCs in vegetation and water in wetlands and riparian areas. Effects of selenium exposure from the Proposed Action would be long-term and negligible to minor. Indirect effects from habitat alteration would be localized and long-term. The Proposed Action would result in the loss of up to 447 acres of forested and shrubland habitat and 20.5 acres of wetland and riparian habitat. This would include the effectively permanent loss of 83 acres of aspen forest habitat. This would be a long-term and major effect on the habitats of many terrestrial wildlife species.	The RCA would have impacts to terrestrial wildlife similar to the Proposed Action. The maximum total acreage of upland wildlife habitat affected would be 540.9 acres, or 73 acres more than the Proposed Action. The RCA would not disturb any wetland areas, which translates to 20.5 acres less wetland disturbance than the Proposed Action. The use of an existing haul road and backfill of overburden in a previously disturbed area would also consolidate new disturbance and result in less habitat fragmentation than the Proposed Action. Depending on the season and species, overall disturbance and displacement impacts would be long-term and range from negligible to minor.	Under the No Action Alternative, the Rasmussen Valley Lease would not be developed, and there would be no new impacts to wildlife from the proposed mining.

Table 2.9-1 Alternative Comparison and Effects Summary

Resource	Proposed Action	RCA	No Action Alternative
Fisheries and Aquatic Resources			
Aquatic Habitat	The Proposed Action would result in direct impact to 20.5 acres of wetland habitat and would also impact stream channels in the Study Area. There would also be indirect impact to aquatic habitats within and adjacent to the Study Area. Clearing of vegetation in the Study Area could contribute to increased soil erosion and sediment loading in local drainages if not controlled with BMPs. This could result in altered stream morphology, choking out of aquatic plants, and changes in fish and aquatic invertebrate communities. BMPs for sedimentation and capturing of surface runoff during mining would decrease the severity of or eliminate these potential impacts. However, the reduced quantity of water resulting from capture of runoff could also result in the drying of some aquatic habitats downstream of the Proposed Action. The Proposed Action would impact 80 acres of AIZ, which could result in increased water temperatures, decreases in natural sediment filtration, changes in channel morphology, loss of instream wood recruitment, and decrease in inputs of organic matter as energy. Overall effects of the Proposed Action to aquatic habitat would be long-term and moderate.	The RCA was developed to avoid most impacts to aquatic resources. The RCA would have no impact on wetlands, and therefore would impact 20.5 fewer acres of wetland habitat than the Proposed Action. The majority of RCA disturbance would occur in upland habitats. The RCA would also impact 70 fewer acres of AIZ than the Proposed Action. Overall impacts to aquatic resources would be negligible and long-term under the RCA.	Under the No Action Alternative, the Rasmussen Valley Lease would not be mined, and there would be no effects to aquatic habitat beyond the existing conditions.

Table 2.9-1 Alternative Comparison and Effects Summary

Resource	Proposed Action	RCA	No Action Alternative
Macroinvertebrates	Macroinvertebrates would be impacted by changes in sedimentation and changes to AIZs resulting from the Proposed Action. These impacts would change the physical characteristics of the aquatic environment. Changes in the macroinvertebrate community may include temporary increases in the abundance of some species and decreases in the abundance of other species less tolerant of changes in turbidity. Macroinvertebrate community composition is also impacted by removal of vegetation in the AIZ. Macroinvertebrates could bioaccumulate selenium in reaches of Angus Creek where impacted shallow alluvial water discharges to the creek. Overall impacts of the Proposed Action to macroinvertebrates would be long-term and minor.	Impacts to macroinvertebrates under the RCA would be less than the Proposed Action. Macroinvertebrates may be affected by sedimentation and changes to the AIZ. There would be only 10 acres of direct impact to the AIZ under the RCA compared to 80 under the Proposed Action. The RCA would also have a lower potential to contribute selenium and other COPCs to surface water. Overall, the impacts of the RCA on macroinvertebrates would be negligible in wetlands and waters downstream of the RCA.	Under the No Action Alternative, the Rasmussen Valley Lease would not be mined, and there would be no effects to macroinvertebrates beyond the existing conditions.
Fish	Culverts would be designed so that the minimum depth of water for fish passage is always available. BMPs and design features would be implemented to minimize sedimentation. The Proposed Action is unlikely to contribute to population level effects of selenium and other COPCs on fish downstream of the Study Area. Overall impacts of the Proposed Action to fish would be long-term and moderate.	The RCA does not include any crossings of fish-bearing streams. The RCA would comply with BLM and USFS guidelines for the maintenance of instream flows and would not fragment fish habitat. The potential for the bioaccumulation of selenium and other COPCs in the aquatic food chain would be lower under the RCA. Overall, the RCA would have a negligible impact on fish populations in wetlands and	Under the No Action Alternative, the Rasmussen Valley Lease would not be mined, and there would be no effects to fish habitat beyond the existing conditions.

Table 2.9-1 Alternative Comparison and Effects Summary

Resource	Proposed Action	RCA	No Action Alternative
		waters downstream of the Study Area.	
Amphibians and Reptiles	Direct mortality of amphibians and reptiles may occur in wetland, riparian, and stream habitats disturbed by the Proposed Action, including 20.5 acres of wetland and riparian areas. In addition, direct mortalities may occur on haul roads when individuals move between wetland habitats. Amphibians are also susceptible to selenium toxicity and to the effects of other COPCs. Overall impacts of the Proposed Action to amphibians and reptiles would be long-term and moderate.	All wetlands would be avoided under the RCA. Only 10 acres of AIZ would be impacted under the RCA, 70 fewer acres than under the Proposed Action. Consequently, impacts on amphibians and reptiles from the RCA would be negligible.	Under the No Action Alternative, the Rasmussen Valley Lease would not be mined, and there would be no effects to amphibians and reptiles beyond the existing conditions.
Threatened, Endangered, and Special Status Species			
	Threatened, endangered, or sensitive species include threatened, endangered, and proposed candidate species; Caribou National Forest (CNF) sensitive species and management indicator species and BLM sensitive species; and special status plants. Threatened, endangered, and proposed candidate species that may occur in the analysis area are Canada lynx and North American wolverine. Sensitive species and management indicator species that may occur in the analysis area are gray wolf, greater sage-grouse, Townsend's big-eared bat, special status raptor species,	Under the RCA, there would be a loss of 132 acres of marginal aspen forest foraging habitat, 49 acres more than under the Proposed Action. This would make these marginal areas less attractive to Canada lynx, gray wolf and North American wolverine, but would not result in mortality or loss of important habitat. A greater loss of sagebrush shrubland under the RCA would result in displacement of individuals, marginal habitat loss, and habitat fragmentation, making	Under the No Action Alternative, the federal phosphate leases would not be developed. The No Action Alternative would result in no new impacts in the Study Area.

Table 2.9-1 Alternative Comparison and Effects Summary

Resource	Proposed Action	RCA	No Action Alternative
	Columbian sharp-tailed grouse, small birds, special status migratory and water birds, special status reptiles and amphibians, and special status fish. There are no identified threatened, endangered, and proposed candidate plant species, CNF sensitive plant species, CNF Forest Watch rare plant species, or BLM sensitive plant species in the analysis area. Canada lynx, gray wolf, wolverine, greater sage-grouse, and Columbian sharp-tailed grouse may range into the analysis area or may occur in limited numbers. In general, the habitat in the analysis area is marginal for these species. There is no sage grouse habitat formally designated in the federal land use plans within the Study Area. Wide-ranging species like the Canada lynx, gray wolf, and wolverine would avoid these marginal habitats. The greatest effects to these species would be from the loss of 83 acres of marginal aspen forest foraging habitat under the Proposed Action. Given the marginal and patchy nature of habitat and the large foraging range of these species, adverse impacts would be negligible. Greater sage-grouse and Columbian sharp-tailed grouse have been observed sporadically in the analysis area. The existing sagebrush	the Study Area unattractive for greater sage-grouse and Columbian sharp-tailed grouse although the area is not in designated sage-grouse habitat. The RCA would not impact any wetlands which is foraging habitat for the Townsend's big-eared bat. Other impacts to the species would be similar to the Proposed Action. In general, impacts of the RCA to special status raptor species and small birds would be similar to the Proposed Action. The RCA would result in long-term loss of 132 acres of aspen forest, 49 acres more than the Proposed Action. On the other hand, the RCA would result in no disturbance to wetland and riparian habitat. Overall impacts would be negligible and long-term. The RCA would have the same types of impacts to special status fish, reptiles and amphibians, and migratory and water birds as the Proposed Action, but they would be reduced because of the reduced impacts to wetland habitats and improved protection of downstream water quality. Overall impacts to special status	

Table 2.9-1 Alternative Comparison and Effects Summary

Resource	Proposed Action	RCA	No Action Alternative
	communities do not provide optimum habitat for either grouse species. Townsend's big-eared bats may occupy a variety of the habitats in the Study Area. The Proposed Action would result in long-term alteration of up to 468 acres of upland, woodland, and wetland foraging habitat. Overall impacts would be minor and long-term. Special status raptors and small birds would be affected principally by disturbance to upland woodlands and shrubland habitat. These habitats are important for both nesting and foraging. These species also use wetland habitat for foraging. There would be long-term loss of foraging and nesting habitat for special status raptor species and small birds. Noise and human disturbance would temporarily displace the raptors. The Proposed Action would result in permanent loss of 83 acres of aspen habitat and 20.5 acres of wetland and riparian habitat. On a landscape scale, these impacts would be minor. Special status fish, reptiles and amphibians, and migratory and water birds are more heavily dependent on wetlands and riparian areas. These species would be directly affected by the loss or degradation of wetland habitat and are also more susceptible to potential exposure to selenium and	water birds would be negligible and long-term. Overall impacts of the RCA on threatened, endangered, and special status species would be less than the Proposed Action, but similar in nature. The overall impact of the RCA on threatened, endangered, and special status species would be long-term and negligible to minor.	

Table 2.9-1 Alternative Comparison and Effects Summary

Resource	Proposed Action	RCA	No Action Alternative
	other COPCs. The Proposed Action would result in the loss of 20.5 acres of wetland and riparian habitat. Impacts to these species under the Proposed Action would be moderate and long-term. Overall impacts to threatened and special status species from the Proposed Action would be negligible to long-term and moderate.		
Special Status Plant Species	There are no identified threatened, endangered, proposed, or candidate plant species; CNF sensitive plant species; CNF Forest Watch rare plant species; or BLM sensitive plant species in the Study Area.	There are no special status plant species in the Study Area.	There are no special status plant species in the Study Area.
Visual Resources			
	Under the Proposed Action, impacts to visual resources would include alterations of the existing visual landscape by project components. These components would contrast with the existing visual landscape character, and would remain with somewhat less contrast after reclamation. However, views of the Study Area are limited by the surrounding terrain. The area is viewed by comparatively few people for limited periods of time. The modifications would meet both the USFS Visual Quality Objectives (VQOs) of modification and the BLM Visual Resource Management (VRM) objectives for the area.	Under the RCA, there would be no overburden piles on the downslope side of the mine pit and the GM stockpiles in that area would be transient. Although the overall mine pit of the RCA would be slightly larger than in the Proposed Action, the individual pit phases, and associated stockpiles would be less noticeable than those of the Proposed Action. As in the Proposed Action, the landscape modifications would meet both the USFS VQO of modification and the BLM VRM management objectives for the area.	Under the No Action Alternative, the mine would not be developed, and there would be no new impacts to visual resources

Table 2.9-1 Alternative Comparison and Effects Summary

Resource	Proposed Action	RCA	No Action Alternative
	Overall, the impacts of the Proposed Action to scenic attractiveness would be long-term and minor.	The overall impacts of the RCA to scenic attractiveness would be negligible.	
Land Use, Access, and Transportation			
Grazing	The Proposed Action would result in a loss of 200 head months (HMs) for the Rasmussen Valley Cattle Allotment (RVCA), including almost all of Unit 3A in the Study Area. Although impacts to some grazing units would be major, impacts to the RVCA as a whole would be minor, because the grazing lands would not be displaced all at once, but progressively as mining activities progress, and thus portions of the grazing lands within the Study Area may remain accessible during mining activities. In contrast, only 9 acres of the Henry Olsen Sheep and Goat Allotment (HOSGA; 0.08 percent) would be unusable. The impact to the HOSGA would be negligible. When areas are reclaimed, the vegetation in the early stages of reclamation may be more favorable for forage production than the pre-mine vegetation, although the species diversity would be limited. Overall impacts of the Proposed Action to grazing would be negligible to long-term and minor.	Impacts to grazing under the RCA would be equivalent to those under the Proposed Action. The additional acreage to be mined and the slight changes in access would not alter the effects of the RCA in comparison to the Proposed Action. The changes to acreage to be mined and sequence of mining would have little if any additional effect on land available for grazing in comparison to the Proposed Action. The overall impacts of the RCA on grazing would be long-term and minor.	Under the No Action Alternative, the mine would not be developed. There would be no impact to the availability or quality of grazing.

Table 2.9-1 Alternative Comparison and Effects Summary

Resource	Proposed Action	RCA	No Action Alternative
Traffic	Under the Proposed Action, workforce and equipment currently being used at the Rasmussen Ridge Mines would transition to the Proposed Action. This continuation of activities, equivalent to existing activities, would result in little or no change to workforce or traffic. No impacts to traffic or motorist safety are anticipated under the Proposed Action. Consequently, the impacts on traffic from the Proposed Action would be negligible.	Effects to traffic under the RCA would be would be equivalent to those under the Proposed Action Overall impacts on traffic from the RCA would be in slightly different locations than the Proposed Action, but would also be negligible.	Under the No Action Alternative, the mine would not be developed, and there would be a reduction of traffic on public roadways.
Recreation	The Study Area includes 1,008 acres of public lands and 833 acres of state lands that are open for recreation. Of that, approximately 410 acres are located in the Blackfoot River WMA. The Proposed Action would directly impact 38 acres of BLM land, 203 acres of USFS land, and 137 acres of state land. Given the industrial nature of the Proposed Action, access for recreation would be restricted or prohibited on the disturbed lands and on additional nearby areas that would not be directly impacted for the duration of the Proposed Action. In addition, it is likely that recreationists would choose not to use nearby areas that would be accessible. The acreage of lands available for recreation that would be reduced under the Proposed Action is negligible at the local and regional scales given the large acreage that would remain available.	The RCA would have similar effects to wildlife as those described under the Proposed Acton. Consequently, impacts to hunting and other upland wildlife-related recreation would be the same. The effects of the RCA to wetlands would be eliminated, and would thus be less than the Proposed Action and would have less effect on aquatic species including game fish. Overall the impacts of the RCA to recreation, like those of the Proposed Action would be long-term, moderate and site-specific, but negligible at the local and regional scales.	Under the No Action Alternative, the mine would not be developed. There would be no new impacts to recreation or recreationists.

Table 2.9-1 Alternative Comparison and Effects Summary

Resource	Proposed Action	RCA	No Action Alternative
	The Proposed Action does not include any developed recreational facilities in the Study Area. There are sections of some designated trails that would be lost from use. Overall, the impacts of the Proposed Action to recreation would be long-term, moderate, and site-specific, but negligible at the local and regional scales.		
Cultural Resources			
	Class III cultural resource inventories have been performed for the entire area of potential effects (APE) of the Proposed Action. No historic properties were identified in the APE of the Proposed Action. The Proposed Action would have no effect on known historic properties. If cultural resources are discovered during mine operation, they would be avoided and evaluated and, if necessary, a treatment plan would be developed and implemented. Effects of the Proposed Action to cultural resources would be negligible.	Class III cultural resource inventories have been performed for the entire APE of the RCA. No historic properties were identified in the APE of the RCA. The RCA would have no effect on known historic properties. If cultural resources are discovered during mine operation, they would be avoided and evaluated and, if necessary, a treatment plan would be developed and implemented. Effects of the RCA to cultural resources would be negligible.	Under the No Action Alternative, the mine would not be developed. There would be no effect to historic properties as a result of the No Action Alternative.
Tribal Treaty Rights and Interests			
	Agency consultation with the Shoshone-Bannock Tribes has been ongoing. The Tribes have identified the loss of access to public lands as an issue of concern, but have not identified any locations having traditional concern such as sacred sites. The Tribes have provided a list of culturally sensitive plant species that would be affected and have	Effects of the RCA on tribal treaty rights and interest would be the same as for the Proposed Action. Similar to the Proposed Action, the Tribes have identified the loss of access to public lands as an issue of concern for the RCA, but have not identified any locations having traditional concern such as	The No Action Alternative would have no effect on tribal treaty rights and interests.

Table 2.9-1 Alternative Comparison and Effects Summary

Resource	Proposed Action	RCA	No Action Alternative
	asked that revegetation take these plants into consideration. Effects of the Proposed Action to known treaty rights and interests would be negligible. Overall impacts to traditional resources would be long-term and minor.	sacred sites. The Tribes have provided a list of culturally sensitive plant species that would be affected and have asked that revegetation take these plants into consideration. Overall impacts to traditional resources would be long-term and minor.	
Social and Economic Conditions			
	The Proposed Action would take effect during the shutdown of the Rasmussen Ridge Mines. The existing work force and associated services would transfer to the new mine. Effects to population, housing, community services, employment, income to local and regional businesses, taxes and other revenues, and property values would be negligible. Effects to tourism and recreation from restricted access to mine property during operations would also be negligible. Over the 3.9-year life-of-mine, the Proposed Action would support 1,700 direct, indirect, and induced jobs, generate $724 million in personal income throughout Idaho ($260 million in personal income in Caribou County), $6.5 million in Caribou County property taxes, $20 million in federal mineral royalty payments, and other payments/tax receipts.	Effects of the RCA on social and economic conditions would be similar to those for the Proposed Action. The additional 10 months of mining and related increased production royalties and the 15 months of additional project life would increase the positive impact to the economy compared to the Proposed Action. Over the 4.8-year life-of-mine, the RCA would support 1,700 direct, indirect, and induced jobs, generate $876 million in personal income throughout Idaho ($315 million in personal income in Caribou County), $7.9 million in Caribou County property taxes, $24 million in federal mineral royalty payments, and other payments/tax receipts. Overall favorable impacts of the RCA on social and economic conditions would be short-term and major.	Under the No Action Alternative, the mine would not be developed. There would be major effects to employment, income to local and regional businesses, taxes and other revenues, and property values in Caribou County and lesser effects in neighboring counties. There would also be moderate effects to population and housing resulting from unemployment. Overall impacts of the No Action Alternative to social and economic conditions would be adverse, long-term, and major.

Table 2.9-1 Alternative Comparison and Effects Summary

Resource	Proposed Action	RCA	No Action Alternative
	Overall favorable impacts of the Proposed Action to social and economic conditions would be short-term and major.		
Environmental Justice			
	There are no communities in the vicinity of the Proposed Action that are minority as a whole, and none would be exposed to high and adverse environmental effects. Because The Shoshone-Bannock Tribes of the Fort Hall Reservation, approximately 30 miles from the Study Area, have treaty rights and interests in public lands in the region, the Proposed Action could have disproportionate impacts on the population at the Reservation. These potential effects are addressed in Tribal Treaty Rights and Interests. Impacts of the Proposed Action to the Shoshone-Bannock Tribe would be long-term and minor. Impacts to remaining populations using the analysis area would be negligible.	The environmental justice effects of the RCA would be the same as with the Proposed Action. Like the Proposed Action, impacts of the RCA to the Shoshone-Bannock Tribe would be long-term and minor. Impacts to remaining populations using the Study Area would be negligible.	Under the No Action Alternative, the mine would not be developed, and there would be no new environmental justice effects.
Hazardous Materials and Solid Waste			
	Appropriate BMPs, storage, and secondary containment would be used for all hazardous materials and wastes, similar to those used at the Rasmussen Ridge Mines. In the event of any inadvertent spills or releases, Agrium would implement its SPCC Program. Effects of the Proposed	The RCA storage area for fuels and hazardous materials would be at the existing Rasmussen Ridge Mine Shop. Management practices for fuels, hazardous materials, and wastes would continue in the same manner as that currently implemented at the Rasmussen Ridge Mines. As in	Under the No Action Alternative, the proposed mine would not be developed and there would be no new effects associated with fuels, hazardous materials, and wastes.

Table 2.9-1 Alternative Comparison and Effects Summary

Resource	Proposed Action	RCA	No Action Alternative
	Action on hazardous materials and wastes would be negligible. Under the Proposed Action, there would be little or no net increase in the quantities of materials used or wastes generated relative to what is currently managed at the Rasmussen Ridge Mines.	the Proposed Action, effects associated with fuels, hazardous materials, and wastes would be negligible. Overall impacts of the RCA would be negligible. Under the RCA, there would be little or no net increase in the quantities of materials used or wastes generated relative to what is currently managed at the Rasmussen Ridge Mines.	
Public Health and Safety			
	The Proposed Action has the potential to impact surface waters by introducing pollutants, such as sediment, selenium, and other COPCs, and restricting access by the public, livestock, and wildlife. However, no adverse effects to public health and safety are anticipated to occur from implementation of the Proposed Action. The impacts of the Proposed Action to public health would be negligible.	Under the RCA, potential impacts to public health and safety would be similar to those described for the Proposed Action; however, this alternative would have less potential for selenium and other COPCs to be released to surface water or to bioaccumulate in the aquatic food chain. No adverse effects to public health and safety are anticipated to occur from implementation of the RCA. The impacts of the RCA to public health and safety would be negligible.	Under the No Action Alternative, the facilities would not be constructed or operated; therefore, there would be no project-related impacts to public health and safety.

CHAPTER 3
AFFECTED ENVIRONMENT

This chapter describes the affected environment, which is the portion of the existing environment likely under the influence of the Rasmussen Valley Mine Project (Proposed Action). The information summarized in this chapter was obtained from field and laboratory studies, published sources, unpublished materials, and communications with relevant governmental personnel as well as individuals with knowledge of the area.

The affected environment varies for each resource. Both the nature of the resource and components of the alternatives define this variation. For some resources, such as geology, soils, and vegetation, the affected area is the physical location and immediate vicinity of the areas that the project would disturb. For other resources, such as water resources, air quality, and social and economic values, the affected environment is larger (e.g., watershed, airshed, and local communities).

The Proposed Action was defined in **Chapter 1** and consists of all areas of proposed surface disturbance including the mine pits, temporary or permanent overburden and overfill piles, GM growth medium (GM) stockpiles, temporary stockpiles, access roads, new haul roads from the mine pits to the existing Wooley Valley Tipple Haul Road, and ancillary mine facilities. The mine footprint is the area within the Proposed Action affected by the mine pits and mine access roads, not including the West Side Haul Road, the Rasmussen Valley Haul Road, storage piles, stockpiles, or ancillary facilities. The Study Area shown on **Figure 1.2-2** (and many of the figures in **Chapter 3**) encompasses the Proposed Action and anticipated elements of the alternatives for which baseline studies were conducted. The Study Area is larger than the Proposed Action. In addition, individual resource sections in this document may discuss an analysis area that is larger than the Study Area. The analysis area defined for a given resource consists of areas of potential direct disturbance in the Study Area plus adjacent areas of indirect effects.

3.1 GEOLOGY, MINERALS, AND PALEONTOLOGY

3.1.1 Geologic Setting

The Study Area is located in the Rocky Mountain Physiographic Province, a region characterized by subparallel folded mountain ranges separated by thinly filled valleys (Mabey and Oriel 1970; Fenneman 1917). **Figure 3.1-1** illustrates the geology of the Study Area and adjacent areas. Geologic units present in the Study Area range from Pennsylvanian (deposited 299 to 318 million years ago) to recent in age. Most geologic units in the Study Area are marine sedimentary deposits. The Permian (251 to 299 million years old) Phosphoria Formation, which contains the phosphatic ore, would be mined under the Proposed Action. Lithologic descriptions, thickness ranges, and hydrogeologic characteristics of major geologic units within the Study Area are included in a general stratigraphic column (**Figure 3.1-2**). Regional geology and stratigraphy are presented in detail in the Rasmussen Valley Mine Project Geology Baseline Study Report (Brown and Caldwell [BC] 2013b).

The Phosphoria Formation is divided into three stratigraphic units including the Cherty Shale, Rex Chert, and Meade Peak Phosphatic Shale Members. The Meade Peak Phosphatic Shale Member (Meade Peak) is the host of phosphate ore in the Southeast Idaho Phosphate District. It is overlain in ascending order by the Rex Chert and Cherty Shale Members.

The Meade Peak Member of the Phosphoria Formation was deposited in an interior marine basin that extended across parts of Idaho, Utah, Wyoming, and southwestern Montana (Perkins and Piper 2004). The basin had a maximum depth of 1,000 to 1,600 feet and was an area of moderate to intense water upwelling, which brought cold, nutrient-rich water to the surface, causing increased algal and plankton productivity. The resulting steady rain of organic debris on the former seafloor is the source of the high-grade phosphorite deposits (Hein 2004, Piper and Link 2002, Moyle and Piper 2004).

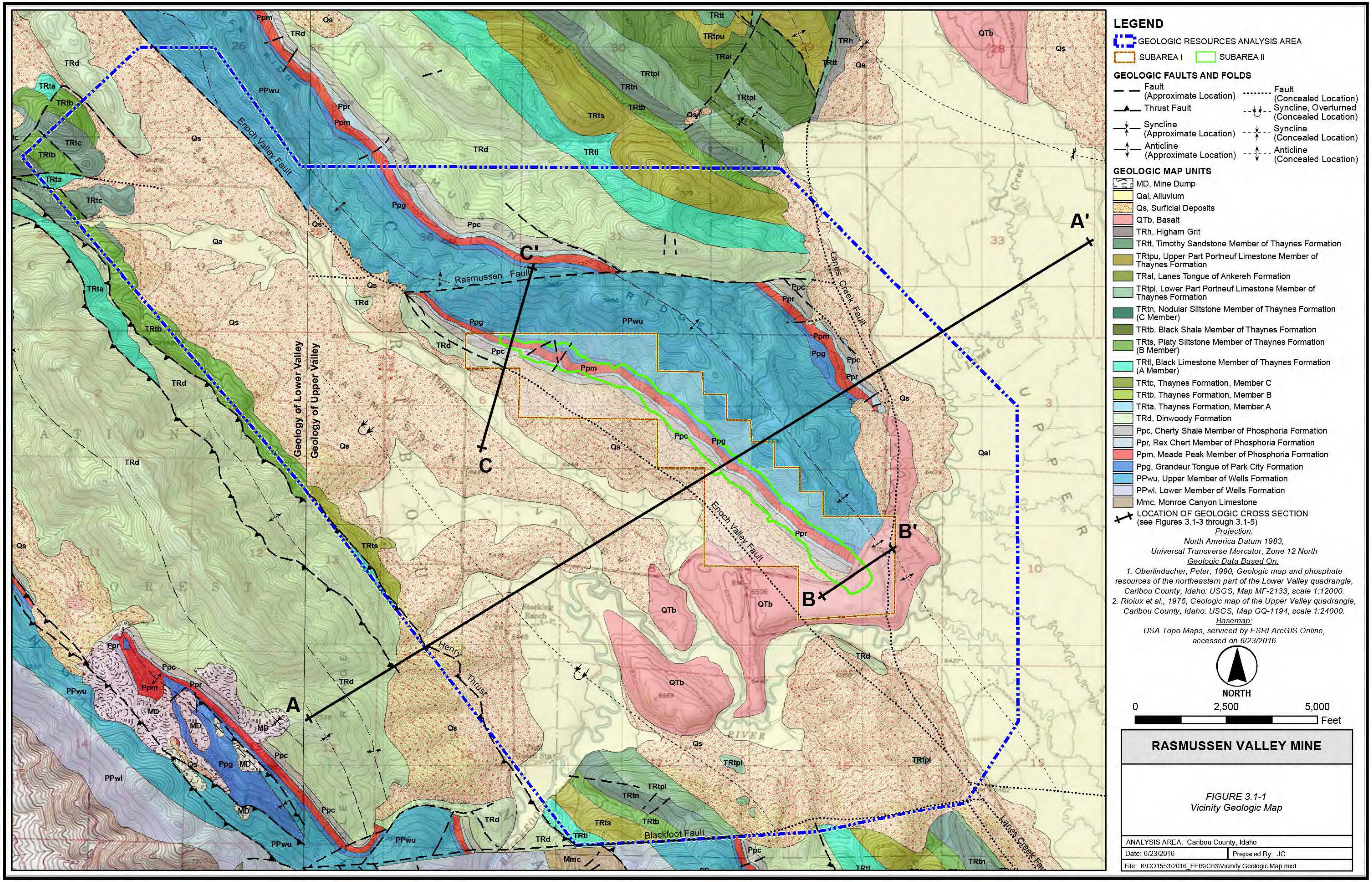
The Phosphoria Formation forms the Western Phosphate Field and comprises one of the world's largest known reserves of phosphate. Phosphate reserves in the Western Phosphate Field are estimated at 1.6 billion metric tons and represent 3 percent of world reserves and 30 percent of U.S. reserves (U.S. Geological Survey [USGS] 2002).

Phosphate is a leasable mineral and one of a group of minerals named in the Mineral Leasing Act of 1920, as amended. Other leasable minerals include oil, gas, geothermal, uranium, coal, and non-energy common minerals (e.g., sodium, potassium, and sulfur). Leasable minerals differ from locatable minerals, for which a claim is staked after an ore body is found. Locatable minerals include metallic minerals (e.g., gold, silver, lead, copper, zinc, nickel), non-metallic minerals (e.g., fluorspar, mica, certain limestones and gypsum, tantalum, heavy minerals in placer form, and gemstones), and certain uncommon variety minerals. Locatable minerals have not been identified at concentrations that would justify extraction within the Study Area. Salable minerals, such as sand and gravel, are commonly located in alluvial drainages but are not currently being extracted from within the Study Area and are not protected by leases or mining claims.

3.1.2 Seismicity and Geotechnical Setting

3.1.2.1 Structural Setting

The Study Area is situated on the southwest-dipping limb of the northwest-trending Snowdrift Anticline, the axis of which generally parallels Rasmussen Ridge. A general cross-section of the geological resources analysis area shows the position of the Snowdrift Anticline in relation to the Lanes Creek and Enoch Valley Faults and other locally significant features (**Figure 3.1-3**). **Figure 3.1-4** and **Figure 3.1-5** show cross-sections south and north, respectively, of the general cross-section developed based on data collected from within the Study Area (BC 2013b). Within the Study Area, structural dip generally increases to the north, ranging from an average of 32 degrees to the southwest near the south end of the anticline to nearly vertical to overturned near the north end (BC 2013b). The Snowdrift Anticline and similar northwest-trending features in the region were formed by compressional forces during the late Cretaceous (Petrun 1999). High-angle normal faults in the region (e.g., Lanes Creek and Enoch Valley Faults) were mostly formed during Basin and Range extension starting in the Miocene 17 million years ago (Mabey and Oriel 1970). The Rasmussen and Blackfoot Faults have been interpreted as tear faults associated with thrust faulting, and other minor tear faults have been mapped within the northern portion of the Study Area (STRATA 2013).



LEGEND
GEOLOGIC RESOURCES ANALYSIS AREA
SUBAREA I
SUBAREA II
GEOLOGIC FAULTS AND FOLDS
Fault (Approximate Location)
Fault (Concealed Location)
Thrust Fault
Syncline, Overturned (Concealed Location)
Syncline (Approximate Location)
Syncline (Concealed Location)
Anticline (Approximate Location)
Anticline (Concealed Location)
GEOLOGIC MAP UNITS
MD, Mine Dump
Qal, Alluvium
Qs, Surficial Deposits
QTb, Basalt
TRh, Higham Grit
TRtt, Timothy Sandstone Member of Thaynes Formation
TRtpu, Upper Part Portneuf Limestone Member of Thaynes Formation
TRal, Lanes Tongue of Ankereh Formation
TRtpl, Lower Part Portneuf Limestone Member of Thaynes Formation
TRtn, Nodular Siltstone Member of Thaynes Formation (C Member)
TRtb, Black Shale Member of Thaynes Formation
TRts, Platy Siltstone Member of Thaynes Formation (B Member)
TRtl, Black Limestone Member of Thaynes Formation (A Member)
TRtc, Thaynes Formation, Member C
TRtb, Thaynes Formation, Member B
TRta, Thaynes Formation, Member A
TRd, Dinwoody Formation
Ppc, Cherty Shale Member of Phosphoria Formation
Ppr, Rex Chert Member of Phosphoria Formation
Ppm, Meade Peak Member of Phosphoria Formation
Ppg, Grandeur Tongue of Park City Formation
PPwu, Upper Member of Wells Formation
PPwl, Lower Member of Wells Formation
Mmc, Monroe Canyon Limestone
LOCATION OF GEOLOGIC CROSS SECTION (see Figures 3.1-3 through 3.1-5)
Projection:
North America Datum 1983, Universal Transverse Mercator, Zone 12 North
Geologic Data Based On:
1. Oberlindacher, Peter, 1990, Geologic map and phosphate resources of the northeastern part of the Lower Valley quadrangle, Caribou County, Idaho: USGS, Map MF-2133, scale 1:12000.
2. Rioiux et al., 1975, Geologic map of the Upper Valley quadrangle, Caribou County, Idaho: USGS, Map GQ-1194, scale 1:24000.
Basemap:
USA Topo Maps, serviced by ESRI ArcGIS Online, accessed on 6/23/2016
NORTH
0
2,500
5,000
Feet
RASMUSSEN VALLEY MINE
FIGURE 3.1-1
Vicinity Geologic Map
ANALYSIS AREA: Caribou County, Idaho
Date: 6/23/2016
Prepared By: JC
File: K:\CO1553\2016_FEIS\Ch3\Vicinity Geologic Map.mxd

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AGE	UNIT		THICKNESS	LITHOLOGY	DESCRIPTION
QUATERNARY	ALLUVIUM		3-80 ft		SANDS AND CLAYS
QUATERNARY	BASALT		29-57 ft		BASALT
QUATERNARY	ALLUVIUM/COLLUVIUM		0-120 ft		GRAVELS, SANDS, AND LAKEBED CLAYS
TRIASSIC	DINWOODY FORMATION		72 ft		SHALE
PERMIAN	PHOSPHORIA FORMATION	CHERTY SHALE MEMBER	55-232 ft		SILICEOUS SHALE
PERMIAN	PHOSPHORIA FORMATION	REX CHERT MEMBER	29-80 ft		CHERT - THICK TO MASSIVE BEDDED
PERMIAN	PHOSPHORIA FORMATION	MEADE PEAK MEMBER	15-35 ft		UPPER WASTE (HANGING WALL MUD)
PERMIAN	PHOSPHORIA FORMATION	MEADE PEAK MEMBER	15-18 ft		UPPER ORE - LOW/MEDIUM TO HIGH GRADE (INTERBEDDED PHOSPHORITE, MUDSTONE, SILTSTONE, LIMESTONE, AND SHALE)
PERMIAN	PHOSPHORIA FORMATION	MEADE PEAK MEMBER	80-110 ft		CENTER WASTE SHALE - MUDSTONE AND SHALE
PERMIAN	PHOSPHORIA FORMATION	MEADE PEAK MEMBER	28-38 ft		LOWER ORE - LOW TO HIGH GRADE (INTERBEDDED PHOSPHORITE, MUDSTONE, SILTSTONE, LIMESTONE, AND SHALE)
PERMIAN	PHOSPHORIA FORMATION	MEADE PEAK MEMBER	5-10 ft		FOOTWALL MUD
PERMIAN	GRANDEUR TONGUE MEMBER		40-80 ft		DOLOMITE AND SANDSTONE
PENNSYLVANIAN TO PERMIAN	WELLS FORMATION		1,350-1,450 ft		LIMESTONE, DOLOMITE, AND SANDSTONE

Source: 2012 Geologic Baseline Report, Brown and Caldwell

RASMUSSEN VALLEY MINE

FIGURE 3.1-2
Generalized Column and Stratigraphic Section for Project Area

ANALYSIS AREA: Caribou County, Idaho
Date: 8/28/2015 | Prepared By: JC
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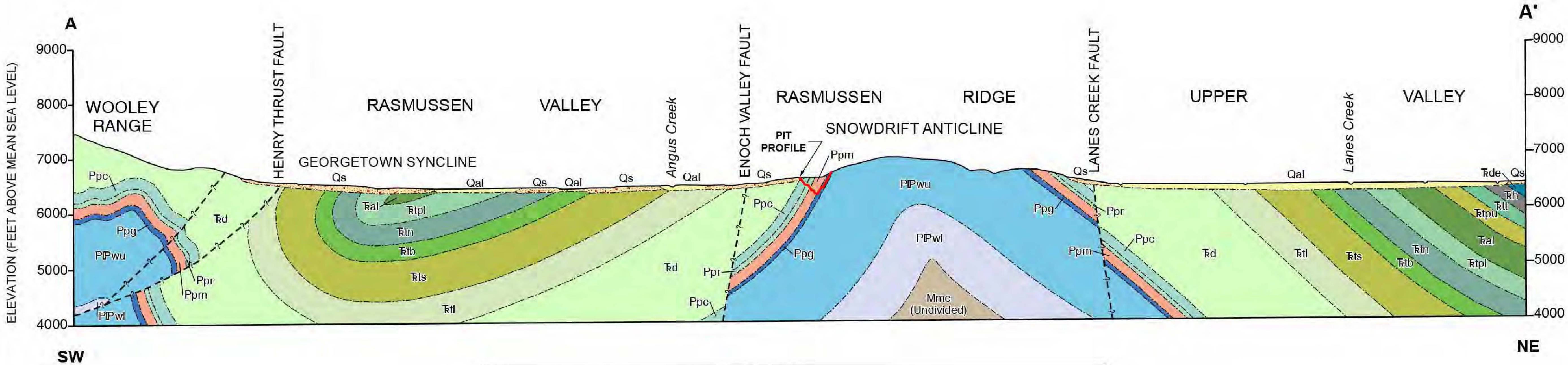


GEOLOGY

Qal	ALLUVIUM
Qs	SURFICIAL DEPOSITS
Ꞧde	DEADMAN LIMESTONE
Ꞧh	HIGHAM GRIT
Ꞧal	LANES TONGUE OF ANKAREH FORMATION

THAYNES FORMATION

Ꞧtt	TIMOTHY SANDSTONE MEMBER
Ꞧtpu	UPPER PART OF PORTNEUF LIMESTONE MEMBER
Ꞧtpl	LOWER PART OF PORTNEUF LIMESTONE MEMBER
Ꞧtn	NODULAR SILTSTONE MEMBER
Ꞧts	PLATY SILTSTONE MEMBER
Ꞧtl	BLACK LIMESTONE MEMBER
Ꞧtb	MEMBER B
Ꞧd	DINWOODY FORMATION

PHOSPHORIA FORMATION (PERMIAN)

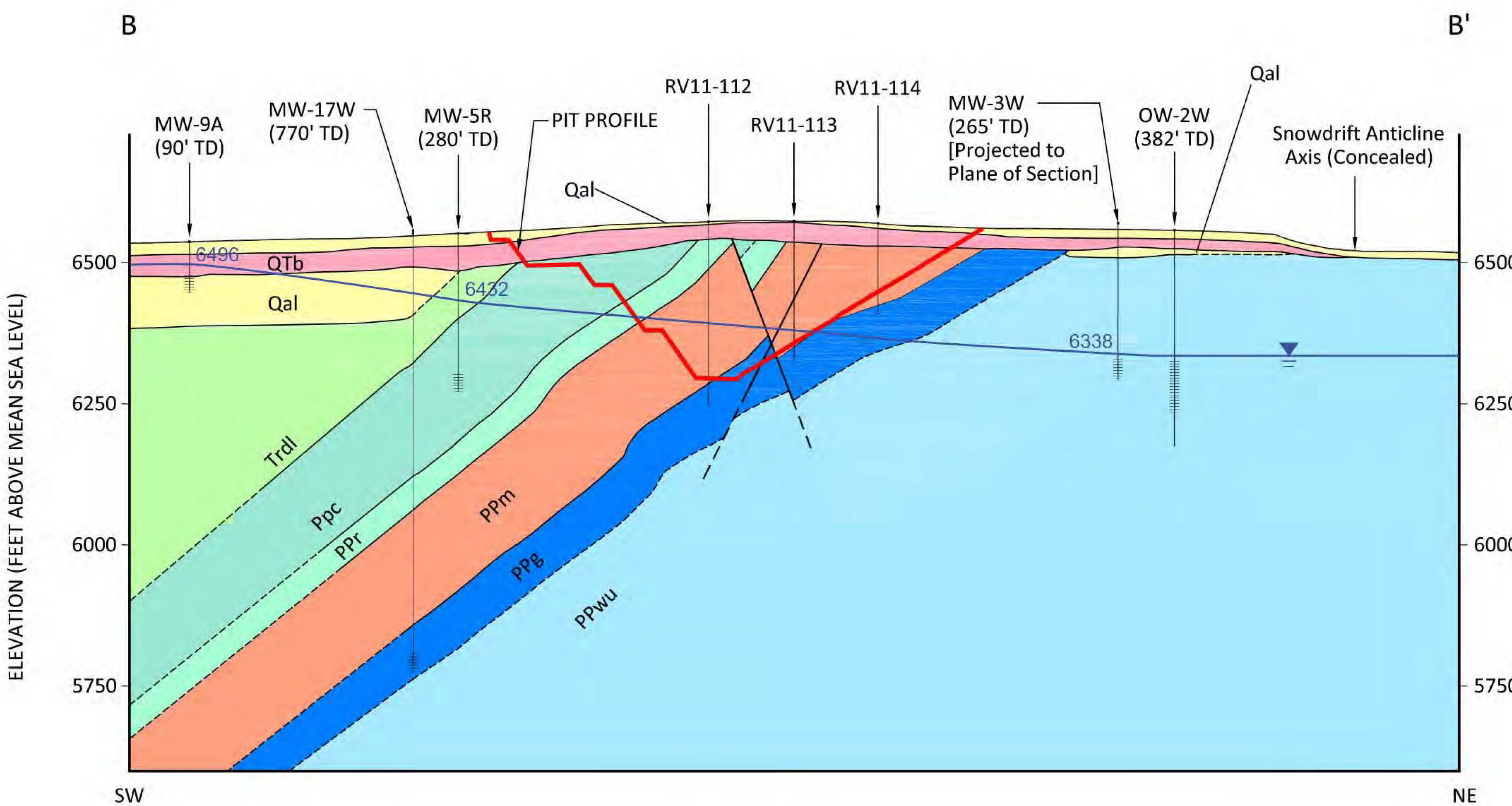
Ppc	CHERTY SHALE MEMBER
Ppr	REX CHERT
Ppm	MEADE PEAK PHOSPHATIC SHALE MEMBER
Ppg	GRANDEUR TONGUE OF PARK CITY FORMATION
PIPwu	WELLS FORMATION (UPPER)
PIPwl	WELLS FORMATION (LOWER)
Mmc	MONROE CANYON LIMESTONE (UPPER MISSISSIPPIAN)
– – –?	FAULT
(red line)	PIT PROFILE

Source: Upper Valley Quadrangle (Rioux et al, 1975).

RASMUSSEN VALLEY MINE

FIGURE 3.1-3
Geologic Cross Section A-A'

ANALYSIS AREA: Caribou County, Idaho
Date: 6/23/2016 Prepared By: JC
File: K:\CO1553\2016_FEIS\Chapter3\GeologicXS_AA.mxd



GEOLOGY

Qal	SURFICIAL DEPOSITS (QUATERNARY)
QTb	BASALT (PLIOCENE/PLEISTOCENE)
Trdu	UPPER DINWOODY FORMATION (LOWER TRIASSIC)
Trdl	LOWER DINWOODY FORMATION (LOWER TRIASSIC)
	WATER TABLE

PHOSPHORIA FORMATION (PERMIAN)

Ppc	CHERTY SHALE MEMBER
PPr	REX CHERT MEMBER
PPm	MEADE PEAK MEMBER
PPg	GRANDEUR TONGUE (PERMIAN)
PPwu	WELLS FORMATION (PERMIAN-PENNSYLVANIAN)

Sources:
Geology based on Agrium exploration borings and well logs, Rioux et al. (1975), and professional judgement.

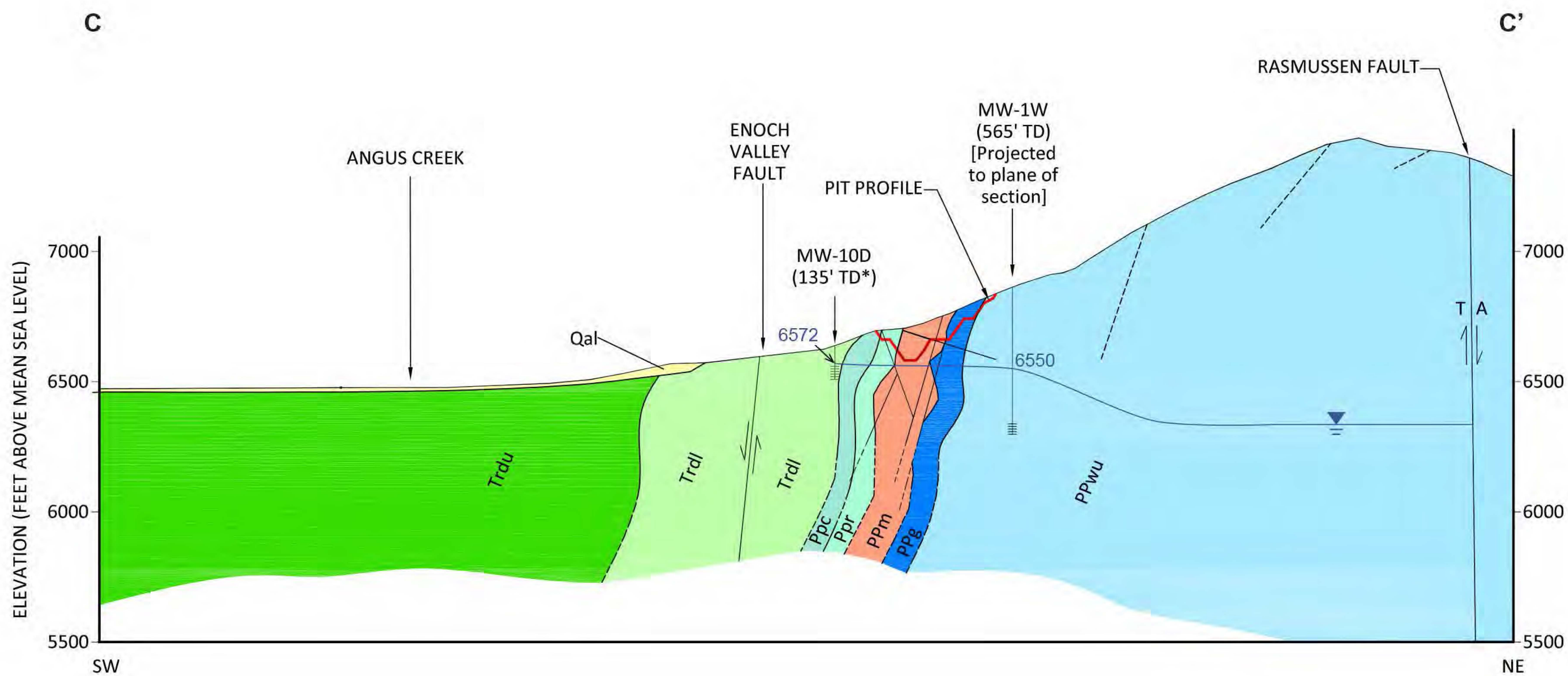
TD = TOTAL DEPTH

Source: Revised from Figure 11 in 2012 Geology Baseline Report, Brown and Caldwell.

RASMUSSEN VALLEY MINE

FIGURE 3.1-4
Geologic Cross Section B-B'

ANALYSIS AREA: Caribou County, Idaho
Date: 8/28/2015 | Prepared By: JC
File: K\CO1553\Image\2016_FEIS\EIS_GeoCrossSection BB.ai



GEOLOGY

Qal	SURFICIAL DEPOSITS (QUATERNARY)
QTb	BASALT (PLIOCENE/PLEISTOCENE)
Trdu	UPPER DINWOODY FORMATION (LOWER TRIASSIC)
Trdl	LOWER DINWOODY FORMATION (LOWER TRIASSIC)
(symbol)	WATER TABLE

PHOSPHORIA FORMATION (PERMIAN)

Ppc	CHERTY SHALE MEMBER
PPr	REX CHERT MEMBER
PPm	MEADE PEAK MEMBER
PPg	GRANDEUR TONGUE (PERMIAN)
PPwu	WELLS FORMATION (PERMIAN-PENNSYLVANIAN)

*Well abandoned from 135' to 995'. VWP installed at 330'. Borehole deviation prevented interception of target formation (Ppc/PPr)

Sources:
Geology based on Agrium exploration borings and well logs, Rioux et al. (1975), and professional judgement.

TD = TOTAL DEPTH

VWP = VIBRATING WIRE PIEZOMETER

RASMUSSEN VALLEY MINE

FIGURE 3.1-5
Geologic Cross Section C-C'

ANALYSIS AREA: Caribou County, Idaho
Date: 8/28/2015 | Prepared By: JC
File: K:\CO1553\Image\2016_FEIS\EIS_GeoCrossSection CC.ai

Source: Revised from Figure 13 in 2012 Geology Baseline Report, Brown and Caldwell.

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3.1.2.2 Seismicity and Geotechnical Stability

The Study Area lies within a Zone III seismic region extending from northern Arizona, through the Wasatch Front in Utah, to the Yellowstone and Hebgen Lake regions in Wyoming and Montana. About 20 earthquakes capable of damaging structures (magnitudes greater than 5.0 on the Richter scale) occurred within this seismic region from 1880 through 1994. The Idaho Geological Survey has mapped the southeastern part of Idaho, including the Study Area, as having the highest of three seismic shaking rankings (Bureau of Land Management [BLM] and U.S. Forest Service [USFS] 2007).

Between 1972 and 2011, 62 earthquakes with magnitudes greater than 4.0 occurred within 50 miles of the Study Area. These events are all characterized by shallow crustal movement (i.e., epicenter depth less than 10 miles). The largest event was a magnitude 5.8 earthquake that occurred on February 3, 1994 near Afton, Wyoming, 19 miles east of the Study Area. This event, known as the Draney Peak Earthquake, was part of a swarm of earthquakes that occurred over a 10-day period. Although shaking was felt as far away as Grand Junction, Colorado, no damage was reported in Bonneville, Teton, or Caribou Counties (Post Register 1994). Another significant event was a magnitude 5.3 earthquake that occurred April 21, 2001 near Henry Peak, 6 miles north of the Study Area (USGS 2012). Although several earthquakes have occurred in recent years, and slide debris is prevalent within the Study Area (STRATA 2013), no instances of seismically induced slope failure are known to have occurred within the Study Area.

Ground shaking within the Study Area is likely a function of extensional fault activity more than 8 miles away from the Study Area (USGS 2014a). Parameters for the active, major fault systems closest to the Study Area are presented in **Table 3.1-1**. The individual fault with the greatest likelihood of contributing to site seismicity is the Grand Valley Fault, located 20 miles east of the Study Area (USGS 2014a).

Table 3.1-1 Active Fault Parameters in the Vicinity of the Study Area

Fault	Distance from Study Area	Characteristic Earthquake Magnitude	Recurrence Interval for Characteristic Magnitude (years)	Recurrence Interval for M= 6.5 Event (years)
Eastern Bear Lake Fault	42 miles south	7.3	2,580	630
Grand Valley Fault	20 miles east	7.1	1,370	480
Greys River Fault	34 miles east	7.1	2,700	940

Source: STRATA 2013

Earthquake-generated ground shaking is typically the greatest cause of damage during an earthquake. Earthquake statistics can be used to estimate the level of ground motion likely to occur within a certain number of years. These estimates are most commonly made in terms of peak ground acceleration (PGA). The predicted PGA value for the Study Area for an earthquake with a 475-year mean return time (10 percent probability of occurring in 50 years) is approximately 19%g, where g is equal to acceleration resulting from gravity at the Earth's surface (USGS 2014a). Seismic analysis conducted by STRATA (2013) used a PGA of 42%g for an earthquake with a return interval of 2,475 years when assessing potential instability of site features resulting from earthquakes. This provides a more conservative estimate (more acceleration and more potential for damage). Evidence of landslides has been observed within the Study Area, particularly in SW¼ Section 5, T7S R44E. Based on inclinometer data, these landslide deposits are currently exhibiting movement. Colluvial deposits in much of the Study Area also display evidence indicating that soil movement has occurred in the recent past (STRATA 2013).

3.1.3 Mineralogy and Geochemistry

3.1.3.1 Mineralogy and Elemental Distribution

The mineral assemblage of the Meade Peak at Rasmussen Valley is dominated by quartz and feldspar with subordinate amounts of carbonate fluorapatite (CFA), dolomite, calcite, clay, and oxide minerals (GeoSystems 2014). CFA is the primary phosphate mineral in the geologic materials that will comprise both ore and overburden. Pyrite (iron sulfide) and sphalerite (zinc sulfide) occur as fine-grained trace minerals disseminated in the rock matrix or replacing cementing agent between mineral grains. Selenium and nickel are strongly associated with pyrite. Cadmium is associated with sphalerite (Grauch et al. 2004).

Pyrite is the principal host of selenium in Meade Peak rocks. A small fraction of selenium is also present in elemental form. Selenite (Se^{4+}) is more abundant than reduced forms of selenium in weathered rocks and is associated with oxyhydroxide minerals and organic matter. It is assumed that the selenite is derived from the oxidation of primary sulfide minerals (Perkins and Foster 2004). Oxidation reactions involve the loss of electrons from metallic ions and metalloids. Reduction reactions occur when metallic ions and metalloids gain electrons. Sphalerite and organic matter are the primary hosts of cadmium and zinc in unweathered rocks. Cadmium and zinc tend to be strongly adsorbed to oxyhydroxide minerals where the Meade Peak is weathered (Perkins and Foster 2004).

Organic matter and oxyhydroxide minerals contain the majority of selenium, cadmium, copper, zinc, nickel, and vanadium that are not associated with sulfide minerals. Apatite is the primary host for uranium. Both apatite and organic matter host molybdenum. Chromium and vanadium occur as acid-insoluble phases that are probably silicate and oxide minerals (Perkins and Foster 2004).

3.1.3.2 Environmental Mobility of Selenium

Reduced forms of selenium, such as selenide (Se^{2-}), selenite, and elemental selenium (Se^{0}), have relatively low environmental mobility in water compared to oxidized forms, such as biselenate (Stewart and Howell 2003; Mebane et al. 2015). Mobile forms of selenium can be transported in water and bioaccumulate in plants and organisms (Pickering et al. 1995; Hem 1989; Fessler et al. 2003; Masscheleyn et al. 1990). The pH and oxidation and reduction (redox) conditions of natural surface waters, including those in the region, generally promote higher mobility of selenate than less oxidized forms such as selenite (Mebane et al. 2015; Brookins 1988).

Geochemical controls that reduce or limit the mobility of selenium in water include adsorption to mineral surfaces such as oxyhydroxides of iron, manganese, and aluminum (Hayes et al. 1987; Balistrieri and Chao 1990; Rajan 1979). Clay and carbonate minerals may also provide effective surfaces for selenium adsorption (Bar-Yosef and Meek 1987; Cowan et al. 1990). Redox potential and pH both affect selenium solubility and adsorption reactions. Adsorption of selenium is least efficient under oxidizing conditions at circum-neutral pH (Elrashidi et al. 1987). Selenite is more strongly retained than selenate by sorption to mineral surfaces and by microbial reactions (Stewart and Howell 2003).

Redox reaction rates for selenium can be rapid (Pickering et al. 1995) with the dissolved species selenite and selenate (Se^{6+}) being readily reduced to insoluble elemental selenium (Hem 1989). Likewise, elemental selenium and selenide are easily oxidized to forms that are more mobile in the environment (Pickering et al. 1995). Microbial processes strongly affect the redox state of selenium. Selenate in solution is reduced to elemental selenium and precipitated by anaerobic bacteria in a wide range of sediments (Stolz et al. 2002). Oxidizing bacteria may also mobilize selenium in favorable environments. Bacterially mediated oxidation rates are generally three to four orders of magnitude slower than bacterially mediated reduction (Stolz et al. 2002).

Selenium bioaccumulates in plants and, although it is an essential micronutrient for the maintenance of health in mammals, it is toxic to mammals at relatively modest concentrations in vegetation (Fessler et al. 2003). Organo-selenium compounds are commonly formed in plant tissue and may become present in soil and water by the release from decaying seleniferous vegetation. Microorganisms can methylate selenium, and methyl-selenium compounds can be volatilized to the atmosphere (Flury et al. 1997; Frankenberger and Karlson 1995).

3.1.3.2.1 Regional Selenium Studies

A number of regional studies have evaluated the release mechanisms, transportation pathways, and environmental effects of selenium from phosphate mine overburden. Important conclusions of these studies include the following:

- Two mechanisms control the release of selenium from unsaturated overburden. The primary release occurs from water-soluble selenium that was present in the material (such as overburden) at the time of placement. The secondary release is from the weathering of sulfide minerals (primarily pyrite) and organic material. Weathering reactions are sluggish, and releases by this mechanism are smaller than those from water-soluble selenium (Tetra Tech 2008).
- The oxygen content in the pore spaces of overburden is independent of the type of waste rock facility and age, but appears to be affected by the method used to construct the facility. End dumping from the pit crest, a ramp, or a lift appears to support overburden piles with oxygenated interiors. Plug or butt dumping tends to result in oxygen-depleted conditions (Tetra Tech 2008).
- The content of water-soluble selenium in unsaturated oxygenated and oxygen-depleted overburden piles is similar. This observation suggests that microbiological reduction of selenium in oxygen-depleted overburden piles is limited (Tetra Tech 2008).
- Selenium concentrations in overburden seeps vary seasonally, with the highest concentrations typically occurring during spring runoff, mostly as selenate. Organic selenide concentrations tend to increase as a percentage of total selenium concentration in area streams and rivers during low-flow periods. A change in speciation to reduced selenium may indicate elevated biotic productivity during summer months and could result in enhanced selenium uptake in food webs (Presser et al. 2004).
- Selenium concentrations in wetlands, sediment, and vegetation decrease with increasing distance away from overburden seeps. Controlling mechanisms include adsorption or co-precipitation with iron oxides and organic matter in sediments, and plant uptake (Stillings and Amacher 2004).
- Selenium concentrations in water, stream sediments, aquatic plants, and invertebrates are correlated (Hamilton 2004).
- Selenium is usually present in streams in three forms: selenate, selenite, and organic selenium, in order of usual relative abundance (Mebane et al. 2015).
- Selenium concentrations in vegetation on uncapped phosphate overburden piles, and in wetlands receiving seepage from overburden piles, are approximately 20 times higher than in vegetation at undisturbed sites (Mackowiak et al. 2004).

3.1.3.3 Baseline Geochemical Characterization Study

A geochemical characterization study of the planned overburden and ore from the Proposed Action was completed to assess the potential environmental impacts that could occur from material handling and disposal. The study included an extensive sampling and testing program with an analysis of the mineralogy and elemental content of the rocks that would be produced from the mine. Leaching studies, attenuation testing, and an evaluation of the acid-producing potential of the proposed overburden and ore were also completed to evaluate the mobility of metals and other constituents in seepage from the pit backfill, external overburden piles, and temporary ore stockpiles.

3.1.3.3.1 Study Design and Test Materials

The Proposed Action would produce about 64.88 million tons of overburden, which would be placed in external overburden piles or backfilled into the mined out pit (BC 2013b). The majority of overburden (76.5 percent) would be derived from the Phosphoria Formation. The remaining material (23.5 percent) would include basalt, alluvium, Grandeur Tongue, and Wells Formation. The estimated overburden material balance for the Proposed Action is summarized in **Table 3.1-2**.

Table 3.1-2 Estimated Overburden Material Balance for the Proposed Action

Lithology	Million Tons of Material	Percent Total
Alluvium	2.72	4.2
Basalt	0.51	0.8
Cherty Shale	9.55	14.7
Rex Chert	10.88	16.8
Hanging Wall Mud	4.07	6.3
Center Waste	20.61	31.8
Ore Partings	3.70	5.7
Footwall Mud	0.84	1.3
Grandeur Tongue	10.32	15.9
Wells Formation	1.67	2.6

Source: BC 2013b

The baseline geochemistry study (Whetstone 2015a) evaluated a total of 4,085 samples from 45 boreholes and nine surface trenches for use in the testing program. The samples were geologically logged and reviewed for adequacy based on location, volume of available material, and completeness of the intersected stratigraphy. Based on this review, material representing 2-foot intervals from five boreholes (629 samples) were analyzed for whole-rock elemental content by x-ray fluorescence (XRF), and material from 27 boreholes (2,818 samples) and nine surface trenches (12 samples) were composited to form 158 samples (A-composite samples) that represented a single rock type from each borehole or trench. The A-composite samples were analyzed for elemental content by inductively coupled plasma atomic emission spectroscopy and mass spectrometry (ICP-AES/MS), leaching characteristics by acid-base accounting (ABA), and synthetic precipitation leaching procedure (SPLP) tests. The number of A-composite samples tested for each rock type is summarized in **Table 3.1-3**.

Table 3.1-3 Summary of A-Composite Samples that were Analyzed by ICP-AES/MS, SPLP, and ABA Tests for the Baseline Geochemistry Study

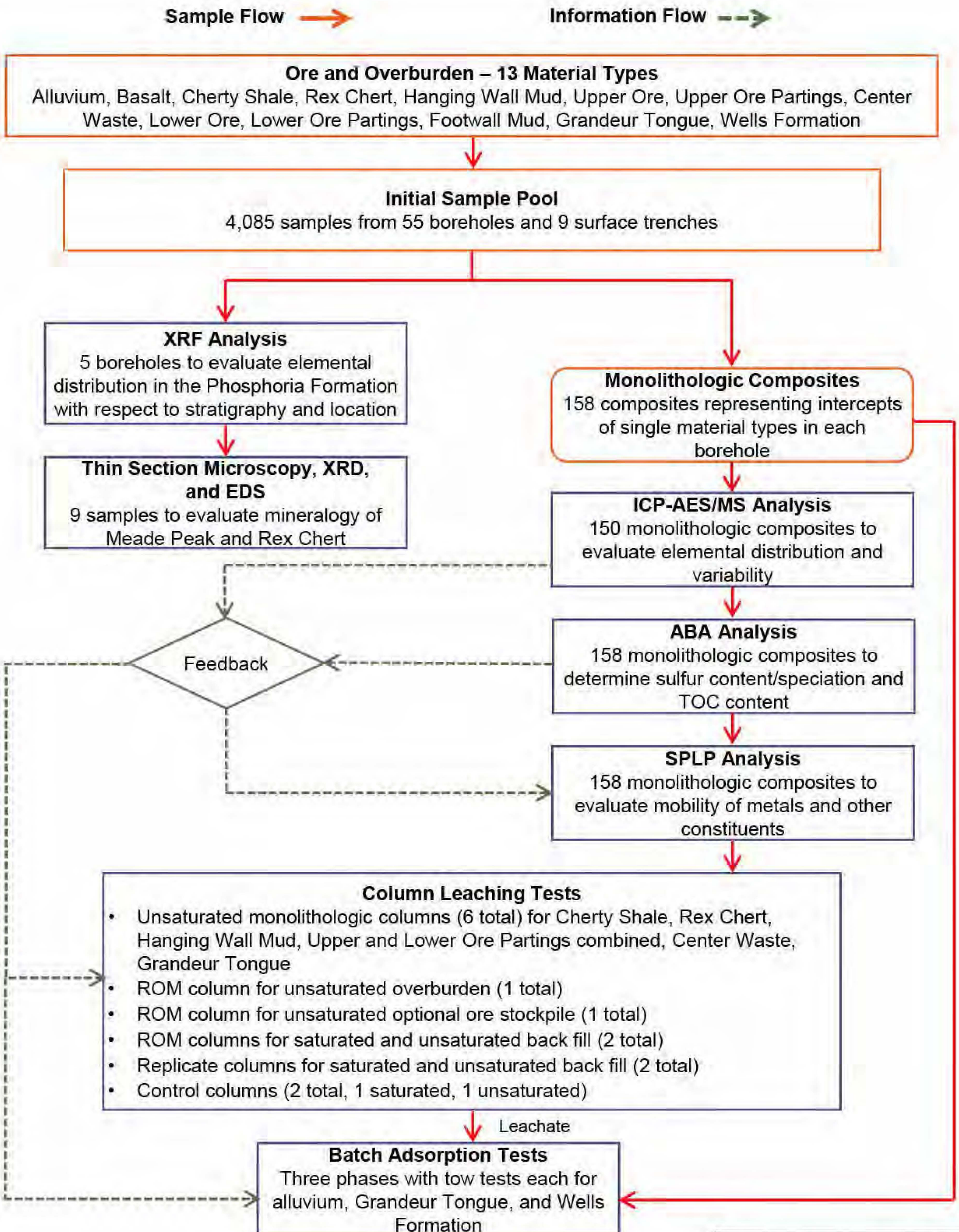
Material Type	Number of Tested A-Composite Samples
Alluvium	17
Basalt	6
Cherty Shale	14
Rex Chert	24
Hanging Wall Mud	13
Upper Ore Partings	6
Upper Ore	6
Center Waste	22
Lower Ore Partings	9
Lower Ore	9
Footwall Mud	8
Grandeur Tongue	18
Wells Formation	6

Upon completion of the ICP-AES/MS, ABA, and SPLP tests, splits of the A-Composite were combined to form B-Composite samples that represented the average composition of each rock type for the entire site. The B-Composite samples were used for column leaching studies to develop loading terms for the groundwater contaminant fate-and-transport model. In addition to the tests previously discussed, the geochemistry study also evaluated the mineralogical content of selected samples using transmitted light thin-section microscopy (thin-section analysis), x-ray diffraction (XRD), energy dispersive x-ray spectroscopy (EDS), and backscatter imaging (BEI) with electron microscopy (Whetstone 2015a).

An overview of the testing program is presented on **Figure 3.1-6**. The following sections summarize the results of the mineralogical studies, the elemental content analyses, and the ABA testing. The SPLP and column leaching tests provide data to evaluate the potential environmental impacts from the proposed mining operation and are discussed in **Chapter 4**.

The results of the mineralogical analyses indicate that overburden and ore from the Study Area are extensively weathered (oxidized). Quartz is the primary component of the Rex Chert and Cherty Shale (89 to 99 percent) with clay minerals, feldspar, glauconite, jarosite, and pyrite making up the remaining percentage of the rock mass. Selenium was observed by BEI as oxide compound associated with organic matter in the Rex Chert.

The primary components of the Meade Peak rocks are quartz (8 to 63 percent) and CFA (trace to 70 percent). Clays, including illite with lesser amounts of smectite, comprised 4 to 26 percent of the tested samples. The carbonate content of the Meade Peak rocks ranged from 0 to 13 percent. Sulfide minerals were generally sparse, with pyrite and a selenium-sulfide compound being the only minerals that were positively identified by XRD or BEI. Selenium was observed as an oxide mineral in both Meade Peak ore and overburden. The pyrite content of the Meade Peak samples ranged from 0 to 6 percent. Manganese, nickel, and zinc were observed in association with oxide minerals and organic matter, but relatively few trace metals were present at high enough concentrations to be identified by BEI. This result is probably a function of weathering, which causes dispersion of the metals throughout the matrix, lowering the concentration to below the detection limit at any given point.



XRD = X-Ray Defraction
XRF = X-Ray Fluorescence
EDS = Energy Dispersive x-ray Spectroscopy
ICP-AES/MS = Inductively Coupled Plasma Atomic Emission Spectroscopy and Mass Spectrometry
ABA = Acid-Based Accounting
SPLP = Synthetic Precipitation Leaching Procedure
ROM = Run of Mine

RASMUSSEN VALLEY MINE

FIGURE 3.1-6
Overview of the Baseline Geochemistry Characterization Study

ANALYSIS AREA: Caribou County, Idaho	
Date: 8/28/2015	Prepared By: JC
File: K\CO1553\Image\2016_FEIS\EIS_BaselineGeoChemCharStudy.ai	

3.1.3.3.2 Elemental Distribution Analysis

The results of the XRF and ICP-AES/MS analyses indicated that trace metals of potential environmental concern are widely distributed throughout the proposed overburden and ore (Whetstone 2015a). ICP-AES/MS data indicate that antimony, arsenic, cadmium, calcium, chromium, copper, iron, magnesium, manganese, molybdenum, nickel, phosphorus, selenium, silver, strontium, thallium, uranium, vanadium, and zinc are present in Rasmussen Valley rocks at concentrations that are above world shale averages (WSAs; **Table 3.1-4**). The trace metal content varies by lithology and location with the Meade Peak Member having the highest average metal content followed by the Cherty Shale and Rex Chert. Evaluation of the XRF data indicates that most metals do not exhibit obvious spatial trends of increasing or decreasing concentration along the strike of the deposit (Whetstone 2015a).

3.1.3.3.3 Acid-Base Accounting Analysis

Acid rock drainage (ARD) is produced when sulfide minerals chemically react with oxygen and water to produce sulfuric acid and other reaction products. Many metals are more soluble under acidic conditions, and the formation of ARD can result in increased metal mobility in groundwater and surface water. Acid produced by the oxidation of sulfide minerals can be neutralized by a number of reactions involving carbonate mineral and basic silicates (Morin and Hutt 1994). Reactions with carbonates minerals are typically more effective at neutralizing ARD than reactions with silicate minerals. The potential for ARD formation can be minimized by using appropriate engineering practices, such as concurrent reclamation and capping to reduce the availability of oxygen and water for the reaction.

ABA testing provides a screening-level evaluation of the net acid-producing potential of rock by comparing the total acid generating potential (AGP) of the material to the acid neutralizing potential (ANP) of the material. According to BLM guidelines, the ratio of ANP to AGP is used to evaluate ABA data (BLM 1996). Rocks with ANP:AGP ratios greater than 3 are considered to have low potential to produce acidic drainage. ANP:AGP ratios between 3 and 1 are indeterminate, and ratios below 1 are potentially acid generating.

Results of the ABA analyses indicated that overburden and ore from the proposed Rasmussen Valley Mine have low potential to produce ARD. Average ANP:AGP ratios for the tested rock types ranged from 3.6:1 to 931.7:1 and are summarized in **Table 3.1-5**. **Figure 3.1-7** shows the percentages of each tested rock type broken out by the recommended BLM threshold values.

A review of the sulfur speciation data from the ABA analyses indicates that sulfate and organic sulfur form significant fractions of the total sulfur content of the tested material (**Table 3.1-6**). Organic sulfur does not participate in reactions that generate acidity (Casagrande et al. 1989) and was subtracted from the ABA values presented in **Table 3.1-5**. Based on the mineralogical analyses, sulfate sulfur may be associated with acid producing minerals such as jarosite. The calculated ANP:AGP ratios assume that sulfate sulfur is pyritic. This assumption is conservative because sulfate mineral reactions produce less acidity than reactions involving pyrite.

ABA results for Rasmussen Valley rocks are consistent with regional data for the Southeast Idaho Phosphate District. Whetstone (2009) compiled the results of 613 tests completed for several other phosphate mining sites in the region, including 19 tests from the Enoch Valley Mine, 61 tests from the Dry Valley Mine, 151 tests from the North Rasmussen Ridge Mine, and 382 test from the Smoky Canyon Mine, and determined that the average regional ANP:AGP ratio was 240:1. The median value of the regional data set exceeded the BLM criterion for material that has low potential to produce ARD by a factor of 10. The regional results and the ABA data from the

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Table 3.1-4 Comparison of the Average ICP-AES/MS Elemental Content of Rasmussen Valley Rocks with World Shale Averages (mg/kg)

Parameter	WSA	ALV	BST	DCS	REX	HWM	UO	UOP	CW	LO	LOP	FWM	GDT	WEL
Aluminum	80,000	16,536	15,167	11,561	3,435	13,796	11,340	11,988	9,630	8,132	5,380	10,494	1,275	2,923
Antimony	1.2	**1.5**	0.2	0.4	0.5	**1.4**	**3.7**	**1.7**	**5.5**	**6.8**	**4.1**	**2.6**	0.4	0.5
Arsenic	13	7.2	1.8	9.0	4.5	**14.7**	11.0	**14.2**	**24.8**	**17.9**	**14.2**	**16.8**	3.2	4.9
Barium	550	132	143	50	147	47	66	57	64	59	37	28	6	15
Beryllium	3	1.12	0.28	0.71	0.29	0.94	1.57	0.92	1.34	1.67	0.78	0.90	0.13	0.25
Boron	100	21	<10.	37	15	66	52	60	33	30	8	31	<5.	<10.
Cadmium	0.3	**26.8**	**1.86**	**2.47**	**2.31**	**14.38**	**108**	**36.7**	**22.29**	**141**	**80.3**	**88.8**	**14.38**	**15.64**
Calcium	22,100	**88,953**	14,667	15,207	15,012	**36,385**	**221,167**	**143,417**	**134,250**	**226,333**	**217,667**	**121,863**	**185,833**	**142,783**
Chromium	90	**226**	60	**304**	**101**	**346**	**743**	**387**	**680**	**797**	**383**	**308**	40	28
Copper	42	39	33	41	31	**46**	**62**	35	**77**	**99**	**43**	**45**	4	12
Iron	47,200	16,901	**59,883**	17,924	7,833	15,206	7,190	13,308	14,907	5,988	5,102	9,468	1,708	5,195
Lead	25	9.20	2.24	5.53	2.83	7.57	9.82	8.39	7.93	12.2	6.80	9.67	1.19	3.01
Magnesium	15,000	**19,247**	**17,017**	3,429	432	5,738	3,783	4,033	15,609	5,511	**49,456**	**44,125**	**112,511**	**56,817**
Manganese	850	469	**1,013**	128	41	174	76	213	167	40	98	179	115	275
Molybdenum	2.6	**4.6**	1.2	**3.8**	**4.6**	**16.6**	**18.0**	**11.5**	**31.4**	**40.7**	**21.1**	**58.4**	2.4	2.5
Nickel	68	67	45	**111**	37	**141**	**105**	**97**	**246**	**219**	**151**	**434**	46	**87**
Phosphorus	700	**22,624**	**2,983**	**5,350**	**2,865**	**13,423**	**100,050**	**62,483**	**37,205**	**96,244**	**53,644**	**18,025**	**4,230**	**3,833**
Potassium	26,600	3,153	767	3,836	1,082	3,785	3,250	2,900	2,859	3,411	1,911	3,613	271	1,017
Selenium	0.6	**4.88**	**0.69**	**20.6**	**15.1**	**68.0**	**44.1**	**21.4**	**139**	**127**	**63.0**	**57.3**	**2.9**	**3.59**
Silver	0.19	**1.43**	**0.20**	**0.31**	**0.33**	**1.72**	**5.45**	**2.69**	**5.49**	**11.94**	**5.51**	**2.36**	0.18	0.18
Sodium	9,600	935	2,600	261	310	369	983	733	832	2,411	922	1,013	388	262
Strontium	300	218	65	61	72	128	**540**	**348**	**546**	**753**	**449**	201	97	82
Thallium	1.4	0.85	0.20	0.30	0.22	0.83	**3.17**	**2.68**	0.65	**4.03**	**2.62**	**8.52**	0.29	1.06
Uranium	3.7	**29.9**	0.70	**6.87**	**8.26**	**21.3**	**96**	**49.3**	**24.0**	**106**	**57.3**	**22.1**	**6.02**	**4.70**
Vanadium	130	**235**	89	52	39	**111**	**646**	**259**	**185**	**1,240**	**622**	**920**	44	54
Zinc	100	**471**	**118**	**371**	**106**	**584**	**1,248**	**948**	**1,215**	**2,033**	**1,647**	**4,298**	**348**	**545**

Notes:

1 Bold values are values that exceed world shale average (WSA) values from Erickson 1973, Rose et al. 1979, and Turekian and Wedepohl 1961.

2 Abbreviations: ALV = alluvium, BST = basalt, DCS = Cherty Shale, REX = Rex Chert, HWM = hanging wall mud, UO = upper ore, UOP = upper ore partings CWS = center waste, LO = lower ore, LOP = lower ore partings, FWM = footwall mud, GTD = Grandeur Tongue, WEL = Wells Formation, mg/kg = milligrams per kilogram

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Rasmussen Valley baseline geochemistry study are consistent with the observation that phosphate mining has occurred in the district for about 90 years with only isolated reports of overburden-associated seepage with pH below 6.0 s.u.

Table 3.1-5 Average ABA Results for Rasmussen Valley Rocks

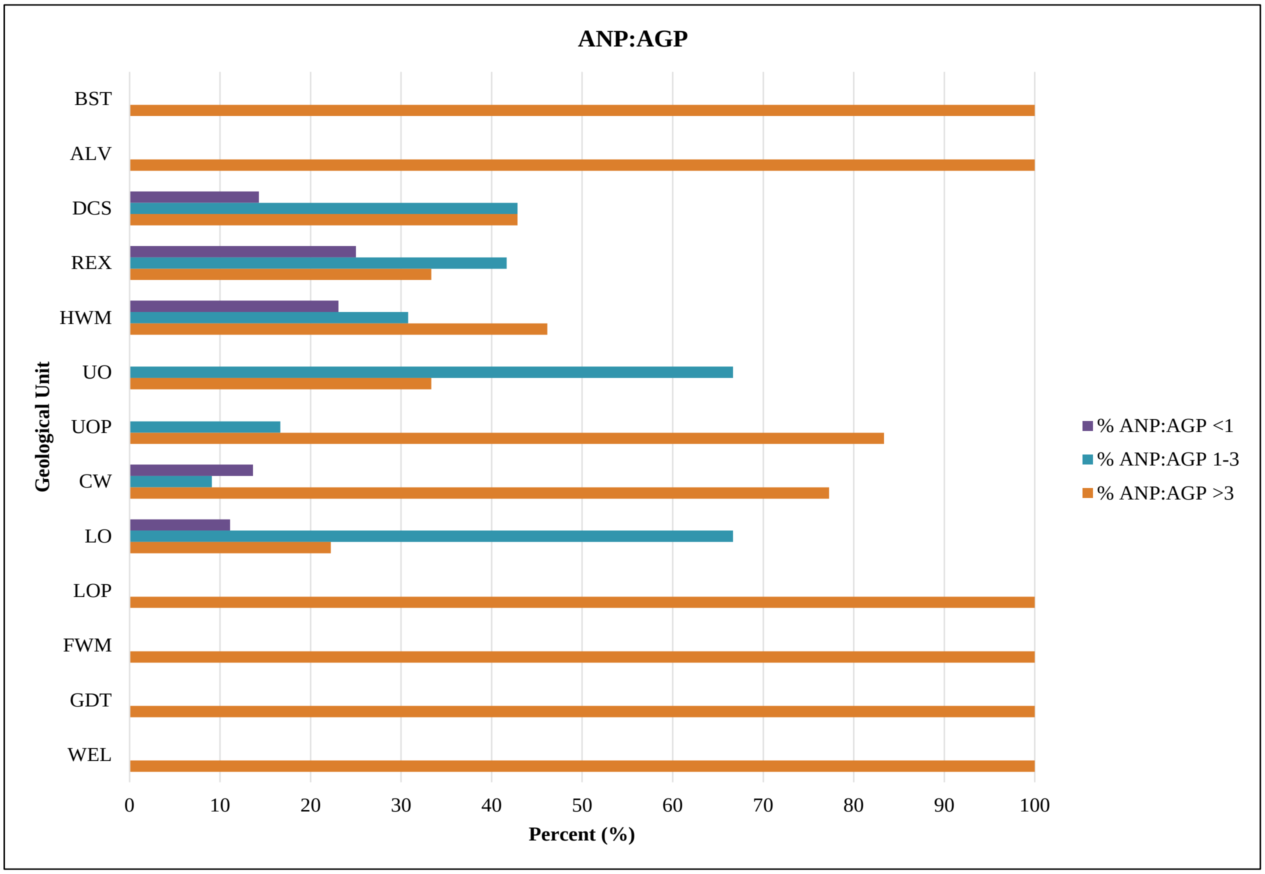
	AGP[1] (t $CaCO_3$/Kt)	ANP (t $CaCO_3$/Kt)	NNP[1] (t $CaCO_3$/Kt)	ANP:AGP[1]
Alluvium	3	154	151	116.5
Basalt	<1	20	19	20.3
Cherty Shale	12	35	24	9.1
Rex Chert	7	9	4	3.6
Hanging Wall Mud	26	61	35	3.8
Upper Ore	9	64	55	7.9
Upper Ore Partings	9	102	93	14.0
Center Waste	39	238	199	23.5
Lower Ore	18	99	81	5.9
Lower Ore Partings	7	475	469	159.8
Footwall Mud	9	416	406	256.8
Grandeur Tongue	<1	932	931	931.7
Wells Formation	1	579	578	487.5

Notes:

1 AGP calculated based on total sulfur minus organic sulfur

Abbreviations: AGP = acid generating potential, ANP = acid neutralizing potential, NNP = Net Neutralization Potential, t $CaCO_3$/Kt = tons calcium carbonate equivalent per kiloton of material

Figure 3.1-7 Percentage of Tested Samples by ANP:AGP Ratio



Abbreviations: BST = Basalt, ALV = Alluvium, DCS = Dark Cherty Shale, REX = Rex Chert, HWM = Hanging Wall Mud, UO = Upper Ore, UOP = Upper Ore Partings, CW = Center Waste, LO = Lower Ore, LOP = Lower Ore Partings, FWM = Footwall Mud, GDT = Grandeur Tongue, WEL = Wells Formation

Table 3.1-6 Average Sulfur and TOC Content of A-Composite Samples

	Organic Sulfur (%)	Pyritic Sulfur (%)	Sulfate (%)	Total Sulfur (%)	TOC[1] (%)
Alluvium	0.04	0.02	0.08	0.13	0.8
Basalt	<0.01	<0.01	0.01	0.01	0.1
Cherty Shale	0.08	0.30	0.06	0.45	2.2
Rex Chert	0.05	0.19	0.03	0.26	0.9
Hanging Wall Mud	0.24	0.72	0.11	1.07	2.6
Upper Ore	0.39	0.20	0.09	0.68	4.3
Upper Ore Partings	0.22	0.22	0.07	0.51	2.3
Center Waste	0.61	0.88	0.37	1.85	5.9
Lower Ore	0.64	0.34	0.24	1.22	5.5
Lower Ore Partings	0.23	0.17	0.05	0.45	2.1
Footwall Mud	0.25	0.23	0.08	0.54	2.0
Grandeur Tongue	0.01	0.01	<0.01	0.01	0.2
Wells Formation	0.02	0.03	0.01	0.03	0.1

Note:
1 TOC = total organic carbon

3.1.4 Paleontology

Sedimentary rocks of southeastern Idaho contain paleontological resources consisting of vertebrate, invertebrate, and plant fossils. Although some of the known types of fossils found in the Study Area are found elsewhere in southeastern Idaho, all fossils represent unique data concerning paleoecology and evolution.

The Potential Fossil Yield Classification (PFYC) system (BLM 2007) is used to provide baseline guidance for predicting, assessing, and mitigating impacts to fossils. Using the PFYC system, geologic units are classified based on the relative abundance of vertebrate fossils and traces (skin impressions, footprints, burrows) or scientifically significant invertebrate or plant fossils and their sensitivity to adverse impacts. A higher PFYC number indicates a higher potential for finding scientifically significant paleontological resources. A fossil is considered scientifically significant if it is a rare or previously unknown species, is of high quality and well preserved, preserves a previously unknown anatomical or other characteristic, provides new information about the history of life on earth, or has an identified educational or recreational value. On the other hand, a fossil may be considered to lack scientific significance if it lacks geologic context or physical integrity, or is commonly found and not useful for research (BLM 2007). Although significant localities (identified locations where large numbers of scientifically significant fossils or traces are found) may occasionally occur in a geologic unit, a few widely scattered important fossils or localities do not necessarily indicate a higher class; instead, the relative abundance of significant localities is intended to be the major factor in determining the class.

Table 3.1-7 summarizes the known fossil resources present within Study Area geologic units, their PFYC ratings as previously determined by BLM, where applicable, and their surface distribution within the Study Area. Units with low or very low potential to contain scientifically significant fossils (e.g., basalt) are not discussed.

Table 3.1-7 Summary of Fossil Resources Associated with Geologic Units Present in the Study Area

Geologic Unit	Known Fossil Resources	PFYC Ranking[1]	Study Area Acres
Thaynes Formation	Clams, snails, brachiopods, crinoids, crustaceans, sponges, *hybodontidae* shark teeth, *cestriacont* shark spines, acantodiform and paleonisciform fish, and ichthyosaur (*Cymbospondylys*) vertebrae Ammonoid-rich zone near base of formation	5a	9
Dinwoody Formation	Clams, ammonites, snails, and brachiopods.	3a	54
Phosphoria Formation – Meade Peak Member[3]	Brachiopods, snails, bivalves, ammonoids, isolated fish scales[2], fragmentary articulated fish, and tooth whorls of the giant shark *Helicoprion*.	5a	95
Wells Formation	Snails, clams, brachiopods, bryozoans, and rare corals in upper Permian units. Branching bryozoans and brachiopod (*Spirifer occidentalis*) in lower Pennsylvanian units.	3a	716
Alluvium	Mammoths, mastodons, horses, bison, camels, ground sloths, carnivores, ferrets, rodents, and other animals.	3b[3]	221

Notes:
1 PFYC potential for encountering scientifically significant fossil resources: Class 3a = Moderate; 3b = Moderate-Unknown; 5a = Very High-Exposed.
2 Commonly at the base of the Meade Peak Member is a fossiliferous phosphorite referred to as the "Fish Scale Marker Bed". Predictably, fish scales are more common in this bed but could be found isolated throughout the formation.
3 Other members of the Phosphoria Formation are not recognized fossil-producing geological units (BLM 2009).
4 Quaternary alluvial deposits are typically considered PFYC Class 3b deposits, particularly when vertebrate fossils have been recovered from similar deposits in the region but the area of concern has not been surveyed.
Source: Modified from BLM 2009, except alluvium.

3.2 AIR RESOURCES, CLIMATE, AND NOISE

3.2.1 Air Quality

3.2.1.1 Existing Pollutant Emission Sources

The Study Area is located 18 miles northeast of Soda Springs, Idaho. Locally, the topography is characterized by a series of north- to northwest-trending mountain ranges separated by broad intermountain valleys. The Study Area is located between the Wooley Range and Rasmussen Ridge in Rasmussen Valley. Elevation ranges from 6,480 feet to 7,020 feet. Rasmussen Ridge is at an elevation of approximately 7,000 feet.

The Study Area is located in a rural area where gaseous pollutant concentrations are expected to be low. Existing sources of air pollution in and near the Study Area include mining, ranching, and recreation. The closest sources of air pollution are within 20 miles of the Study Area. The Blackfoot Bridge Mine is located 8 miles southwest of the Study Area. The Rasmussen Ridge Mine is located north within 5 miles of the Study Area. The South Rasmussen Mine within the northern portion of the Study Area is in the process of reclamation. The Smoky Canyon Mine is located 12 miles southeast of the Study Area. Soda Springs, which is located 18 miles southwest of the Study Area, is a source of air pollution which includes the Agrium's Conda Phosphate Operations (CPO) Fertilizer Manufacturing Plant. Phosphate processing occurs near Soda

Springs. Air pollution from mining includes fugitive dust from paved and unpaved roads and gaseous emissions from combustion sources.

The Clean Air Act, last amended in 1990, establishes National Ambient Air Quality Standards (NAAQS) for six principal pollutants, called “criteria” pollutants, which are considered harmful to public health and the environment. The criteria pollutants include carbon monoxide (CO), lead (Pb), nitrogen dioxide (NO_2), ozone (O_3), particulate matter 10 microns or less in diameter (PM_{10}), particulate matter 2.5 microns or less in diameter ($PM_{2.5}$), and sulfur dioxide (SO_2). **Table 3.2-1** identifies the NAAQS. The State of Idaho adheres to the NAAQS (Idaho Department of Environmental Quality [IDEQ] 2010).

Table 3.2-1 NAAQS and State of Idaho Air Quality Standards

Pollutant (final rule citation)		Primary/ Secondary	Averaging Time	Level	Form
Carbon Monoxide (76 FR 54294, Aug 31, 2011)		primary	8-hour	9 ppm	Not to be exceeded more than once per year
			1-hour	35 ppm	
Lead (73 FR 66964, Nov 12, 2008)		primary and secondary	Rolling 3-month average	0.15 $\mu g/m^3$ [1]	Not to be exceeded
Nitrogen Dioxide (75 FR 6474, Feb 9, 2010) (61 FR 52852, Oct 8, 1996)		primary	1-hour	100 ppb	98th percentile, averaged over 3 years
		primary and secondary	Annual	53 ppb [2]	Annual Mean
Ozone (73 FR 16436, Mar 27, 2008)		primary and secondary	8-hour	0.075 ppm [3]	Annual fourth-highest daily maximum 8-hour concentration, averaged over 3 years
Particle Pollution Dec 14, 2012	$PM_{2.5}$	primary	Annual	12 $\mu g/m^3$	annual mean, averaged over 3 years
		secondary	Annual	15 $\mu g/m^3$	annual mean, averaged over 3 years
		primary and secondary	24-hour	35 $\mu g/m^3$	98th percentile, averaged over 3 years
	PM_{10}	primary and secondary	24-hour	150 $\mu g/m^3$	Not to be exceeded more than once per year on average over 3 years
Sulfur Dioxide (75 FR 35520, Jun 22, 2010) (38 FR 25678, Sept 14, 1973)		primary	1-hour	75 ppb [4]	99th percentile of 1-hour daily max. concentrations, averaged over 3 years
		secondary	3-hour	0.5 ppm	Not to be exceeded more than once per year

Notes:

1 Final rule was signed October 15, 2008. The 1978 lead standard (1.5 $\mu g/m^3$ as a quarterly average) remains in effect until 1 year after an area is designated for the 2008 standard, except that, in areas designated non-attainment for the 1978, the 1978 standard remains in effect until implementation plans to attain or maintain the 2008 standard are approved.

2 The official level of the annual NO_2 standard is 0.053 ppm, equal to 53 ppb, which is shown here for the purpose of clearer comparison to the 1-hour standard.

3 Final rule signed March 12, 2008. The 1997 ozone standard (0.08 ppm, annual fourth-highest daily maximum 8-hour concentration, averaged over 3 years) and related implementation rules remain in place. In 1997, the U.S. Environmental Protection Agency (USEPA) revoked the 1-hour ozone standard (0.12 ppm, not to be exceeded more than once per year) in all areas, although some areas have continued obligations under that standard (“anti-backsliding”). The 1-hour ozone standard is attained when the expected number of days per calendar year with maximum hourly average concentrations higher than 0.12 ppm is less than or equal to 1.

4 Final rule was signed June 2, 2010. The 1971 annual and 24-hour SO_2 standards were revoked in that same rulemaking. However, these standards remain in effect until 1 year after an area is designated for the 2010 standard, except in areas designated non-attainment for the 1971 standards, where the 1971 standards remain in effect until implementation plans to attain or maintain the 2010 standard are approved.

Abbreviations: ppb = parts per billion, ppm = parts per million, $\mu g/m^3$ = micrograms per cubic meter

Source: USEPA 2014

3.2.1.2 Regional Air Quality

The Proposed Action is located within an area designated as an Attainment area. A geographic area that meets or has pollutant levels below the NAAQS is called an Attainment area. An area with persistent air quality problems is designated a Non-attainment area, and means that activities in the area have violated federal health-based standards. The closest Non-attainment area is for $PM_{2.5,}$ particulates, located at Cache Valley, 30 miles south of the Study Area. The Fort Hall area is classified Non-attainment for PM_{10} particulates and is 40 miles west of the Study Area. The Caribou County Air Quality Index rating has been rated good in 2005, meaning that air quality is satisfactory, and air pollution poses little or no risk to public health or the environment (IDEQ 2012a).

The Idaho Department of Health and Welfare has collected air quality monitoring data at the Norton Site near Soda Springs, Idaho. PM_{10} particulates data were collected at the site from 1990 through 1995. The annual average concentration ranged from 20.1 to 31.6 micrograms per cubic meter ($\mu g/m^3$) during that period. The 24-hour NAAQS for PM_{10} particulates is 150 $\mu g/m^3$. The 24-hour maximum for PM_{10} particulates was exceeded once in 1992 (BLM 2003a).

The Idaho Air Monitoring Network Plan has a nearby site in Soda Springs, 15 miles southwest of the Study Area, located next to the P4 Processing Plant. This monitoring site has provided 1-hour continuous SO_2 data since 2002. Initially, the monitoring objective was to assess SO_2 NAAQS for industrial impacts from a nearby source in Caribou County (IDEQ 2012b). Soda Springs has historically been affected by industrial SO_2.

Consequently, a major project to desulfurize flue gas from the source was implemented in 2001, and SO_2 emissions dropped to well below the annual, 24-hour, and 3-hour NAAQS. In 2002, one SO_2 monitor was shut down, and a site located near a phosphorous plant became the primary monitoring location. The objective was then changed from population-based monitoring to hot-spot monitoring. From 2007 through 2009, the short-term SO_2 concentrations remained well below the level of the three old SO_2 NAAQS and the new 1-hour SO_2 NAAQS of 75 parts per billion (ppb; IDEQ 2010). No air quality exceedances of SO_2 were recorded for 2010, the last year reported (IDEQ 2012a).

Agrium currently operates the CPO Plant, 5 miles north of Soda Springs, Idaho on State Route 34. The facility has been in operation since at least the 1960s. Raw phosphate is processed to produce fertilizer products at the plant. This plant operates under Idaho Air Quality Tier 1 Operations Permit number 029-00003 (DKL 2015). IDEQ tracks emissions from the facility. Under a Tier 1 permit, operators are required to comply with the conditions of the permit and report the status of compliance. Emissions generated by the sulfur burning plant are approximately 4 pounds (lb.) of SO_2 and 0.15 lb. of acid mist per ton of material processed. Based on the air quality monitoring data collected by the nearby monitoring station as described above, the short-term SO_2 emissions remain below the NAAQS (IDEQ 2012a).

Federal Prevention of Significant Deterioration (PSD) regulations limit the maximum allowable incremental increase in Class I, Class II, and Class III areas. PSD applies to new major sources or major modifications at existing sources for pollutants located in an area that is in Attainment or unclassifiable with the NAAQS. The level of deterioration allowed within a Class I PSD area is lower than that for Class II designated areas, resulting in standards that are more stringent. Class I areas include all national parks larger than 6,000 acres, wilderness areas and national memorial parks larger than 5,000 acres, and certain international parks.

The Study Area is located within a Class II area (IDEQ 2012a), which allows moderate degradation of air quality within certain prescribed limits above baseline levels. Before an industrial facility, such as a mine, can locate or expand within a Class II area, it must demonstrate that the increase in emissions associated with the facility would not cause degradation of air quality in all classified areas and would not cause degradation of visibility in Class I areas.

The Clean Air Act requires that Class I areas be evaluated for haze and visibility impacts if a new or a major-modification facility is planned. Within a 100-kilometer radius of the Study Area is the Grand Teton National Park, Class I area (IDEQ 2014a). Environmental practices for evaluation of impacts to air resources shall be considered for the airshed (generally the surrounding airshed within 100 kilometers) as well as written notification of the new source to the Federal Land Managers for that area (National Park Service [NPS] 2010). In addition, a major action (e.g., construction) is also subject to visibility and hazard impact analyses. The distances and directions to the nearest Class I areas are presented in **Table 3.2-2**.

Table 3.2-2 Federal Mandatory Class I Areas Nearest to Study Area

Area	Direction From Project	Distance From Project (Miles)
Grand Teton National Park	Northeast	55
Bridger Wilderness Area	East	72
Yellowstone National Park	North	88
Teton Wilderness Area	Northeast	83
Fitzpatrick Wilderness Area	Northeast	87
Craters of the Moon National Monument	Northwest	86

Source: IDEQ 2014a

The Clean Air Act authorized the U.S. Environmental Protection Agency (USEPA) to develop technology-based standards that apply to specific categories of stationary sources. These standards are referred to as New Source Performance Standards (NSPS) and apply to new, modified, and reconstructed affected facilities in specific source categories. The NSPS were developed and implemented by the USEPA and are delegated to the states. Sources subject to NSPS are required to perform an initial performance test to demonstrate compliance. To demonstrate continuous compliance, some NSPS require sources to monitor emissions continuously.

Federal Operating Permits (Title V permits) are required for facilities with the potential to emit more than 100 tons per year of a regulated pollutant, 10 tons per year of any single hazardous air pollutant, or 25 tons per year of any combination of hazardous air pollutants.

3.2.2 Noise

Noise is generally described as unwanted sound. Discussions of environmental noise do not focus on pure tones because commonly heard sounds have complex frequency and pressure characteristics. Accordingly, sound measurement equipment has been designed to account for the sensitivity of human hearing to different frequencies. Correction factors for adjusting actual sound pressure levels to correspond with human hearing have been determined experimentally. For measuring noise in ordinary environments, A-weighted correction factors are employed. The filter de-emphasizes the very low and very high frequencies of sound in a manner similar to the response of the human ear. Therefore, the A-weighted decibel (dBA) is a good correlation to a human's subjective reaction to noise.

The dBA is measured on a logarithmic scale. To the average human ear, the apparent increase in "loudness" doubles for every 10 dBA increase in noise (Bell 1982).

Equivalent noise level (L_{eq}) values are used to develop single-value descriptions of average noise exposure over various periods. Such average ratings for noise exposure often include additional weighting factors for potential annoyance because of time of day or other considerations. The L_{eq} data used for describing average noise exposure generally are based on A-weighted sound level measurements. L_{eq} are not an averaging of decibel values. High dB events contribute more to the L_{eq} value than low dB events.

Average noise exposure over a 24-hour period is often presented as a day-night average sound level (L_{dn}). L_{dn} values are calculated from hourly L_{eq} values, with the L_{eq} values for the nighttime period (10 p.m. to 7 a.m.) increased by 10 dB to reflect the greater disturbance potential from nighttime noises. **Table 3.2-3** shows examples of day-night average noise levels generated in land use areas.

Table 3.2-3 Examples of Outdoor Day-Night Average Sound Levels in dB Measured at Various Locations

Noise Location	L_{dn} Sound Level (dB)
Apartment next to a freeway	87.5
Urban high density apartment	78
Urban row housing on major avenue	68
Wooded residential	51
Agricultural crop land	44
Rural residential	39
Wilderness ambient	35
Eagle Mine	39 - 52
Humboldt Mill	35 - 47

Source: USEPA 1978, TRIMEDIA 2014

For comparison, the noise level experienced during normal conversation between two people 5 feet apart is 60 dBA.

The USEPA has identified outdoor levels of 55 dBA L_{dn} and L_{eq} as desirable to protect against interference and annoyance where people spend widely varying amounts of time in sensitive areas, such as residences and other places, where quiet is a basis for use. Outdoor sites are generally unacceptable if exposed to sound levels of 70 dBA L_{eq} or higher (USEPA 1974).

3.2.2.1 Existing Noise Levels

Existing noise levels in the Study Area are low. The Study Area is located in a rural area with a low density of residences. Based on **Table 3.2-3**, background ambient noise levels in the Study Area would range from 35 to 52 dBA. Noise from nearby phosphate mining operations, such as Rasmussen Ridge, South Rasmussen, Blackfoot Bridge, and Smoky Canyon, are within 12 miles of the Study Area, which cumulatively would contribute to ambient noise.

3.2.2.2 Existing Regulations

A review of the Idaho Statutes and Soda Springs municipal codes did not reveal any noise regulations. There are no national noise regulations. In the Noise Control Act of 1972, Congress directed the USEPA to publish scientific information on the effects of different qualities and quantities of noise and to define acceptable noise levels under different conditions that would protect public health and welfare with an adequate margin of safety. The USEPA published "Information on Levels of Environment Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety" in 1974 (USEPA 1974). This guidance document is not a standard, specification, or regulation. The document provides a summary of noise levels identified to be protective of public health and welfare in indoor settings and "outdoors in residential areas and farms and other outdoor areas where people spend widely varying amounts of time and other places in which quiet is a basis for use". The outdoor level is 55 dBA L_{dn}. The USEPA also provides a level of 55 dBA L_{eq} for outdoor areas where people spend limited amounts of time, such as schoolyards and playgrounds. For all areas, USEPA (1974) recommends that 24-hour noise exposure should not exceed 70 dBA_{eq}.

3.2.2.3 Locations of Sensitive Receptors Identified

Sensitive receptors include residences, schools, medical facilities, and recreational areas. The closest populated area is the small, unincorporated Town of Wayan, which is located 7.6 miles north of the Study Area. The closest seasonal residence is located 0.5 mile south of the Study Area and east of Diamond Creek Road. The next closest residence (also seasonal) is located 0.64 mile from the Study Area and east of Blackfoot River Road. There is a grouping of nine residences located 1.17 to 1.30 miles northeast of the Study Area. The Blackfoot River Wildlife Management Area (WMA) overlaps the south end of the Study Area.

3.2.3 Climate

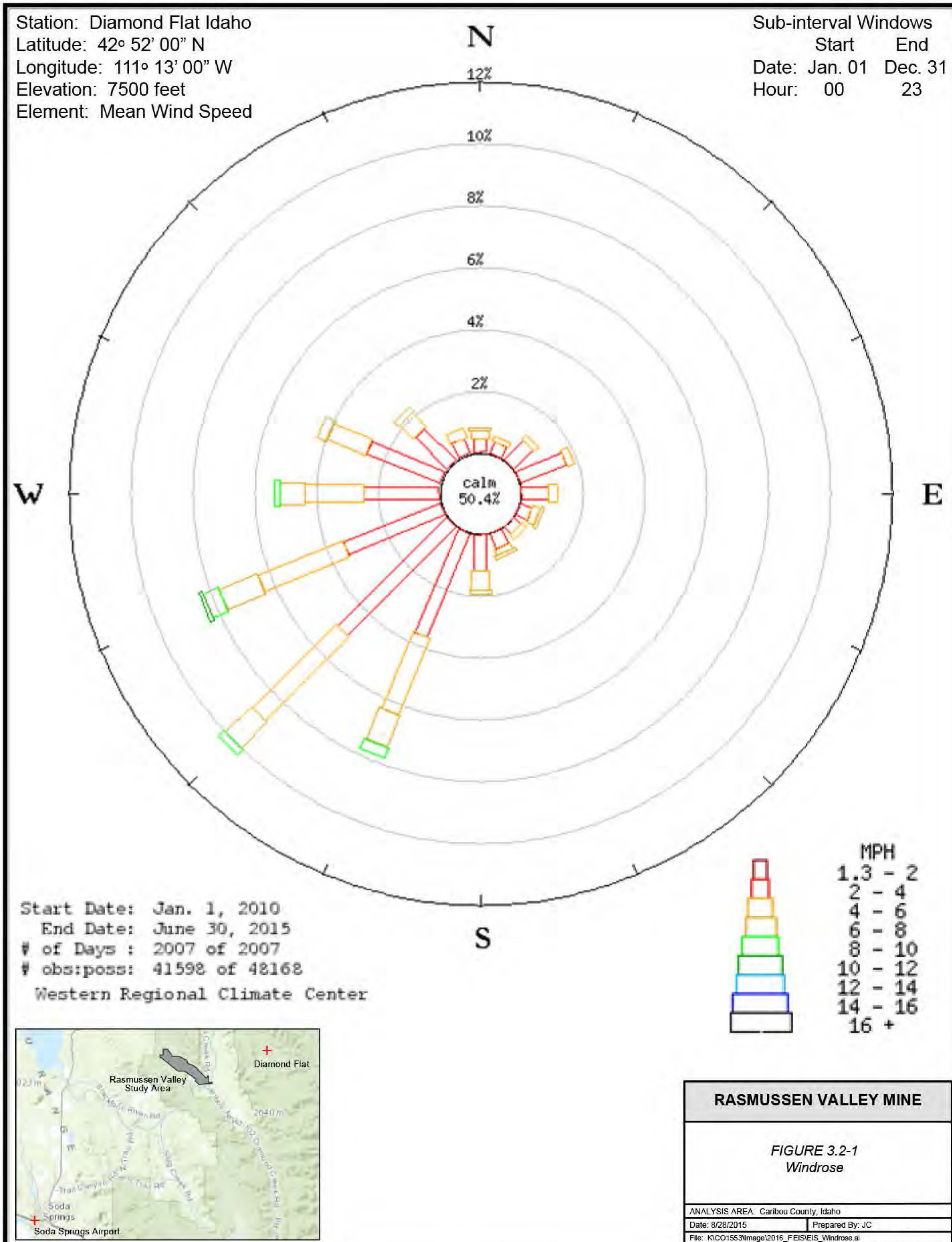
3.2.3.1 Current Climate

The climate of the Study Area is semi-arid, and local patterns of wind, precipitation, and temperature are influenced by prominent geographic features, including Blackfoot Reservoir and the Wooley Range.

A study of the climate for the Study Area was assessed using a Parameter-elevation Regressions on Independent Slopes Model (PRISM) with 12 local meteorological data sets. The operators of the 12 meteorological stations include the National Weather Service (NWS), Remote Automated Weather Station (RAWS), Natural Resource Conservation Service (NRCS), and Snow Telemetry (SNOTEL). The weather stations are located within a 6.3- to 64.4-mile range of the Study Area (Whetstone 2014).

The climate summary for the Study Area for the period 1981 through 2013 suggests that the area experiences variations in temperature across the site associated with elevation and geographic differences. Area-weighted averages were calculated to account for the spatial variation in temperature. Average monthly temperatures range from 61.7 degrees Fahrenheit (ºF) in July to 19.4ºF in December. Normally, May is the wettest month of the year, with an average precipitation of 2.74 inches. The average annual precipitation is 23.41 inches. Winds blow predominantly from the southwest (Whetstone 2014). The average annual snowfall is 50 inches (WRCC 2014). Climate summary data by month from the Study Area are summarized in **Table 3.2-4**.

The Diamond Flat RAWS station is the closest public meteorological station to the Study Area (6.3 miles east) and presents the best available data to characterize the existing winds for the Study Area. The Diamond Flat station is located in the Webster Range adjacent to the Grays Range. Winds are predominantly from the southwest, with wind speeds averaging 2.1 miles per hour (mph); 50 percent of the winds are calm and below 1.3 mph. **Figure 3.2-1** is a wind rose generated with 2010 to 2015 Diamond Flat station data, which illustrates estimated wind direction and speeds for the Study Area.



RASMUSSEN VALLEY MINE

FIGURE 3.2-1
Windrose

ANALYSIS AREA: Caribou County, Idaho
Date: 8/28/2015 | Prepared By: JC
File: K:\CO1553\Image\2016_FEIS\EIS_Windrose.ai

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Table 3.2-4 Monthly Climate Summary for Rasmussen Valley Analysis Area

Period of Record : 1981 to 2013													
	Jan	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Annual**
Avg Temperature (ºF)	19.4	21.6	29.3	37.2	46.0	53.7	61.7	60.9	51.9	41.2	28.2	19.2	19.4
Avg Total Precipitation (in)	2.4	1.9	2.0	2.0	2.7	1.8	1.1	1.2	1.5	1.9	2.4	2.5	23.4
Avg Total Snow Fall (in)	11.7	8.6	7.3	3.7	0.5	0.1	0	0	0	0.9	6.7	10.6	50
Avg Snow Depth (in)	10	11	5	0	0	0	0	0	0	0	1	5	

Abbreviations: Avg = average ºF = degrees Fahrenheit, in = inches, Jan = January, Feb = February, Mar = March, Apr = April, Jun = June, Jul = July, Aug = August, Sep = September, Oct = October, Nov = November, Dec = December

Source: WRCC 2014; Whetstone 2014

3.2.3.2 Climate Change

Ongoing scientific research has identified the potential impacts of the “greenhouse effect” resulting from several types of greenhouse gasses (GHGs) in air including CO_2, methane, nitrous oxide, and several fluorinated trace gasses on global climate.

The National Climate Change Viewer Program, developed by the USGS, was used to model climate change for Caribou County, Idaho. Based on the USGS models, since 1950, the average minimum and maximum temperatures (measured at 2 meters above ground level) have risen 2.1°F. The predictive model projects an average minimum and maximum temperature increase of 4.7°F and 4.4°F, respectively, in the next 100 years (USGS 2014b).

The USEPA states that the earth’s average temperature has risen by 1.4°F over the past century and is projected to rise another 2 to 11.5°F over the next 100 years. Small changes in the average temperature of the planet can translate to large and potentially dangerous shifts in climate and weather (USEPA 2013).

According to the Intergovernmental Panel on Climate Change (IPCC), “warming of the climate system is unequivocal, and since the 1950s, many of the observed changes are unprecedented over decades to millennia. The atmosphere and ocean have warmed, the amounts of snow and ice have diminished, sea level has risen, and the concentrations of greenhouse gases have increased. Each of the last three decades has been successively warmer at the Earth’s surface than any preceding decade since 1850. In the Northern Hemisphere, 1983 to 2012 was likely the warmest 30-year period of the last 1,400 years (medium confidence).

“The atmospheric concentrations of carbon dioxide, methane, and nitrous oxide have increased to levels unprecedented in at least the last 800,000 years. Carbon dioxide concentrations have increased by 40 percent since pre-industrial times, primarily from fossil fuel emissions and secondarily from net land use change emissions. The ocean has absorbed about 30 percent of the emitted anthropogenic carbon dioxide, causing ocean acidification.

“Human influence on the climate system is clear. This is evident from the increasing greenhouse gas concentrations in the atmosphere, positive radiative forcing, observed warming, and understanding of the climate system.

“Continued emissions of greenhouse gases will cause further warming and changes in all components of the climate system. Limiting climate change will require substantial and sustained reductions of greenhouse gas emissions” (IPCC 2013). These ongoing climate change trends may affect aspects of mine operation and reclamation success as discussed in **Section 4.2.1.1.2**.

3.3 WATER RESOURCES

3.3.1 Surface Water Resources

The Proposed Action is located within the Blackfoot Sub-Basin, a USGS 4th level Hydrologic Unit Code (HUC-4) sub-basin (17040207) that drains into the Snake River Basin. The analysis area is located in two of the 5th level HUCs (watersheds) within the sub-basin. The 5th level HUCs are further divided into three 6th level HUCs (sub-watersheds). **Table 3.3-1** lists the 5th and 6th level HUCs that are associated with the analysis area (**Figure 3.3-2**). Named surface water features within the analysis area include Blackfoot River, Lanes Creek, Diamond Creek, Angus Creek, Rasmussen Creek, Bacon Creek, Spring Creek, and Mill Canyon Creek (also referred to as East Mill Creek; **Figure 3.3-2**).

Table 3.3-1 Major Watersheds within the Study Area

Watershed (HUC 5)	Sub-Watershed (HUC 6)	Acres
Lanes Creek-Diamond Creek (HUC 1704020701)	Lower Lanes Creek (HUC 170402070102)	26,865
	Diamond Creek (HUC 170402070104)	25,214
	Subtotal	52,079
Upper Blackfoot River (HUC 1704020702)	Angus Creek-Blackfoot River (HUC 170402070205)	19,167
	Total	71,246

Within the analysis area, the watershed for Lanes Creek includes Bacon Creek, Upper Valley, and a relatively small portion of the southeast Study Area (**Figure 3.3-2**). Lanes Creek joins with Diamond Creek 0.5 mile southeast of the project boundary to form Blackfoot River. Spring Creek joins Blackfoot River 0.4 mile below its origin. Mill Canyon Creek is tributary to Spring Creek. The Blackfoot River meanders west then southwest as it crosses Rasmussen Valley before turning northwest toward Blackfoot Reservoir. Angus Creek drains the watershed for Rasmussen Valley including the Study Area on the southern flank of Rasmussen Ridge. Angus Creek is tributary to Blackfoot River 0.5 mile southwest of the project boundary. Rasmussen Creek is tributary to the upper reaches of Angus Creek. The southwestern flank of Rasmussen Ridge has six drainages in the Study Area that are mapped as having intermittent flow by the USGS (USGS 2011). The drainages are tributary to Angus Creek. The major watershed divides for the Study Area are shown on **Figure 3.3-1**. Several stock ponds and intermittent springs are located on the southwest flank of the ridge in the mid to upper portions of the drainages (**Figure 3.3-3**).

Primary commercial activities in the Blackfoot Sub-basin include agriculture, livestock grazing, and phosphate mining. Recreational uses include fishing and hunting. Streams within the analysis area support aquatic life and are used for agricultural water supply and recreational activities such as fishing salmonids.

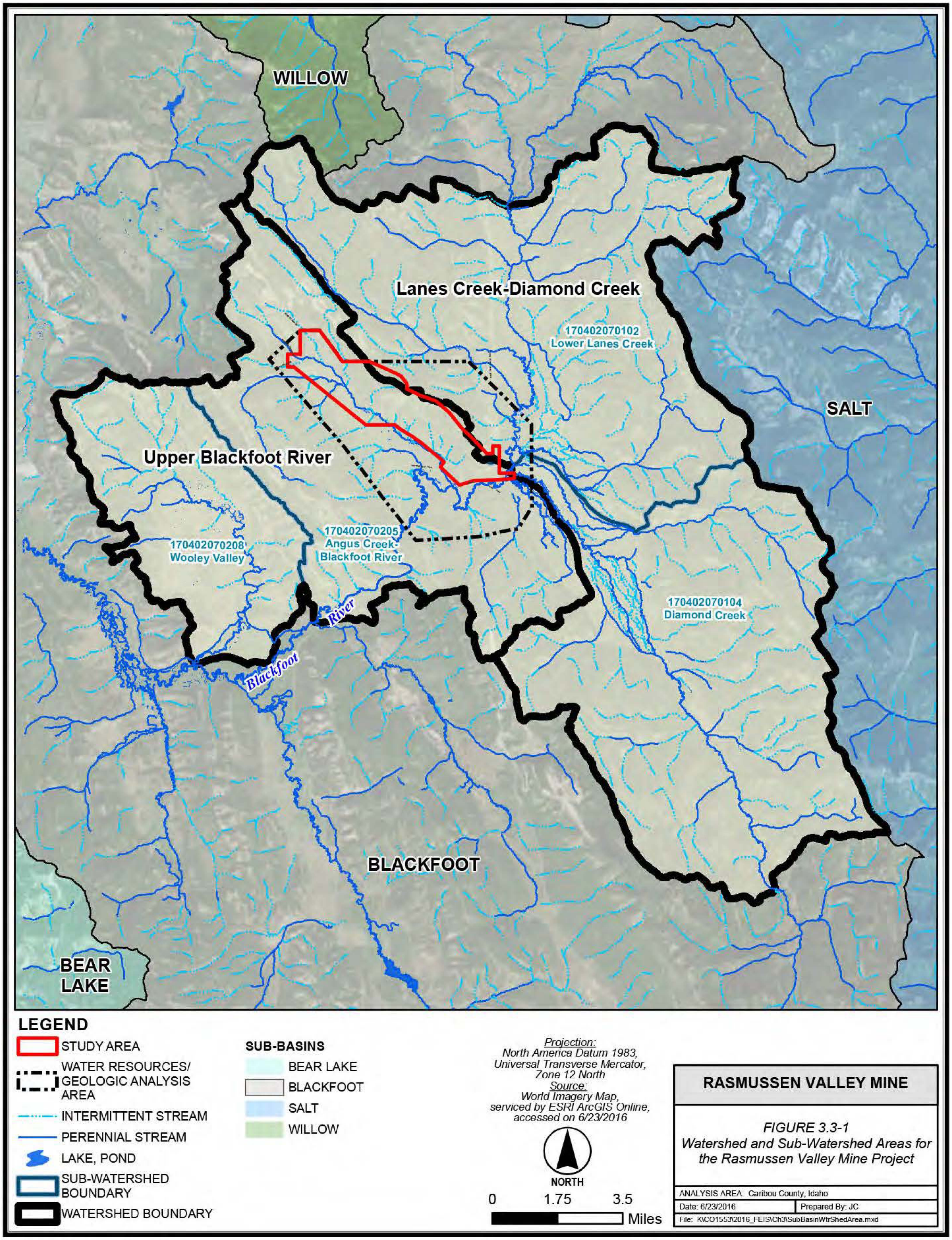
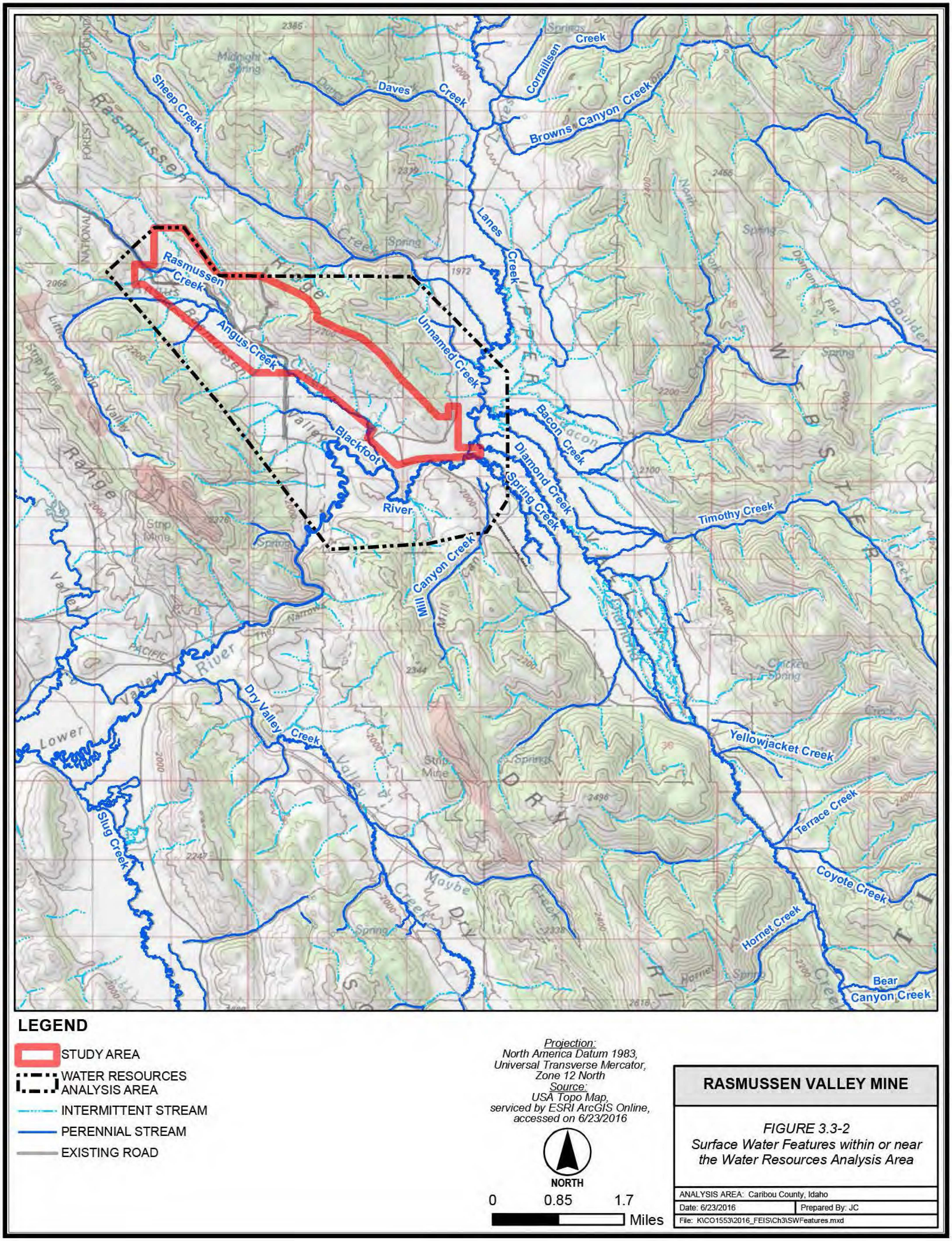


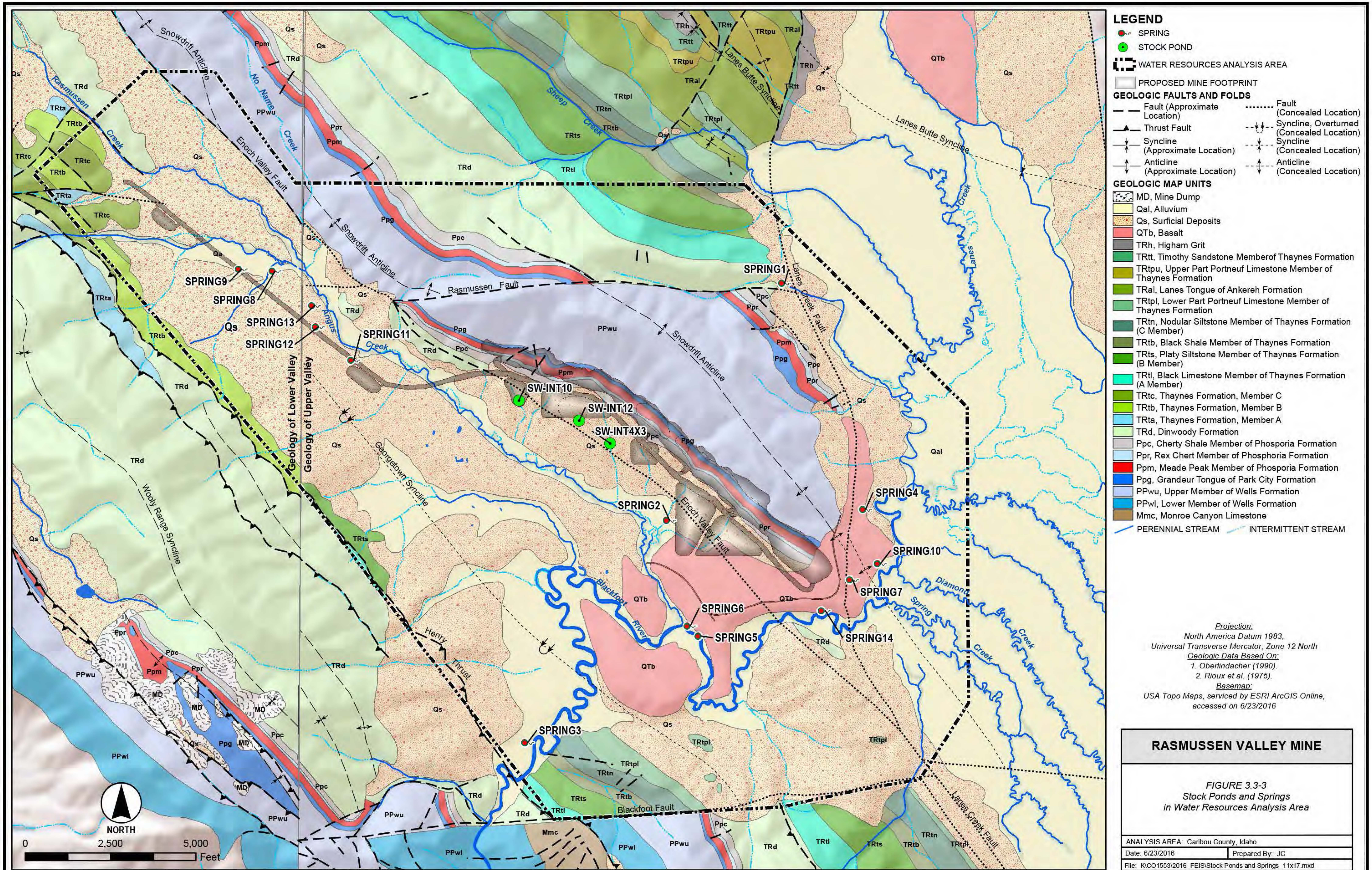
FIGURE 3.3-1
Watershed and Sub-Watershed Areas for the Rasmussen Valley Mine Project



RASMUSSEN VALLEY MINE

FIGURE 3.3-2
Surface Water Features within or near the Water Resources Analysis Area

ANALYSIS AREA: Caribou County, Idaho
Date: 6/23/2016 | Prepared By: JC
File: K:\CO1553\2016_FEIS\Ch3\SWFeatures.mxd


LEGEND
SPRING
STOCK POND
WATER RESOURCES ANALYSIS AREA
PROPOSED MINE FOOTPRINT
GEOLOGIC FAULTS AND FOLDS
Fault (Approximate Location)
Fault (Concealed Location)
Thrust Fault
Syncline, Overturned (Concealed Location)
Syncline (Approximate Location)
Syncline (Concealed Location)
Anticline (Approximate Location)
Anticline (Concealed Location)
GEOLOGIC MAP UNITS
MD, Mine Dump
Qal, Alluvium
Qs, Surficial Deposits
QTb, Basalt
TRh, Higham Grit
TRtt, Timothy Sandstone Memberof Thaynes Formation
TRtpu, Upper Part Portneuf Limestone Member of Thaynes Formation
TRal, Lanes Tongue of Ankereh Formation
TRtpl, Lower Part Portneuf Limestone Member of Thaynes Formation
TRtn, Nodular Siltstone Member of Thaynes Formation (C Member)
TRtb, Black Shale Member of Thaynes Formation
TRts, Platy Siltstone Member of Thaynes Formation (B Member)
TRtl, Black Limestone Member of Thaynes Formation (A Member)
TRtc, Thaynes Formation, Member C
TRtb, Thaynes Formation, Member B
TRta, Thaynes Formation, Member A
TRd, Dinwoody Formation
Ppc, Cherty Shale Member of Phosporia Formation
Ppr, Rex Chert Member of Phosporia Formation
Ppm, Meade Peak Member of Phosporia Formation
Ppg, Grandeur Tongue of Park City Formation
PPwu, Upper Member of Wells Formation
PPwl, Lower Member of Wells Formation
Mmc, Monroe Canyon Limestone
PERENNIAL STREAM
INTERMITTENT STREAM
SPRING1
SPRING2
SPRING3
SPRING4
SPRING5
SPRING6
SPRING7
SPRING8
SPRING9
SPRING10
SPRING11
SPRING12
SPRING13
SPRING14
SW-INT10
SW-INT12
SW-INT4X3
Snowdrift Anticline
Rasmussen Creek
No Name Creek
Enoch Valley Fault
Sheep Creek
Lanes Butte Syncline
Rasmussen Fault
Lanes Creek Fault
Angus Creek
Geology of Lower Valley
Geology of Upper Valley
Georgetown Syncline
Wooly Range Syncline
Henry Thrust
Blackfoot River
Blackfoot Fault
Diamond Creek
Spring Creek
Lanes Creek
Projection:
North America Datum 1983,
Universal Transverse Mercator, Zone 12 North
Geologic Data Based On:
1. Oberlindacher (1990).
2. Rioux et al. (1975).
Basemap:
USA Topo Maps, serviced by ESRI ArcGIS Online,
accessed on 6/23/2016
NORTH
0
2,500
5,000
Feet
RASMUSSEN VALLEY MINE
FIGURE 3.3-3
Stock Ponds and Springs
in Water Resources Analysis Area
ANALYSIS AREA: Caribou County, Idaho
Date: 6/23/2016
Prepared By: JC
File: K:\CO1553\2016_FEIS\Stock Ponds and Springs_11x17.mxd

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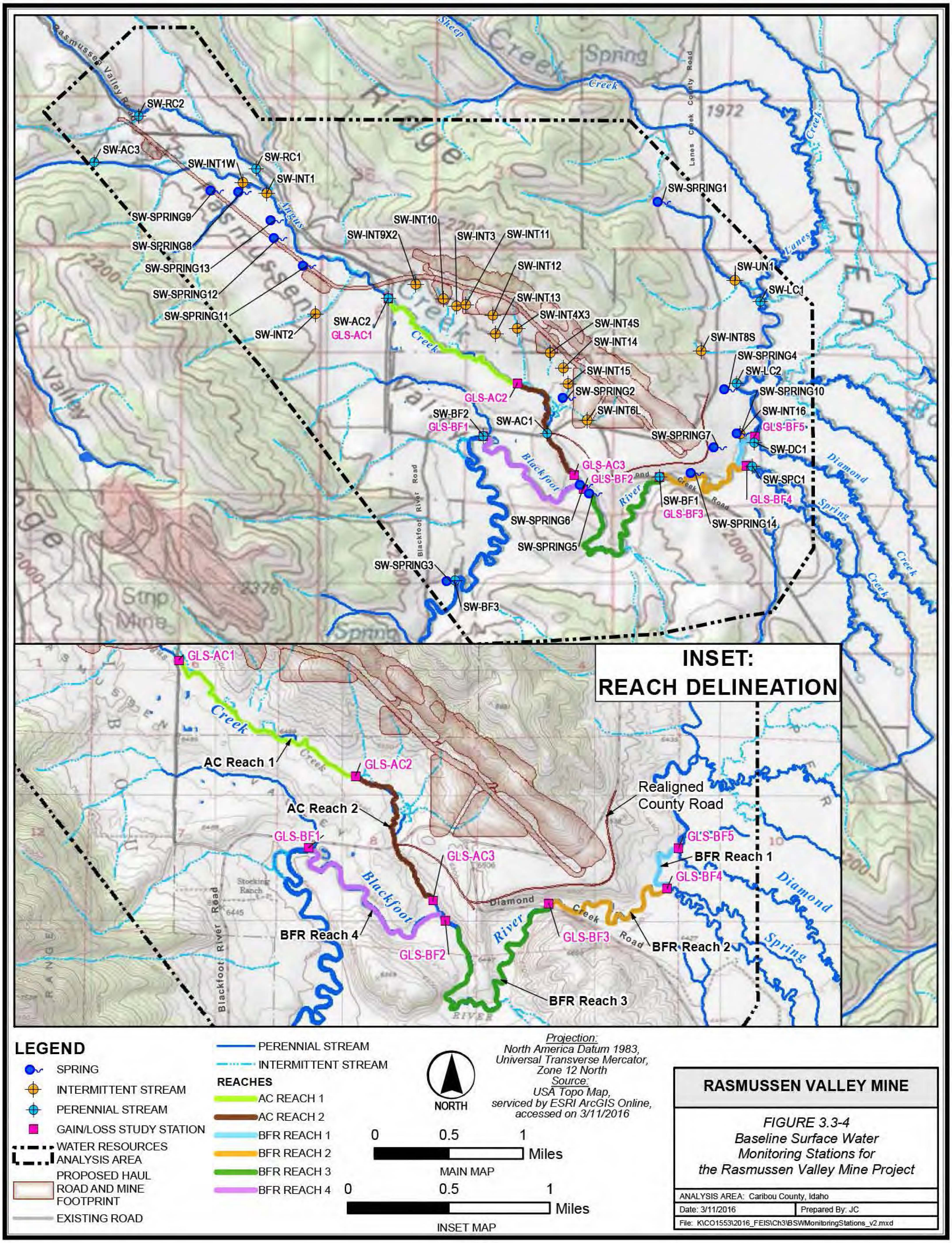
INSET:
REACH DELINEATION
SW-RC2
SW-AC3
SW-INT1W
SW-RC1
SW-INT1
SW-SPRING9
SW-SPRING8
SW-SPRING13
SW-SPRING12
SW-SPRING11
SW-INT2
SW-AC2
GLS-AC1
SW-INT10
SW-INT9X2
SW-INT3
SW-INT11
SW-INT12
SW-INT13
SW-INT4X3
SW-INT4S
SW-INT14
SW-INT15
SW-SPRING2
SW-INT6L
GLS-AC2
SW-AC1
SW-BF2
GLS-BF1
GLS-AC3
GLS-BF2
SW-SPRING6
SW-SPRING5
SW-SPRING3
SW-BF3
SW-BF1
GLS-BF3
SW-SPRING14
SW-SPRING1
SW-UN1
SW-LC1
SW-INT8S
SW-SPRING4
SW-LC2
SW-SPRING10
SW-INT16
GLS-BF5
SW-SPRING7
SW-DC1
SW-SPC1
GLS-BF4
AC Reach 1
AC Reach 2
BFR Reach 1
BFR Reach 2
BFR Reach 3
BFR Reach 4
Realigned County Road
LEGEND
SPRING
INTERMITTENT STREAM
PERENNIAL STREAM
GAIN/LOSS STUDY STATION
WATER RESOURCES ANALYSIS AREA
PROPOSED HAUL ROAD AND MINE FOOTPRINT
EXISTING ROAD
PERENNIAL STREAM
INTERMITTENT STREAM
REACHES
AC REACH 1
AC REACH 2
BFR REACH 1
BFR REACH 2
BFR REACH 3
BFR REACH 4
NORTH
0 0.5 1 Miles
MAIN MAP
0 0.5 1 Miles
INSET MAP
Projection:
North America Datum 1983,
Universal Transverse Mercator,
Zone 12 North
Source:
USA Topo Map,
serviced by ESRI ArcGIS Online,
accessed on 3/11/2016
RASMUSSEN VALLEY MINE
FIGURE 3.3-4
Baseline Surface Water Monitoring Stations for the Rasmussen Valley Mine Project
ANALYSIS AREA: Caribou County, Idaho
Date: 3/11/2016
Prepared By: JC
File: K:\CO1553\2016_FEIS\Ch3\BSWMonitoringStations_v2.mxd

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3.3.1.1 Baseline Surface Monitoring Network, Applicable Water Quality Standards, and Description of Waterbodies

Data for the Rasmussen Valley surface water analysis were compiled from public domain sources, including reports, maps, and databases prepared by governmental agencies, private entities, university researchers, non-governmental organizations. These data are supplemented by site-specific baseline studies completed between April 2010 and December 2014. Baseline surface water studies for Rasmussen Valley were prepared under the direction of the Agencies and included:

- Monitoring of 13 stream stations, 16 intermittent drainages, and 14 springs seven times annually starting in 2010
- Multiple gain-loss surveys on the upper Blackfoot River and lower Angus Creek

The locations of baseline surface water monitoring stations are shown on **Figure 3.3-4**. A complete description of the surface water baseline monitoring program is presented in the Rasmussen Valley Mine Project Baseline Water Resources Technical Report (Whetstone 2015b).

Water quality standards for surface water are contained in Idaho Administrative Procedures Act (IDAPA 58.01.02). According to IDAPA 58.01.02, streams and lakes are classified and managed by beneficial use. Designated beneficial uses for a water body may include warm or cold water aquatic life; salmonid spawning; seasonal cold-water or modified aquatic life; primary- or secondary-contact recreation domestic, agricultural, or industrial water supply; wildlife habitat; and aesthetics. If more than one beneficial use is recognized for a water body, the most stringent water quality standard is applicable. Standards for cold-water aquatic life, primary or secondary-contact recreation, agricultural water supply, industrial water supply, wildlife habitat, and aesthetics are applicable to all undesignated non-private surface water bodies in the State of Idaho. Water quality standards are not applicable to mine water management and impoundment facilities, such as sedimentation ponds and pit impoundments.

Blackfoot River has designated beneficial uses. These uses are cold-water aquatic life, salmonid spawning, primary-contact recreation, and domestic water supply. All other surface water bodies in the Study Area are undesignated, and applicable criteria include cold-water aquatic life and primary- or secondary-contact recreation (IDAPA 58.01.02).

Surface water quality standards are divided into two broad categories based on the designated use: aquatic life and human health. The human health standards are further divided into consumption of water and organisms or the consumption of organisms only. The aquatic life standards are also divided, based on the duration of exposure, and include acute and chronic criteria. The Criteria Maximum Concentration (CMC) is the highest concentration to which aquatic life can be exposed for a 1-hour period without deleterious effects. The Criteria Continuous Concentration (CCC) is the highest concentration that aquatic life can be exposed to for an extended period. Of these standards, the aquatic life standards are generally the most rigorous.

Aquatic life standards are based on dissolved concentrations, with the exceptions of criteria for selenium, ammonia, and turbidity. The standard for selenium is based on total recoverable concentration. Standards for ammonia and turbidity are based on total concentration. The standard for ammonia depends on temperature and pH. Turbidity is measured in nephelometric turbidity units (NTU) and is not to exceed 50 NTU above background instantaneously or more than 25 NTU for more than 10 days. Cadmium, chromium (III), copper, lead, nickel, silver, and zinc standards are hardness-dependent and are calculated according to the following equations:

$$CMC = WER \cdot e^{m_A \cdot \ln(H) + b_A} \cdot K_A$$

$$CCC = WER \cdot e^{m_C \cdot \ln(H) + b_C} \cdot K_C$$

Where: WER is the water effect ratio
m_A is a metal-specific constant for acute toxicity
m_C is a metal-specific constant for chronic toxicity
H is hardness (mg/L as $CaCO_3$)
b_A is a metal-specific constant for acute toxicity
b_C is a metal-specific constant for chronic toxicity
K is a freshwater conversion factor (K_A = acute, K_C = chronic)

Aquatic life standards, based on 100 milligrams per liter (mg/L) hardness and a WER of 1, are presented in **Table 3.3-2**. Metal-specific constants and conversion factors for the calculation of hardness-specific standards are presented in **Table 3.3-3**.

In addition to the quality standards for surface water listed in **Table 3.3-2** and **Table 3.3-3**, Section 303(d) of the Clean Water Act (CWA) requires states to identify streams and lakes that do not meet water quality standards and to establish Total Maximum Daily Loads (TMDLs) for the listed pollutants. The listed 303 (d) water bodies and TMDLs near the analysis area are summarized in **Table 3.3-4** A map showing 303(d) listed water bodies near the analysis area is presented in **Figure 3.3-5**.

Table 3.3-2 Idaho Surface Water Quality Standards

Parameter (mg/L)	Surface Water Standards[1] (IDAPA 58.01.02)			
	Aquatic Life Based on 100 mg/L Total Hardness and WER[2] of 1		Standards for Human Health Based on Consumption of:	
	CMC[3]	CCC[4]	Water and Organisms	Organisms Only
Major Ions and Solution Parameters				
Chloride	—	—	—	—
Fluoride	—	—	—	—
Sulfate	—	—	—	—
TDS[5]	—	—	—	—
Nutrients				
Ammonia as Nitrogen	—[6]	—[7 or 8]	—	—
Nitrate as Nitrogen	—	—	—	—
Nitrite as Nitrogen	—	—	—	—
Metals				
Aluminum	—	—	—	—
Antimony	—	—	0.0056[9]	0.64[9]
Arsenic	0.340[10]	0.150[10]	0.010[11]	0.010[11]
Barium	—	—	—	—
Beryllium	—	—	—	—
Cadmium	0.0013[13]	0.0006[13]	—	—
Chromium	—	—	—	—
Chromium, VI	0.016[10]	0.011[10]	—	—
Chromium III	0.570[13]	0.074[13]	—	—
Copper	0.017[13]	0.011[13]	—	—
Iron	—	—	—	—
Lead	0.065[13]	0.0025[13]	—	—
Manganese	—	—	—	—
Mercury	—[12]	—[12]	—	—
Nickel	0.470[13]	0.0520[13]	0.610	4.6

Table 3.3-2 Idaho Surface Water Quality Standards

Parameter (mg/L)	Surface Water Standards[1] (IDAPA 58.01.02)			
	Aquatic Life Based on 100 mg/L Total Hardness and WER[2] of 1		Standards for Human Health Based on Consumption of:	
	CMC[3]	CCC[4]	Water and Organisms	Organisms Only
Selenium[8]	0.02	0.005	0.17	4.2
Silver	0.0034[13]	—	—	—
Thallium	—	—	0.00024[9]	0.00047[9]
Uranium	—	—	—	—
Zinc	0.120[13]	0.120[13]	7.4	26
Field Parameters				
pH (s.u.)	6.5-9.0			
Dissolved oxygen	>6 mg/L at all times			
Temperature (ºC)	<u><</u>22 ºC (daily average 19)			
Turbidity (NTU)	<u><</u>50 NTU above background (10 day consecutive <u><</u>25)			

Notes:

1 Water quality standards from Idaho Administrative Code April 1, 2014. Aquatic standards are based on dissolved concentrations with the exception of selenium, which is based on total recoverable concentration, and ammonia and turbidity, which are based on total concentration

2 WER is the water effect ratio

3 CMC is criterion maximum concentrations; acute

4 CCC is criterion continuous concentrations; chronic

5 TDS = total dissolved solids

6 Numeric criterion for ammonia CMC: the 1-hour average concentration of total ammonia nitrogen in mg N/L is not to exceed more than once every 3 years the value calculated by the following equation: $(0.275/(1+10^{7.204-pH}))+(39.0/(1+10^{pH-7.204}))$

7 Numeric criterion for ammonia CCC when fish early life stages are likely present: the 30-day average concentration of total ammonia nitrogen (mg N/L) is not to exceed more than once every 3 years the value calculated by the following equation: $(0.0577/(1+10^{7.688-pH}))+(2.487/(1+10^{pH-7.688}))*\min(2.85,1.45*(10^{0.028*(25-T)})$; T = °C, min represents the smallest number in a set of values

8 Numeric criterion for ammonia CCC when fish early life stages are likely absent is: the 30-day average concentration of total ammonia nitrogen (mg N/L) is not to exceed more than once every 3 years the value calculated by the following equation: $(0.0577/(1+10^{7.688-pH}))+(2.487/(1+10^{pH-7.688}))*(1.45*(10^{0.028*(25-T)})$; T =°C

9 Aquatic human health based standards for antimony and thallium, and aquatic standards for cold-water biota and human health, are fixed numerical standards

10 Standards for CMC and CCC are the presented values multiplied by the WER

11 Standards for human health apply to inorganic arsenic only

12 Fish tissue criteria per implementation guidance document for Idaho mercury water quality criteria (IDEQ 2005a)

13 Hardness-dependent CMC and CCC standards

Table 3.3-3 Metal-specific Constants and Conversion Factors for the Calculation of Cold-water Aquatic Life Water Quality Standards

Parameter	m_a[1]	b_a[2]	m_c[3]	b_c[4]	K_a[5]	K_c[6]
Arsenic	NA[7]	NA	NA	NA	1.0	1.0
Cadmium	0.8367	-3.560	0.6247	-3.344	0.944[8]	0.909[9]
Chromium (III)	0.819	3.7256	0.8190	0.6848	0.316	0.860
Chromium (VI)	NA	NA	NA	NA	0.982	0.962
Copper	0.9422	-1.464	0.8545	-1.465	0.960	0.960
Lead	1.273	-1.460	1.273	-4.705	0.791[10]	0.791[10]
Mercury	NA	NA	NA	NA	0.85	0.85
Nickel	0.846	2.255	0.8460	0.0584	0.998	0.997

Table 3.3-3 Metal-specific Constants and Conversion Factors for the Calculation of Cold-water Aquatic Life Water Quality Standards

Parameter	m_a[1]	b_a[2]	m_c[3]	b_c[4]	K_a[5]	K_c[6]
Silver	1.72	-6.52	—[11]	—[11]	0.85	—[11]
Zinc	0.8473	0.884	0.8473	0.884	0.978	0.986

Notes:
1 m_a = Metal-specific constant for acute toxicity
2 b_a = Metal-specific constant for acute toxicity
3 m_c = Metal-specific constant for chronic toxicity
4 b_c = Metal-specific constant for chronic toxicity
5 K_a = Acute freshwater conversion factor
6 K_c = Chronic freshwater conversion factor
7 NA = Not applicable
8 No acute conversion factor is required for cadmium. The cadmium acute criterion equation was derived from dissolved metals toxicity data. The equation Ka = 1.136672-[(ln hardness)(0.041838)] may be used to back-calculate an equivalent total recoverable concentration
9 Cadmium Kc = 1.101672-[(ln hardness)(0.041838)]
10 Lead Ka and Kc = 1.46203-[(ln hardness)(0.145712)]
11 No chronic standards have been established for silver

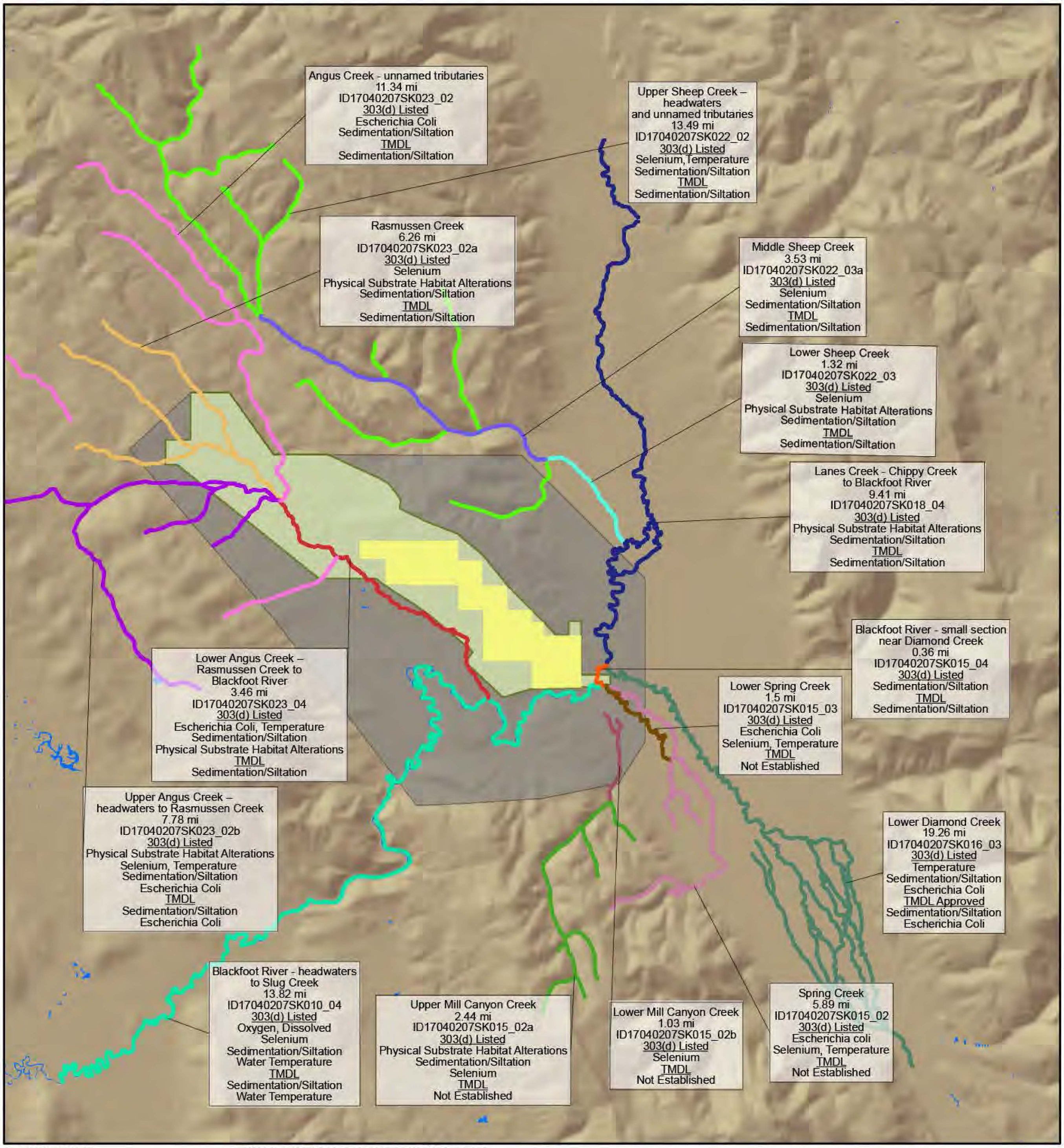
Table 3.3-4 303 (d) Listings and TMDLs for Water Bodies near the Analysis Area

Stream Segment	303 (d) Listings / TMDLs
Blackfoot River from confluence of Lanes and Diamond Creeks to Blackfoot Reservoir	Listed for sediment/siltation, dissolved oxygen, temperature, and selenium, with approved TMDLs for sediment and water temperature
Lanes Creek from Chippy Creek to Blackfoot River	Listed for sediment/siltation and physical substrate habitat alterations with an approved TMDL for sediment
Angus Creek from source to mouth	*Listed for Escherichia coli*, temperature, sediment/siltation, and physical substrate habitat alterations, with an approved TMDL for sediment
Upper Angus Creek	Listed for selenium with an approved TMDL for *Escherichia coli*
Lower Spring Creek	*Listed for Escherichia coli*, temperature, and selenium
Lower Diamond Creek	*Listed for Escherichia coli*, temperature, and sediment/siltation, with approved TMDLs for sediment and *Escherichia coli*
Rasmussen Creek	Listed for selenium, physical substrate habitat alterations, and sediment/siltation, with an approved TMDL for sediment

Source: IDEQ 2005a, 2014c

3.3.1.1.1 Blackfoot River

The Blackfoot River flows northwest from its headwaters near the Idaho-Wyoming state line to its confluence with the Snake River upstream of American Falls Reservoir. The Blackfoot River above Blackfoot Reservoir is generally a low-gradient river that meanders southwest from its origin and then northwest along alluvial valleys between northwest-trending ridges. Numerous small springs issue from the basalt outcrops along the channel of Blackfoot River where it passes through the Study Area. The Blackfoot River is designated for cold-water aquatic life, salmonid spawning, primary-contact recreation, and domestic water supply (IDAPA 58.01.02). It is a 303(d) listed stream for sediment/siltation, DO, temperature, and selenium, with approved TMDLs for sediment and water temperature from the confluence of Lanes and Diamond Creeks to Blackfoot Reservoir (**Figure 3.3-5**) (IDEQ 2005a, 2014c).



LEGEND

- LEASE AREA
- STUDY AREA
- WATER RESOURCES ANALYSIS AREA

Projection:
North America Datum 1983, Universal Transverse Mercator, Zone 12 North
Source:
Idaho Shaded Relief, with a horizontal grid spacing of 30-meters, from Idaho Geospatial Data Clearinghouse

EXPLANATION OF STREAM LABELS

5.89 mi = Total Assessment Unit Mileage or Acreage

ID17040207SK015_02 = Assessment Unit Identifier

303(d) Listed = From 303(d) Listed Impaired Water Bodies from the Idaho Department of Environmental Quality 2014, 2012 Integrated (303[d]/(305[b]) Report

TMDL = Section 4(a) USEPA TMDL Approved

TMDLs and Delisted Assessment Units from the Idaho Department of Environmental Quality 2014, 2012 Integrated (303[d]/(305[b]) Report

USEPA = United States Evironemntal Protection Agency

TMDL = Total Maximum Daily Load

NORTH

0 1 2 Miles

RASMUSSEN VALLEY MINE

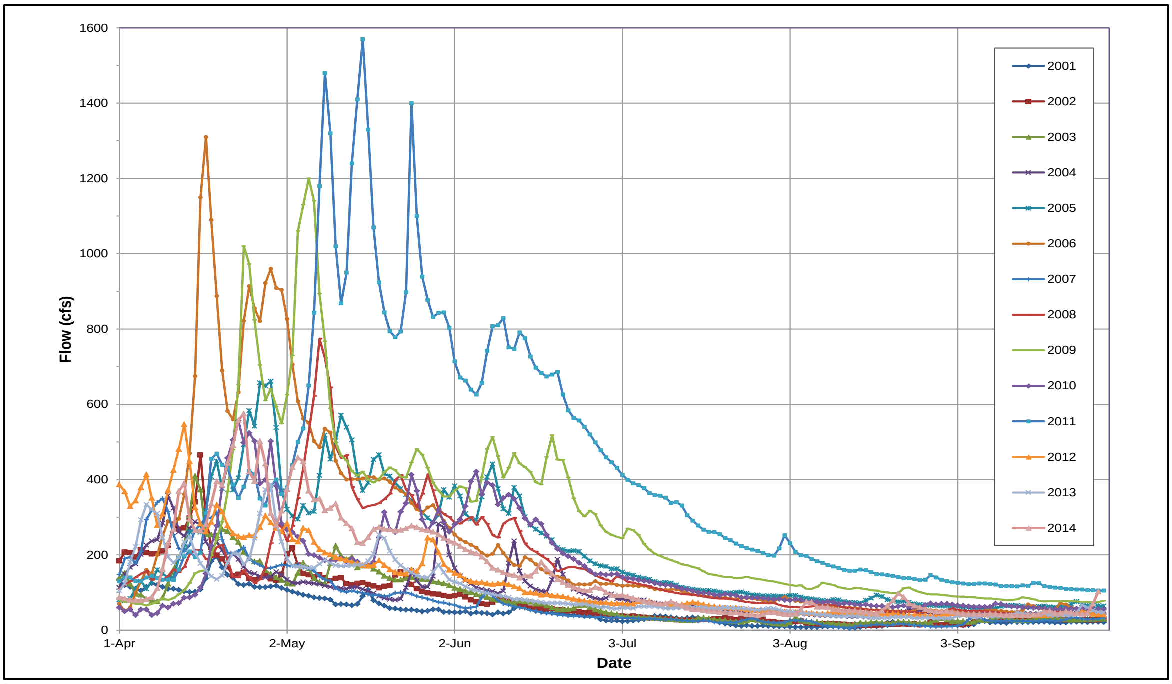
FIGURE 3.3-5
303(d) Listings and Total Maximum Daily Loads for Area Streams

ANALYSIS AREA: Caribou County, Idaho
Date: 6/23/2016 Prepared By: SMK & JC
File: K:\CO1553\2016_FEIS\Chapter3\303d_ListingsTMDLs.mxd

The Blackfoot River discharges into Blackfoot Reservoir 12.9 linear miles west of the Study Area. Blackfoot Reservoir was built in 1910 and is owned and operated by the Fort Hall Agency of the Bureau of Indian Affairs. Water stored in the reservoir is primarily used to irrigate lands on Fort Hall Indian Reservation near Blackfoot and Pocatello. Blackfoot Reservoir is a designated water body for cold-water aquatic life and primary-contact recreation (IDAPA 58.01.02).

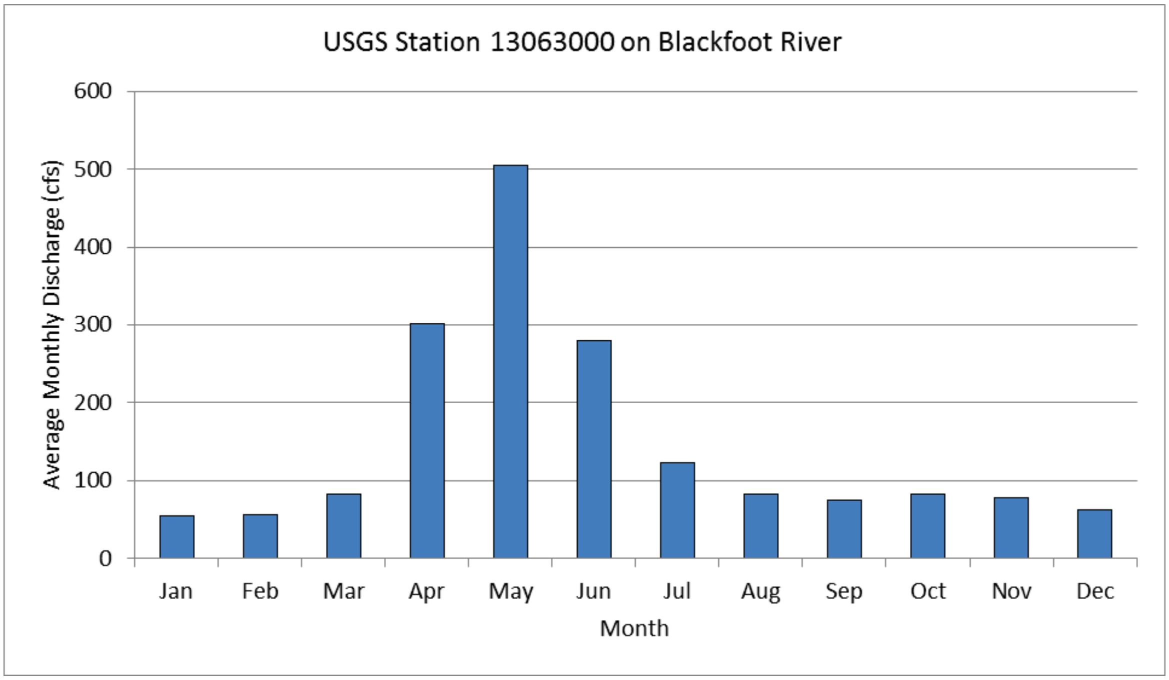
Streamflow data for the Blackfoot River are available from USGS monitoring station 13063000 and several monitoring stations within the Study Area that were established to complete gain-loss studies for the project (**Figure 3.3-4**). USGS monitoring station 13063000 is located 9.6 linear miles downstream of the Study Area, above Blackfoot Reservoir, and has operated intermittently from 1914 to present. Beginning in 2001, the station has operated seasonally April through October. Hydrographs for the Blackfoot Bridge monitoring station are presented on **Figure 3.3-6**.

Figure 3.3-6 Hydrograph Showing Peak Flows for Blackfoot River between 2001 and 2014



Streamflow in the Blackfoot River upstream of the Blackfoot Reservoir is regulated by snowmelt, precipitation, and groundwater discharge. Peak flows generally occur in April or May during spring runoff and decline to low-flow conditions by mid- to late summer. Average monthly discharge for Blackfoot River at the USGS monitoring station is highest in May (501 cubic feet per second [cfs]) followed by April (302 cfs) and June (276 cfs). The low-flow period for Blackfoot River typically extends from August through March, with monthly average discharge ranging from 54 to 82 cfs (**Figure 3.3-7**).

Figure 3.3-7 Average Monthly Stream Flow (1914 – 2014) for Blackfoot River at USGS Gaging Station 13063000



The Blackfoot River discharges into Blackfoot Reservoir 12.9 linear miles west of the Study Area. Blackfoot Reservoir was built in 1910 and is owned and operated by the Fort Hall Agency of the Bureau of Indian Affairs. Water stored in the reservoir is primarily used to irrigate lands on Fort Hall Indian Reservation near Blackfoot and Pocatello. Blackfoot Reservoir is a designated water body for cold-water aquatic life and primary-contact recreation (IDAPA 58.01.02).

Peak flows for the Blackfoot River have ranged from 221 to 1,570 cfs since 2001 (USGS 2014c; **Figure 3.3-6**). The highest recorded daily average streamflow at the USGS monitoring station was 2,150 cfs on April 26, 1974 (USGS 2014c).

Three monitoring stations were established on the Blackfoot River for the Baseline Water Resources Study: SW-BF1, SW-BF-2, and SW-BF3 (**Figure 3.3-4**). Station SW-BF1 is a dedicated stream gage that measures stream stage at 15-minute intervals. A hydrograph for the station is presented on **Figure 3.3-8**. The highest estimated flow at SW-BF1 was 2,312 cfs on May 16, 2011. Peak flows in subsequent years were estimated to range from 230 to 541 cfs (Whetstone 2015b). Precipitation at the Natural Resource Conservation Service SNOTEL monitoring station at Somsen Ranch in 2011 was 130 percent above average, which contributed to the high peak flow on the Blackfoot River that year. The Somsen Ranch monitoring station is located 7.9 miles north of the Proposed Action.

Two gain-loss studies were also completed on the Blackfoot River as part of the baseline analysis. The studies were performed at stations GLS-BF1 through GLS-BF5 (**Figure 3.3-4**) during the low-flow periods in August 2012 and September 2013 and were intended to evaluate the interaction between surface water and groundwater for the Blackfoot River. The recorded flows at station GLS-BF3 during the gain-loss studies ranged from 29.72 to 29.92 cfs (**Table 3.3-5**). The evaluated reaches are numbered sequentially, moving from upstream to downstream, and are shown on **Figure 3.3-4**. Data from the gain-loss studies indicate that BFR-Reach 1 is a losing segment under baseflow conditions. The results for BFR-Reach 2 through BFR-Reach 4 were indeterminate, indicating that the stream segments demonstrated gained or lost flow depending on the date of the survey. The ambiguity of the results for BFR-Reach 2 through BFR-Reach 4 is most likely related to the accuracy of the measurements, which are estimated to be plus or minus 10 to 20 percent of the total streamflow at any given station. The gain-loss data are not interpreted to indicate that the monitored reaches alternate between gaining and losing conditions during the low-flow period for the river. The measured gains and losses on Blackfoot River represent late summer and fall baseflow conditions, and may not be representative of gains or losses during spring runoff.

Table 3.3-5 Results of Gain-Loss Studies on Blackfoot River

Survey Date	Discharge at GLS-BF3 (cfs)	BFR -Reach 1 (cfs)	BFR -Reach 2 (cfs)	BFR -Reach 3 (cfs)	BFR -Reach 4 (cfs)
August 2012	29.72	-8.90	+5.86	-3.11	-0.94
September 2013	29.92	-3.49	-0.34	+1.60	+6.37

Note:
Positive values indicate gaining sections, negative values indicate losing sections

3.3.1.1.2 Lanes Creek

Lanes Creek is a perennial stream that originates 8.3 miles northeast of the Study Area near Stump Peak and flows northwest from its headwaters for 3.2 miles before turning west and then south through Upper Valley to its confluence with Diamond Creek. Lanes Creek receives flow from numerous tributaries that drain mountainous areas to the east and west of Upper Valley. Sheep Creek and Bacon Creek are named tributaries to Lanes Creek that occur near the Study Area. Lanes Creek is 303(d) listed for sediment/siltation and physical substrate habitat alterations with an approved TMDL for sediment from Chippy Creek to the Blackfoot River (**Figure 3.3-5**) (IDEQ 2005a, 2014c).

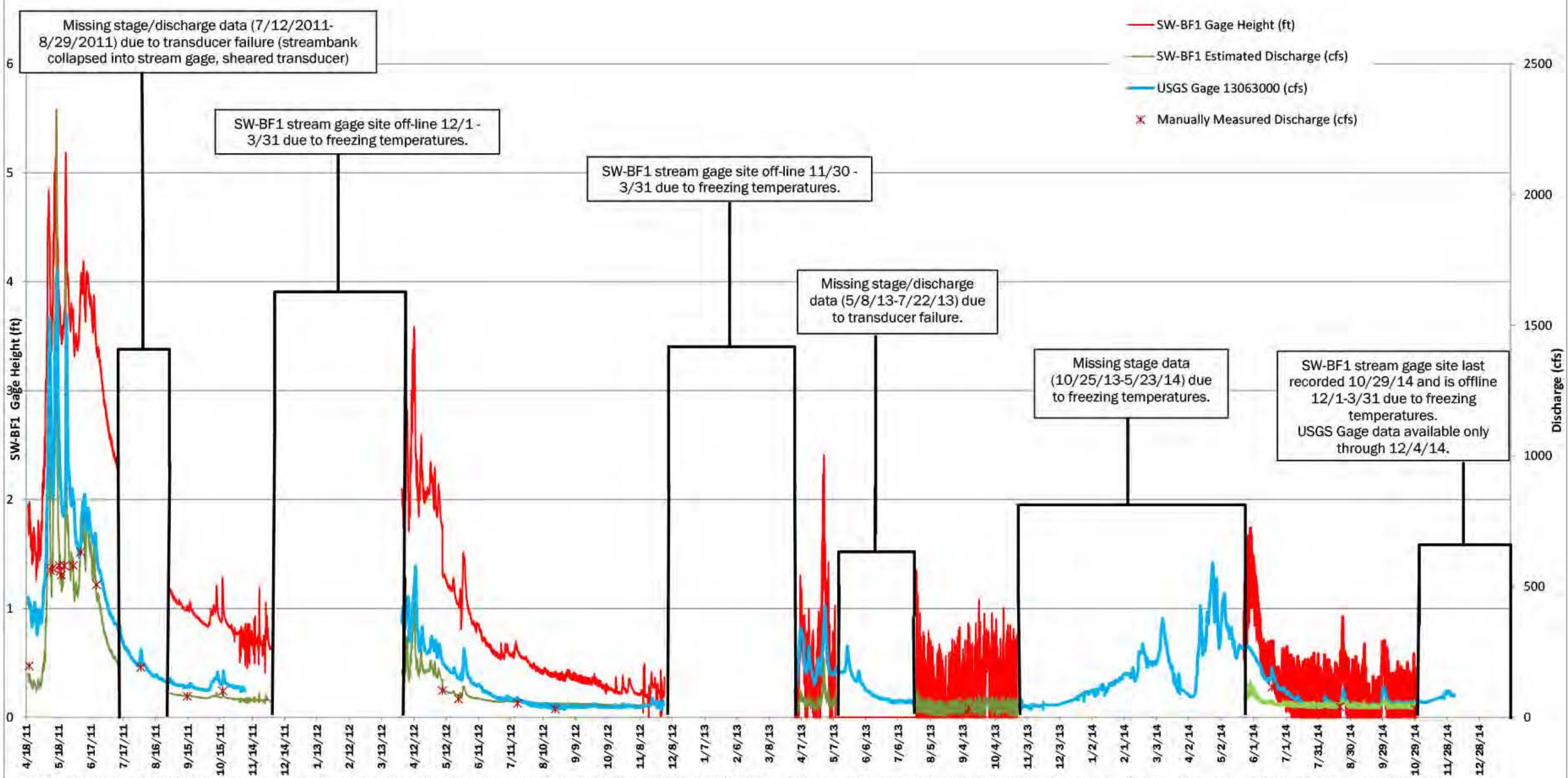
Two monitoring stations were established on Lanes Creek for the Baseline Water Resources Study: SW-LC1 and SW-LC2 (**Figure 3.3-4**). Streamflow and water quality were monitored at these stations. Streamflow in Lanes Creek was also monitored at station GLS-BF1 above its confluence with Diamond Creek on two dates in 2010 as part of the gain-loss studies for Blackfoot River. The measured flows during baseline monitoring ranged from 4 to 133 cfs (Whetstone 2015b).

3.3.1.1.3 Diamond Creek

Diamond Creek is a perennial stream with headwaters located in the valley between Dry Ridge and the Webster Range. Diamond Creek flows northwest from its origin to its confluence with Lanes Creek to form the headwater of the Blackfoot River. Lower Diamond Creek is a 303(d) listed stream for *Escherichia coli*, water temperature, and sediment/siltation, with approved TMDLs for sediment and *Escherichia coli* (**Figure 3.3-5**) (IDEQ 2005a, 2014c).

Streamflow and water quality data for Diamond Creek are available from baseline monitoring station SW-DC1, which is located immediately above the confluence with Lanes Creek (Figure 3.3-4). The measured flows during baseline monitoring have ranged from 8 to 99 cfs (Whetstone 2015b).

Figure 3.3-8 Hydrograph of Blackfoot River Discharge at Diamond Creek Bridge (Station SW-BF1) and Blackfoot Bridge (USGS Station 13063000)



Note: USGS Gage 13063000 data recorded in 15-minute intervals. This data was not available from 11/7/11-11/30/11, and the gage does not record 12/1 to 3/31. Source: http://waterdata.usgs.gov/nwis/uv?site_no=13063000

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3.3.1.1.4 Spring Creek

Spring Creek is a perennial stream tributary to the Blackfoot River 0.4 mile below the Blackfoot River headwater. Spring Creek flows northwest parallel to Diamond Creek, but is located within the Angus Creek-Blackfoot River Sub-Watershed. Spring Creek and lower Spring Creek are 303(d) listed for *Escherichia coli*, selenium, and water temperature (**Figure 3.3-5**) (IDEQ 2005a, 2014c). Spring Creek receives discharge from Mill Canyon Creek. Upper Mill Canyon Creek is a perennial stream that is 303(d) listed for physical substrate habitat alteration, sediment/siltation, and selenium. Lower Mill Canyon Creek is 303(d) listed for selenium.

Streamflow and water quality data for Spring Creek are available from baseline monitoring station SW-SPC1, which is located immediately above the confluence with Lanes Creek (**Figure 3.3-4**). The measured flows during baseline monitoring have ranged from 7 to 107 cfs (Whetstone 2015b).

3.3.1.1.5 Angus Creek

Angus Creek drains Rasmussen Valley west of the Study Area (**Figure 3.3-2**). It flows northwest from its source in Little Long Valley (a small valley in the south-central portion of Wooly Range), curves east, and then flows 600 feet downstream from the project boundary. Upper Angus Creek, from its headwater to Rasmussen Creek, is 303(d) listed for sediment/siltation, water temperature, *Escherichia coli*, physical substrate habitat alterations, and selenium. It has approved TMDLs for sedimentation/siltation and *Escherichia coli*. Lower Angus Creek from Rasmussen Creek to the Blackfoot River is 303(d) listed for sediment/siltation, water temperature, physical substrate habitat alterations, and *Escherichia coli* with an approved TMDL for sedimentation/siltation. Unnamed tributaries to Angus Creek are also 303(d) listed for sedimentation/siltation and *Escherichia coli* with approved TMDL for sedimentation/siltation (**Figure 3.3-5**) (IDEQ 2005a, 2014c).

Three monitoring stations were established on Angus Creek for the Baseline Water Resources Study: SW-AC1, SW-AC2, and SW-AC3 (**Figure 3.3-4**). The stations were used to monitor streamflow and water quality. Measured flows during baseline monitoring ranged from 0.004 cfs to 53 cfs (Whetstone 2015b). Four gain-loss studies were also completed on Angus Creek for the baseline analysis. The studies were performed for two reaches between stations GLS-AC1, GLS-AC2, and GLS-AC3 (**Figure 3.3-4**) during the low-flow periods between August 2010 and September 2013. The gain-loss measurements indicated that Angus Creek is a losing stream below station GLS-AC3 during low-flow conditions (**Table 3.3-6**). The measured gains and losses on Angus Creek represent late summer and fall baseflow conditions, and may not be representative of conditions during spring or early summer.

Table 3.3-6 Results of Gain-Loss Studies on Angus Creek

Survey Date	Discharge at GLS-AC1 (cfs)	AC -Reach 1 (cfs)	AC -Reach 2 (cfs)
August 2010	1.96	-0.69	-0.40
October 2010	0.86	-0.01	-0.06
August 2011	1.93	+0.01	-0.02
August 2012	0.19	-0.08	-0.00
September 2013	0.52	-0.25	-0.09

Note:
Positive values indicate gaining sections, negative values indicate losing sections

3.3.1.1.6 Rasmussen Creek

Rasmussen Creek is tributary to Angus Creek and originates northwest of the Study Area at the divide between Rasmussen Valley and Enoch Valley. Its headwaters are located within the disturbance area of the North Rasmussen Ridge Mine. Rasmussen Creek is 303(d) listed for sedimentation/siltation, selenium, and physical substrate habitat alterations with an approved TMDL for sedimentation/siltation (**Figure 3.3-5**; IDEQ 2005a, 2014c).

Two monitoring stations were established on Rasmussen Creek for the Baseline Water Resources Study: SW-RC1 and SW-RC2 (**Figure 3.3-4**). Measured flows during baseline monitoring ranged from 0.08 to 4 cfs (Whetstone 2015b).

3.3.1.1.7 Unnamed Tributary to Lanes Creek Water Quality

Baseline monitoring station SW-UN1 (**Figure 3.3-4**) is located on an unnamed tributary to Lanes Creek that drains a reclaimed surface disturbance area at the Lanes Creek Mine. The station is used to monitor stream flow and water quality annually. The unnamed tributary has perennial flow in an incised low-gradient meandering channel. Measured flows at SW-UN1 ranged from 0.2 to 4 cfs during baseline monitoring (Whetstone 2015b).

3.3.1.1.8 Intermittent Tributaries

Sixteen baseline monitoring stations were established in intermittent drainages in the Study Area (**Figure 3.3-4**). Most of the drainages are tributary to Angus Creek and occur on the southwest slope of Rasmussen Ridge. The drainages flow seasonally in response to snowmelt and precipitation. Intermittent streams are defined as streams that have no surface flow for at least 1 week during most years (IDAPA 58.01.02). Numerical water quality standards only apply to intermittent waters during periods of optimum flow that are sufficient to support the uses for which the water body is designated. Optimum flow for recreation is defined as being greater than or equal to 5 cfs. Optimum flow for aquatic life is greater than or equal to 1 cfs (IDAPA 58.01.02).

3.3.1.1.9 Springs and Seeps

A total of 14 seeps, springs, and spring complexes were identified in the Study Area during baseline surveys (**Figure 3.3-4**; Whetstone 2015b). Most of the springs occur west of the Study Area in Rasmussen Valley or are located along the banks of Blackfoot River. The springs and seeps are intermittent and flow seasonally with the exceptions of SW-SPRING1 and SW-SPRING3. Spring SW-SPRING1 is perennial and issues from an unnamed drainage in Upper Valley east of the Study Area. The observed flows from the spring have ranged from less than 0.02 to 2 cfs. Spring SW-SPRING3 is perennial and issues from the bank of the Blackfoot River southwest of the Study Area. The observed flows from the spring have ranged from damp with no flow to 0.034 cfs. Springs and seeps identified during the baseline surveys were monitored for flow and water quality (Whetstone 2015b).

3.3.1.2 Chemical Characteristics of Surface Water

3.3.1.2.1 Selenium in the Upper Blackfoot River Watershed

The upper Blackfoot River watershed includes 12 phosphate mining areas, three of which are currently active. Phosphate mine overburden contains selenium, which can be transported into streams by runoff or seepage depending on site-specific conditions. The USGS, in cooperation with BLM, has monitored selenium concentrations in Blackfoot River at station 13063000 since 2001. The station typically operates from April through October of each year and uses an automatic sampler to collect water quality samples based on the stage (height) of the river. Synoptic sampling (i.e., samples collected during a short period of time) at 21 sites on the

Blackfoot River and its tributaries above USGS station 13063000 has also been performed by IDEQ during May of each year since 2001 (Mebane et al. 2015).

Dissolved selenium concentrations in 450 samples collected at USGS station 13063000 between 2001 and 2012 ranged from 0.0005 to 0.0114 mg/L. The State of Idaho CCC of 0.005 mg/L was exceeded in 31 percent of the samples, with 80 percent of the exceedances occurring during May, and 17 and 3 percent of the exceedances occurring during April and June, respectively. No exceedances of the selenium criterion were recorded in months other than April, May, or June. Speciation data from the USGS station indicate that selenate is the dominant form of selenium in surface water (81 percent median value), followed by selenite (19 percent median value), and organic selenium (trace). Dissolved selenium typically accounts for more than 90 percent of the total selenium in the water column (Presser et al. 2004). Selenium concentrations in the Blackfoot River have indicated an increasing upward trend during the low-flow period between August and October during 2001 through 2012, but trends are not obvious for other seasons (Mebane et al. 2015). Trends in selenium during the low-flow period in 2013 and 2014 (additional data from USGS station 1306300 not tracked in Mebane et al. 2015) may indicate a flatter trend than previously reported.

Synoptic sampling by IDEQ during the month of May between 2001 and 2012 indicates that the majority of the selenium load passing the USGS station originates from a single tributary, Mill Canyon Creek (also referred to as East Mill Creek), which enters the Blackfoot River through Spring Creek in the Study Area. Selenium loads in Mill Canyon Creek decrease by about half before reaching the Blackfoot River, suggesting that much of the selenium is at least temporarily removed from the water column through uptake by aquatic vegetation or through losses to sediment. Similar decreases in selenium loads occurred in the main stem Blackfoot River above the USGS station in low-flow years, but not in high-flow years (Mebane et al. 2015).

Selenium concentrations in the upper Blackfoot River watershed tend to correlate positively with streamflow (i.e., high concentrations are typically observed in years with high streamflows). Water years 2006 through 2008 were exceptions to this generalization, which suggests that streamflow is not the only factor controlling selenium concentrations in the river (Mebane et al. 2015). The relationship between streamflow and selenium concentration is also affected by annual patterns of streamflow that tend to have more than one peak. Peak selenium concentrations at the USGS monitoring station have lagged from 2 to 36 days behind peak streamflows for the period of record with a median lag of 14 days. The lag between peak streamflows and peak selenium concentrations was shorter during high-flow years.

3.3.1.2.2 Blackfoot River Water Quality

Baseline monitoring studies completed between April 1, 2010 and December 31, 2014 in the analysis area indicate that water in the Blackfoot River is a well buffered calcium-bicarbonate type water with low to moderate concentrations of total dissolved solids (TDS; 122 to 230 mg/L) and circum-neutral to moderately alkaline pH (6.28 to 8.82 standard units [s.u.]). Water in the river did not meet Idaho Cold-water Aquatic Life Standards for pH (6.5 to 9.0 s.u.) in two of 96 samples collected during baseline monitoring, but generally met all other applicable water quality standards with the exception of total selenium. Total selenium concentrations were equal to or exceeded the Cold-water Aquatic Life CCC of 0.005 mg/L at least four times at all stations (13 of 48 samples). The observed range of total selenium concentrations was 0.00089 to 0.011 mg/L, with the highest concentrations occurring during the spring high-flow period (**Figure 3.3-9**).

Data from USGS monitoring station 13063000 indicate that selenium concentrations in the Blackfoot River are cyclic and generally exceed the CCC of 0.005 mg/L each spring during the peak flow period (**Figure 3.3-10**). This seasonal cycling is likely related to increased seepage and runoff from phosphate mine disturbance areas in the Blackfoot Sub-Basin during spring snowmelt (Whetstone 2009). The USGS station also reported cadmium concentrations that exceeded the CCC of 0.0006 mg/L on three dates during the spring of 2006 and 2007. The elevated cadmium concentrations ranged from 0.00062 to 0.00104 mg/L. Cadmium was not detected during baseline surface water monitoring for Blackfoot River.

Figure 3.3-9 Selenium Concentrations and Discharge for Baseline Monitoring Stations on Blackfoot River

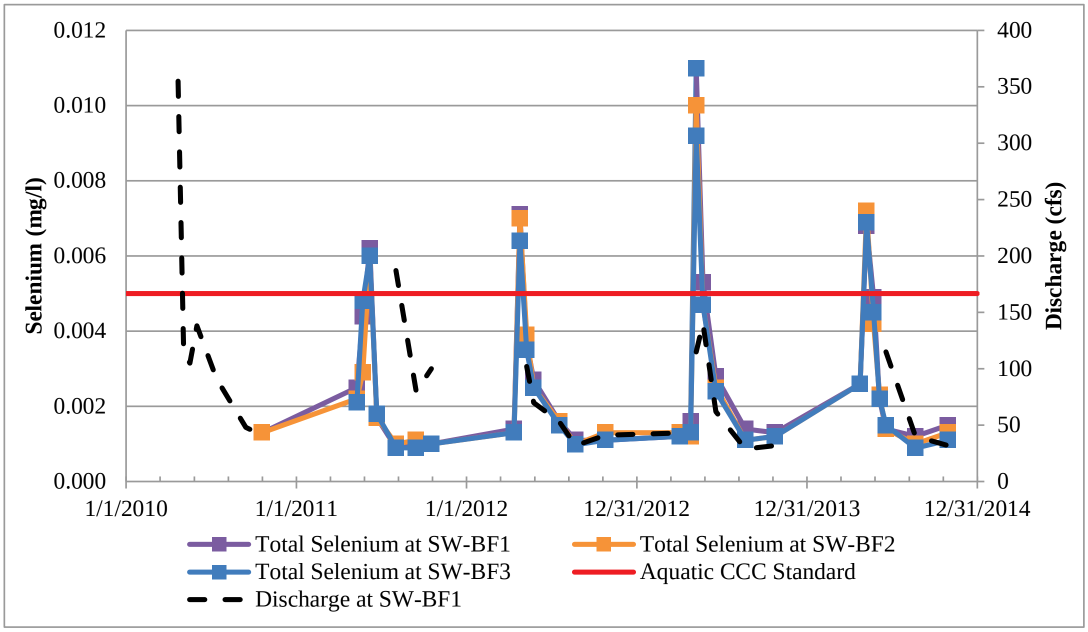
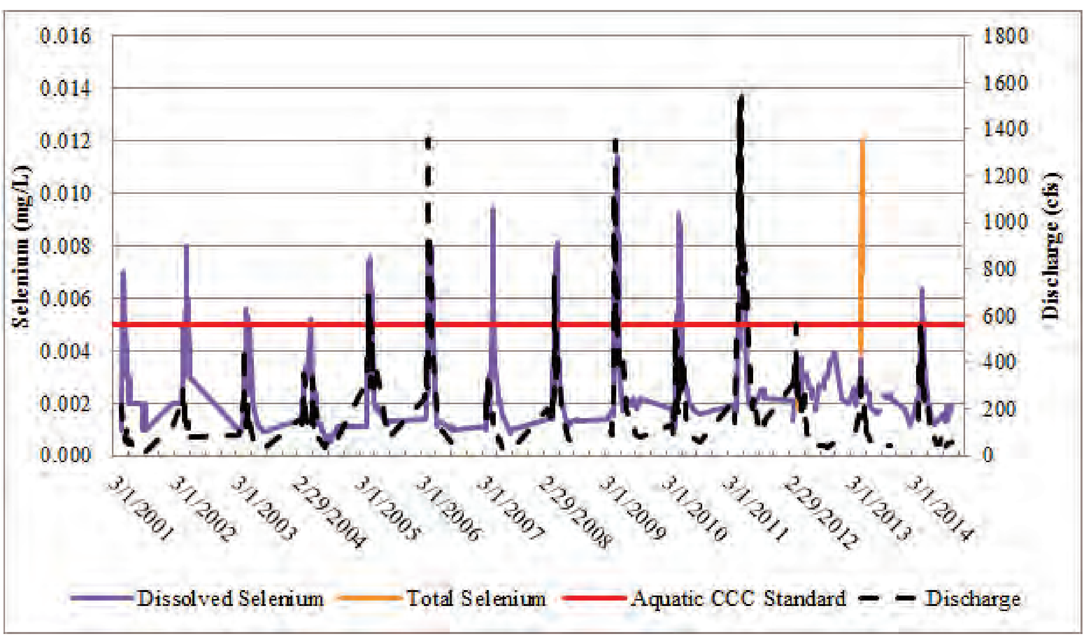


Figure 3.3-10 Selenium Concentrations and Discharge for USGS Monitoring Station 13063000 on Blackfoot River

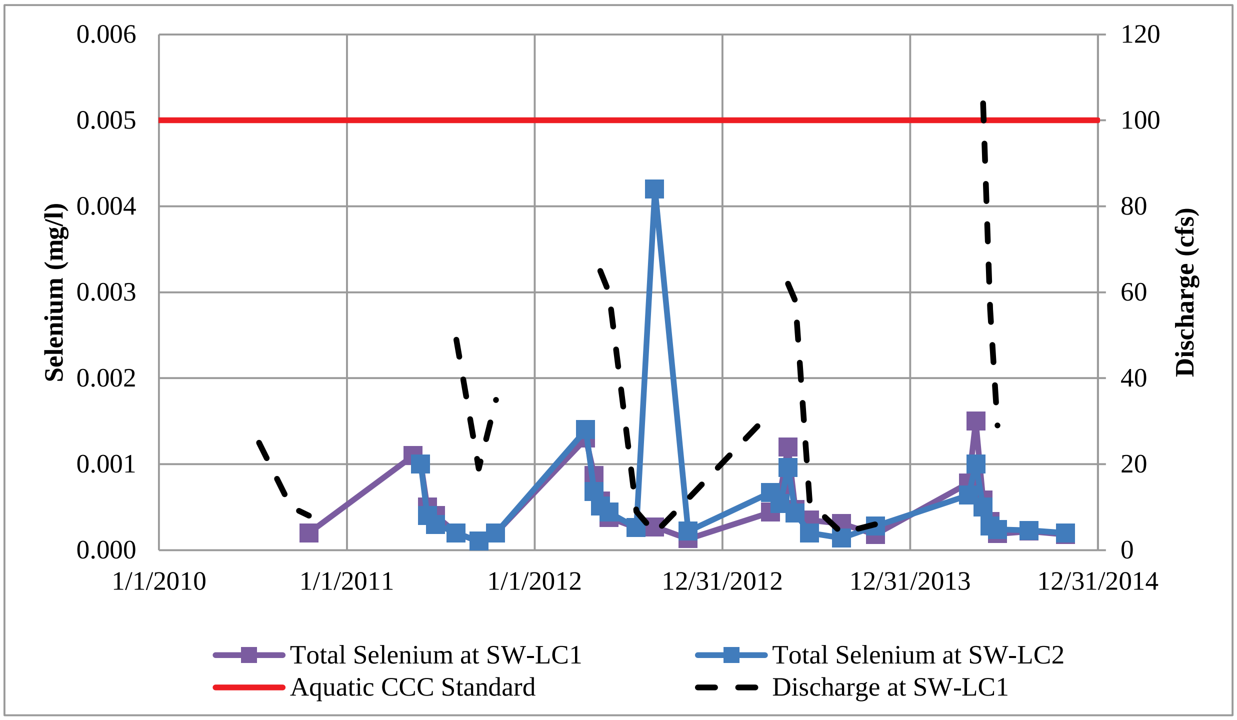


Water quality data for the Blackfoot River above Blackfoot Reservoir are also available from monitoring completed for the TMDL study (Tetra Tech 2002a, 2002b, 2004; IDEQ 2005b, 2005c, 2006, 2007). Reported selenium concentrations of Blackfoot River water from these studies ranged from 0.0001 to 0.012 mg/L. Cadmium concentrations in the river were generally below detection limits, with the exception of one sample that yielded a concentration of 0.0000667 mg/L.

3.3.1.2.3 Lanes Creek Water Quality

Water in Lanes Creek is a well buffered calcium-bicarbonate type water with low to moderate concentrations of TDS (88 to 238 mg/L) and circum-neutral to moderately alkaline pH (7.01 to 8.92 s.u.). Selenium was present at detectable concentrations in most water samples from Lanes Creek. The observed range of total selenium concentrations was less than 0.0001 mg/L to 0.0042 mg/L (**Figure 3.3-11**). Selenium concentrations in Lanes Creek exhibit a pattern of seasonal cycling similar to that of the Blackfoot River.

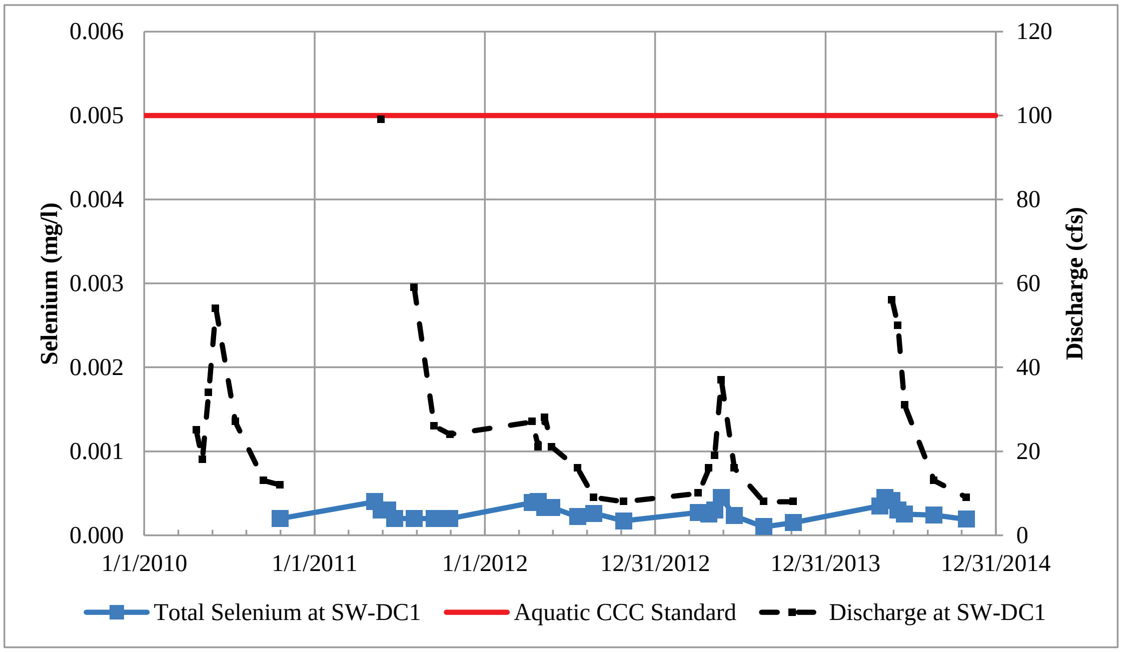
Figure 3.3-11 Selenium Concentrations and Discharge for Baseline Monitoring Stations on Lanes Creek



3.3.1.2.4 Diamond Creek Water Quality

Water in Diamond Creek is a well buffered calcium-bicarbonate type water with low to moderate concentrations of TDS (154 to 210 mg/L) and circum-neutral to alkaline pH (6.37 to 9.24 s.u.). Water in the creek did not meet the Idaho Cold-water Aquatic Life Standard (6.5 to 9.0 s.u.) for pH during one sampling event, but met all other applicable surface water quality standards during baseline monitoring. Selenium was present at detectable concentrations in most water samples from Diamond Creek. The observed range of total selenium concentrations was less than 0.0001 mg/L to 0.00045 mg/L (**Figure 3.3-12**). Selenium concentrations in Diamond Creek exhibit a subdued pattern of seasonal cycling similar to that of the Blackfoot River.

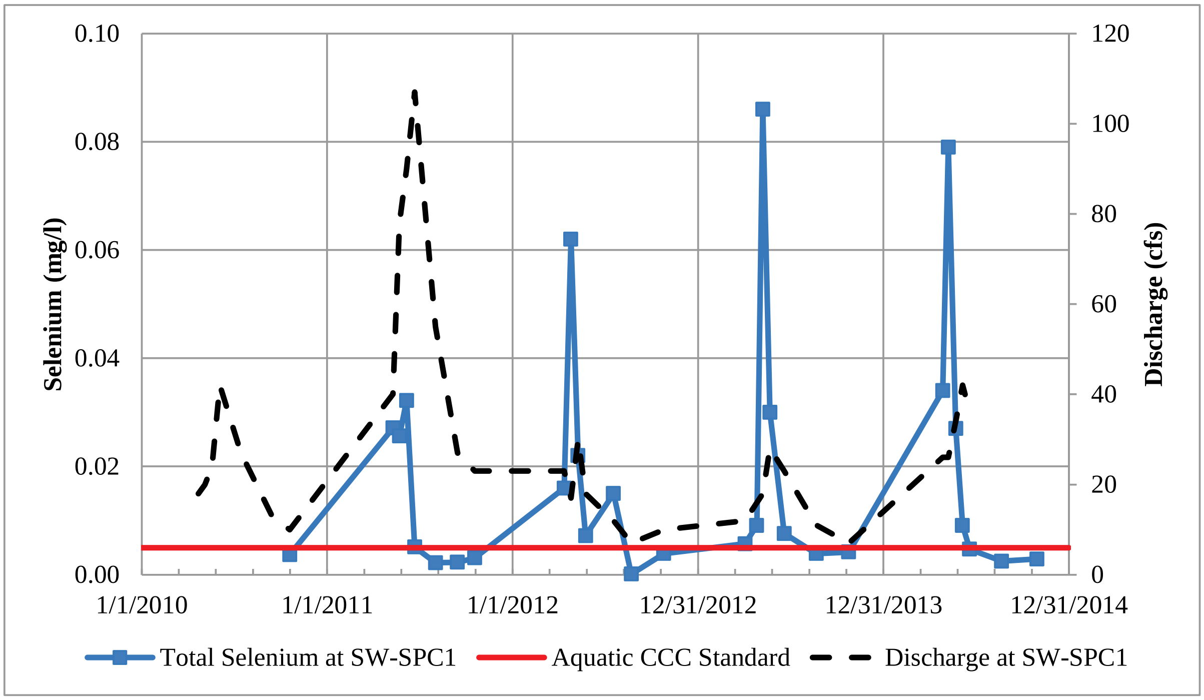
Figure 3.3-12 Total Selenium Concentrations and Discharge, Diamond Creek Baseline Monitoring 2010 to 2014



3.3.1.2.5 Spring Creek Water Quality

Water in Spring Creek is a well buffered calcium-bicarbonate type water with low to moderate concentrations of TDS (180 to 264 mg/L) and circum-neutral to moderately alkaline pH (7.02 to 8.86 s.u.). Water in the creek did not meet the CCC Idaho Cold-water Aquatic Life Standard for total selenium (0.005 mg/L) in 17 of 28 samples, and was detected in 96 percent of the samples collected during the baseline monitoring period. The observed range of total selenium concentrations was less than 0.0001 mg/L to 0.086 mg/L (**Figure 3.3-13**). Selenium concentrations in Spring Creek originate from previous phosphate mining operations in the Mill Creek drainage, which is tributary to Spring Creek and have a pattern of seasonal cycling similar to that of the Blackfoot River.

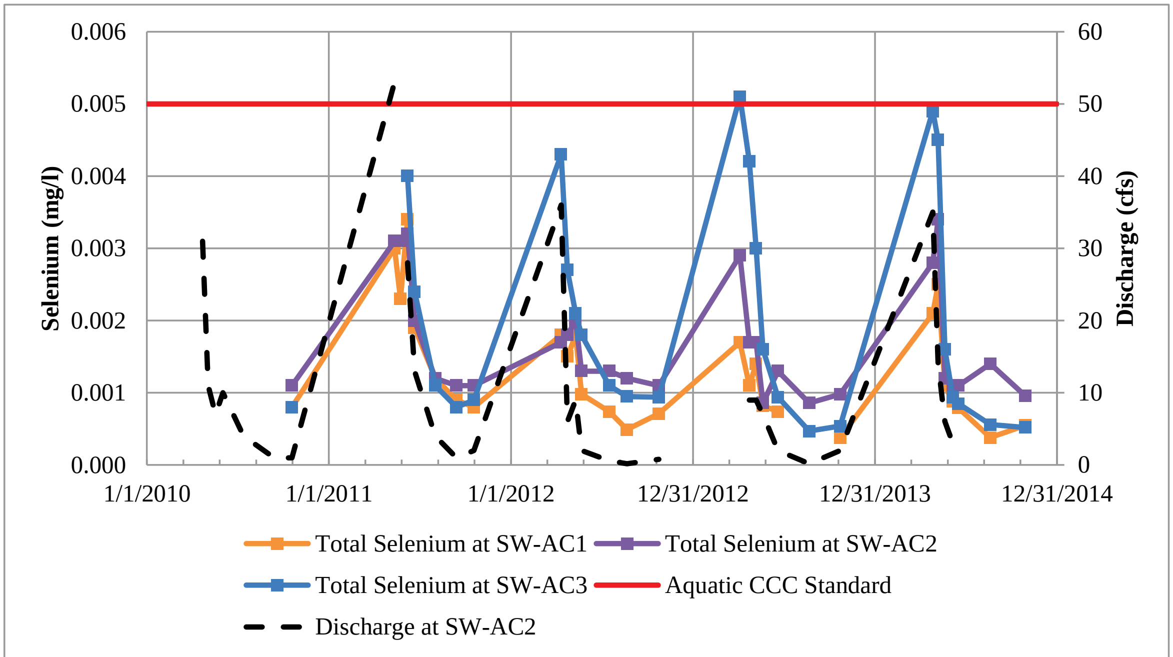
Figure 3.3-13 Selenium Concentrations and Discharge for Baseline Monitoring Stations on Spring Creek



3.3.1.2.6 Angus Creek Water Quality

Baseline monitoring indicates that water in Angus Creek is a well buffered calcium-bicarbonate type water with low to moderate concentrations of TDS (100 to 310 mg/L) and circum-neutral to moderately alkaline pH (6.14 to 8.47 s.u.). Water in Angus Creek met the Idaho Cold-water Aquatic Life Standard for pH (6.5 to 9.0 s.u.) at all stations during the baseline monitoring period with the exception of one sample from SW-AC2 on May 24, 2011 that exhibited a pH of 6.14 s.u. Selenium concentrations in Angus Creek were generally below the CCC with the exception of one sample (**Figure 3.3-14**). The observed range of total selenium concentrations in Angus Creek was less than 0.00038 mg/L to 0.0051 mg/L. Selenium concentrations in Angus Creek exhibit a pattern of seasonal cycling similar to that of the Blackfoot River. All other analyses for samples collected from Angus Creek met applicable surface water standards.

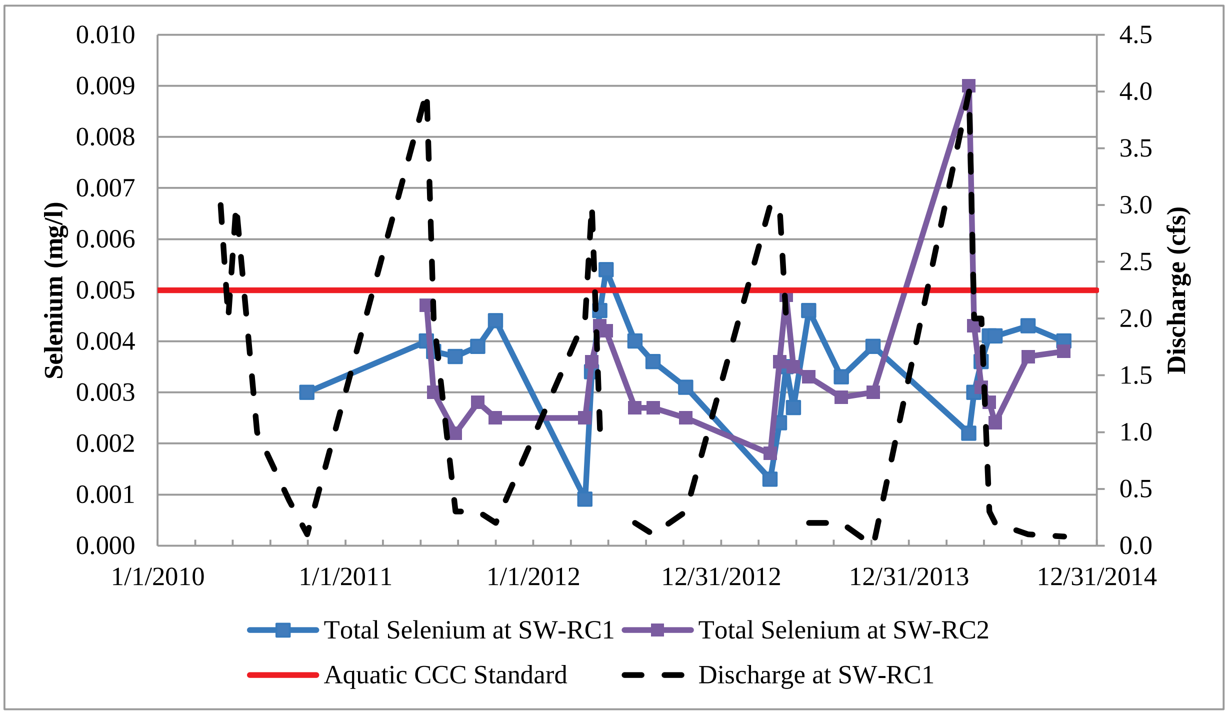
Figure 3.3-14 Selenium Concentrations and Discharge for Baseline Monitoring Stations on Angus Creek



3.3.1.2.7 Rasmussen Creek Water Quality

Baseline monitoring indicates that water in Rasmussen Creek is a moderately buffered, calcium-bicarbonate to calcium-sulfate type water with low to moderate concentrations of TDS (97 to 338 mg/L) and circum-neutral to moderately alkaline pH (6.24 to 8.67 s.u.). Water in Rasmussen Creek generally met the applicable Idaho Cold-water Aquatic Life Standard for pH (6.5 to 9.0 s.u.) with the exception of the June sampling event in 2013 when the measured value was 6.24 s.u. Selenium (0.0054 mg/L), and thallium (0.0003 mg/L) exceeded their applicable standards (the selenium CCC is 0.005 mg/L, the thallium aquatic standard for human health, water, and organisms is 0.00024 mg/L) at SW-RC1 on one date each during the baseline monitoring period. Selenium concentrations in Rasmussen Creek exhibit a pattern of seasonal cycling similar to that of the Blackfoot River (**Figure 3.3-15**), but peak concentrations do not correspond as closely to the peak flows.

Figure 3.3-15 Selenium Concentrations and Discharge for Baseline Monitoring Stations on Rasmussen Creek



3.3.1.2.8 Unnamed Tributary to Lanes Creek Water Quality

Baseline monitoring indicates that the unnamed tributary to Lanes Creek at station SW-UN1 contains well buffered calcium-bicarbonate type water with low concentrations of TDS (100 to 214 mg/L) and pH between 7.25 and 8.88. Water quality in the unnamed tributary met all applicable water quality standards during baseline monitoring events.

3.3.1.2.9 Intermittent Stream Water Quality

Baseline monitoring of 16 stations located on intermittent streams in the Study Area indicates that water quality in the drainages usually meets applicable water quality standards for all parameters, with sporadic exceptions for pH, arsenic, cadmium, copper, lead, and selenium. Summaries of baseline monitoring results that are equal to or exceed their applicable standards are presented in **Table 3.3-7** and **Table 3.3-8**.

3.3.1.2.10 Spring Water Quality

Baseline monitoring indicates that the water quality of seeps and springs in the Study Area usually meets potentially applicable water quality standards, with sporadic exceptions for pH, lead, selenium, thallium, and zinc. Summaries of baseline monitoring results that are equal to or exceed their applicable standards are presented in **Table 3.3-9** and **Table 3.3-10**.

3.3.2 Groundwater Resources

3.3.2.1 Hydrogeologic Setting

Patterns of groundwater movement in the Southeast Idaho Phosphate District are controlled by flow from areas of recharge at higher elevations to areas of discharge at lower elevations. This flow occurs in local-, intermediate-, and regional-scale systems defined by topography, geology, and the continuity of the water-bearing units. With the exceptions of basalt, and the Meade Peak and Cherty Shale Members of the Phosphoria Formation, all geologic units at Rasmussen Valley are aquifers that host groundwater flow systems. Aquifers are defined as porous and permeable geologic strata that transmit groundwater in economically usable quantities. The Meade Peak and Cherty Shale Members typically have low permeability, and are considered to be aquitards (leaky barriers to groundwater flow) except where faulted or fractured (Ralston et al. 1977; Winter 1980). Basalt is unsaturated where it was encountered during drilling of monitoring wells within the Study Area.

3.3.2.1.1 Regional-scale Groundwater Flow System in the Grandeur Tongue and Wells Formation

The Grandeur Tongue and Wells Formation form a regionally extensive aquifer (Wells Regional Aquifer) that participates in inter-basin transfers of groundwater (Ralston et al. 1977, 1983; Winter 1980). Regional aquifers are characterized by long flow paths, inter-basinal flow, and large springs with nearly constant annual discharges. They contain large quantities of groundwater and are typically hosted by thick, aerially extensive formations that have relatively high permeability. Groundwater in the Wells Regional Aquifer may be confined or unconfined depending on location. The aquifer is typically confined where capped by the Meade Peak aquitard and unconfined in areas of surface outcrop. A confined aquifer has a water level that will rise above the top of the aquifer where tapped by a well. An unconfined aquifer is characterized by a water level that is below the top of the aquifer and is open to the atmosphere through the overlying permeable material. As shown on **Figure 3.3-16**, groundwater flow in the Wells Regional Aquifer near the Study Area is generally northwest from recharge areas along the ridge of the Snowdrift Anticline toward discharge areas at the Enoch Valley Sinkhole (Arcadis 2013; Ralston et al. 1983). The Enoch Valley Sinkhole is situated on the trace of the Enoch Valley Fault, but there are other high-discharge springs northwest of the Study Area, including the Henry spring complex, that are also potential discharge areas for the site.

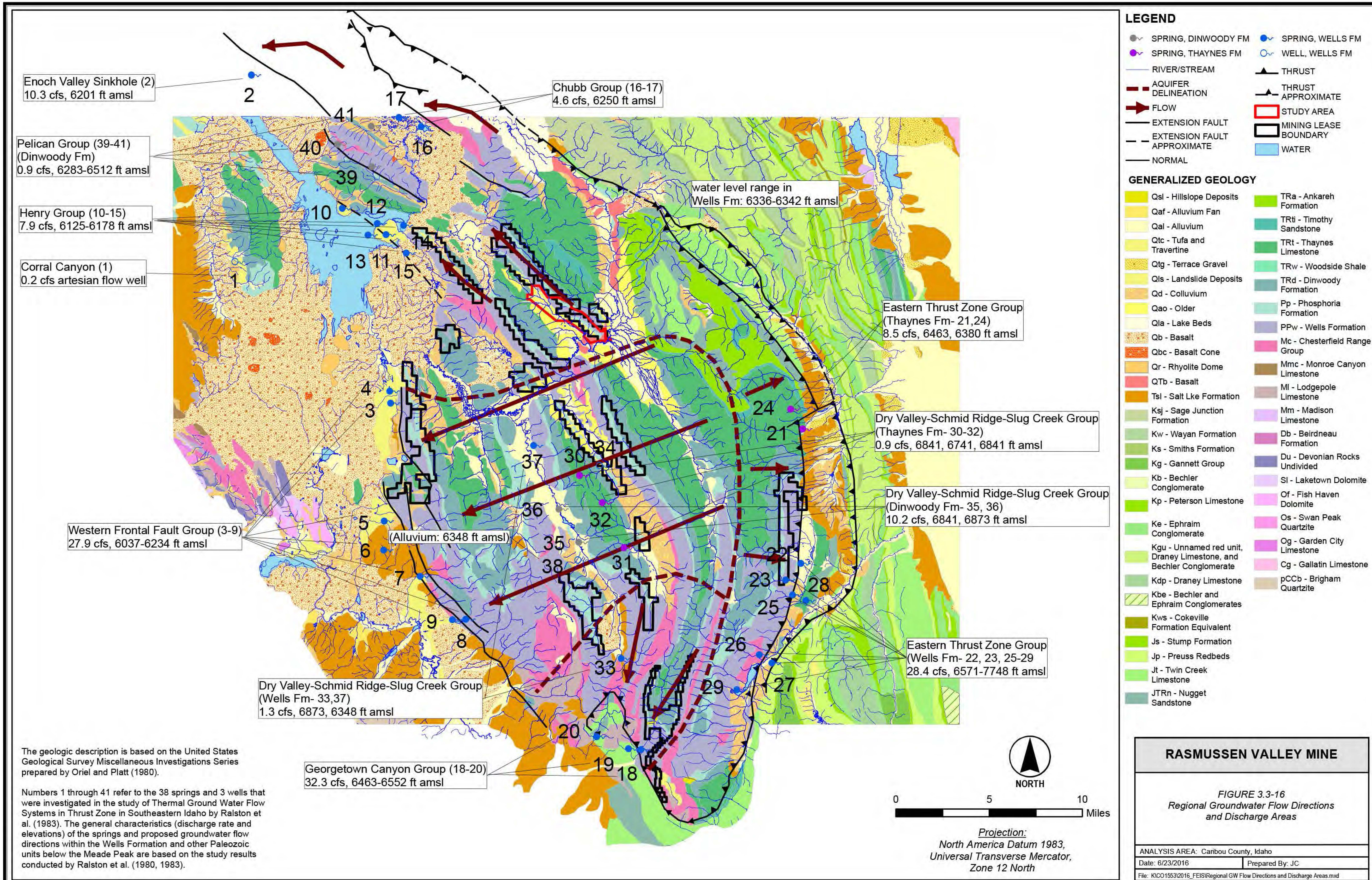


FIGURE 3.3-16
Regional Groundwater Flow Directions and Discharge Areas

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Table 3.3-7 Ranges of Concentrations for Constituents Exceeding Potentially Applicable Water Quality Standards in Intermittent Streams during Baseline Monitoring

Station	pH[1] (s.u.)			Arsenic[2] (mg/L)			Cadmium[3] (mg/L)			Copper[4] (mg/L)			Lead[5] (mg/L)			Selenium[6] (mg/L)		
	[7]	Low	High	[7]	low	high	[7]	low	high	[7]	low	high	[7]	low	high	[7]	low	high
SW-INT1	27	7.19	8.58	28	<0.0005	0.0011	28	<0.0001	0.0002	28	<0.0005	0.0029	28	<0.0001	0.00063	23	<0.0001	**0.011**
SW-INT1W	27	7.4	8.34	27	<0.0005	0.0011	27	<0.0001	0.0002	27	<0.0005	0.0011	27	<0.0001	0.0006	26	<0.0001	**0.0075**
SW-INT2	14	6.64	7.82	15	<0.0005	0.00064	15	<0.0001	<0.0001	15	<0.0005	0.0013	15	<0.0001	0.0005	12	<0.0001	0.00078
SW-INT3	19	6.68	8.54	20	0.0005	0.0019	20	<0.0001	0.00059	20	0.00051	0.0039	20	<0.0001	0.00064	16	0.00059	0.0027
SW-INT4	1	6.75	6.75	1	0.0010	0.0010	1	**0.0006**	**0.0006**	1	0.0026	0.0026	1	0.0004	0.0004	1	---	---
SW-INT4S	16	**5.73**	7.95	18	<0.0005	0.0013	18	<0.0001	0.00034	18	<0.0005	0.004	18	<0.0001	0.00082	14	0.0017	0.0029
SW-INT4X2	0	--	--	1	0.0024	0.0024	1	0.0005	0.0005	1	0.0023	0.0023	1	0.0002	0.0002	0	---	---
SW-INT4X3	22	**5.62**	**10.79**	25	0.0006	**0.022**	25	<0.0001	**0.0018**	25	<0.0005	**0.015**	25	<0.0001	**0.0043**	23	0.0013	0.0042
SW-INT6L	15	6.67	8.02	17	<0.0005	0.0021	17	<0.0001	0.0002	17	<0.0005	0.0019	17	<0.0001	0.0004	14	0.0002	0.00066
SW-INT8S	5	6.74	7.93	7	<0.0005	0.00073	7	<0.0001	<0.0001	7	0.0009	0.003	7	<0.0001	0.00096	4	<0.0001	0.0011
SW-INT9	2	7.40	7.46	2	<0.0005	0.0012	2	0.0001	0.0002	2	0.0009	0.0025	2	<0.0001	0.0002	1	0.0028	0.0028
SW-INT9X2	22	7.05	**9.31**	22	0.0005	0.0020	22	<0.0001	0.00029	22	<0.0005	0.004	22	<0.0001	0.0007	20	0.0005	**0.0067**
SW-INT10	26	**6.50**	**10.24**	26	0.0012	**0.013**	26	<0.0001	**0.0016**	26	0.0017	0.007	26	<0.0001	0.00054	26	0.0013	**0.0066**
SW-INT11	23	**6.13**	**10.74**	24	<0.0005	0.0078	24	<0.0001	0.00047	24	0.0014	0.0084	24	<0.0001	0.0019	24	0.0007	**0.0210**
SW-INT12	17	**6.42**	**9.45**	17	0.00086	**0.012**	17	<0.0001	0.0002	17	0.0017	0.0034	17	<0.0001	0.0019	17	0.00023	0.0015
SW-INT13	15	**5.77**	**9.20**	15	0.00059	**0.0114**	15	<0.0001	0.0005	15	0.0021	0.0046	15	<0.0001	0.0006	15	0.0003	0.0017
SW-INT14	6	6.62	7.84	6	<0.0005	0.00096	6	0.0002	0.00036	6	0.0012	0.0036	6	<0.0001	0.00068	6	0.0004	0.0013
SW-INT15	12	6.55	7.62	13	0.0005	0.0011	13	0.0002	0.0006	13	0.0012	0.0028	13	<0.0001	0.0004	13	0.0006	0.0035
SW-INT16	2	6.92	8.09	2	0.00064	0.00069	2	<0.0001	<0.0001	2	0.00094	0.0012	2	<0.0001	0.0003	2	<0.0001	<0.0001

Notes:

1 pH - numerical surface water standard is the range between 6.5 and 9.0

2 Dissolved arsenic - lowest numerical surface water standard is the human health-based criterion for consumption of water and organisms, 0.010 mg/L

3 Dissolved cadmium - lowest numerical surface water standard is the Idaho cold-water biota CCC, 0.0006 mg/L based on a hardness of 100 $CaCO_3$ mg/L and water effect ratio of 1

4 Dissolved copper - lowest numerical surface water standard is the Idaho cold-water biota CCC, 0.011 mg/L based on a hardness of 100 $CaCO_3$ mg/L and water effect ratio of 1

5 Dissolved lead - lowest numerical surface water standard for lead is the Idaho cold-water biota CCC, 0.0025 mg/L based on a hardness of 100 $CaCO_3$ mg/L and water effect ratio of 1

6 Total selenium - lowest numerical surface water standard is the Idaho cold-water biota CCC, 0.005 mg/L

7 The first column under each constituent lists the number of samples from that station

Table 3.3-8 Percentages of Samples Exceeding Potentially Applicable Water Quality Standards in Intermittent Streams during Baseline Monitoring

Station	pH		Arsenic		Cadmium		Copper		Lead		Selenium	
	Number of samples	Percent Meets or Exceeds Standard	Number of samples	Percent Meets or Exceeds Standard	Number of samples	Percent Meets or Exceeds Standard	Number of samples	Percent Meets or Exceeds Standard	Number of samples	Percent Meets or Exceeds Standard	Number of samples	Percent Meets or Exceeds Standard
SW-INT1	27	0.0	28	0.0	28	0.0	28	0.0	28	0.0	23	4.3
SW-INT1W	27	0.0	27	0.0	27	0.0	27	0.0	27	0.0	26	3.8
SW-INT2	14	0.0	15	0.0	15	0.0	15	0.0	15	0.0	12	0.0
SW-INT3	19	0.0	20	0.0	20	0.0	20	0.0	20	0.0	16	0.0
SW-INT4	1	0.0	1	0.0	1	100.0	1	0.0	1	0.0	1	0.0
SW-INT4S	16	6.2	18	0.0	18	0.0	18	0.0	18	0.0	14	0.0
SW-INT4X2	0	0.0	1	0.0	1	0.0	1	0.0	1	0.0	0	0.0
SW-INT4X3	22	40.9	25	20.0	25	16.0	25	4.0	25	4.0	23	0.0
SW-INT6L	15	0.0	17	0.0	17	0.0	17	0.0	17	0.0	14	0.0
SW-INT8S	5	0.0	7	0.0	7	0.0	7	0.0	7	0.0	4	0.0
SW-INT9	2	0.0	2	0.0	2	0.0	2	0.0	2	0.0	1	0.0
SW-INT9X2	22	4.5	22	0.0	22	0.0	22	0.0	22	0.0	20	5.0
SW-INT10	26	15.4	26	3.8	26	57.7	26	0.0	26	0.0	26	7.7
SW-INT11	23	30.4	24	0.0	24	0.0	24	0.0	24	0.0	24	4.2
SW-INT12	17	11.8	17	11.8	17	0.0	17	0.0	17	0.0	17	0.0
SW-INT13	15	26.7	15	6.7	15	0.0	15	0.0	15	0.0	15	0.0
SW-INT14	6	0.0	6	0.0	6	0.0	6	0.0	6	0.0	6	0.0
SW-INT15	12	0.0	13	0.0	13	0.0	13	0.0	13	0.0	13	0.0
SW-INT16	2	0.0	2	0.0	2	0.0	2	0.0	2	0.0	2	0.0

Table 3.3-9 Ranges of Concentrations for Constituents Exceeding Potentially Applicable Water Quality Standards in Springs during Baseline Monitoring

Station	pH (field)[1] (s.u.)		Lead[2] (mg/L)		Selenium[3] (mg/L)		Thallium[4] (mg/L)		Zinc[5] (mg/L)	
	low	High	low	high	low	high	low	high	low	high
SW-SPRING1	**6.18**	8.56	<0.0001	0.0009	0.0003	0.00054	<0.0001	<0.0001	<0.0028	0.021
SW-SPRING2	**6.48**	7.70	<0.0001	0.0002	0.0009	**0.031**	<0.0001	<0.0001	<0.0028	0.01
SW-SPRING3	**6.15**	8.72	<0.0001	**0.0257**	<0.0001	0.00042	<0.0001	<0.0001	<0.0028	**0.15**
SW-SPRING4	**5.63**	7.37	<0.0001	0.00067	<0.0001	0.0017	<0.0001	<0.0001	<0.0028	0.01
SW-SPRING5	6.67	8.59	<0.0001	0.0003	0.00015	0.001	<0.0001	<0.0001	<0.0028	0.02
SW-SPRING6	7.05	8.69	<0.0001	0.0003	0.00016	0.00062	<0.0001	**0.0003**	<0.0028	0.01
SW-SPRING7	6.55	8.02	<0.0001	0.00034	0.00014	0.00054	<0.0001	<0.0001	<0.0028	0.0037
SW-SPRING8	6.60	7.99	<0.0001	0.00026	<0.0001	0.00032	<0.0001	<0.0001	<0.0028	0.0032
SW-SPRING9	6.73	7.68	<0.0001	<0.0001	<0.0001	0.00021	<0.0001	<0.0001	<0.0028	0.0043
SW-SPRING10	6.65	7.01	<0.0001	0.00013	0.00014	0.00075	<0.0001	<0.0001	<0.0028	<0.0028
SW-SPRING11	7.31	8.12	<0.0001	<0.0001	<0.0001	0.00035	<0.0001	<0.0001	<0.0028	0.0038
SW-SPRING12	6.96	7.75	<0.0001	0.0007	0.00011	0.00063	<0.0001	<0.0001	<0.0028	**0.66**
SW-SPRING13	7.49	8.27	<0.0001	<0.0001	<0.0001	0.00023	<0.0001	<0.0001	<0.0028	0.0042
SW-SPRING14	7.77	7.88	<0.0001	<0.0001	0.0003	0.0017	<0.0001	<0.0001	<0.0028	0.0057

Notes:

1 pH - numerical surface water standard is the range between 6.5 and 9.0

2 Dissolved lead - lowest numerical surface water standard is the Idaho cold-water biota CCC, 0.0025 mg/L based on a hardness of 100 $CaCO_3$ mg/L and water effect ratio of 1

3 Total selenium - lowest numerical surface water standard is the Idaho cold-water biota CCC, 0.005 mg/L

4 Dissolved thallium - lowest numerical surface water standard is the human health-based criterion for consumption of water and organisms, 0.00024 mg/L

5 Dissolved zinc - lowest numerical surface water standard is the Idaho cold-water biota CCC, 0.120 mg/L based on a hardness of 100 $CaCO_3$ mg/L and water effect ratio of 1

Table 3.3-10 Percentages of Samples Exceeding Potentially Applicable Water Quality Standards in Springs during Baseline Monitoring

Station	pH		Lead		Selenium		Thallium		Zinc	
	Number of samples	Percent Meets or Exceeds Standard	Number of samples	Percent Meets or Exceeds Standard	Number of samples	Percent Meets or Exceeds Standard	Number of samples	Percent Meets or Exceeds Standard	Number of samples	Percent Meets or Exceeds Standard
SW-SPRING1	32	6.3%	32	0.0%	29	0.0%	32	0.0%	32	0.0%
SW-SPRING2	11	9.1%	12	0.0%	12	16.7%	12	0.0%	12	0.0%
SW-SPRING3	24	8.3%	27	3.7%	27	0.0%	27	0.0%	27	3.7%
SW-SPRING4	10	40.0%	13	0.0%	13	0.0%	13	0.0%	13	0.0%
SW-SPRING5	20	0.0%	20	0.0%	20	0.0%	20	0.0%	20	0.0%
SW-SPRING6	14	0.0%	14	0.0%	14	0.0%	14	7.1%	14	0.0%
SW-SPRING7	8	0.0%	9	0.0%	9	0.0%	9	0.0%	9	0.0%
SW-SPRING8	8	0.0%	8	0.0%	8	0.0%	8	0.0%	8	0.0%
SW-SPRING9	9	0.0%	9	0.0%	9	0.0%	9	0.0%	9	0.0%
SW-SPRING10	2	0.0%	2	0.0%	2	0.0%	2	0.0%	2	0.0%
SW-SPRING11	10	0.0%	10	0.0%	10	0.0%	10	0.0%	10	0.0%
SW-SPRING12	9	0.0%	9	0.0%	9	0.0%	9	0.0%	9	11.1%
SW-SPRING13	10	0.0%	10	0.0%	10	0.0%	10	0.0%	10	0.0%
SW-SPRING14	2	0.0%	2	0.0%	2	0.0%	2	0.0%	2	0.0%

3.3.2.1.2 Intermediate-Scale Groundwater Flow Systems

The Dinwoody Formation and the Rex Chert host intermediate-scale aquifers within the Study Area. Intermediate-scale aquifers recharge and discharge within the same basin and have the capacity to store and transmit appreciable amounts of groundwater to adjacent geologic formations, springs, and surface water bodies (Cannon and Ralston 1980; Ralston et al. 1983). The intermediate flow system in the Dinwoody Formation may be separated from the Rex Chert by the Cherty Shale, which acts as an aquitard where the unit is well developed and not fractured. Groundwater flow within the Study Area in intermediate-scale aquifers is generally southwest, following bedding and topography away from outcrop recharge areas adjacent and parallel to the axis of the Snowdrift Anticline. Groundwater flow in the intermediate flow systems is expected to be downdip towards the Enoch Valley Fault (**Figure 3.3-17**). In addition, there are minor faults present within the Study Area that could provide localized hydraulic connections between intermediate- and regional-scale flow systems.

3.3.2.1.3 Local-Scale Groundwater Flow Systems

Within the Study Area, local-scale groundwater flow systems are relatively shallow and are generally located in Quaternary alluvium and colluvium deposits. A local groundwater flow system is typically characterized by short flow paths and with relatively small quantities of water in storage. The groundwater in the local-scale systems is usually unconfined and flows from higher elevations to lower elevations. Specifically, local groundwater flows from the ridge crest of the Snowdrift Anticline towards Angus Creek and to the northeast within the Study Area. Local-scale groundwater flows primarily in the lateral directions due to the associated anisotropy in hydraulic conductivity (i.e., lateral hydraulic conductivity much greater than vertical hydraulic conductivity) within aquifers. There is likely minor leakage between local- and intermediate-scale groundwater flow systems within the Study Area.

3.3.2.1.4 Groundwater Recharge

Recharge to groundwater occurs by infiltration of precipitation in topographically high areas. Precipitation in the region occurs primarily as snow, with the greatest accumulations occurring on east sides of the ridges (Ralston et al. 1977). West-facing slopes and valley floors receive less snow or have the snow blown off the slopes or lost through sublimation, and have lower recharge potentials than east-facing slopes. Infiltration of precipitation and snowmelt along the crest and slopes of Rasmussen Ridge plays a key role in recharging aquifer systems in the Study Area. The estimated average recharge for the Study Area, based on the average annual precipitation of 23.41 inches (Whetstone 2014), is 2.6 inches per year (i.e., 11 percent of annual precipitation). Estimated average recharge values for groundwater in the Southeast Idaho Phosphate District as a function of precipitation are summarized in **Table 3.3-11** (Buck and Mayo 2004).

Table 3.3-11 Estimated Recharge to Groundwater in Southeast Idaho

Annual Precipitation	Percent Recharge
0 to 12 in/yr	0
12 to 16 in/yr	4
16 to 20 in/yr	7
20 to 25 in/yr	11
25 to 30 in/yr	14
30 to 35 in/yr	18
> 35 in/yr	21

Source: Buck and Mayo 2004

Recharge to groundwater in the Study Area may also occur by leakage from streams. Although the results of the gain-loss studies on the Blackfoot River were inconclusive, the elevation of the river where it crosses the southern portion of the Study Area is approximately 6,430 feet, which is about 100 feet higher than the water level in the Wells Regional Aquifer at approximately 6,333 feet. Gain-loss studies for Angus Creek indicate that it is a losing stream during the low-flow season when it provides recharge to the underlying alluvial aquifer.

3.3.2.2 Groundwater Data

Groundwater data for the region are available from reports, maps, and databases prepared by the USGS, the Idaho Department of Water Resources (IDWR), and other public domain sources. These data are supplemented by a site-specific groundwater investigation completed under the direction of the Agencies (Whetstone 2015b). The baseline groundwater investigation for the Study Area included:

- Installation of 20 wells and 11 vibrating wire piezometers (VWPs) within the Study Area
- Quarterly monitoring (spring through fall) of groundwater levels and water quality, starting April 1, 2012 and extending through December 31, 2014
- Single-well permeability tests (pneumatic slug, and pump and recovery tests) in 13 monitoring wells
- An aquifer test in the Wells Regional Aquifer near the southeastern end of the proposed pit

A list of wells and VWPs installed for baseline monitoring is presented in **Table 3.3-12**. Construction details for monitoring wells and VWPs are presented in **Table 3.3-13** and **Table 3.3-14**. Locations of baseline monitoring wells and VWPs are shown on **Figure 3.3-17**.

3.3.2.2.1 Hydrologic Characteristics of Bedrock and Unconsolidated Deposits

Hydraulic conductivity, transmissivity, and storage data for bedrock and unconsolidated deposits in the Study Area were obtained from an aquifer test in the Wells Regional Aquifer and permeability tests performed in 13 wells. Additional hydrogeologic data for the project were also evaluated from studies at other phosphate mines in the region. Hydraulic conductivity (K) is the permeability of a rock mass or unconsolidated deposit with respect to water. It is reported in units of distance over time (i.e., feet per day [ft/day]). Transmissivity (T) is the rate at which water can be transmitted through a unit width of an aquifer under a unit hydraulic gradient and is equal to hydraulic conductivity multiplied by the thickness (b) of the aquifer (i.e., T=Kb in units of length squared over time [ft^2/day]). Storage is a dimensionless value that is defined as the volume of water an aquifer releases or takes into storage per unit surface area of the aquifer for a unit change in head. In a confined aquifer, storage values (storativity [S]) are typically small (0.005 to 0.00005), and changes in storage are controlled by the expansion and contraction of the water and the mineral skeleton (i.e. aquifer solids) (Freeze and Cherry 1979). Storage values for unconfined aquifers (specific yield [Sy]) are typically much larger than those for confined aquifers (0.3 to 0.01) and reflect filling or dewatering of pore spaces as the water table rises or falls (Freeze and Cherry 1979).

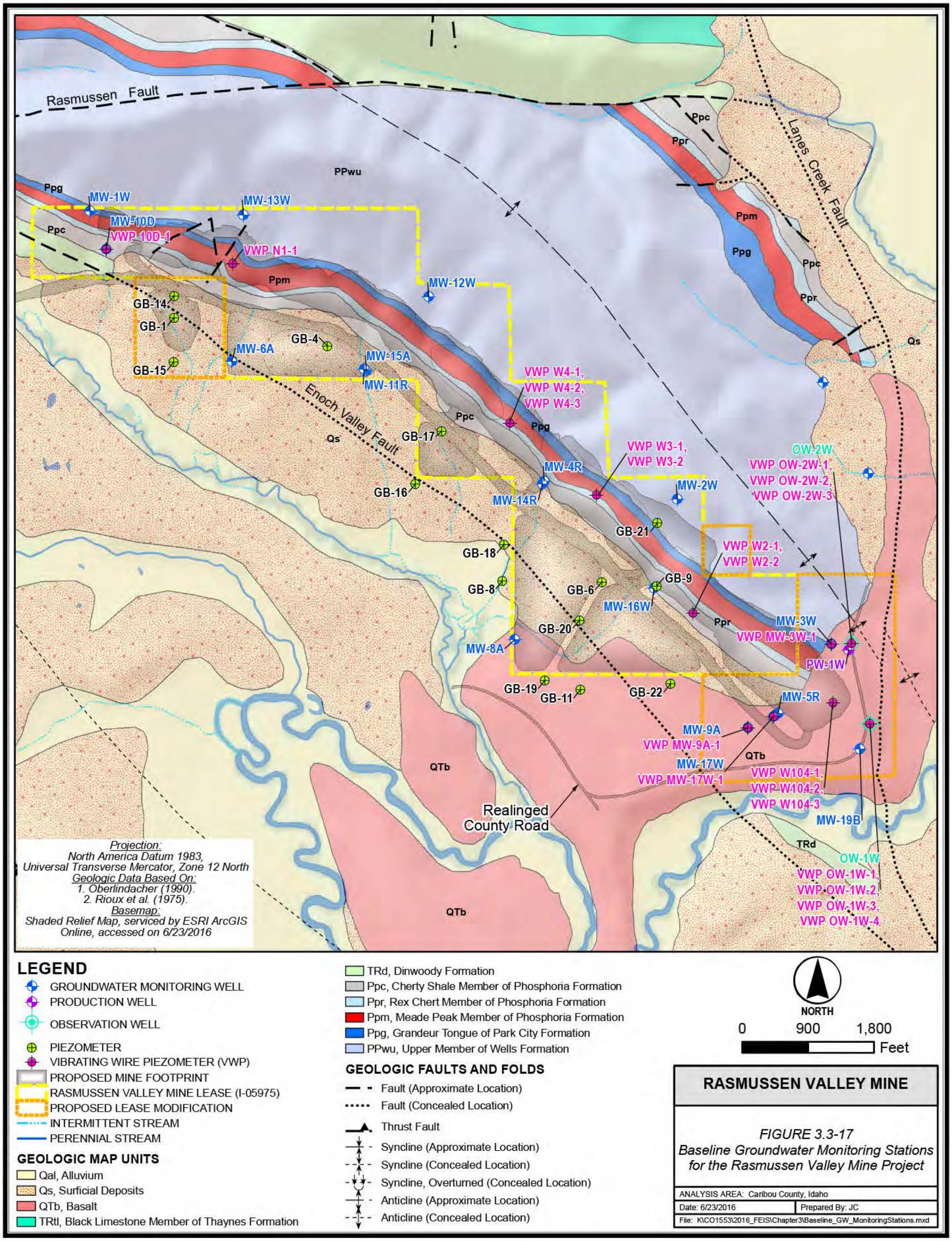

FIGURE 3.3-17
Baseline Groundwater Monitoring Stations for the Rasmussen Valley Mine Project

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Table 3.3-12 Summary of Baseline Monitoring Wells and Vibrating Wire Piezometers for the Rasmussen Valley Mine Project

Well ID	Location	Type
Alluvium and Basalt		
MW-6A	Western edge of proposed North Overburden Pile	Monitoring well
MW-8A	Between South Main and South-South overburden piles	Monitoring well
MW-9A	Southern Study Area alluvium below basalt flows	Monitoring well
MW-15A	Eastern edge of proposed North Overburden Pile	Monitoring well
MW-19B	Basalt and alluvium south of proposed pit	Monitoring well
MW-9A-1	Southern Study Area in alluvium below basalt flows	VWP
OW-1W-4	Between proposed pit and Blackfoot River	VWP
Dinwoody Fm.		
MW-10D	Northern Study Area southwest of proposed pit	Monitoring well
VWP-10D-1	Northern Study Area southwest of proposed pit	VWP
Rex Chert		
MW-4R	South central Study Area west of proposed pit	Monitoring well
MW-5R	Southern Study Area south of proposed pit	Monitoring well
MW-11R	Eastern edge of proposed North Overburden Pile	Monitoring well
MW-14R	South central Study Area west of proposed pit	Monitoring well
VWP W104-3	Southern Study Area within footprint of proposed pit	VWP
OW-1W-2	Between proposed pit and Blackfoot River	VWP
OW-1W-3	Between proposed pit and Blackfoot River	VWP
Meade Peak		
VWP W2-2	Southern Study Area within footprint of proposed pit	VWP
VWP W4-2	Central Study Area within footprint of proposed pit	VWP
VWP W4-3	Central Study Area within footprint of proposed pit	VWP
VWP W104-2	Southern Study Area within footprint of proposed pit	VWP
MW-17W-1	Southern Study Area southwest of proposed pit	VWP
Grandeur Tongue		
MW-16W	Southern Study Area southwest of proposed pit	Monitoring well
MW-17W	Southern Study Area southwest of proposed pit	Monitoring well
VWP N1-1	Northern Study Area within footprint of proposed pit	VWP
VWP W2-1	Southern Study Area within footprint of proposed pit	VWP
VWP W3-1	Central Study Area within footprint of proposed pit	VWP
VWP W3-2	Central Study Area within footprint of proposed pit	VWP
OW-1W-1	Between proposed pit and Blackfoot River	VWP
Wells Formation		
MW-1W	Northwest end of proposed pit	Monitoring well
MW-2W	South central Study Area east of proposed pit	Monitoring well
MW-3W	Southern Study Area east of proposed pit	Monitoring well
MW-12W	North central Study Area north of proposed pit	Monitoring well
MW-13W	North central Study Area north of proposed pit	Monitoring well
PW-1W	Between proposed pit and Blackfoot River	Production well
OW-1W	Between proposed pit and Blackfoot River	Observation well
OW-2W	Between proposed pit and Blackfoot River	Observation well
VWP N1-1	Northern Study Area within footprint of proposed pit	VWP
VWP W2-1	Southern Study Area within footprint of proposed pit	VWP
VWP W3-1	Central Study Area within footprint of proposed pit	VWP
VWP W3-2	Central Study Area within footprint of proposed pit	VWP
VWP W4-1	Central Study Area within footprint of proposed pit	VWP
VWP W104-1	Southern Study Area within footprint of proposed pit	VWP
MW-3W-1	Southern Study Area east of proposed pit	VWP
OW-2W-1	Between proposed pit and Blackfoot River	VWP
OW-2W-2	Between proposed pit and Blackfoot River	VWP
OW-2W-3	Between proposed pit and Blackfoot River	VWP

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Table 3.3-13 Summary of Well Construction Details

Well ID	Monitored Formation	Coordinate Location Northing (m)	Coordinate Location Easting (m)	Casing Top Elev. (ft amsl)	Casing Depth (ft btoc)	Casing Diameter (in)	Casing Type	Screened Interval Top (ft btoc)	Screened Interval Bottom (ft btoc)	Screened Interval Length (ft)	Completion Water Level DTW (ft btoc)	Completion Water Level Date Measured
MW-1W	Wells Fm.	4,743,794.02	470,858.44	6,762.54	486.59	4	SS	441.99	481.99	40	214.93	9/25/12
MW-2W	Wells Fm.	4,742,596.03	473,303.92	6,852.06	566.96	4	SS	541.96	561.96	20	513.07	7/1/12
MW-3W	Wells Fm.	4,741,992.42	473,945.16	6,570.41	262.58	4	PVC	237.58	257.58	20	235.58	1/10/11
MW-4R	Rex Chert	4,742,671.88	472,749.31	6,567.31	181.10	4	SS	156.10	176.10	20	Flowing	7/26/11
MW-5R	Rex Chert	4,741,706.82	473,724.08	6,552.11	276.83	4	PVC	251.83	271.83	20	62.23	1/10/11
MW-6A	Alluvium	4,743,169.24	471,449.09	6,584.89	67.42	4	PVC	42.42	62.42	20	59.51	8/9/12
MW-8A	Alluvium	4,742,010.63	472,626.63	6,461.20	71.76	4	PVC	46.76	66.76	20	21.61	8/30/11
MW-9A	Alluvium	4,741,644.67	473,598.46	6,544.58	91.63	4	PVC	64.63	84.63	20	50.63	1/10/11
MW-10D	Dinwoody	4,743,638.45	470,925.59	6,636.86	137.29	4	PVC	72.29	132.29	60	71.46	2/28/12
MW-11R	Rex Chert	4,743,135.31	472,000.31	6,701.24	292.07	4	SS	267.07	287.07	20	191.15	8/1/12
MW-12W	Wells Fm.	4,743,437.25	472,269.09	6,883.39	640.92	4	SS	615.92	635.92	20	546.12	8/17/12
MW-13W	Wells Fm.	4,743,779.58	471,496.93	7,043.47	767.03	4	SS	742.03	762.03	20	707.05	8/17/12
MW-14R	Rex Chert	4,742,660.82	472,742.31	6,566.10	56.89	4	PVC	31.89	51.89	20	10.54	7/27/11
MW-15A	Alluvium	4,743,132.37	472,008.95	6,700.92	42.99	4	PVC	17.99	37.99	20	Dry	6/28/12
MW-16W	Grandeur	4,742,224.63	473,207.18	6,678.66	783.71	4	SS	758.71	778.71	20	208.04	2/14/12
MW-17W	Grandeur	4,741,690.43	473,704.48	6,551.95	768.20	4	SS	743.20	763.20	20	180.07	11/16/11
MW-19B	Basalt	4,741,556.25	474,064.33	6,520.63	67.13	2	PVC	32.13	62.13	30	Dry	6/6/12
OW-1W	Wells Fm.	4,741,661.02	474,106.50	6,531.21	514.85	4	SS	419.85	509.85	90	223.2	11/8/12
OW-2W	Wells Fm.	4,741,996.56	474,030.25	6,557.54	316.15	4	SS	221.15	311.15	90	173.63	10/3/11
PW-1W	Wells Fm.	4,741,968.41	474,017.56	6,558.42	375.03	10	SS	220.03	370.03	150	219.79	10/4/12

Notes:

Coordinate location system is North American Datum of 1983 (NAD 83), Universal Transverse Mercator (UTM) meters, Zone 12 North.

amsl = above mean sea level

ags = above ground surface

btoc = below top of casing

SS = stainless steel

PVC = polyvinyl chloride

Table 3.3-14 Summary of Vibrating Wire Piezometer Construction Details

VWP ID	Monitored Formation	Collar Coordinate Location		Instrument Location Notes			Completion Water Level and Temperature		
		Northing (m)	Easting (m)	Depth (ft bgs)	Elevation (ft amsl)	Placement Notes	DTW (ft bgs)	Temp. (°C)	Date Measured
N1-1*	Grandeur	471,453.47	4,743,577.28	350	6,512.6	Grouted in place in cored borehole	321.55	NA	12/9/2010
W104-1	Grandeur	473,953.44	4,741,748.47	465	6,176.3	Grouted in place in cored borehole	219.74	14.2	8/18/2010
W104-2	Meade Peak	473,953.44	4,741,748.47	320	6,351.3	Grouted in place in cored borehole	119.49	10.3	8/18/2010
W104-3	Rex Chert	473,953.44	4,741,748.47	200	6,471.3	Grouted in place in cored borehole	81.06	8.7	8/18/2010
W2-1*	Grandeur	473,369.24	4,742,121.44	379.3	6,371.5	Grouted in place in cored borehole	300.65	13.5	7/19/2010
W3-1*	Grandeur	472,967.31	4,742,612.20	360	6,446.0	Grouted in place in cored borehole	327.46	17.1	8/7/2010
W3-2*	Grandeur	472,967.31	4,742,612.20	360	6,446.0	Grouted in place in cored borehole	331.28	17.4	8/7/2010
W4-1*	Wells Fm.	472,606.70	4,742,912.13	465	6,349.6	Grouted in place in cored borehole	444.06	17.5	7/16/2010
W4-2*	Meade Peak	472,606.70	4,742,912.13	320	6,492.4	Grouted in place in cored borehole	331.62	27.4	7/16/2010
W4-3*	Meade Peak	472,606.70	4,742,912.13	200	6,610.6	Grouted in place in cored borehole	162.11	12.6	7/25/2010
MW-3W-1	Wells Fm.	4,741,992.42	473,945.16	240	6,328.8	At top of well screen in filter pack	233.6	22.9	5/24/2011
MW-9A-1	Alluvium	4,741,644.67	473,598.46	63	6,480.0	Adjacent to well screen in filter pack	52.63	7.3	12/22/2010
MW-10D-1	Dinwoody	4,743,638.45	470,925.59	330	6,304.6	Grouted in annulus adjacent to well casing	71.44	14.5	2/22/2012
MW-17W-1	Meade Peak	4,741,690.43	473,704.48	550	5,998.8	Grouted in annulus adjacent to well casing	168.5	14.2	12/16/2011
OW-1W-1	Grandeur	4,741,996.56	474,030.25	385	6,144.4	Grouted in annulus adjacent to well casing	170.93	11.3	10/8/2011
OW-1W-2	Rex Chert	4,741,996.56	474,030.25	257	6,272.4	Grouted in annulus adjacent to well casing	159.11	10.8	10/8/2011
OW-1W-3	Rex Chert	4,741,996.56	474,030.25	197	6,332.4	Grouted in annulus adjacent to well casing	154.79	8.7	10/8/2011
OW-1W-4	Alluvium	4,741,996.56	474,030.25	137	6,392.4	Grouted in annulus adjacent to well casing	88.2	8.7	10/8/2011
OW-2W-1	Wells Fm.	4,741,968.41	474,017.56	325	6,230.4	Grouted in borehole below constructed well	215.53	27.3	11/14/2015
OW-2W-2	Wells Fm.	4,741,968.41	474,017.56	345	6,210.4	Grouted in borehole below constructed well	222.66	28.8	11/14/2015
OW-2W-3	Wells Fm.	4,741,968.41	474,017.56	365	6,190.4	Grouted in borehole below constructed well	212.04	29.5	11/14/2015

Notes:

Coordinate location system is NAD 83, UTM meters, Zone 12 North.

amsl = above mean sea level

bgs = below ground surface

btoc = below top of casing

* VWP installed in angled borehole. Groundwater depths are corrected for inclination

Single-Well Permeability Tests

Short-duration single-well permeability tests were performed in 13 wells to provide data for the calculation of the hydraulic conductivity of rocks and unconsolidated deposits in the Study Area. The tests were performed by one of three methods: pneumatic slug tests, mechanical slug tests, or pump and recovery tests. Pneumatic slug test were performed by attaching an air-tight assembly with a pressure release valve to the well heads, closing the valve to shut the wells from the outside atmosphere, depressing or increasing the water levels in the wells with compressed air or a vacuum, and then monitoring the recovery of water levels upon release of the air slugs. Three to ten pneumatic slug tests were performed in each well. Three mechanical slug tests were performed in wells MW-8A and MW-14R by lowering a PVC cylinder (slug) into the well, waiting for the water level to stabilize, and then removing the slug rapidly and monitoring the subsequent recovery of the water level. Pump and recovery tests were performed by pumping the wells for several hours while monitoring the discharge rate. The recoveries of water levels were monitored at the end of pumping to provide data that could be used to calculate hydraulic conductivity. Complete descriptions of the testing procedures and data analysis are presented in the Water Resources Baseline Characterization Report (Whetstone 2015b). The results of the tests are summarized in **Table 3.3-15**.

Table 3.3-15 Summary of Single Well Permeability Tests for the Rasmussen Valley Mine Project

Well	Test Type	Hydraulic Conductivity (ft/day)	
		Range of Calculated Values	**Best Estimate**
Alluvium			
MW-8A	Mechanical slug	10.7 – 46.8	17.3
MW-9A	Pneumatic slug	6.9 – 13.5	9.0
Dinwoody Fm.			
MW-10D	Pump and recovery	2.2 – 2.4	2.3
Rex Chert			
MW-4R	Pneumatic slug	0.36 – 1.8	0.50
MW-5R	Pneumatic slug	10.6 – 21.6	16.4
MW-14R	Mechanical slug	0.11 – 0.35	0.20
Grandeur Tongue			
MW-16W	Pump and recovery	0.2 – 2.4	2.1
MW-17W	Pump and recovery	8.6	8.6
Wells Formation			
MW-1W	Pump and recovery	0.04 – 0.12	0.06
MW-2W	Pneumatic slug	4.7 – 18.7	5.3
MW-3W	Pneumatic slug	14.0 – 60.7	17.7
MW-12W	Pneumatic slug	0.41 – 2.4	0.69
OW-1W	Pneumatic slug	1.9 – 7.7	2.6

Aquifer Test in the Wells Regional Aquifer

An aquifer test was performed in the Wells Regional Aquifer to develop reliable estimates of transmissivity, hydraulic conductivity, and storage. The test consisted of a 7.5-hour step-drawdown test and a 72-hour constant-rate discharge test (BC 2013c). The pumped well (PW-1W) was screened across the water table in an unconfined section of the Wells Formation near the south end of the proposed pit. The response to pumping during the aquifer test was monitored in 22 wells and eight VWPs (**Figure 3.3-17**).

The step-drawdown test was completed on November 19, 2012 by pumping well PW-1W at four consecutively higher discharge rates (250, 357, 453, and 541 gallons per minute [gpm]) while monitoring water level changes in the pumping well, observation wells, and VWPs. The first three pumping steps were performed for 2 hours each. The duration of the fourth step was 1.5 hours. At the end of the last step, the pump was shut off, and the recovery of water levels in the aquifer was monitored for 16 hours. Data from the step-drawdown test were used to evaluate the efficiency of the pumping well and to determine the sustainable pumping rate for the constant-rate discharge test. The efficiency of the pumping well was initially estimated to be 21 percent at a discharge rate of 500 gallons per minute (gpm). This estimate was later modified to 31 percent based on a distance-drawdown analysis of data from the constant-rate test. The observed maximum drawdown in the pumping well at the end of the step-drawdown test was 26.89 feet which is corrected to 8.34 feet based on 31 percent well efficiency.

The constant-rate discharge test was completed between December 11 and 14, 2012 by pumping PW-1W for 72 hours at an average rate of 504 gpm. Water levels in the pumping well, observation wells, and VWPs were monitored during pumping, and for an additional 96 hours after the pump had been shut off. The drawdown in PW-1W approached steady-state conditions near the end of the pumping period and was 7.98 feet after correcting for 31 percent well efficiency (**Figure 3.3-17**). Data from the pumping well and observations wells were analyzed using methods by Moench (1984) and Theis (1935), which returned T values ranging from approximately 14,400 to 17,300 ft^2/day. Estimates of K ranged from 94 to 113 ft/day with a geometric mean of 105 ft/day. The estimated range of storage values was 0.016 to 0.007 (unitless).

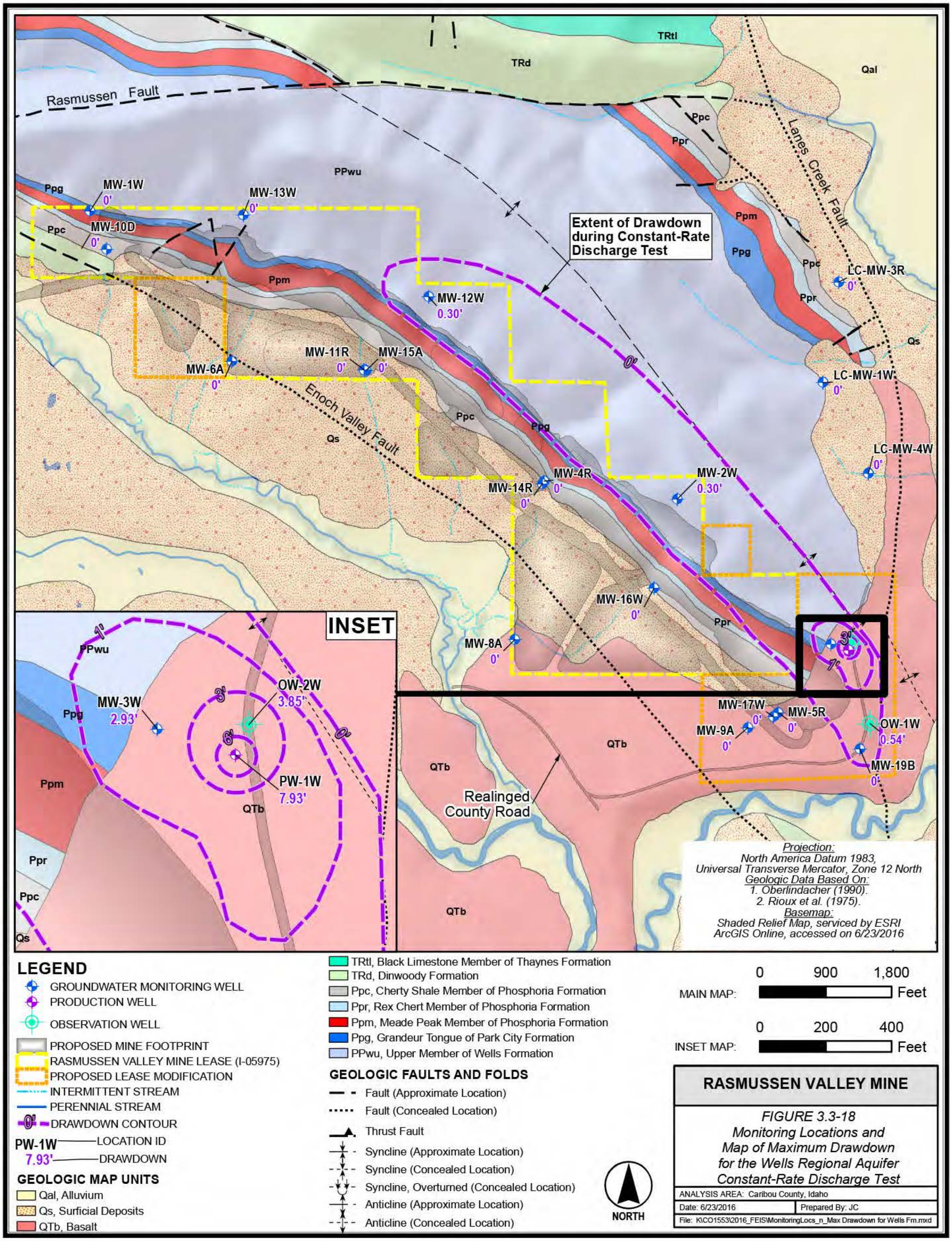
Drawdown data from the constant-rate discharge test indicated that hydraulic properties of the Wells Regional Aquifer are anisotropic (i.e., different in different directions). The calculated anisotropy ratio of the aquifer was 14.8:1, with the axis of highest K being oriented parallel to the strike of bedding (north 60° west) and the axis of lowest permeability being oriented perpendicular to the strike of bedding. A map showing drawdown in the Wells Regional Aquifer at the end of the constant-rate discharge test is presented on **Figure 3.3-18**.

Regional Hydrologic Parameters

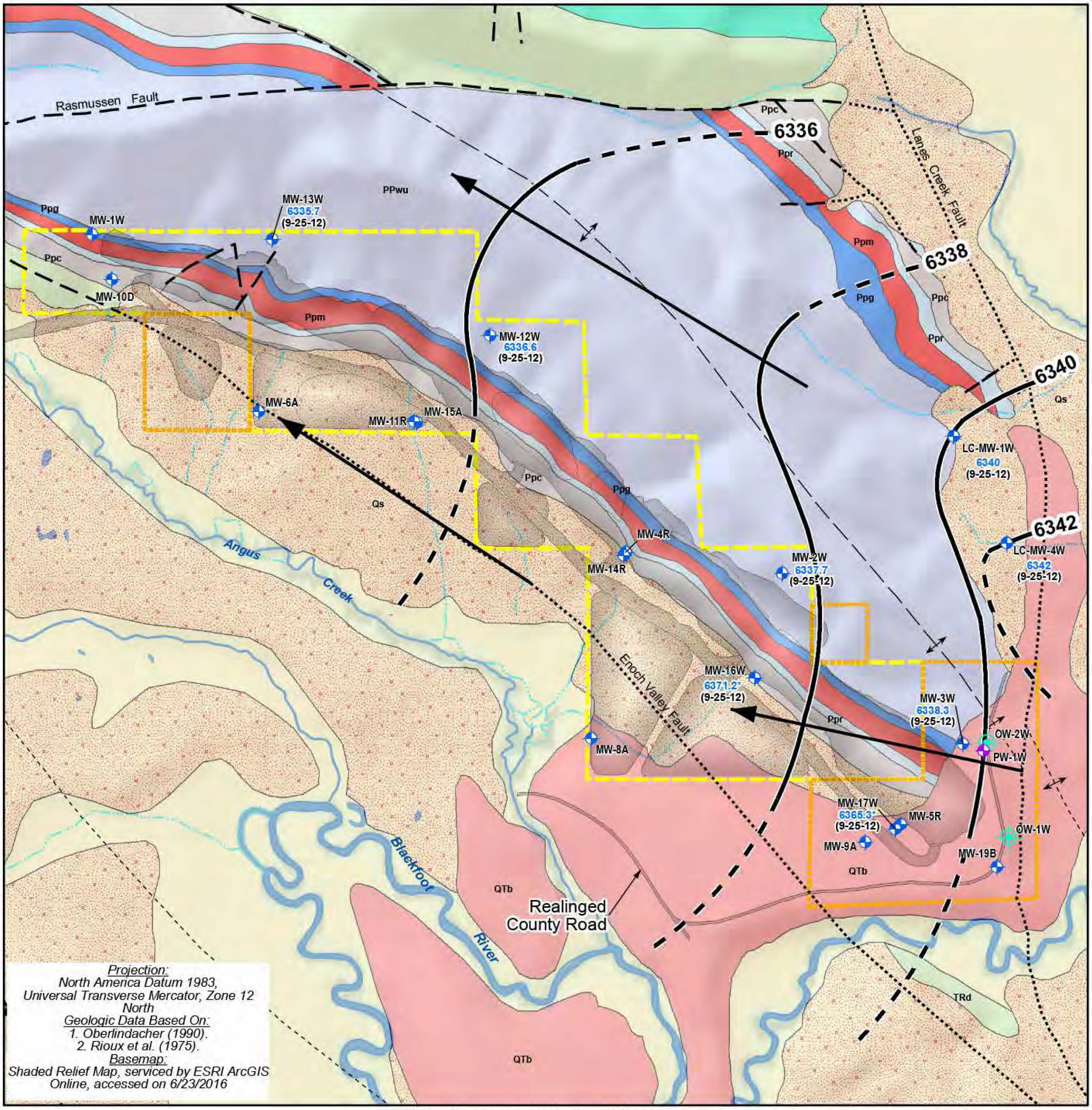
Hydrologic data, including T, K, and storage coefficients, have been developed for a number of phosphate mining sites in the region. Whetstone compiled regional data in 2010. This compilation, presented in **Table 3.3-16**, has been updated with additional information from recent testing at the North Rasmussen Ridge (BC 2014a) and Blackfoot Bridge Mines (Whetstone 2009). The results indicate that K varies widely in bedrock, often spanning two or more orders of magnitude for each unit. This type of variability is typical for fracture flow systems.

Groundwater Levels and Direction of Flow in the Study Area

Data from monitoring wells MW-2W, MW-3W, MW-12W, and MW-13W indicate that the regional groundwater elevation in the Wells Regional Aquifer ranges from approximately 6,330 to 6,340 feet amsl at Rasmussen Valley. The planned minimum elevation of the open pit for the Proposed Action is 6,280 feet amsl, and the southern portion of the pit would extend 50 to 60 feet below the regional water level (Agrium 2011). The lowest portion of the pit for the Rasmussen Collaborative Alternative (RCA) would be near the top of the regional water table, but would not extend below it. Groundwater elevations in the Wells Regional Aquifer vary seasonally with an observed annual fluctuation of 3.4 feet (Whetstone 2015b). The general direction of groundwater flow in the Wells Regional Aquifer is northwest, with a gradient of 0.0003 ft/ft between monitoring wells MW-3W and MW-13W (**Figure 3.3-19**).



Rasmussen Fault
Lanes Creek Fault
Enoch Valley Fault
TRtl
TRd
Qal
Ppc
Ppr
Ppm
Ppg
PPwu
Qs
QTb
MW-1W 0'
MW-13W 0'
MW-10D 0'
Extent of Drawdown during Constant-Rate Discharge Test
MW-12W 0.30'
LC-MW-3R 0'
MW-11R 0'
MW-15A 0'
MW-6A 0'
LC-MW-1W 0'
LC-MW-4W 0'
MW-4R 0'
MW-14R 0'
MW-2W 0.30'
MW-16W 0'
MW-8A 0'
MW-17W 0'
MW-5R 0'
MW-9A 0'
OW-1W 0.54'
MW-19B 0'
Realinged County Road
INSET
MW-3W 2.93'
OW-2W 3.85'
PW-1W 7.93'
Projection:
North America Datum 1983,
Universal Transverse Mercator, Zone 12 North
Geologic Data Based On:
1. Oberlindacher (1990).
2. Rioux et al. (1975).
Basemap:
Shaded Relief Map, serviced by ESRI
ArcGIS Online, accessed on 6/23/2016
LEGEND
GROUNDWATER MONITORING WELL
PRODUCTION WELL
OBSERVATION WELL
PROPOSED MINE FOOTPRINT
RASMUSSEN VALLEY MINE LEASE (I-05975)
PROPOSED LEASE MODIFICATION
INTERMITTENT STREAM
PERENNIAL STREAM
DRAWDOWN CONTOUR
PW-1W LOCATION ID
7.93' DRAWDOWN
GEOLOGIC MAP UNITS
Qal, Alluvium
Qs, Surficial Deposits
QTb, Basalt
TRtl, Black Limestone Member of Thaynes Formation
TRd, Dinwoody Formation
Ppc, Cherty Shale Member of Phosphoria Formation
Ppr, Rex Chert Member of Phosphoria Formation
Ppm, Meade Peak Member of Phosphoria Formation
Ppg, Grandeur Tongue of Park City Formation
PPwu, Upper Member of Wells Formation
GEOLOGIC FAULTS AND FOLDS
Fault (Approximate Location)
Fault (Concealed Location)
Thrust Fault
Syncline (Approximate Location)
Syncline (Concealed Location)
Syncline, Overturned (Concealed Location)
Anticline (Approximate Location)
Anticline (Concealed Location)
NORTH
MAIN MAP: 0 900 1,800 Feet
INSET MAP: 0 200 400 Feet
RASMUSSEN VALLEY MINE
FIGURE 3.3-18
Monitoring Locations and Map of Maximum Drawdown for the Wells Regional Aquifer Constant-Rate Discharge Test
ANALYSIS AREA: Caribou County, Idaho
Date: 6/23/2016
Prepared By: JC
File: K:\CO1553\2016_FEIS\MonitoringLocs_n_Max Drawdown for Wells Fm.mxd



LEGEND

- GROUNDWATER MONITORING WELL
- PRODUCTION WELL
- OBSERVATION WELL
- REGIONAL FLOW DIRECTION
- REGIONAL AQUIFER WATER LEVEL CONTOUR (DASHED WHERE INFERRED)
- PROPOSED MINE FOOTPRINT
- RASMUSSEN VALLEY MINE LEASE (I-05975)
- PROPOSED LEASE MODIFICATION
- INTERMITTENT STREAM
- PERENNIAL STREAM

GEOLOGIC MAP UNITS

- Qal, Alluvium
- Qs, Surficial Deposits
- QTb, Basalt
- TRtl, Black Limestone Member of Thaynes Formation
- TRd, Dinwoody Formation
- Ppc, Cherty Shale Member of Phosphoria Formation
- Ppr, Rex Chert Member of Phosphoria Formation
- Ppm, Meade Peak Member of Phosphoria Formation
- Ppg, Grandeur Tongue of Park City Formation
- PPwu, Upper Member of Wells Formation

GEOLOGIC FAULTS AND FOLDS

- Fault (Approximate Location)
- Fault (Concealed Location)
- Thrust Fault
- Syncline (Approximate Location)
- Syncline (Concealed Location)
- Syncline, Overturned (Concealed Location)
- Anticline (Approximate Location)
- Anticline (Concealed Location)

NORTH

0 900 1,800 Feet

RASMUSSEN VALLEY MINE

FIGURE 3.3-19
Groundwater Flow Direction for the Wells Regional Aquifer in the Project Area

ANALYSIS AREA: Caribou County, Idaho

Date: 6/23/2016 | Prepared By: JC

File: K:\CO1553\2016_FEIS\GW FlowDir for Wells Regional Aquifer in PA.mxd

Table 3.3-16 Summary of Regional Data for Hydraulic Conductivity, Transmissivity, and Storage

Geologic Unit	Aquifer Property	Units	Minimum	Maximum	Average	Median	Geometric Mean	Standard Deviation	Number of Tests
Alluvium	K	ft/day	0.01	55	8.5	0.1	0.3	20.5	7
	T	ft^2/day	3,200	3,200	3,200	3,200	3,200	N/A	1
	Storage	Unitless	N/A	N/A	N/A	N/A	N/A	N/A	0
Dinwoody Formation	K	ft/day	N/A	N/A	N/A	N/A	N/A	N/A	0
	T	ft^2/day	83	620	352	380	227	352	2
	Storage	Unitless	N/A	N/A	N/A	N/A	N/A	N/A	0
Rex Chert	K	ft/day	0.1	8.3	2.8	2.3	1.6	2.6	15
	T	ft^2/day	154	1,200	515	423	394	380	8
	Storage	Unitless	0.007	0.028	0.014	0.007	0.0111	0.012	3
Meade Peak	K	ft/day	0.03	11.5	2.4	1.3	0.8	3.2	17
	T	ft^2/day	6	300	79	23	36	105	11
	Storage	Unitless	0.001	0.002	0.002	0.002	0.002	0.001	2
Wells Formation and Grandeur Tongue Alluvium	K	ft/day	0.08	118	11.4	2.0	1.6	28.8	19
	K	ft/day	0.1	18,086	1,913	41	61	4,994	13
	T	ft^2/day	0.0016	0.1884	0.0513	0.0074	0.0115	0.0035	6

The Enoch Valley Fault is conceptualized to be a permeable conduit that collects groundwater from the regional aquifer and directs it northwest, discharging at the Enoch Valley Sinkhole (Arcadis 2013). The Rasmussen Fault and Blackfoot Fault appear to act as barriers to groundwater flow in the regional system based on differences in groundwater levels on adjacent sides of the faults (Arcadis 2013). Monitoring wells MW-1W, MW-16W, and MW-17W are completed in the Grandeur Tongue, and OW-1W is completed in the Wells Formation; however, water levels in these wells that are about 30 to 220 feet higher than those observed along the Snowdrift Anticline axis in the Wells Regional Aquifer. The high water levels appear to be related to leakage through the Meade Peak (a leaky confining unit) and a low cross-bedding K in the Grandeur Tongue and the Upper Wells Formation.

Water levels in the Rex Chert (MW-4R, MW-5R, MW-11R, and MW-14R) and Dinwoody Formation (MW-10D) are 90 to 230 feet above the elevation of the regional water level. The Rex Chert and Dinwoody Formation are recharged on the southwest limb of the Snowdrift Anticline, where they crop out at the surface west of the proposed pit. Meteoric water that enters at the outcrop flows down-dip to the southwest becoming confined as it moves away from the recharge areas. Groundwater in confined portions of the aquifer may have artesian water levels that are above ground surface at some locations. Groundwater flow in the intermediate-flow systems is expected to be downdip towards the Enoch Valley Fault (**Figure 3.3-17**). The Enoch Valley Fault is interpreted to be a conduit that allows groundwater from the Rex Chert and Dinwoody Formation to move downward into the regional Wells Aquifer. In addition, there are minor faults present within the Study Area that could provide localized hydraulic connections between intermediate and regional flow systems.

Groundwater occurs in alluvium and colluvium on the southwest limb of the Snowdrift Anticline. The flow direction is typically southwest following topography toward Angus Creek. Water level data for unconsolidated deposits near the proposed overburden and ore storage facilities are available from baseline monitoring wells MW-6A, MW-8A, and MW-15A. Piezometers from the 2013 geotechnical investigation (STRATA 2013) provide additional information about the depth to water below the planned facilities (**Figure 3.3-17**). Monitoring well MW-9 is completed in alluvium that is buried beneath basalt near the south end of the proposed pit. Monitoring well

MW-19B straddles the basalt/alluvium contact, and water is observed in this well only seasonally (June through August). Water level data for unconsolidated deposits in the Study Area are summarized by area in **Table 3.3-17**.

Table 3.3-17 Summary of Depth to Water Measurements in Unconsolidated Deposits

Area	Monitoring Location	Type	Range of Measured Depths to Water (ft bgs)	
			Minimum	Maximum
North Growth Media Stockpile	GB-1	Piezometer	8.0	11.0
	GB-14	Piezometer	11.0	19.8
	GB-15	Piezometer	5.5	10.3
North Overburden Pile	MW-6A	Monitoring Well	50.22	57.07
	MM-15A	Monitoring Well	Dry	Dry
	GB-4	Piezometer	30.2	33.7
Optional Ore/Waste Stock Pile	GB-16	Piezometer	22.8	36.0
	GB-17	Piezometer	56.0	56.0
South-Main/South-South Overburden Piles	MW-8A	Monitoring Well	15.64	20.12
	GB-6	Piezometer	51.6	56.0
	GB-8	Piezometer	3.4	3.8
	GB-9	Piezometer	55.6	Dry
	GB-11	Piezometer	13.2	Dry
	GB-18	Piezometer	2.1	6.9
	GB-19	Piezometer	51.5	51.5
	GB-20	Piezometer	25.0	33.5
	GB-22	Piezometer	24.4	39.0
South External Overfill Area	GB-21	Piezometer	Dry	Dry
Alluvium Below Basalt	MW-9A	Monitoring Well	39.42	48.80
	MW-19B	Monitoring Well	51.02	51.51

3.3.2.3 Chemical Characteristics of Groundwater and Applicable Standards

3.3.2.3.1 Applicable Groundwater Standards

Idaho water quality standards for groundwater are contained in IDAPA 58.01.11. Aquifers in Idaho are classified as Sensitive Resources, General Resources, or Other Resources based on the vulnerability of the groundwater, existing and projected beneficial uses of the water, existing water quality, and social and economic considerations (IDAPA 58.01.11.150.02). Groundwater is spelled as two words (ground water) in IDAPA 58.01.11 and Idaho statistical Guidance Documents (IDEQ 2009, 2014b). This convention is observed for direct citations, but otherwise, groundwater is spelled as one word for consistency in this EIS. Groundwater classified as a Sensitive Resource receives the highest degree of protection, and applicable water quality standards for these resources may be stricter than those listed in IDAPA 58.01.11.200. Currently, the Rathdrum Prairie Aquifer, located 440 miles northwest of the Study Area, is the only aquifer listed as a Sensitive Resource in the State of Idaho (IDAPA 58.01.11.300.1). All other aquifers are categorized according to IDAPA 58.01.11.300.02, which defines a General Resource as:

> *"All aquifers or portions of aquifers where there are activities with the potential to degrade groundwater quality of the aquifer, unless otherwise listed in subsection 300.01 or 300.03. Once an activity with the potential to degrade the ground water quality of an uncategorized aquifer or portion of an aquifer is initiated, the uncategorized aquifer shall automatically become General Resource unless petitioned into the Sensitive Resource, or Other Resource category."*

No aquifers are currently listed as an Other Resource in the State of Idaho (IDAPA 58.01.11.300.03). Based on the aquifer classification system described in the Idaho Administrative Code, groundwater in the Study Area is classified as a General Resource and is subject to numerical standards contained in section 58.01.11.200 and modified in subsections 200.03, 301.02.a, and 401.1.

Subsection 200.03 states:

> *"If the natural background level of a constituent exceeds the standard in this section, the natural background level shall be used as the standard."*

Subsection 301.02 states:

> *"Activities with the potential to degrade General Resource aquifers shall be managed in a manner which maintains or improves existing ground water quality through the use of best management practices and best practical methods to the maximum extent practical except when a point of compliance is set pursuant to Section 401."*

Subsection 401.01 states:

> *"At the request of a mine operator, pursuant to this section, the Department [IDEQ] shall set a point of compliance, or points of compliance, at which the mine operator shall protect current and projected future beneficial uses of the ground water and meet the ground water quality standards as described in Section 200 or as allowed under Subsection 400.05. Degradation of ground water is allowed at a point of compliance if the mine operator implements the level of protection during mining activities appropriate for the aquifer category as specified in Table 1 of Subsection 150.02. If a request is not made, the mine operator must meet the ground water quality standards as described in Subsection 150.01 in ground water both within and beyond the mining area unless the Department establishes the point(s) of compliance consistent with Subsection 401.03."*

Finally, IDEQ's considerations for setting points of compliance are provided in subsection 401.3, which states:

> *The point(s) of compliance shall be set as close as possible to the boundary of the mining area, taking into consideration the relevant factors set forth in Subsections 401.03.a. through 401.03.h., but in no event shall the point(s) of compliance be within the boundary of the mining area. The mining area boundary means the outermost perimeter of the mining area (projected in the horizontal plane) as it would exist at the completion of the mining activity. The point(s) of compliance shall be set so that, outside the mining area boundary, there is no injury to current or projected future beneficial uses of ground water and there is no violation of water quality standards applicable to any interconnected surface waters. The Department's determination regarding the point(s) of compliance shall be based on an analysis and consideration of all relevant factors including, but not limited to:*
>
> *a. The hydrogeological characteristics of the mining area and surrounding land, including any dilution characteristics of the aquifer and any natural attenuation supported by site-specific data;*

b. The concentration, volume, and physical and chemical characteristics of contaminants resulting from the mining activity, including the toxicity and persistence of the contaminants;

c. The quantity, quality, and direction of flow of ground water underlying the mining area;

d. The proximity and withdrawal rates of current ground water users;

e. A prediction of projected future beneficial uses;

f. The availability of alternative drinking water supplies;

g. The existing quality of the ground water, including other sources of contamination and their cumulative impacts on the ground water; and

h. Public health, safety, and welfare effects.

Agrium has applied for and received a Points of Compliance determination from the IDEQ for the Rasmussen Valley Mine. Numerical groundwater quality standards for Idaho are presented in **Table 3.3-18** and are based on total concentration. For the Point of Compliance determination background levels or another method approved by IDEQ would be determined using methods described in Statistical Guidance for Determining Background Ground Water Quality and Degradation (IDEQ 2014b). For the point of compliance determination, background levels would be determined using methods described in Statistical Guidance for Determining Background Ground Water Quality and Degradation (IDEQ 2014b). For the EIS, baseline concentrations are calculated using summary statistics to provide a basis for determining impacts to groundwater.

Table 3.3-18 Idaho Groundwater Standards

Parameter	Idaho Groundwater Standards[1]	
	Primary	**Secondary**
Major Ions and Solution Parameters		
pH (s.u.)	–	6.5–8.5
Chloride (mg/L)	–	250
Fluoride (mg/L)	4	–
Sulfate (mg/L)	–	250
TDS (mg/L)	–	500
Nutrients		
Nitrate as nitrogen (mg/L)	10	–
Nitrite as nitrogen (mg/L)	1	
Nitrate/nitrite as nitrogen (mg/L)	10	–
Trace Metals (total concentrations)		
Aluminum (mg/L)	–	0.2
Antimony (mg/L)	0.006	–
Arsenic (mg/L)	0.05	–
Barium (mg/L)	2	–
Beryllium (mg/L)	0.004	
Cadmium (mg/L)	0.005	–
Chromium (mg/L)	0.1	–
Copper (mg/L)	1.3	–
Iron (mg/L)	–	0.3
Lead (mg/L)	0.015	–
Manganese (mg/L)	–	0.05
Mercury (mg/L)	0.002	–
Selenium (mg/L)	0.05	–

Table 3.3-18 Idaho Groundwater Standards

Parameter	Idaho Groundwater Standards[1]	
	Primary	Secondary
Silver (mg/L)	–	0.1
Thallium (mg/L)	0.002	–
Zinc (mg/L)	–	5

Notes:
– No standard
1 Standards are based on total (unfiltered) concentrations in groundwater.
Source: IDAPA 58.01.11

3.3.2.3.2 Baseline Groundwater Quality

Baseline monitoring of groundwater quality for the Study Area began in January 2011 and has been performed four times annually (April, June, August, and October) through the end of 2014. The baseline monitoring network includes four wells completed in alluvium, one well completed in the Dinwoody Formation, four wells completed in Rex Chert, and eight wells completed in the Wells Regional Aquifer. Samples from the monitoring wells were analyzed for 42 constituents including major ions, nutrients, and a suite of 21 metals (both total and dissolved concentrations). Complete documentation for baseline groundwater quality monitoring at Rasmussen Valley is presented in the Water Resources Baseline Characterization Report (Whetstone 2015b).

Baseline quality statistics for groundwater were calculated for 39 constituents using methods described in Statistical Guidance for Determining Background Ground Quality and Degradation (IDEQ 2014b, Whetstone 2015b) in order to inform an understanding of groundwater quality. The dataset for the statistical analysis extended through December 31, 2014 and included the full list of analyzed parameters with the exceptions of specific conductance, turbidity, and total suspended solids. These parameters do not represent specific chemical constituents and were omitted from the calculations. In addition, the statistical analysis used field-measured values of pH in place of laboratory measurements. The pH of groundwater samples can change rapidly after collection and may not be representative of the in situ pH of the aquifer(s). The suite of analytical parameters for the baseline monitoring program included both total (unfiltered) and dissolved (filtered) metals. The statistical analysis was performed using total metal concentrations to be consistent with Idaho groundwater quality standards (IDAPA 58.01.11).

<u>Groundwater Quality in Alluvium</u>

Baseline water quality statistics for groundwater in alluvium (**Table 3.3-19**) were calculated using data from monitoring wells MW-6A, MW-8A, and MW-9A. Monitoring well MW-15A was dry during all sampling events, and no data were available for the statistical analysis. Analytical results from the baseline monitoring program indicate that groundwater in alluvium is a moderate to well buffered calcium-bicarbonate type water with low to moderate concentrations of TDS (46 to 274 mg/L) and circum-neutral to alkaline pH (6.25 to 8.05 s.u.). Alluvial groundwater generally meets applicable water quality standards with the exceptions of pH, aluminum, iron, and manganese (MW-6A, MW-8A, and MW-9A). pH was outside of (below) the standard range of 6.5 to 8.5 s.u. for 2 percent of the samples and had a median value of 7.33 s.u. Aluminum exceeded the secondary groundwater standard of 0.2 mg/L in 18 percent of the samples and had a median concentration of 0.03 mg/L. Iron exceeded the secondary groundwater standard of 0.3 mg/L in 16 percent of the samples and had a median value of 0.09 mg/L. Manganese exceeded the secondary groundwater standard of 0.05 mg/L in 55 percent of the samples and had a median value of 0.094 mg/L.

Table 3.3-19 Baseline Water Quality Statistics for Groundwater in Alluvium

	Units	Ground-water Standard	Number of Samples	Percent Non-Detect	Min Value	Max Value	Median Value	Average Value	Standard Deviation
Major Ions and Solution Parameters									
pH[2]	s.u.	6.5-8.5	42	0.0	**6.25**	8.05	7.33	7.33	0.48
Alkalinity, Bicarbonate (as $CaCO_3$)	mg/L		45	0.0	86.8	214	106	124	42.7
Alkalinity, Carbonate (as $CaCO_3$)	mg/L		45	97.8	<2	<2.5	---	---	---
Alkalinity, Hydroxide (as $CaCO_3$)	mg/L		45	100.0	<2	<2.5	---	---	---
Alkalinity, Total (as $CaCO_3$)	mg/L		45	0.0	86.8	214	106	125	42.7
Total Dissolved Solids[2]	mg/L	500	45	0.0	46	274	170	168	52
Total Organic Carbon	mg/L		44	59.1	0.27	8.9	1	1.46	1.87
Calcium	mg/L		45	0.0	23.6	66.2	32.8	37.2	12.3
Magnesium	mg/L		45	0.0	4	13.4	6	7.0	2.9
Potassium	mg/L		45	2.2	0.48	1.7	0.76	0.80	0.30
Sodium	mg/L		44	0.0	4.1	14.3	7.3	6.9	1.9
Bromide	mg/L		44	43.2	<0.01	0.085	0.030	0.031	0.021
Chloride[2]	mg/L	250	44	2.3	2.5	8.1	5.7	5.2	1.9
Fluoride[1]	mg/L	4	44	4.5	0.1	0.25	0.2	0.20	0.03
Sulfate	mg/L	250	44	2.3	3.132	11.2	5.75	5.65	1.44
Nutrients									
Nitrate-Nitrite (as N) [1]	mg/L	10	44	27.3	<0.02	0.4	0.17	0.17	0.12
Ammonia (as N)	mg/L		45	22.2	<0.05	0.4	0.09	0.16	0.12
Phosphorus	mg/L		44	0.0	0.035	0.14	0.097	0.094	0.024
Trace Metals (total concentration)									
Aluminum[2]	mg/L	0.2	44	54.5	<0.03	**2.3**	0.03	0.19	0.42
Antimony[1]	mg/L	0.006	45	88.9	<0.0004	0.0010	---	---	---
Arsenic[1]	mg/L	0.05	45	40.0	<0.0005	0.0028	0.0008	0.0009	0.0005
Barium[1]	mg/L	2	45	0.0	0.024	0.128	0.055	0.070	0.031
Beryllium[1]	mg/L	0.004	37	97.3	<0.0001	0.00023	---	---	---
Boron	mg/L		45	17.8	<0.01	0.023	0.014	0.010	0.004
Cadmium[1]	mg/L	0.005	45	84.4	<0.0001	0.0005	---	---	---
Chromium[1]	mg/L	0.1	44	59.1	<0.0005	0.006	0.0005	0.0006	0.0010
Copper[1]	mg/L	1.3	44	72.7	<0.0005	0.0057	0.0005	0.0006	0.0010
Iron[2]	mg/L	0.3	44	27.3	<0.02	**3.8**	0.09	0.27	0.61
Lead[1]	mg/L	0.015	44	68.2	<0.0001	0.0021	0.0001	0.0002	0.004
Manganese[2]	mg/L	0.05	45	4.4	<0.0005	**0.54**	**0.094**	**0.121**	0.127
Mercury[1]	mg/L	0.002	45	100.0	<0.0002	<0.0002	---	---	---
Molybdenum	mg/L		45	82.2	<0.01	<0.02	---	---	---
Nickel	mg/L		45	100.0	<0.01	<0.02	---	---	---
Selenium[1]	mg/L	0.05	44	34.1	<0.0001	0.0014	0.0005	0.0005	0.0003
Silver[2]	mg/L	0.1	45	97.8	<0.00005	0.00013	---	---	---
Thallium[1]	mg/L	0.002	45	91.1	<0.0001	0.00033	---	---	---
Uranium	mg/L		44	34.1	<0.0001	0.0021	0.0002	0.0005	0.0005
Vanadium	mg/L		44	40.9	<0.0002	<0.01	0.0026	0.0019	0.0017
Zinc[2]	mg/L	5	44	79.5	<0.0028	0.028	0.0028	0.0031	0.0060

Notes:

1 Idaho primary groundwater standard

2 Idaho secondary groundwater standard

s.u. standard units

< Indicates that the value was below the analytical detection limit. Applies only to laboratory determined minimum and maximum values. Statistically determined values for median, average, and standard deviation are not marked as being below the detection limit

Bolded values are equal to or exceed Idaho groundwater quality standards in IDAPA 58.01.11. 200

Samples with elevated aluminum concentrations typically have elevated turbidity, suggesting that the aluminum is associated with suspended clay sediment

Statistics for median, average, and standard deviation were not calculated for datasets containing more than 80 percent non-detect values

Groundwater Quality in the Dinwoody Formation

Baseline water quality statistics for groundwater in the Dinwoody Formation (**Table 3.3-20**) were calculated using data from monitoring well MW-10D. Analytical results from the baseline monitoring program indicate that groundwater in the Dinwoody Formation is a well buffered calcium-bicarbonate to calcium-sulfate type water with moderate concentrations of TDS (374 to 496 mg/L) and circum-neutral pH (7.14 to 7.51 s.u.). Groundwater in the Dinwoody Formation generally meets applicable water quality standards with the exceptions of iron and manganese. Iron was equal to or exceeded the secondary groundwater standard of 0.3 mg/L in 64 percent of the samples and had a median value of 0.30 mg/L. Manganese exceeded the secondary groundwater standard of 0.05 mg/L in 100 percent of the samples and had a median value of 0.285 mg/L.

Table 3.3-20 Baseline Water Quality Statistics for Groundwater in the Dinwoody Formation

	Units	Groundwater Standard	Number of Samples	Percent Non-Detect	Min Value	Max Value	Median Value	Average Value	Standard Deviation
Major Ions and Solution Parameters									
pH[2]	s.u.	6.5-8.5	12	0.0	7.14	7.51	7.34	7.32	0.11
Alkalinity, Bicarbonate (as $CaCO_3$)	mg/L		11	0.0	205	222	212	213	5.9
Alkalinity, Carbonate (as $CaCO_3$)	mg/L		12	100.0	<2.5	<2.5	---	---	---
Alkalinity, Hydroxide (as $CaCO_3$)	mg/L		12	100.0	<2.5	<2.5	---	---	---
Alkalinity, Total (as $CaCO_3$)	mg/L		11	0.0	205	222	212	213	5.9
Total Dissolved Solids[2]	mg/L	500	12	0.0	374	496	405	416	38.3
Total Organic Carbon	mg/L		12	91.7	<0.72	1.1	---	---	---
Calcium	mg/L		12	0.0	67.8	80.7	73.9	74.4	4.2
Magnesium	mg/L		12	0.0	30.6	36.8	33.3	33.5	1.9
Potassium	mg/L		11	0.0	0.88	1.2	0.99	1.02	0.11
Sodium	mg/L		11	0.0	5.7	9.7	6.5	7.1	1.3
Bromide	mg/L		12	66.7	<0.01	0.044	0.01	0.016	0.012
Chloride[2]	mg/L	250	12	0.0	7.4	9.1	7.9	8.0	0.47
Fluoride[1]	mg/L	4	11	0.0	0.19	0.33	0.22	0.23	0.04
Sulfate[2]	mg/L	250	12	0.0	91.5	185	114	126.2	31.6
Nutrients									
Nitrate-Nitrite (as N) [1]	mg/L	10	12	83.3	<0.02	0.052	---	---	---
Ammonia (as N)	mg/L		11	0.0	0.22	0.43	0.28	0.29	0.05
Phosphorus	mg/L		11	36.4	<0.01	0.044	0.013	0.016	0.009
Trace Metals (total concentration)									
Aluminum[2]	mg/L	0.2	12	66.7	<0.03	0.06	0.03	0.04	0.01
Antimony[1]	mg/L	0.006	12	100.0	<0.0004	<0.0004	---	---	---
Arsenic[1]	mg/L	0.05	12	0.0	0.0054	0.013	0.0072	0.008	0.0020
Barium[1]	mg/L	2	12	0.0	0.019	0.043	0.021	0.024	0.007
Beryllium[1]	mg/L	0.004	12	100.0	<0.0001	<0.0001	---	---	---
Boron	mg/L		12	0.0	0.017	0.029	0.026	0.024	0.004
Cadmium[1]	mg/L	0.005	12	100.0	<0.0001	<0.0001	---	---	---
Chromium[1]	mg/L	0.1	12	83.3	<0.0005	0.0008	---	---	---
Copper[1]	mg/L	1.3	12	100.0	<0.0005	<0.0005	---	---	---
Iron[2]	mg/L	0.3	11	0.0	0.18	**0.65**	**0.30**	**0.32**	0.12
Lead[1]	mg/L	0.015	12	100.0	<0.0001	<0.0001	---	---	---
Manganese[2]	mg/L	0.05	12	0.0	**0.24**	**0.41**	**0.285**	**0.298**	0.047
Mercury[1]	mg/L	0.002	12	100.0	<0.0002	<0.0002	---	---	---
Molybdenum	mg/L		12	100.0	<0.01	<0.01	---	---	---
Nickel	mg/L		12	100.0	<0.01	<0.01	---	---	---
Selenium[1]	mg/L	0.05	12	91.7	<0.0001	0.0001	---	---	---
Silver[2]	mg/L	0.1	12	91.7	<0.00005	0.00007	---	---	---
Thallium[1]	mg/L	0.002	12	91.7	<0.0001	0.0005	---	---	---
Uranium	mg/L		12	0.0	0.0008	0.0021	0.0011	0.0010	0.0004

Table 3.3-20 Baseline Water Quality Statistics for Groundwater in the Dinwoody Formation

	Units	Ground-water Standard	Number of Samples	Percent Non-Detect	Min Value	Max Value	Median Value	Average Value	Standard Deviation
Vanadium	mg/L		12	100.0	<0.0002	<0.0002	---	---	---
Zinc[2]	mg/L	5	12	100.0	<0.0028	<0.0028	---	---	---

Notes:

1 Idaho primary groundwater standard

2 Idaho secondary groundwater standard

s.u. standard units

< Indicates that the value was below the analytical detection limit. Applies only to laboratory determined minimum and maximum values. Statistically determined values for 25th percentile, median, and 75th percentile are not marked as being below the detection limit

Bolded values are equal to or exceed Idaho groundwater quality standards in IDAPA 58.01.11. 200.

Statistics for median, average, and standard deviation were not calculated for datasets containing more than 80 percent non-detect values

Groundwater Quality in the Rex Chert

Baseline water quality statistics for groundwater in the Rex Chert (**Table 3.3-21**) were calculated using data from monitoring wells MW-4R, MW-5R, MW-11R, and MW-14R. Analytical results from the baseline monitoring program indicate that groundwater in the Rex Chert is a well buffered calcium-bicarbonate type water with low to weakly elevated concentrations of TDS (96 to 418 mg/L) and circum-neutral to weakly alkaline pH (6.77 to 7.95 s.u.). Groundwater in the Rex Chert generally meets applicable water quality standards with the exceptions of iron (MW-4R, MW-5R, MW-11R, and MW-14R), and manganese (MW-4R, MW-5R, MW-11R, and MW-14R). Iron was equal to or exceeded the secondary groundwater standard of 0.3 mg/L in 61 percent of the samples and had a median value of 0.37 mg/L. Manganese exceeded the secondary groundwater standard of 0.05 mg/L in 97 percent of the samples and had a median value of 0.122 mg/L.

Table 3.3-21 Baseline Water Quality Statistics for Groundwater in the Rex Chert

	Units	Ground-water Standard	Number of Samples	Percent Non-Detect	Min Value	Max Value	Median Value	Average Value	Standard Deviation
Major Ions and Solution Parameters									
pH[2]	s.u.	6.5-8.5	55	0.0	6.77	7.95	7.21	7.20	0.20
Alkalinity, Bicarbonate (as $CaCO_3$)	mg/L		58	0.0	125	289	226	216	49.6
Alkalinity, Carbonate (as $CaCO_3$)	mg/L		58	98.3	<2	3	---	---	---
Alkalinity, Hydroxide (as $CaCO_3$)	mg/L		58	100.0	<2	<2.5	---	---	---
Alkalinity, Total (as $CaCO_3$)	mg/L		58	0.0	125	289	226	216	49.7
Total Dissolved Solids[2]	mg/L	500	57	0.0	96	418	264	276	62.2
Total Organic Carbon	mg/L		58	36.2	0.53	12	2.25	3.06	2.97
Calcium	mg/L		58	0.0	37.5	82.4	49.9	55.0	14.7
Magnesium	mg/L		58	0.0	13.3	33.2	19.3	20.3	5.9
Potassium	mg/L		57	3.5	0.4	1.9	0.61	0.79	0.40
Sodium	mg/L		57	0.0	4.9	59.6	8.6	15.3	13.8
Bromide	mg/L		58	46.6	<0.01	0.089	0.023	0.031	0.024
Chloride[2]	mg/L	250	58	0.0	2.3	14.5	6.1	6.4	3.5
Fluoride[1]	mg/L	4	58	0.0	0.17	1.2	0.50	0.52	0.33
Sulfate[2]	mg/L	250	57	0.0	19	80.9	25.4	26.7	8.7
Nutrients									
Nitrate-Nitrite (as N)[1]	mg/L	10	56	60.7	<0.02	0.44	0.02	0.03	0.07
Ammonia (as N)	mg/L		58	22.4	<0.05	1.2	0.10	0.25	0.33
Phosphorus	mg/L		58	6.9	<0.01	0.69	0.04	0.15	0.20
Trace Metals (total concentration)									
Aluminum[2]	mg/L	0.2	57	64.9	<0.03	0.19	0.03	0.03	0.04
Antimony[1]	mg/L	0.006	58	94.8	<0.0004	0.001	---	---	---
Arsenic[1]	mg/L	0.05	57	50.9	<0.0005	0.0075	0.0005	0.0014	0.0014

Table 3.3-21 Baseline Water Quality Statistics for Groundwater in the Rex Chert

	Units	Ground-water Standard	Number of Samples	Percent Non-Detect	Min Value	Max Value	Median Value	Average Value	Standard Deviation
Barium[1]	mg/L	2	58	0.0	0.006	0.2	0.056	0.050	0.044
Beryllium[1]	mg/L	0.004	47	100.0	<0.0001	<0.0001	---	---	---
Boron	mg/L		58	8.6	<0.01	0.04	0.02	0.02	0.01
Cadmium[1]	mg/L	0.005	58	96.6	<0.0001	0.00019	---	---	---
Chromium[1]	mg/L	0.1	58	46.6	<0.0005	0.0031	0.0005	0.0009	0.0006
Copper[1]	mg/L	1.3	57	77.2	<0.0005	0.0084	0.0005	0.0005	0.0012
Iron[2]	mg/L	0.3	57	0.0	0.048	**3.5**	**0.37**	**0.75**	0.90
Lead[1]	mg/L	0.015	58	89.7	<0.0001	0.0010	---	---	---
Manganese[2]	mg/L	0.05	58	0.0	0.033	**0.73**	**0.122**	**0.230**	0.187
Mercury[1]	mg/L	0.002	58	100.0	<0.0002	<0.0004	---	---	---
Molybdenum	mg/L		58	44.8	<0.01	0.05	0.02	0.02	0.01
Nickel	mg/L		57	68.4	<0.01	0.08	0.01	0.01	0.01
Selenium[1]	mg/L	0.05	57	82.5	<0.0001	0.0009	---	---	---
Silver[2]	mg/L	0.1	58	96.6	<0.00005	0.00007	---	---	---
Thallium[1]	mg/L	0.002	58	94.8	<0.0001	0.00034	---	---	---
Uranium	mg/L		57	5.3	<0.0001	0.002	0.0006	0.0007	0.0005
Vanadium	mg/L		58	74.1	<0.0002	0.01	0.0002	0.0003	0.0008
Zinc[2]	mg/L	5	57	61.4	<0.0028	0.33	0.0039	0.0148	0.0533

Notes:

1 Idaho primary groundwater standard

2 Idaho secondary groundwater standard

s.u. standard units

< Indicates that the value was below the analytical detection limit. Applies only to laboratory determined minimum and maximum values. Statistically determined values for median, average, and standard deviation are not marked as being below the detection limit

Bolded values are equal to or exceed Idaho groundwater quality standards in IDAPA 58.01.11. 200.

Statistics for median, average, and standard deviation were not calculated for datasets containing more than 80 percent non-detect values

Groundwater Quality in the Wells Regional Aquifer

Baseline statistics for groundwater in the Wells Regional Aquifer (**Table 3.3-22**) were calculated using data from monitoring wells MW-1W, MW-12W, MW-13W, MW-16W, MW17W, and OW-1W. Analyses from monitoring wells MW-2W and MW-3W were omitted from the statistical analyses because of differences in the groundwater chemistry at these locations compared to other wells in the Wells Regional Aquifer. Groundwater monitored by MW-2W has an approximate temperature of 32 degrees Celsius (°C) and is classified as a low-temperature geothermal water (i.e., above 29.4 °C [IDAPA 37.03.09]). Groundwater temperatures in other wells completed in the regional aquifer range from 10 to 25°C, with most falling below 20°C. MW-2W also exhibits elevated concentrations of TDS (834 to 1,020 mg/L), calcium (114 to 134 mg/L), magnesium (35.3 to 42.7 mg/L), potassium (6.3 to 6.8 mg/L), sodium (108 to 186 mg/L), chloride (149 to 172 mg/L), fluoride (1.4 to 1.7 mg/L), sulfate (340 to 404 mg/L), boron (0.038 to 0.086 mg/L), and uranium (0.00094 to 0.0086 mg/L) compared to other wells (Whetstone 2015b). Differences in the temperature and chemistry of groundwater from MW-2W are interpreted to be caused by localized fracturing that allows deeper geothermal water to circulate upward in the area of MW-2W. Analyses for MW-3W indicate that groundwater from the well has elevated selenium concentrations (0.0012 to 0.0035 mg/L) compared to groundwater from other wells in the Wells Regional Aquifer (less than 0.0001 to 0.0009 mg/L). Similar to MW-2W, the differences in chemistry at MW-3W are interpreted to be related to localized conditions and are not considered to be representative of the baseline chemistry of the wider Wells Regional Aquifer.

Table 3.3-22 Baseline Water Quality Statistics for Groundwater in the Regional Wells Aquifer

	Units	Ground-water Standard	Number of Samples	Percent Non-Detect	Min Value	Max Value	Median Value	Average Value	Standard Deviation
Major Ions and Solution Parameters									
pH[2]	s.u.	6.5-8.5	70	0.0	6.98	8.89	7.40	7.50	0.35
Alkalinity, Bicarbonate (as $CaCO_3$)	mg/L		72	0.0	139	292	209	215	26.8
Alkalinity, Carbonate (as $CaCO_3$)	mg/L		72	94.4	<2	17	---	---	---
Alkalinity, Hydroxide (as $CaCO_3$)	mg/L		72	100.0	<2	<2.5	---	---	---
Alkalinity, Total (as $CaCO_3$)	mg/L		72	0.0	155	292	209	215	25.5
Total Dissolved Solids[2]	mg/L	500	71	0.0	92	316	268	261	39.2
Total Organic Carbon	mg/L		71	52.1	0.31	5.6	1	1.4	1.3
Calcium	mg/L		72	0.0	27.4	81.6	55.5	56.3	7.97
Magnesium	mg/L		72	0.0	13.5	27.3	18.6	19.0	3.1
Potassium	mg/L		71	0.0	0.7	4.7	1.2	1.6	0.9
Sodium	mg/L		72	0.0	4.2	42.1	8.8	12.3	9.4
Bromide	mg/L		72	48.6	0.01	0.083	0.019	0.024	0.018
Chloride[2]	mg/L	250	72	0.0	2.3	13.7	3.8	4.9	3.2
Fluoride[1]	mg/L	4	72	0.0	0.11	0.86	0.67	0.57	0.24
Sulfate[2]	mg/L	250	72	0.0	6.9	51	21.4	22.4	9.6
Nutrients									
Nitrate-Nitrite (as N)[1]	mg/L	10	71	80.3	<0.02	0.19	---	---	---
Ammonia (as N)	mg/L		72	15.3	<0.05	0.33	0.11	0.13	0.07
Phosphorus	mg/L		71	54.9	<0.01	0.066	0.010	0.013	0.013
Trace Metals (total concentration)									
Aluminum[2]	mg/L	0.2	71	67.6	<0.03	**0.54**	0.03	0.04	0.08
Antimony[1]	mg/L	0.006	71	66.2	<0.0004	<0.0067	0.0004	0.0005	0.0010
Arsenic[1]	mg/L	0.05	71	22.5	<0.0005	0.018	0.0016	0.0033	0.0036
Barium[1]	mg/L	2	72	0.0	0.011	0.175	0.070	0.070	0.038
Beryllium[1]	mg/L	0.004	67	98.5	<0.0001	0.00072	---	---	---
Boron	mg/L		72	9.7	<0.01	0.03	0.02	0.02	0.005
Cadmium[1]	mg/L	0.005	71	80.3	<0.0001	0.0017	---	---	---
Chromium[1]	mg/L	0.1	72	52.8	<0.0005	0.0047	0.0005	0.0007	0.0009
Copper[1]	mg/L	1.3	71	69.0	<0.0005	0.0034	0.0005	0.0005	0.0007
Iron[2]	mg/L	0.3	71	2.8	<0.02	**4.5**	0.28	**0.61**	0.84
Lead[1]	mg/L	0.015	71	88.7	<0.0001	0.00036	---	---	---
Manganese[2]	mg/L	0.05	71	0.0	0.02	**0.94**	**0.10**	**0.15**	0.18
Mercury[1]	mg/L	0.002	72	100.0	<0.0002	<0.0002	---	---	---
Molybdenum	mg/L		71	28.2	<0.01	0.11	0.02	0.02	0.02
Nickel	mg/L		71	69.0	<0.01	0.044	0.010	0.009	0.007
Selenium[1]	mg/L	0.05	71	80.3	<0.0001	0.0009	---	---	---
Silver[2]	mg/L	0.1	72	97.2	<0.00005	0.0001	---	---	---
Thallium[1]	mg/L	0.002	71	70.4	<0.0001	0.00068	0.0001	0.0001	0.0001
Uranium	mg/L		71	16.9	<0.0001	0.0028	0.0006	0.0009	0.0008
Vanadium	mg/L		71	46.5	<0.0002	0.008	0.0003	0.0010	0.0016
Zinc[2]	mg/L	5	71	43.7	<0.0028	0.19	0.0059	0.0285	0.0437

Notes:

1 Idaho primary groundwater standard

2 Idaho secondary groundwater standard

s.u. Standard units

< Indicates that the value was below the analytical detection limit. Applies only to laboratory determined minimum and maximum values. Statistically determined values for median, average, and standard deviation are not marked as being below the detection limit

Bolded values are equal to or exceed Idaho groundwater quality standards in IDAPA 58.01.11. 200.

Statistics for median, average, and standard deviation were not calculated for datasets containing more than 80 percent non-detect values

Excluding monitoring wells MW-2W and MW-3W, analytical data from the baseline monitoring program indicate that groundwater in the Wells Regional Aquifer is a well buffered calcium-bicarbonate type water with moderate concentrations of total dissolved solids (92 to 316 mg/L) and circum-neutral to alkaline pH (6.98 to 8.89 s.u.). Groundwater in the wells summarized in **Table 3.3-22** generally met applicable water quality standards with the exceptions of aluminum (MW-1W, MW-13W, MW-16W, and OW-1W), iron (MW-1W, MW-12W, MW-16W, MW17W, and OW-1W), and manganese (MW-1W, MW-12W, MW-13W, MW-16W, MW17W, and OW-1W).

Four percent of the results in **Table 3.3-22** were equal to or exceeded the secondary groundwater standard for aluminum (0.2 mg/L). Forty-six percent of the results were equal to or exceeded the secondary groundwater standard for iron (0.3 mg/L). Sixty-three percent of the results exceeded the secondary groundwater standard for manganese (0.05 mg/L).

3.4 SOILS

The quality and productivity of Study Area soils are critical components of ecosystem and watershed health. Good soil productivity and quality help prevent erosion and soil loss, maintain fine litter and coarse woody debris, help maintain stable vegetation communities, and promote important soil characteristics such as bulk density (USFS 2003). These soil functions support other components of the ecosystem, such as food and other biomass production (e.g., wildlife and livestock forage), biological and microbiological habitat, and other components. Additionally, soils salvaged from mines and associated areas are important reclamation materials (i.e., GM). These materials can be used to return reclaimed mined lands to conditions favorable for pre-mining land uses, including the aforementioned soil functions (U.S. Department of Agriculture [USDA] 2009).

To evaluate baseline soil conditions and GM suitability, Order 2 soil surveys were completed in 2011 and 2014 for the Study Area (AECOM 2012, 2015). Order 2 soil surveys are generally completed at a 1:10,000 or 1:20,000 scale and involve aerial photograph interpretation as well as collecting data by walking transects of the survey area. Soil samples were collected during the 2011 survey to evaluate agronomic properties and soil suitability properties. Agronomic properties are those properties of soil that contribute to plant growth and field crop production. Concentrations of total metals and plant-available selenium in the soil profile were also evaluated because of concerns about environmental mobility of these constituents if the soils are disturbed. The 2014 survey extended the 2011 survey into adjacent contiguous areas potentially to be disturbed by proposed alternatives.

Soil descriptions and data presented in this section are based on the two AECOM studies, except where noted otherwise. **Figure 3.4-1** illustrates a compilation of soil survey data points, including pedons, transect points, and reconnaissance points from the initial and supplemental soil surveys.

3.4.1 Environmental Setting

Existing soils in the Study Area are largely undisturbed except where past mineral exploration has created local disturbances including roads, mineral exploration and environmental drilling pads, and trenches. Some areas have been previously reclaimed with regrading, reseeding, and placement of straw mats. Study Area soils have not been interpreted by the USDA with respect to their status as prime farmland. However, soils with climatic, elevation, topographic, and parent material characteristics similar to those which dominate the Study Area are likely not prime farmland elsewhere in Caribou County (NRCS 2015). Therefore, there is a low likelihood that soils with prime farmland characteristics are present within the Study Area.

3.4.2 Study Area Soils

3.4.2.1 Soil Map Unit Characteristics

Soil map units delineated in the Order 2 soil survey and supplemental survey are illustrated on **Figure 3.4-2** and summarized in **Table 3.4-1**. Eight soil map units, composed of 13 different soil series, were developed for the Order 2 soil survey, as well as map unit DTL, which represents previously disturbed and reclaimed land, and map unit RXO, which represents rock outcrop. Complete soil profile descriptions, detailed laboratory analytical results, and soil survey field data are presented in AECOM (2012, 2015). Most of the soils in the Study Area are very deep and well drained. Texturally, most soils are fine-loamy, fine-silty, or loamy-skeletal. Taxonomic classifications of the soil series are presented in **Table 3.4-2**.

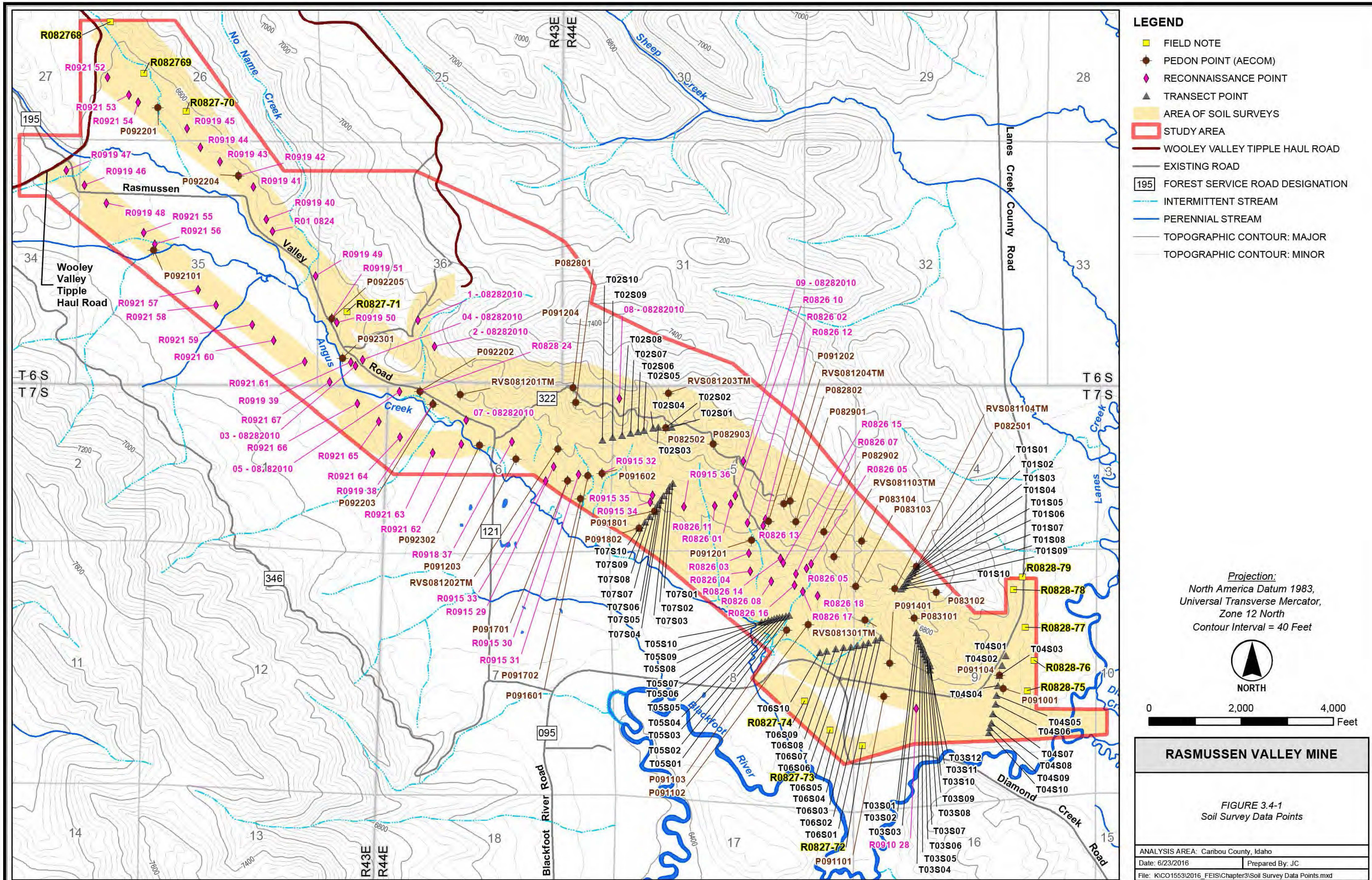
3.4.2.2 Trace Element Results

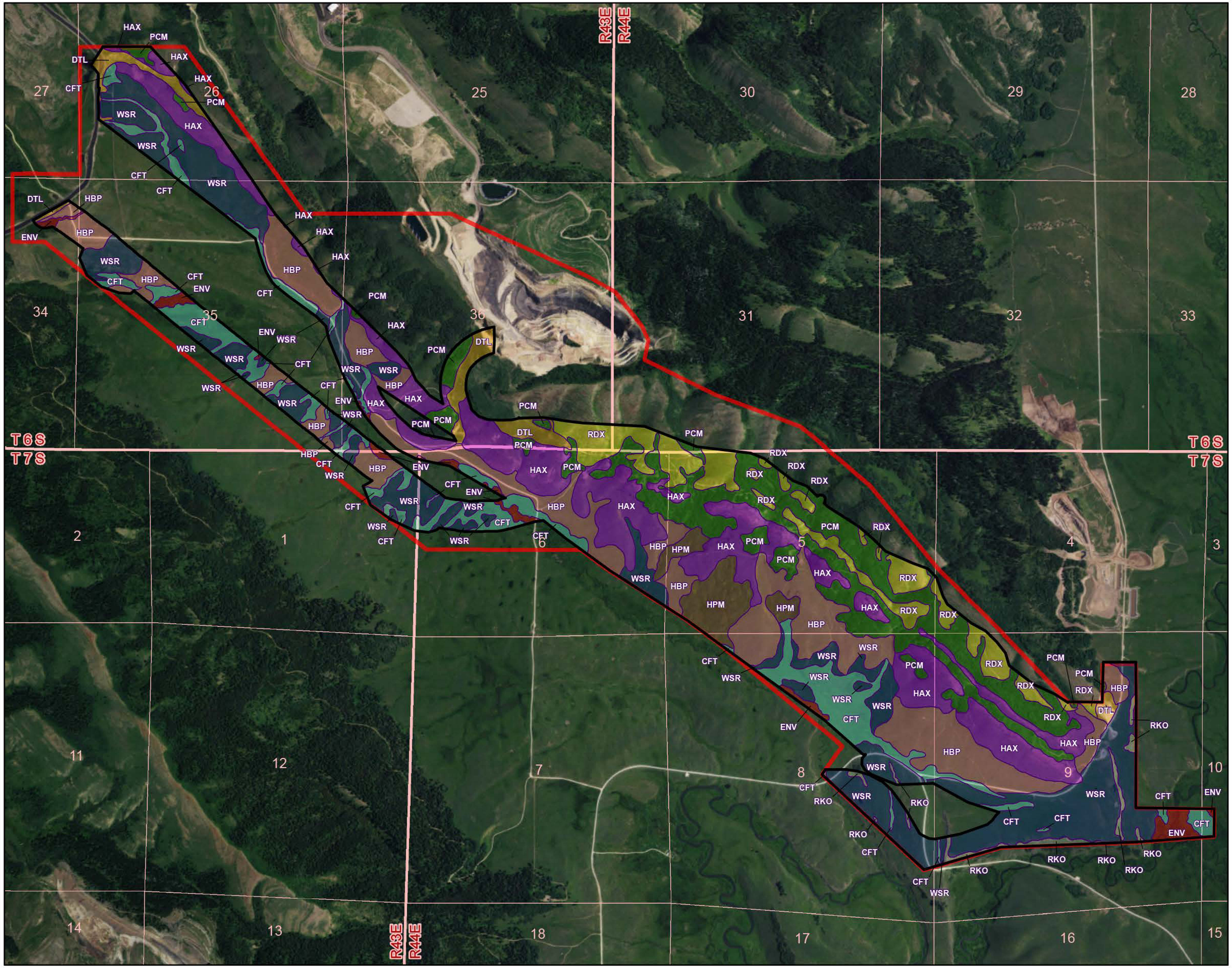
Trace elements are important soil nutrients, but can also limit the use of a soil as GM if plants are able to uptake high concentrations of potentially harmful elements. Uptake of trace elements by plants depends on the species and other factors, such as soil pH. The Caribou National Forest (CNF) Revised Forest Plan (RFP; USFS 2003) and Pocatello Field Office (PFO) Approved Resource Management Plan (ARMP; BLM 2012a) do not establish reclamation suitability criteria for trace element concentrations in soils to be used for reclamation.

The Order 2 soil survey (AECOM 2012) analyzed the total concentrations of many trace elements in Study Area soils. All soil samples were also analyzed for plant-available selenium (i.e., the amount of selenium that may be incorporated into a plant through its root system). In addition, composite samples of GM and alluvium/colluvium were analyzed for plant-available selenium as part of the investigation of potential cap-and-cover materials (BC 2015a). The maximum plant-available selenium reported was 0.03 ppm from the 30- to 58-inch layer of the Chubbflat soil (AECOM 2012). No soils or composite samples of GM and alluvium/colluvium proposed for use in reclamation are considered unsuitable because of selenium concentrations.

3.4.3 Soil Suitability and Quantity

Soil intended for use as GM must exhibit suitable chemical and physical characteristics for successful reclamation. Soil data collected during the Order 2 soil survey and supplemental soil survey reported by AECOM (2012, 2015) were evaluated for suitability as reclamation materials by Arcadis (2015d) per the USDA NRCS “Construction Materials; Reclamation” rule (NRCS 2014b), as modified by USFS (USFS 2014b). This rule supersedes the Topsoil Suitability Rating Guidelines and interpretations presented in the Soil Survey Report (AECOM 2012). Detailed interpretations, and the approach determined by BLM and USFS to provide the most appropriate and useful assessments of salvageable GM, are presented in Arcadis (2015d). Criteria used to rate soils for suitability as GM included cobble content, stone content, clay content, sand content, available water capacity (droughtiness), depth to bedrock, depth to cemented pan, organic material content, carbonate content, sodium content, salinity, alkalinity, acidity, and susceptibility to wind and water erosion. In addition, a site-specific criterion for soils saturated by water was applied (Arcadis 2015e). Each of these criteria has the potential to limit a soil’s usefulness as GM. This interpretation provides a classification of soils as either “good,” “fair,” or “poor” potential GM. Depth to bedrock and depth to cemented pan were also used to evaluate quantity of GM available. As described above, the concentrations of selenium and other trace metals found in Study Area soils do not limit their use as GM. A summary of suitability criteria evaluated by Arcadis (2015d) is provided in **Table 3.4-3**.


LEGEND
FIELD NOTE
PEDON POINT (AECOM)
RECONNAISSANCE POINT
TRANSECT POINT
AREA OF SOIL SURVEYS
STUDY AREA
WOOLEY VALLEY TIPPLE HAUL ROAD
EXISTING ROAD
195 FOREST SERVICE ROAD DESIGNATION
INTERMITTENT STREAM
PERENNIAL STREAM
TOPOGRAPHIC CONTOUR: MAJOR
TOPOGRAPHIC CONTOUR: MINOR
Projection:
North America Datum 1983,
Universal Transverse Mercator,
Zone 12 North
Contour Interval = 40 Feet
NORTH
0
2,000
4,000
Feet
RASMUSSEN VALLEY MINE
FIGURE 3.4-1
Soil Survey Data Points
ANALYSIS AREA: Caribou County, Idaho
Date: 6/23/2016
Prepared By: JC
File: K\CO1553\2016_FEIS\Chapter3\Soil Survey Data Points.mxd
Wooley Valley Tipple Haul Road
Rasmussen Valley Road
Angus Creek
No Name Creek
Sheep Creek
Lanes Creek County Road
Lanes Creek
Blackfoot River
Blackfoot River Road
Diamond Creek Road
R43E
R44E
T 6 S
T 7 S
195
322
121
346
095



LEGEND

STUDY AREA

AREA OF SOIL SURVEYS

MAP UNIT SYMBOL: Soil Description

- CFT: Chubbflat-Turson complex, 0 to 5 percent slopes
- DTL: Disturbed land
- ENV: Enochville silt loam, 0 to 2 percent slopes
- HAX: Hades-Agassiz-Rock Outcrop complex, 20 to 50 percent slopes
- HBP: Hagenbarth-Parkay complex, 3 to 20 percent slopes
- HPM: Hagenbarth-Parkay complex, moist, 12 to 30 percent slopes
- PCM: Parkcity-Moonlight complex, 15 to 50 percent slopes
- RDX: Ireland-Dipcreek-Rock Outcrop complex, 30 to 60 percent slopes
- RKO: Rock Outcrop
- WSR: Woolsted-Robana association, 2 to 15 percent slopes

Projection:
North America Datum 1983, Universal Transverse Mercator, Zone 12 North
Source:
World Imagery Map, serviced by ESRI ArcGIS Online, accessed on 6/23/2016

NORTH

0 2,000 4,000 Feet

RASMUSSEN VALLEY MINE

FIGURE 3.4-2
Order 2 Soil Survey Results

ANALYSIS AREA: Caribou County, Idaho

Date: 6/23/2016 | Prepared By: JC

File: K\CO1553\2016_FEIS\Chapter3\Order 2 Soil Survey Results.mxd

Table 3.4-1 Study Area Soil Distribution

Map Unit Symbol	Map Unit Name	Acreage		Soil component	
		Acres	**% of Study Area**	**Name**	**% of unit**
CFT	Chubbflat-Turson complex, 0 to 5 percent slopes	154.8	10.1	Chubbflat	85
				Turson	10
				Inclusion-Enochville	2
				Inclusion-Robana	2
				Inclusion-Parkay	1
DTL	Disturbed land	43.3	2.8	Disturbed land	100
ENV	Enochville silt loam, 0 to 1 percent slopes	24.7	1.6	Enochville	95
				Inclusion-Chubbflat	3
				Inclusion-Robana	1
				Inclusion-Turson	1
HAX	Hades-Agassiz-Rock Outcrop complex, 20 to 50 percent slopes	271.7	17.7	Hades	55
				Agassiz	25
				Rock Outcrop	10
				Inclusion-Loamy-skeletal soils	5
				Inclusion-Moderately deep soils	5
HBP	Hagenbarth-Parkay complex, 3 to 20 percent slopes	298.4	19.5	Hagenbarth	60
				Parkay	30
				Inclusion-Robana	3
				Inclusion-Woolsted	3
				Inclusion-Clayey soils	3
				Inclusion-Rock outcrop	1
HPM	Hagenbarth-Parkay complex, moist, 12 to 30 percent slopes	48.5	3.2	Hagenbarth	50
				Parkay	35
				Inclusion-Clayey soils	7
				Inclusion-Wet soils	7
				Inclusion-Ponds	1
PCM	Parkcity-Moonlight complex, 15 to 50 percent slopes	224.0	14.6	Parkcity	70
				Moonlight	15
				Inclusion-Fine-loamy soils	5
				Inclusion-Parkay	4
				Inclusion-Hagenbarth	4
				Inclusion-Rock outcrop	2
RDX	Ireland-Dipcreek-Rock Outcrop complex, 30 to 60 percent slopes	108.5	7.1	Ireland	45
				Dipcreek	30
				Rock Outcrop	15
				Inclusion-Xerorthents	5
				Inclusion-Deep soils	3
				Inclusion-Parkcity	2
RKO	Rock Outcrop	15.0	1.0	Rock Outcrop	100
WSR	Woolsted-Robana association, 2 to 15 percent slopes	343.3	22.4	Woolsted	50
				Robana	40
				Inclusion-Hagenbarth	5
				Inclusion-Chubbflat	5
Total Acres in Study Area		**1,532.2**	**100.0**		

Notes:

Inclusions are soil components or miscellaneous areas that are not identified in the name of the map unit and are often too small to be delineated separately.

Source: AECOM 2012, 2015

Table 3.4-2 Classification of Soils

Soil Series	Taxonomic class
Agassiz	Loamy-skeletal, mixed, superactive, frigid Lithic Haploxerolls
Chubbflat	Fine-silty, mixed, superactive Aquic Cumulic Haplocryolls
Dipcreek[1]	Loamy-skeletal, mixed, superactive, frigid Lithic Haploxerolls
Enochville	Fine-silty, mixed, superactive Cumulic Cryaquolls
Hades[2]	Fine-loamy, mixed, superactive, frigid Pachic Argixerolls
Hagenbarth	Fine-loamy, mixed, superactive Pachic Argicryolls
Ireland	Loamy-skeletal, mixed, superactive, frigid Calcic Haploxerolls
Moonlight	Coarse-loamy, mixed, superactive Pachic Haplocryolls
Parkay	Loamy-skeletal, mixed, superactive Pachic Argicryolls
Parkcity	Loamy-skeletal, mixed, superactive Pachic Haplocryolls
Robana	Fine-silty, mixed, superactive Pachic Argicryolls
Turson	Fine-loamy over sandy or sandy-skeletal, mixed, superactive Oxyaquic Haplocryolls
Woolsted	Fine-silty, mixed, superactive Xeric Haplocryolls

Notes:

1 This soil is a taxadjunct[3] to the named series in that the soil mapped in the Study Area has calcium carbonate accumulations or finely disseminated calcium carbonate in the soil profile.

2 This soil is a taxadjunct to the named series in that many of the soils mapped in the Study Area show development in the B horizon but often lack sufficient clay accumulation for an argillic horizon.

3 Taxadjunct refers to a soil map unit that is given the same name as a similar recognized existing soil series for expediency when defining a new soil series would be of limited use.

Source: AECOM 2012

Table 3.4-3 Limiting Values for Soil and Site Properties

Feature	Property	Property Values: Limiting	Property Values: Somewhat Limiting	Property Values: Not Limiting
Properties from Construction Materials: Reclamation (NRCS 2014b), modified for horizon use				
Too clayey	% Clay	≥ 40%	>30 to 40%	≤30%
Cobble content	Cobble by % weight	>50%	>25% to ≤50%	≤25%
	Cobble by % volume[1]	>35%	>16% to ≤35%	≤16%
Stone content	Stone by % weight	>15%	>5% to ≤15%	≤5%
	Stone by % volume[1]	>10%	>3% to ≤10%	≤3%
Carbonate content	Calcium Carbonate Equivalent	≥40%	>15% and <40%	≤15%
Sodium Content	Sodium Adsorption Ratio	>13	>4 and ≤13	≤4
Water Erosion	K factor	≥0.7	> 0.35 to <0.7	≤0.35
Low organic matter	% OM	0	>0 to <1%	≥1%
Too alkaline[2]	Soil pH (1:1 water)	>8.4	≥8.0 to ≤8.4	<8.0
Too acid[2]	Soil pH (1:1 water)	<5.5	≥5.5 to <6.0	≥6.0
Salinity	Electrical Conductivity	>16 mmhos/cm	≤8 to ≥16 mmhos/cm	<8 mmhos/cm
Too sandy	#4 sieve minus #200 sieve	≥85%	>70% and <85%	≤70%
Wind Erosion	Wind Erodibility Group	"1" and "2"	Not Applicable	All Other Groups
Droughty[3]	Available Water Capacity	≤0.05 cm/cm	>0.05 to <0.1 cm/cm	≥0.1 cm/cm
Depth to bedrock	Depth to bedrock	<50 cm	≥50 to ≤100 cm	>100 cm
Depth to cemented pan	Depth to cemented pan	<50 cm	≥50 to <100 cm	≥100 cm

Table 3.4-3 Limiting Values for Soil and Site Properties

Site Specific Property				
Too wet	Months saturated during growing season	Not Applicable	>3	≤3

Notes:

1 Cobble and stone content by volume are not NRCS (2014b) interpretation properties. Field observations of cobble and stone content by volume were converted to content by weight using NRCS 2014c

2 pH values modified per letter from Jack Isaacs (USFS) dated December 8, 2014

3 Horizon adjusted available water capacity limiting values from West National Technology Support Center (2014)

Abbreviations: mmhos = millimhos, cm = centimeter

Source: NRCS 2014b; USFS 2014b; Arcadis 2015d

Physical and chemical factors limiting soil quality and use as GM are present in the Study Area. The primary physical factor limiting suitability is excess rock fragment (cobble or stone) content. Acidity (low pH) and low organic material content are the primary chemical limitations. Less common limiting factors include excess clay content, droughtiness, carbonate content, excess sand content, and others. Depth to water saturated conditions, whether seasonal or perennial, are an issue limiting topsoil salvage for map units CFT and ENV and, to a lesser extent, the HPM and WSR units.

Major components of map units HAX, HBP, HPM, and RDX contain coarse rock fragments in amounts that limit the soil suitability of one or more horizons as GM. Soil horizons limited by excess rock fragment content are most commonly associated with soils that are shallow over bedrock, such as units HAX and RDX.

3.4.3.1 GM Availability

Soil suitability interpretations indicate that, for all soil components, suitability is best near the top of the profile and decreases with depth or is similar throughout the entire profile. **Table 3.4-4** presents the depth of soils classified as good, fair, and poor according to Soil Survey Staff (NRCS 2014b) criteria available within each map unit component as interpreted by Arcadis (2015d). The primary factors limiting quantity are depth to bedrock and depth to water saturated conditions. Shallow soils and rock outcrop that limit salvageable volume are interspersed throughout map units HAX and RDX. These map units represent 25 percent of the Study Area. Because the availability of soils for use as GM depends on the areas from which soils are salvaged, GM volumes available for reclamation are presented in **Chapter 4**.

Table 3.4-4 Distribution of Potential GM by Soil Map Unit

Map Unit	Component Name	% of unit	Limiting Criteria	Good Material (depth in inches)	Fair Material (depth in inches)	Poor Material (depth in inches)
CFT	Chubbflat	85	Too wet; too clayey; low OM; water erosion	0	24	34
	Turson	10	Low OM; too sandy; droughty	17	10	13
	Inclusion - Enochville	2	Too wet; too clayey; low OM, droughty	0	20	40
	Inclusion - Robana	2	Acidic; too clayey; low OM; water erosion	3	46	0
	Inclusion - Parkay	1	Acidic; too clayey; low OM; droughty; cobbles	3	30	7
DTL	--Not Rated--			0	0	0
ENV	Enochville	95	Too wet; too clayey; low OM; droughty	0	20	40
	Inclusion - Chubbflat	3	Too wet; too clayey; low OM; water erosion	0	24	34
	Inclusion - Robana	1	Acidic; too clayey; low OM; water erosion	3	46	0
	Inclusion - Turson	1	Low OM; too sandy; droughty	17	10	13

Table 3.4-4 Distribution of Potential GM by Soil Map Unit

Map Unit	Component Name	% of unit	Limiting Criteria	Good Material (depth in inches)	Fair Material (depth in inches)	Poor Material (depth in inches)
HAX	Hades	55	Stones; acidic; low OM; droughty	0	38	22
	Agassiz	25	Depth to bedrock; Acidic; too sandy; droughty	0	6	8
	Rock Outcrop	10	--Not Rated--	0	0	0
	Inclusion - Loamy-skeletal soils	5	Acidic; low OM; droughty; cobbles; stones; too clayey	2	28	6
	Inclusion - Moderately-deep soils	5	Acidic; low OM; droughty	0	38	0
HBP	Hagenbarth	60	Acidic; low OM; too clayey	17	43	0
	Parkay	30	Acidic; low OM; droughty; cobbles; stones; too clayey	2	28	6
	Inclusion - Robana	3	Acidic; too clayey; low OM; water erosion	3	46	0
	Inclusion - Woolsted	3	Acidic; low OM; water erosion	0	27	33
	Inclusion - clayey soils	3	Too clayey	6	24	0
	Rock Outcrop	10	--Not Rated--	0	0	0
HPM	Hagenbarth	50	Acidic; too clayey; low OM; cobbles	20	27	0
	Parkay	35	Acidic; low OM; droughty; cobbles; too clayey	3	30	7
	Ponds	7	--Not Rated--	0	0	0
	Inclusion - clayey soils	7	Too clayey	6	24	0
	Inclusion - Wet Soils	1	Too wet; too clayey; low OM; water erosion	0	24	34
PCM	Parkcity	70	Droughty; low OM	4	36	0
	Moonlight	15	Carbonate; low OM	21	17	26
	Inclusion - Fine-loamy soils	5	Carbonate; low OM	12	37	11
	Inclusion - Parkay	4	Acidic; low OM; droughty; cobbles; too clayey	3	30	7
	Inclusion - Hagenbarth	4	Acidic; low OM; too clayey	17	43	0
	Rock Outcrop	2	--Not Rated--	0	0	0
RDX	Ireland	45	Stones; cobbles; droughty; too sandy; depth to bedrock; carbonate	0	6	26
	Dipcreek	30	Carbonate; cobbles; droughty; depth to bedrock	0	10	6
	Rock Outcrop	15	--Not Rated--	0	0	0
	Inclusion - Xerorthents	5	Stones; cobbles; droughty; depth to bedrock	0	6	26
	Inclusion - Deep soils	3	Low OM; depth to bedrock	27	12	0
	Inclusion - Parkcity	2	Droughty; low OM	4	36	0
RXO	--Not Rated--			0	0	0
WSR	Woolsted	50	Acidic; low OM; water erosion	0	27	33
	Robana	40	Acidic; too clayey; low OM; Water erosion	3	46	0
	Inclusion - Hagenbarth	5	Acidic; low OM; too clayey	17	43	0
	Inclusion - Chubbflat	5	Too wet; too clayey; low OM; Water erosion	0	0	58

Notes:
1 Not all limiting factors apply to all horizons within a given component
2 OM = organic matter
Source: Arcadis 2015e

All soil map units (except DTL) contain soils rated as fair or good for use as GM; however, some map units have better combinations of suitability and volume. In general, within the Study Area, map unit PCM offers the best combination of volume and good quality soils for reclamation. Conversely, the Chubbflat and Enochville soils (primarily within units CFT and ENV) are limited by wetness and a relatively shallow water table. The drier narrow drainages, dominated by the Turson soil in units CFT and ENV, provide good soils that are not limited by wetness.

3.4.4 Erosion Potential

Soil erodibility characteristics determined by AECOM (2012) are presented in **Table 3.4-5**. In general, soils within the Study Area have moderate to low susceptibility to erosion by water, with the most susceptible soils being located in lower parts of the Study Area. Susceptibility to erosion by wind is generally low except in areas of soil unit HAX.

Soil erodibility factors (Kw) and (Kf) quantify soil detachment by runoff and raindrop impact. These erodibility factors are used to predict the long-term average soil loss from sheet and rill erosion under crop systems and conservation techniques. Factor Kw applies to the whole soil, and factor Kf applies only to the fine-earth (less than 2.0 mm) fraction. Kf was calculated using an empirical formula that incorporates several variables including the percentage of silt and sand, soil organic matter, soil structure, and permeability. This factor is modified according to the percentage (by volume) of rock fragments observed in the soil profile to produce the factor Kw. The higher the soil erodibility factors, the more susceptible the soil is to sheet and rill erosion by water. Soils within the Study Area are likely to be exposed at multiple depths during the life of proposed mining activities. Therefore, a general water erosion hazard, or susceptibility of a disturbed soil to water erosion, was determined for each component of soil map units based on a weighted average of Kw values presented in AECOM (2012). Soil horizons deemed unusable as GM (Arcadis 2015e) were included in erosion hazard calculations because these areas may be exposed during project activities.

For the purposes of this EIS, the soil EH rating was based on weighted average Kw as follows:

If $Kw < 0.25$, then erosion hazard = low (L)

If $0.25 \leq Kw \leq 0.40$, then erosion hazard = moderate (M)

If $Kw > 0.40$, then erosion hazard = high (H).

The weighted average EH soil map unit components where sufficient data are available are shown in **Table 3.4-5**. AECOM (2012) did not determine erodibility characteristics for the DTL or RKO map units. Data, including soil texture and coarse fragment percentages, used to determine the characteristics presented in **Table 3.4-5** are presented in AECOM (2012).

Table 3.4-5 Soil Erodibility Characteristics

Map Unit Symbol	Component Name	Kw Weighted Average	General Water Erosion Hazard	Wind Erodibility Group
CFT	Chubbflat	0.31	M	>2
	Turson	0.28	M	6
	Inclusion-Enochville	0.26	M	6
	Inclusion-Robana	0.42	H	6
	Inclusion-Parkay	0.24	L	7
DTL	Disturbed Land	NA		
ENV	Enochville	0.26	M	6
	Inclusion-Chubbflat	0.31	M	>2
	Inclusion-Robana	0.42	H	6
	Inclusion-Turson	0.28	M	6
HAX	Hades	0.11	L	3
	Agassiz	0.13	L	8
	Rock Outcrop	NA		
	Inclusion-loamy-skeletal soils	0.27	M	6
	Inclusion-moderately deep soils	0.13	L	3

Table 3.4-5 Soil Erodibility Characteristics

Map Unit Symbol	Component Name	Kw Weighted Average	General Water Erosion Hazard	Wind Erodibility Group
HBP	Hagenbarth	0.27	M	6
	Parkay	0.27	M	6
	Inclusion-Robana	0.42	H	6
	Inclusion-Woolsted	0.43	H	6
	Inclusion-clayey soils	NA		
	Inclusion-rock outcrop	NA		
HPM	Hagenbarth	0.28	M	6
	Parkay	0.24	L	7
	Inclusion-clayey soils	NA		
	Inclusion-wet soils	0.31	M	>2
	Inclusion-Ponds	NA		
PCM	Parkcity	0.09	L	7
	Moonlight	0.24	L	5
	Inclusion-fine-loamy soils	0.36	M	>2
	Inclusion-Parkay	0.24	L	7
	Inclusion-Hagenbarth	0.27	M	6
	Inclusion-rock outcrop	NA		
RDX	Ireland	0.04	L	7
	Dipcreek	0.23	L	7
	Rock Outcrop	NA		
	Inclusion-Xerorthents	0.04	L	7
	Inclusion-Deep soils	0.12	L	>2
	Inclusion-Parkcity	0.09	L	7
RKO	Rock Outcrop	NA		
WSR	Woolsted	0.43	H	6
	Robana	0.42	H	6
	Inclusion-Hagenbarth	0.27	M	6
	Inclusion-Chubbflat	0.31	M	>2

Notes:
NA Not assessed because of lack of data (e.g., clayey soil inclusions) or generally accepted low erosion hazards (e.g., rock outcrops, ponds)
Sources: AECOM 2012, 2015

A wind erodibility group (WEG) is a grouping of soils that have similar properties affecting their resistance to soil blowing in cultivated areas. The groups indicate the susceptibility to blowing. WEGs are not officially defined with respect to soil blowing susceptibility or potential. However, WEGs 1 and 2 are typically considered to have the highest susceptibility, WEGs 3 through 6 moderately high to moderately low susceptibility, and WEGs 7 and 8 have low susceptibility. WEG ratings presented in **Table 3.4-5** apply only to the surface layer of an undisturbed soil. Arcadis (2015d) evaluated WEG ratings for subsurface horizons for each soil component and determined that soils with the highest susceptibility to wind erosion (WEGs 1 and 2) are not present.

3.5 VEGETATION, RIPARIAN AREAS, AND WETLANDS

3.5.1 Vegetation Cover Types

Vegetation was characterized in the Study Area by identifying and mapping vegetation cover types, first by reviewing existing studies and then by completing field work. On-site vegetation baseline studies (BC 2012a,b,c) delineated types in the Study Area. Topography, microclimate, soils, and seed sources typically determine the locations of these five types (Steele et al. 1983). Two of these vegetation types (aspen [*Populus tremuloides*] and wetlands) were further divided into subtypes because the vegetation within exhibited wide differences in one of these characteristics (e.g., plant species and structure, soils, moisture). Aspen was divided into four separate strata and wetlands into two separate strata (BC 2012a,b,c). Vegetation cover types are shown on **Figure 3.5-1**, and include the following:

- Aspen forest (consists of four aspen forest strata defined by age, proportion conifer, and dryness)
- High-elevation rangeland
- Big sagebrush (*Artemisia tridentata*) shrubland
- Silver sagebrush (*Artemisia cana*) shrubland.

Wetland consists of two wetland strata:

- Emergent/ wetlands and adjacent drainages
- Shrub/scrub wetlands and adjacent drainages

As described in **Section 2.3.7.9**, quantitative richness-cover-wetness (RICHCOVWET) metric values were calculated for the vegetation cover types in the Study Area to evaluate the wildlife habitat quality of each in the Habitat Equivalency Analysis (HEA; Arcadis 2014a). **Table 3.5-1** summarizes the vegetation cover types that overlap the Study Area and their associated baseline RICHCOVWET values, and the locations of the cover types are shown on **Figure 3.5-1**. The cover types are further described below, largely summarizing BC's vegetation baseline technical report (BC 2012a).

Vegetation cover types and some associated plants in the Study Area can be important to pollinators. There is increasing evidence that many pollinators (such as honey bees [*Apis* sp.] and monarch butterflies [*Danaus plexippus*]) are in decline (USDA 2015, U.S. Fish and Wildlife Service [USFWS] 2015a). To address these population declines, the White House released a Presidential Memorandum – Creating a Federal Strategy to Promote the Healthy of Honey Bees and Other Pollinators on June 20, 2014. With this direction, the USDA and U.S. Department of the Interior (US DOI) issued the 2015 draft document: Pollinator-Friendly Best Management Practices for Federal Lands. This document guides federal land managers to effectively and efficiently use available resources and engage public and private partnerships in taking action for the conservation and management of pollinators and pollinator habitat. Currently, there are no federally listed threatened or endangered pollinator species or USFS sensitive pollinator species on the Caribou-Targhee National Forest (CTNF). Milkweed, which is an important plant to pollinators, and monarch butterfly habitat are not known to occur in the Study Area.

3.5.1.1 Aspen Strata

A broad band of aspen woodland is present on the upper slopes of Rasmussen Ridge. The aspen were divided into four stratum categories as follows:

- Aspen mature dry woodland - Stands in this stratum are those that appear to be dominated by mature aspen on drier sites and have little to no conifer presence.

- Aspen mature - Stands in this stratum are those that appear to be dominated by mature but not old aspen on mesic (wetter) sites and have little to no conifer presence.
- Aspen old growth - Stands in this stratum are those that appear to be dominated by mature to old aspen that are on mesic sites and have little to no conifer presence. These stands appear to meet the compositional, structural, and age definitions of USFS old-growth aspen cover type.
- Aspen/conifer mix - Stands in this stratum are those that appear to be dominated by a mix of mature aspen and conifer, but primarily conifer, or that are known to have substantial conifer in the understory. In addition to aspen, this stratum includes interior Douglas-fir (*Pseudotsuga menziesii var glauca*), lodgepole pine (*Pinus contorta*), and subalpine fir (*Abies lasiocarpa*). Certain areas within aspen/conifer mix stratum are dominated by conifers, particularly by Douglas-fir.

The Study Area also includes 0.9 acre of aspen woodland that were not included in the area surveyed during BC's baseline vegetation studies. This area of aspen woodland was mapped using aerial imagery and is depicted on **Figure 3.5-1** as "aspen stratum not classified."

Table 3.5-1 Vegetation Cover Types and Acreages as Depicted on Figure 3.5-1

Cover Type	Acres in Study Area	RICHCOVWET Value Calculated for HEA[1]
Aspen Mature Dry Woodland	310.0	0.76
Aspen Mature	76.7	0.78
Aspen Old Growth	5.8	0.64
Aspen/Conifer Mix	46.9	0.88
Aspen Stratum not Classified	0.9	N/A (not included in HEA)
Big Sagebrush Rangeland	735.7	0.46
Silver Sagebrush Rangeland	385.0	0.43
High-Elevation Rangeland	392.5	0.61
Shrub/Scrub Wetland	58.6	1.00
Emergent Wetland	261.1	0.89
Existing P4 South Rasmussen Mine Site	138.6	0.00
Reclaimed Areas	78.4	varies depending on age of reclaimed area
TOTAL	**2,490.2**	

Notes:
1 See **Section 2.3.7.9** for further information on how RICHCOVWET values were derived
Source: BC 2012a, 2012b, 2012c; Arcadis 2014a

The four aspen strata occur as a belt of aspen extending from northwest to southeast along the swale formed in Rasmussen Ridge at the outcrop of the Meade Peak Member of the Phosphoria Formation. Aspens favor upper-elevation drainages, which are the more protected portions of the southwest-facing ridge face. Topographic swales in the mountain slope are less exposed, and aspens benefit from increased moisture in these drainages. The Phosphoria Formation and protected drainages appear to provide favorable conditions for aspens.

In general, aspens are stressed and in decline throughout most of the western U.S. There is no single definitive cause for this decline, but it may be linked to climate change (Worrall et al. 2013). Changes in temperature and moisture regimes may be making aspens more susceptible to diseases and insect damage (Morelli and Carr 2011). In the Study Area, the aspens appear to be generally healthy, but there are some signs of stress, such as an occasional stand of dead trees.

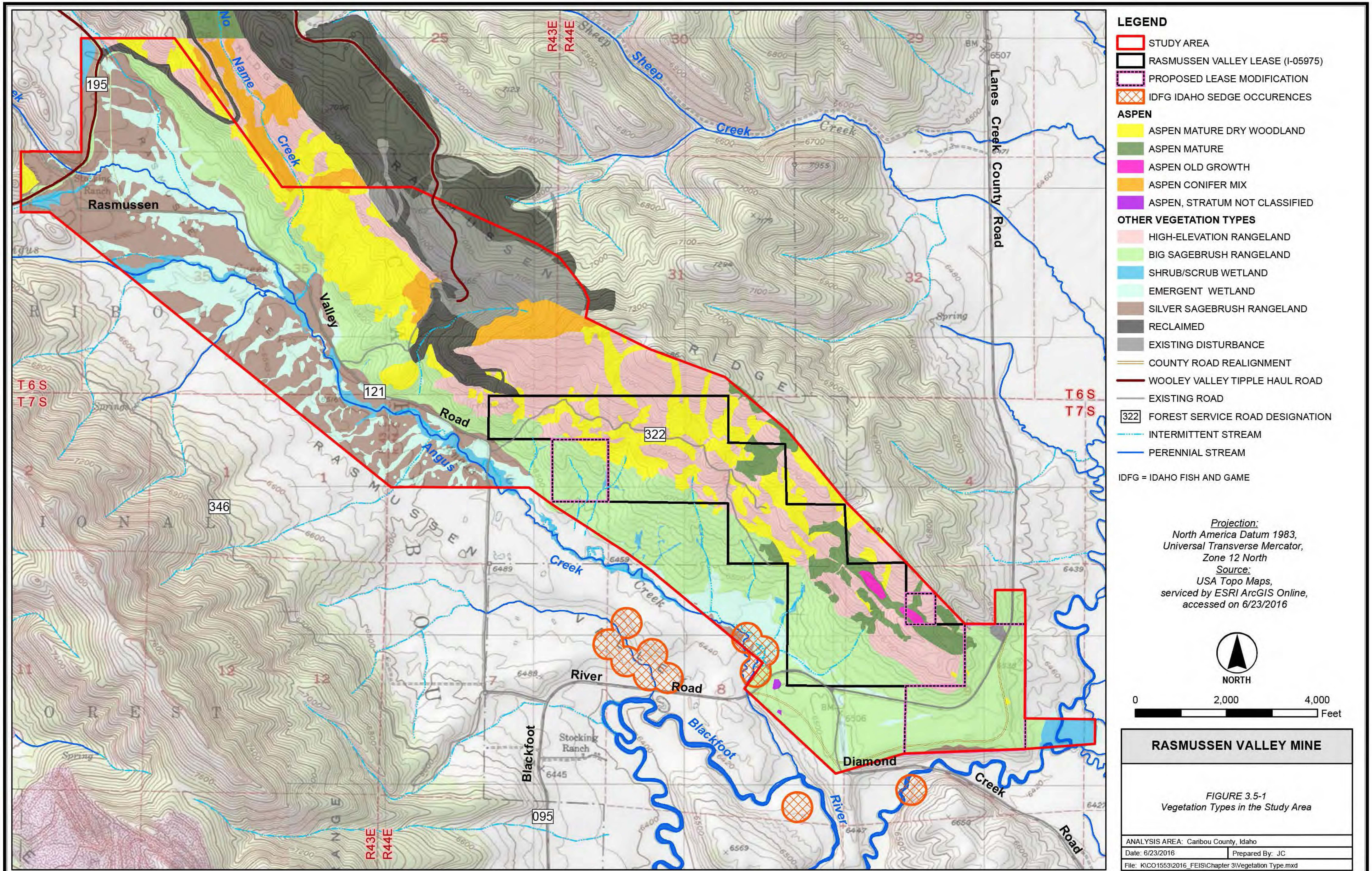


FIGURE 3.5-1
Vegetation Types in the Study Area

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Mountain pine beetle (*Dendroctonus ponderosae*) is affecting lodgepole pine in the mixed aspen/conifer areas, and this may reduce lodgepole pine numbers in this cover type significantly over the next several years (Krist et al. 2014). Aspens are the single dominant overstory tree within the four aspen strata, but a variety of woody species occupy the understory. These species include serviceberry (*Amelanchier alnifolia*), chokecherry (*Prunus virginiana*), bitterbrush (*Purshia tridentata*), mountain snowberry (*Symphoricarpos oreophilus*), Oregon grape (*Mahonia repens*), and wild rose (*Rosa woodsii*). Dominant grasses in the aspen strata include Timothy (*Phleum pratense*), Kentucky bluegrass (*Poa pratensis*), mountain brome (*Bromus marginatus*), and American needlegrass (*Achnatherum nelsonii*).

The aspen strata also provide optimum habitat for a variety of summer-flowering forbs. These include little sunflower (*Helianthella uniflora*), Indian paintbrush (*Castelleja miniata*), western blue flax (*Linum lewisii*), meadowrue (*Thalictrum occidentale*), wild geranium (*Geranium viscosissimum*), mariposa-lily (*Calachortus* spp.), beardtongue (*Penstemon cyaneus*), and tall mountain larkspur (*Delphinium occidentale*).

3.5.1.2 Big Sagebrush Rangeland

In the Study Area, big sagebrush rangeland occupies the high plains and the arid lower mountain slopes. Big sagebrush rangeland is an arid zone between lower-elevational cover-types (mesic emergent/ponded wetland and silver sagebrush [rangeland) and high-altitude plant communities that benefit from greater moisture found at higher elevations.

Big sagebrush rangeland is dominated by mountain big sagebrush (*Artemisia tridentata ssp. vaseyana*), specifically with rabbitbrush (*Ericameria nauseosus*), bitterbrush, and mountain snowberry (present in lesser amounts). Mountain big sagebrush typically comprises 50 percent or more of plant cover in the shrub layer on big sagebrush rangeland.

Grasses and forbs grow in moderate to sparse quantities among the sagebrush. Both native and introduced grass species are widespread. Timothy is an introduced grass that is ubiquitous, and may be predominant among all grasses observed within both types of sagebrush rangeland. Mountain brome, a native grass, is common, and non-native grasses (such as Kentucky bluegrass, orchardgrass [*Dactylis glomerata*], and intermediate wheatgrass [*Thinopyrum intermedium*]) are widespread.

3.5.1.3 Silver Sagebrush Rangeland

In the Study Area, silver sagebrush rangeland occupies an elevational zone between mesic emergent/ponded wetland and big sagebrush rangeland. No precise line exists in nature between areas mapped as silver sagebrush rangeland and big sagebrush rangeland, as shown on **Figure 3.5-1**. Instead, a zone usually exists where the two dominant sagebrush species intermingle, but big sagebrush becomes increasingly dominant as elevation increases. In contrast, the line between silver sagebrush rangeland and mesic emergent/ponded wetland is more distinct because silver sagebrush, which requires more soil moisture than big sagebrush, cannot tolerate the prolonged saturation in the upper soil profile exhibited by emergent wetlands.

Although silver sagebrush is the dominant shrub identifying silver sagebrush rangeland, shrub cinquefoil (*Dasiphora fruticosa*) is also present. Common grasses and forbs include silvery lupine (*Lupinus argenteus*), yarrow (*Achillea millefolium*), and mountain brome. Other species, such as Timothy and Kentucky bluegrass, are also found within this cover type.

3.5.1.4 High-Elevation Rangeland

High-elevation rangeland occurs at higher elevations than big sagebrush rangeland, typically above 6,600 feet in elevation. Although many of the same plant species present in the high-elevation rangeland cover-type also occur in big sagebrush rangeland, the composition of the plant community changes. Big sagebrush is still found, but mountain snowberry in particular becomes more widespread. Increased moisture at higher elevations also favors a greater diversity of shrubs and some trees. Chokecherry, serviceberry, and snowbrush (*Ceanothus velutinus*) are common, and clusters of aspens occur.

Grass species in high-elevation rangeland are similar to those found on sagebrush rangeland. Timothy, Kentucky bluegrass, basin wildrye (*Elymus cinerus*), and mountain brome are widespread. Sandberg bluegrass (*Poa secunda*) is dominant on very exposed slopes, whereas cheatgrass (*Bromus tectorum*) has colonized rocky shale outcrops.

In addition to an increased diversity of shrubs, a greater variety of forbs is found at higher elevations. Species include Indian paintbrush, scarlet gilia (*Ipomopsis aggregata*), buckwheat (*Eriogonum* spp.), balsamroot (*Balsamorhiza sagittata*), and Canada goldenrod (*Solidago canadensis*).

3.5.1.5 Shrub/Scrub Wetland

In the Study Area, shrub/scrub wetlands are relatively narrow, disjointed willow corridors along Angus Creek and its headwater tributaries. Intensive cattle grazing has constricted the willow corridor along stretches of the creek, and in some areas, the cattle (with human assistance) have completely removed all woody vegetation.

The healthiest section of shrub/scrub wetlands is found at the western (upstream) corner of the area (NE¼ of S34, T6S, R43E) where Angus Creek turns west towards the Wooley Range. A healthy complex of willows, currants, and herbaceous riparian vegetation line the creek corridor in this zone, which is above the heavily grazed private ranch. Where cattle are not allowed to graze, the creek and a water table near the ground surface (seasonally saturated zone) support a broad wetland containing willows and currants of mixed ages.

The shrub/scrub wetland corridor along Angus Creek and its tributaries is composed of intermingled coyote willow (*Salix exigua*) and Geyer willow (*Salix geyeriana*) with some occasional golden currant (*Ribes aureum*). In many locations, only large old willows have survived being browsed by cattle. The herbaceous layer consists of wetland plants similar to those observed in the emergent wetlands (described below). Nebraska sedge (*Carex nebrascensis*), Baltic rush (*Juncus arcticus*), redtop bentgrass (*Agrostis stolonifera*), and graceful cinquefoil (*Potentilla gracilis*) dominate this herbaceous layer.

Although the shrub/scrub wetland community is identified as a vegetation type associated with Angus Creek and its tributaries, a small anomalous stand of willows is also located at the head of a spring on the lower slopes of Rasmussen Ridge (NE¼ NE¼ of T7S, R44E). This spring is sufficiently productive to sustain a mature cluster of willows underlain with sedges.

Several intermittent springs are found at the heads of narrow drainages on the relatively steep lower slopes of Rasmussen Ridge. These springs typically arise at 6,600 feet in elevation and flow during spring and early summer. Seasonal hydrology is adequate to support hydrophytic plant communities (adapted to grow in water) in segments of these narrow drainages, but flows are not sufficient to create defined channels. These seasonal mountain drainages support plant communities dominated by redtop bentgrass, Baltic rush, Nebraska sedge, and graceful cinquefoil, which distinguish the drainages from surrounding big sagebrush rangeland. These species also define wetlands on the valley floor, but largely because of steep topography, the mountainside wetland drainages have a vastly different character than wetlands on the Rasmussen Valley bottom.

3.5.1.6 Emergent Wetland

Emergent wetlands are areas dominated by forbs and grasses. This cover-type has largely been delineated as wetlands, but some areas of upland meadow may border the delineated wetlands. Sagebrush is generally absent in emergent wetlands as a result of the presence of soils saturated beyond the tolerance of common sagebrush species. The loss of saturation and the concurrent presence of scattered silver sagebrush typically indicate uplands in the Study Area. Areas mapped as emergent wetlands may also contain small or narrow areas of upland meadow.

The wettest portions of this vegetative community have dense stands of sedges and rushes. Beaked sedge (*Carex utricata [sun: C. rostrata*) and Nebraska sedge are dominant within ponded areas on the valley floor. Broad areas of Baltic rush also occupy highly saturated creek-side terraces. Bluejoint (*Calamagrostis canadensis*), redtop bentgrass, and meadow barley (*Hordeum brachyantherum*) are common wetland grasses. Timothy and Kentucky bluegrass become increasingly dominant at the drier outer portions of the wet bottomland and within upland meadow and range surrounding the delineated wetlands.

Graceful cinquefoil is also found within the emergent wetlands. The blooming period for graceful cinquefoil coincides with a period when seasonal wetlands bordering Angus Creek are drying up and some wetland species have died back. Graceful cinquefoil tolerates a wide range of moisture regimes, and this may account for its ubiquitous presence in emergent wetlands.

3.5.1.7 Existing Mine Site and Reclaimed Areas

The areas delineated as existing mine site on **Figure 3.5-1** are areas of active mining and unreclaimed mining areas and are generally devoid of vegetation. These areas are located at the P4 South Rasmussen Mine. Reclaimed areas are areas of previous mining activities that have been stabilized and seeded as part of approved reclamation plans. The reclaimed areas within the Study Area are newly reclaimed and have not established one or more dominant species. Bare ground dominates these areas with a mixture of grasses, mountain brome, intermediate wheatgrass, and various forb species.

3.5.2 Wetlands

Section 404 of the CWA (33 U.S.C §1344) prohibits discharges of dredge or fill material into waters of the U.S. (WOUS), including jurisdictional wetlands, without a Department of the Army Permit. Section 404 of the CWA is administered by the U.S. Army Corps of Engineers (USACE) with oversight by the USEPA.

Wetlands in the Study Area were delineated using the 1987 USACE Wetlands Delineation Manual (USACE 1987) and the Regional Supplement to the Corps of Engineers Wetlands Delineation Manual: Western Mountains, Valleys, and Coast Region (USACE 2008, 2010). Wetlands for most of the Study Area were delineated during investigations conducted in 2009, 2010, and 2011. The Study Area boundary was revised again after July 2011, and additional wetland delineation was conducted within the 22-acre spur area. **Figure 3.5-2** shows the locations of the wetland assessment areas in relation to the Study Area. Results of these delineations are described below.

Two wetland classifications were identified during the delineations: shrub/scrub wetlands and emergent wetlands. Shrub/scrub wetlands were dominated by Geyer’s willow with an understory similar to that of the wet meadow areas. Typical emergent wetland vegetation consisted of Kentucky bluegrass, Baltic rush, bentgrass (*Agrostis stolonifera*), creeping spikerush (*Eleocharis palustris*), Nebraska sedge, beaked sedge (*Carex utriculata*), water sedge (*Carex aquatilis*), and tall buttercup (*Ranunculus acris*). Altogether, the wetland delineations identified 438.2 acres of wetlands in the Study Area (64.6 acres of shrub/scrub wetland and 373.6 acres of emergent wetland).

3.5.2.1 Wetland Functions and Values

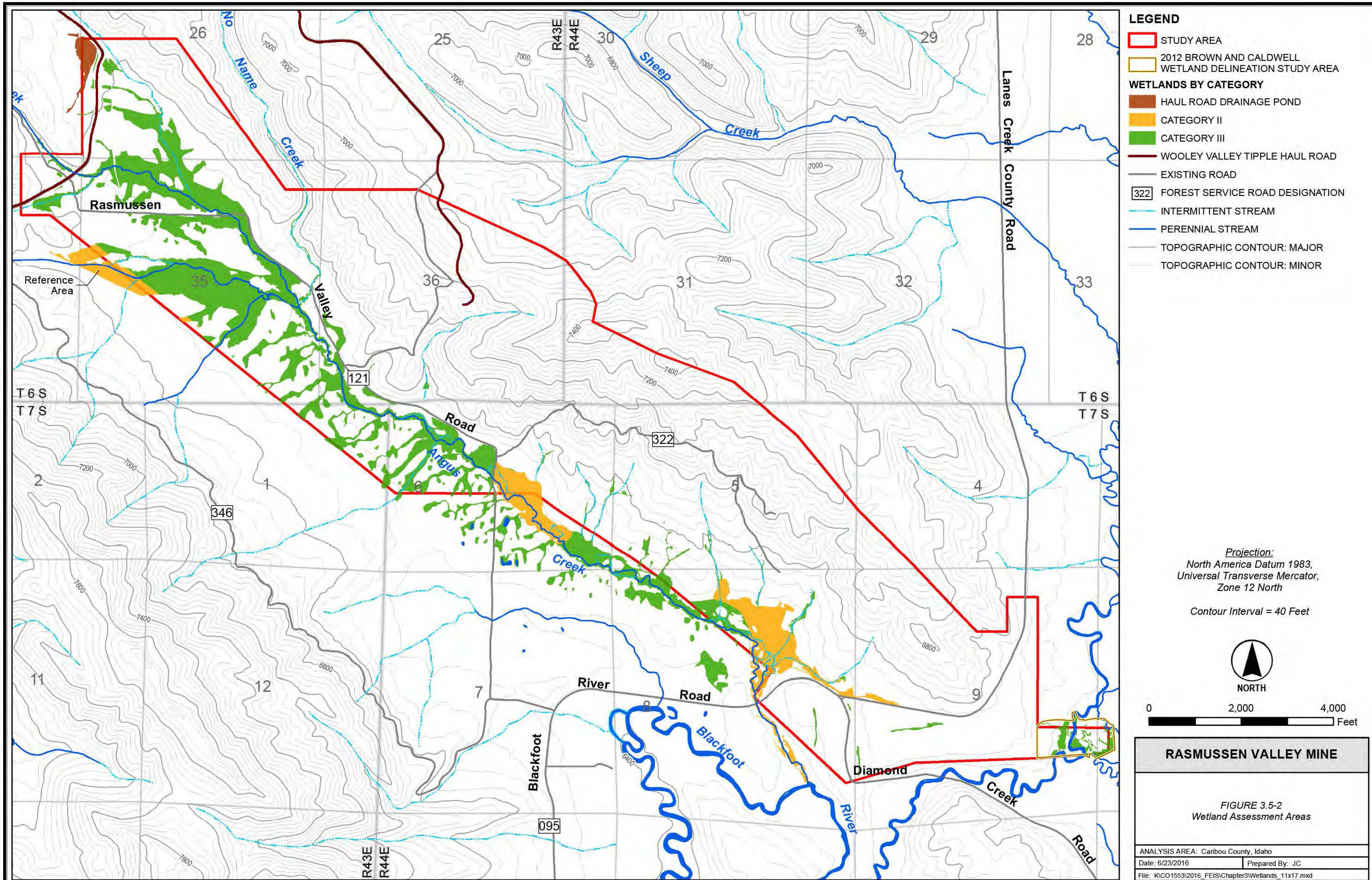
As recommended by the USACE Idaho Falls Regulatory Office, the 2008 Montana Department of Transportation Montana Wetland Assessment Method (MWAM), which is a variation of the Hydrogeomorphic Method (Berglund and McEldowney 2008), was used to assess wetlands in the Study Area. Though the MWAM was developed to evaluate wetlands impacted during linear transportation projects in Montana, it is applicable to Southeast Idaho.

The MWAM uses up to 12 functions or values to describe the condition and classification of a wetland. These include:

- Habitat for federally listed or proposed threatened or endangered plants or animals
- Habitat for plants or animals rated S1, S2, or S3 by the Montana Natural Heritage Program (modified for this project to use Idaho projects species listed in the State of Idaho as S1, S2, or S3)
- General wildlife habitat
- General fish habitat
- Flood attenuation
- Long- and short-term surface water storage
- Sediment/nutrient/toxicant retention and/or removal
- Sediment/shoreline stabilization
- Production export/terrestrial and aquatic food chain support
- Groundwater discharge/recharge
- Uniqueness
- Recreation/education potential

Each function and value is assessed; rated low, moderate, high, or exceptional; and assigned a number value ranging from 0.1 to 1.0 “functional points” according to the attributes of the wetland. These functional points are summed and then expressed as a percentage of possible total points. This percentage is then used with other criteria to provide an overall wetland ranking into one of four categories. Following are descriptions of each wetland category according to Berglund and McEldowney (2008).

- **Category I** - These wetlands are of exceptionally high quality and are generally rare to uncommon or are important from a regulatory standpoint. These wetlands can provide primary habitat for federally listed or proposed threatened or endangered species, represent a high quality example of a rare wetland type, provide irreplaceable ecological functions, exhibit exceptionally high flood attenuation capability, or are assigned high ratings for most of the assessed functions and values.



LEGEND
STUDY AREA
2012 BROWN AND CALDWELL WETLAND DELINEATION STUDY AREA
WETLANDS BY CATEGORY
HAUL ROAD DRAINAGE POND
CATEGORY II
CATEGORY III
WOOLEY VALLEY TIPPLE HAUL ROAD
EXISTING ROAD
322 FOREST SERVICE ROAD DESIGNATION
INTERMITTENT STREAM
PERENNIAL STREAM
TOPOGRAPHIC CONTOUR: MAJOR
TOPOGRAPHIC CONTOUR: MINOR
Projection:
North America Datum 1983, Universal Transverse Mercator, Zone 12 North
Contour Interval = 40 Feet
NORTH
0 2,000 4,000 Feet
RASMUSSEN VALLEY MINE
FIGURE 3.5-2
Wetland Assessment Areas
ANALYSIS AREA: Caribou County, Idaho
Date: 6/23/2016
Prepared By: JC
File: K:\CO1553\2016_FEIS\Chapter3\Wetlands_11x17.mxd
Rasmussen
Valley
Road
Reference Area
No Name Creek
Sheep Creek
Lanes Creek County Road
Argus Creek
River Road
Blackfoot
Blackfoot River
Diamond
Creek Road
121
322
346
095
R43E R44E
T 6 S
T 7 S
26 25 30 29 28 35 36 31 32 33 2 1 6 5 4 11 12 7 8 9

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- **Category II** - These wetlands are more common than Category I wetlands and provide habitat for sensitive plants or animals, function at very high levels for wildlife and fish habitat, are unique in the region, or are assigned high ratings for many of the assessed functions and values.
- **Category III** - These wetlands are more common than Category II wetlands, generally less diverse, and often smaller and more isolated than Category I or Category II wetlands. They can provide many functions and values, although they may not be assigned high ratings for as many parameters as are Category I and II wetlands.
- **Category IV** - These wetlands are generally small, lack vegetative diversity, and have lower ratings for most functions.

Wetlands were delineated in discrete units called Assessment Areas (AAs) because of the Study Area's large size (**Figure 3.5-2**). AAs were assigned according to location within the Study Area, physical points of significant hydrologic change, or were contiguous up- and downstream from the Study Area to a maximum distance of 0.5 mile if no points of significant hydrologic change occurred within this distance. Within the AAs, wetlands were categorized individually according to MWAM. A reference area (AA 10) adjacent to the Study Area in a beaver pond complex was also included. The reference area was selected because it is outside the Study Area and is not subject to disturbance factors present in the Study Area. AA 10 can be used as a reference condition in comparing wetlands within the Study Area. Additional AAs were assigned to the pond complex to the southwest of the Study Area (AA 13) and the mountain streams flowing into Angus Creek in the center of the Study Area (AA 14). All AAs are summarized in **Table 3.5-2**. Wetland categories within and adjacent to the Study Area ranged from Category II wetlands (AA 1, 2, 5, and 10) to Category III wetlands (AA 3, 4, 6-9, 11-15).

Table 3.5-2 Summary of Functions and Values, by Assessment Area

Assessment Area (AA)	Wetland Acres	Actual Functional Points*	Possible Functional Points	Percent of Possible Score**	Wetland Category
1	4.6	7.9	11	71.8	**II**
2	43.8	8.0	11	72.7	**II**
3	10.0	5.7	11	51.8	**III**
4	27.2	5.4	11	49.1	**III**
5	25.3	7.4	11	66.4	**II**
6	21.7	6.55	11	59.5	**III**
7	21.7	5.2	11	47.3	**III**
8	17.0	6.0	11	54.5	**III**
9	49.1	6.65	11	60.5	**III**
10***	18.0	8.75	11	79.5	**II**
11	26.1	5.75	11	52.2	**III**
12	72.6	5.85	11	53.2	**III**
13	69.6	3.95	7	56.4	**III**
14	9.1	4.2	9	46.6	**III**
15	9.0	7.05	11	64.1	**III**
Total	**424.8**				

Notes:

* All wetlands had a low rating (0 functional points) for Listed/Proposed T&E Species Habitat because there was no suspected usable or incidental habitat for T&E species listed in the Pocatello Field Office Resource Area

** This percentage was used to help categorize the wetlands, where >80% = Category I; >65% = Category II; >35% = Category III; <35% = Category IV

*** Reference area outside Study Area

The following summarizes each AA and the wetland functions and values assessed. All wetlands had a low rating (0 functional points) for Listed/Proposed Threatened or Endangered Species Habitat because they contained no potentially usable or incidental habitats for threatened or endangered species listed in the PFO Resource Area.

Assessment Area 1

The wetlands in AA 1 are a mixture of emergent and shrub/scrub wetlands adjacent to Angus Creek south of Blackfoot River Road. The wetland is rated low for uniqueness in the area and moderate for Idaho Special Status Species (ISSS) Habitat, general wildlife habitat, and flood attenuation. Ratings for this wetland were restricted by size, disturbance ratings, and moderate structural diversity.

Assessment Area 2

The wetlands in AA 2 are a mixture of emergent and limited shrub/scrub wetlands adjacent to Angus Creek north of Blackfoot River Road. This wetland is hydrologically influenced by Angus Creek and three ephemeral mountain streams to the north and east of the wetland. The wetlands rated low for uniqueness in the area and moderate for ISSS Habitat, general wildlife habitat, and flood attenuation. Ratings for this wetland were restricted by size, disturbance ratings, and moderate structural diversity.

Assessment Area 3

The wetlands in AA 3 are a mixture of emergent and limited shrub/scrub wetlands adjacent to Angus Creek north of Blackfoot River Road. This wetland is hydrologically influenced by Angus Creek, two ephemeral mountain streams to the east, and surface drainage from the west. The wetlands rated low for uniqueness and flood attenuation and moderate for ISSS Habitat, general fish and wildlife habitat, short- and long-term surface water storage, sediment/nutrient/toxicant removal, and sediment/shoreline stabilization. Ratings for this wetland were restricted by size, disturbance ratings, channel structure, and structural diversity.

Assessment Area 4

The wetlands in AA 4 are a mixture of emergent and limited shrub/scrub wetlands adjacent to Angus Creek north of Blackfoot River Road. This wetland is hydrologically influenced by Angus Creek, four ephemeral mountain streams to the north and east, and surface drainage from the west. The wetlands rated low for uniqueness and moderate for ISSS Habitat, general fish and wildlife habitat, and sediment/nutrient/toxicant removal. Ratings for this wetland were restricted by disturbance ratings, channel structure, and structural diversity.

Assessment Area 5

The wetlands in AA 5 are a mixture of emergent and shrub/scrub wetlands adjacent to Angus Creek north of Blackfoot River Road. This wetland is hydrologically influenced by Angus Creek, an ephemeral mountain stream to the east, and surface drainage from the west. The wetlands rated low for uniqueness and moderate for ISSS Habitat, general fish and wildlife habitat, sediment/shoreline stabilization, and production export/food chain support. Ratings for this wetland were restricted primarily by disturbance factors.

Assessment Area 6

The wetland in AA 6 is dominated by emergent vegetation with a shrub/scrub component and is adjacent to Angus Creek north of Blackfoot River Road. This wetland is hydrologically influenced by Angus Creek and surface drainage from the west. The wetland rated low for uniqueness and flood attenuation and moderate for ISSS Habitat, general fish and wildlife habitat, short- and long-term surface water storage, sediment/nutrient/toxicant removal, and sediment/shoreline stabilization. Ratings for this wetland were restricted by disturbance ratings, channel structure, and structural diversity.

Assessment Area 7

The wetland in AA 7 is dominated by emergent vegetation with a shrub/scrub component and is adjacent to Angus Creek and Rasmussen Valley Road. This wetland is hydrologically influenced by Angus Creek, an ephemeral mountain stream to the east, and surface drainage from the west. The wetland rated low for uniqueness and flood attenuation and moderate for ISSS Habitat, general fish and wildlife habitat, short- and long-term surface water storage, sediment/nutrient/toxicant removal, and sediment/shoreline stabilization. Ratings for this wetland were restricted by size, heavy grazing, channel structure, and structural diversity.

Assessment Area 8

The wetland in AA 8 is mixture of emergent and shrub/scrub wetland vegetation and is adjacent to a western tributary to Angus Creek. This wetland is hydrologically influenced by surface drainage from the west. The wetland rated low for uniqueness and moderate for ISSS Habitat, general fish and wildlife habitat, flood attenuation, sediment/nutrient/toxicant removal, sediment/shoreline stabilization, production export/food chain support, and recreation/education potential. Ratings for this wetland were restricted mainly by grazing disturbances.

Assessment Area 9

The wetland in AA 9 is dominated by emergent vegetation with no shrub/scrub component and is adjacent to Angus Creek. This wetland is hydrologically influenced by Angus Creek and surface drainage. The wetland rated low for ISSS Habitat, uniqueness, and recreation/education potential, and moderate for general fish and wildlife habitat. Ratings for this wetland were restricted by disturbance and structural diversity.

Assessment Area 10 (Reference Site)

The wetland in AA 10 has an equal component of emergent and shrub/scrub wetland vegetation and is adjacent to Angus Creek in a beaver pond complex. This wetland is hydrologically influenced by Angus Creek and surface drainage. The wetland rated exceptional for general wildlife habitat and moderate for ISSS Habitat. Ratings for this wetland were only restricted by lack of a forested component.

Assessment Area 11

The wetland in AA 11 is dominated by emergent vegetation with no shrub/scrub component and is adjacent to a small tributary of Angus Creek. This wetland is hydrologically influenced by surface drainage. The wetland rated low for ISSS, general wildlife, and fish habitat; uniqueness; and recreation/education potential, and moderate for flood attenuation, sediment/nutrient/toxicant removal, sediment/shoreline stabilization, and groundwater discharge/recharge. Ratings for this wetland were restricted by seasonal flow, disturbance, and structural diversity.

Assessment Area 12

The wetland in AA 12 is dominated by emergent vegetation with no shrub/scrub component and is adjacent to a tributary of Angus Creek. This wetland is hydrologically influenced by the tributary and surface drainage. The wetland rated low for ISSS and general wildlife habitat, uniqueness, and recreation/education potential and moderate for general fish habitat, flood attenuation, sediment/nutrient/toxicant removal, and sediment/shoreline stabilization. Ratings for this wetland were restricted by disturbance and structural diversity.

Assessment Area 13

The wetlands in AA 13 are dominated by emergent vegetation with no shrub/scrub or forested component and are a part of a pond and channel complex that is mostly associated with small intermittent drainages west of Angus Creek. The wetlands are hydrologically influenced by tributary flow and surface drainage. The pond complex was analyzed as a complex because of the similar structure and functions of all the wetlands. The wetlands rated moderate for general wildlife habitat, sediment/nutrient/toxicant removal, production export/food chain support, and uniqueness. Ratings for this wetland were restricted by disturbance, seasonality, and structural diversity.

Assessment Area 14

AA 14 comprises seven non-contiguous polygons (named 14A through 14G), each of which includes separate seasonal mountain drainage along the western facing slope of Rasmussen Ridge. Because of the similar structures and sizes of the drainages, one was assessed (AA-14G) and represents the functional value for all the others, as allowed by the MWAM. During the assessment, each mountain drainage was examined to confirm that it corresponded with the individual drainage assessment and fell within the rating. The wetlands are dominated by emergent vegetation with a small percentage of shrub/scrub wetland vegetation. The wetlands are hydrologically influenced by surface drainage. The wetlands rated low for short- and long-term surface water storage and uniqueness, and moderate for ISSS and general wildlife habitat, sediment/nutrient/toxicant removal, sediment/shoreline stabilization, production export/food chain support, and groundwater discharge/recharge. Ratings for these wetlands were restricted by disturbance, seasonality, and structural diversity.

Assessment Area 15

AA 15 includes the wetlands associated with the Blackfoot River that were delineated in May of 2012 by BC as part of the expanded Study Area. The wetland is dominated by emergent vegetation with a shrub/scrub component adjacent to the Blackfoot River. This wetland is hydrologically influenced by the Blackfoot River and its tributaries. The wetlands rated low for uniqueness and recreation/education potential and moderate for ISSS and general wildlife habitat, general fish habitat, flood attenuation, and groundwater discharge/recharge. Ratings for this wetland were restricted by disturbance and stream entrenchment.

3.5.3 Old Growth Forest

The USFS document Characteristics of Old-Growth Forests in the Intermountain Region (USFS 1993) defines old-growth forests as:

> *"Old-growth forests are ecosystems distinguished by old trees and related structural attributes: old-growth encompasses the later stages of stand development that typically differ from earlier stages in a variety of characteristics which may include tree size, accumulations of large dead woody material, number of canopy layers, species composition and ecosystem function."*

Old-growth baseline studies were conducted in the Study Area to determine if forested areas met Region 4 old-growth definitions. BC developed study methods in conjunction with the USFS and BLM. Study methods are detailed in the Old Growth Forest Baseline Study Report (BC 2012c). The old growth baseline study found that one of the four aspen strata met old-growth definitions (the aspen old-growth stratum). Accordingly, 5.9 acres of forest stands within the Study Area were mapped as old growth (**Figure 3.5-1**). The 5.9 acres of old-growth forest are composed of two stands, each less than 4 acres in size, on BLM and private lands. These stands are dominated by mature to old aspen on mesic sites with little to no conifer presence and a prevalence of trees greater than 12 inches in diameter. The stands have abundant snags and down logs and contain trees that are more than 100 years old.

3.5.4 Noxious and Non-Native, Invasive Weeds

Executive Order (EO) 13112, Invasive Species, requires federal agencies to:

- Prevent the introduction of invasive species
- Detect and respond to and control populations of invasive species
- Monitor invasive species populations
- Provide restoration of native species and habitat conditions
- Conduct research and develop technologies to prevent the introduction of invasive species
- Promote public education on invasive species
- Not authorize, fund, or carry out actions that are likely to cause or promote the introduction or spread of invasive species

The State of Idaho has listed 64 species of noxious weeds (State of Idaho 2015). No extensive infestations of noxious weeds were observed during vegetation baseline studies (BC 2012a). However, Canada thistle and cheatgrass are present in scattered stands throughout the Study Area.

3.5.5 Fire Management

The CNF is managed in accordance with the National Fire Plan, Ten-Year Comprehensive Strategy and Implementation Plan, and Cohesive Strategy to improve fire prevention and suppression, to assist rural communities, to reduce hazardous fuels, and to restore fire-adapted ecosystems (USFS 2003). The BLM also manages public land in accordance with the National Fire Plan as well as local fire plans (BLM 2012a).

No documented complete fire history is readily available for the Study Area; however, general fire behavior and frequency can be summarized by characteristics of the vegetation communities in the Study Area. The following fire ecology descriptions discuss general fire ecology and occurrence in the Study Area.

3.5.5.1 Aspen

Aspen is classified as Fire Regime III (Hardy et al. 2001). Fire frequencies in aspen range between 25 and 100 years (63 years mid-range) with mixed severity (Loope and Gruell 1973). Fuel loads range from more than 6 tons per acre. Pure stands of aspen are particularly susceptible to mortality of aboveground stems from fire, but aspen is well adapted to regeneration by sprouting following fire (Jones and DeByle 1985; Mutch 1970). Specific site and climatic conditions are necessary before fires can ignite and spread, as aspen stands do not easily burn and often act as natural fuel breaks during wildland fires. Fires generally do not occur in young aspen stands. In older stands, during the warmest/driest months of the year, abundant fuel can lead to higher severity fires.

3.5.5.2 Sagebrush Shrubland

Historically, natural fires of stand replacement helped to maintain a mosaic of shrublands and perennial grasslands throughout the sagebrush steppe ecosystem. Pre-settlement fire return intervals in mountain big sagebrush communities ranged from 15 to 25 years. Alterations of historical fire regimes have resulted in major successional changes in regions dominated by mountain big sagebrush and other sagebrush species, and the introduction of exotic annual grasses has modified the role of fire across the landscape. In general, fire is less common in mountain big sagebrush shrubland than in pre-settlement times. Mountain big sagebrush is readily killed by fire, and post-fire recovery takes at least 15 years, with more severe fires resulting in slower recovery. Plants that are top-killed by fire do not re-sprout; instead, post-fire re-establishment is from seed. Mountain big sagebrush communities often have low fuel loads; consequently, after fire, the community may become a patchy mosaic of burned and unburned areas (Johnson 2000).

3.5.5.3 Wetland and Riparian

Natural fire is generally infrequent in this vegetation type, though the dominant cover type adjacent to the riparian plant community usually dictates its natural/historical fire rotation. For those larger riparian areas, the natural/historical fire rotation is estimated to range from 200 to 300 years or more; these are thought to be stand-replacing when they occur.

3.6 TERRESTRIAL WILDLIFE

The Idaho Department of Fish and Game (IDFG) manages wildlife in the State of Idaho, including on federal lands. Idaho Code Section 36-103 states that:

> *"All wildlife, including all wild animals, wild birds, and fish, within the State of Idaho, is the property of the State of Idaho. It shall be preserved, protected, perpetuated, and managed. It shall only be captured or taken at such times or places, under such conditions, or by such means, or in such manner, as will preserve, protect, and perpetuate such wildlife, and provide for the citizens of this state and, as by law permitted to others, continued supplies of such wildlife for hunting, fishing and trapping."*

As discussed in the previous section (**Section 3.5**), prevalent vegetation types in the Study Area are big sagebrush, silver sagebrush, and high-elevation rangelands; aspen woodland (consisting of four aspen strata); and wetlands. Stands of aspen with old-growth characteristics occur in small areas. These vegetation types and the variations within the communities provide habitats for terrestrial wildlife species.

In general, the aspen woodlands are the most productive woodland community type in the CNF in terms of wildlife diversity and herbaceous cover (USFS 2003). These woodlands provide areas for big game calving, browse and forage for a variety of wildlife, nesting areas for birds, and security areas. The aspen strata in the analysis area had relatively high baseline RICHCOVWET metric values, reflecting their relatively high wildlife habitat value (Arcadis 2014a).

Wetland and riparian habitats occur primarily along Angus Creek. Many of the species known or suspected to occur in the Study Area depend directly on riparian areas or use these habitats at some time during their lives (USFS 2003). The high value of wetlands as wildlife habitat is reflected in the relatively high RICHCOVWET values for these habitats (Arcadis 2014a).

Rangeland communities, including sagebrush, also provide a variety of habitats for wildlife species. These areas, however, had relatively lower RICHCOVWET values compared to aspen woodlands and wetlands (Arcadis 2014a).

TRC Environmental Corporation conducted several wildlife surveys to determine wildlife use of the Study Area (TRC 2012a,b,c). The TRC survey areas included the Study Area and an additional 0.5-mile buffer area for great gray, boreal, and flammulated owls and a 3-mile buffer for greater sage-grouse and sharp-tailed grouse winter use. The survey years and types of survey are summarized in **Table 3.6-1**.

Table 3.6-1 Wildlife Surveys Completed in the Study Area

Survey Year	Wildlife Survey
2010	• Great Gray, Boreal, and Flammulated Owl Nocturnal Calling Surveys • Winter Track Surveys • Northern Goshawk and Three-toed Woodpecker Diurnal Calling Surveys
2011	• Big Game Winter Survey • Greater Sage-Grouse and Sharp-tailed Grouse Lek Surveys • Aerial Raptor Nest Survey • Northern Goshawk and Three-toed Woodpecker Diurnal Calling Surveys • Passerine/Small Bird Surveys • Raptor/Large Bird Surveys • Waterfowl/Shorebird Surveys • Pygmy Rabbit Surveys • Acoustic Bat Surveys
2012	• Greater Sage-Grouse and Sharp-tailed Grouse Winter Survey • Big Game Winter Survey • Great Gray, Boreal, and Flammulated Owl Nocturnal Calling Surveys • Winter Track Surveys

Source: TRC 2012a,b,c

The sections below discuss mammals, including big game, predators, and bats; and birds, including upland game birds, migratory birds, raptors, passerines/small birds, and waterfowl/water birds. Threatened, Endangered, Proposed, and Candidate Species; Sensitive Species; and Management Indicator Species of wildlife are discussed in **Section 3.8**.

3.6.1 Mammals

Many mammalian species occur or potentially occur within the Study Area. Mammal species that have been directly observed or detected within the Study Area include the big brown bat (*Eptesicus fuscus*), silver-haired bat (*Lasionycteris noctivagans*), hoary bat (*Lasiurus cinereus*), western small-footed myotis (*Myotis ciliolabrum*), long-eared myotis (*Myotis evotis*), little brown myotis (*Myotis lucifugus*), long-legged myotis (*Myotis volans*), Yuma myotis (*Myotis yumanensis*), longtail weasel (*Mustela frenata*), striped skunk (*Mephitis mephitis*), coyote (*Canis latrans*), red fox (*Vulpes vulpes*), yellow-bellied marmot (*Marmota flaviventris*), deer mouse (*Peromyscus maniculatus*), sagebrush vole (*Lagurus curtatus*), snowshoe hare (*Lepus americanus*), mountain cottontail (*Sylvilagus nuttalli*), elk (*Cervus canadensis*), mule deer (*Odocoileus hemionus*), and moose (*Alces alces*) (TRC 2012c).

3.6.1.1 Big Game

The Study Area supports three species of big game: elk, moose, and mule deer. The IDFG considers the Study Area summer range for mule deer, and there is parturition and rearing habitat for both mule deer and elk in the Study Area. This includes moist areas with dense understory for cover and forage, such as willows, aspen stands, and chokecherry/serviceberry thickets. Elk also forage in highly productive wet meadows, such as those found in Rasmussen Valley, when calves become more mobile. Both elk and moose winter in the Study Area, mostly on high ridges that are blown relatively snow-free (Wackenhut 2014).

Winter is the most difficult season for these species because food is limited and energy expenditures are higher than during other seasons. Winter range refers to the habitats on which big game species depend to minimize their energy expenditures and increase their chances of surviving severe winter weather. Winter range is crucial for long-term maintenance of big game populations (USFS 2003). Because of the high variability of winter severity, fall body condition, forage condition, and disturbance factors, the IDFG believes that all existing winter range and potential winter range should be recognized and protected to the extent possible (Wackenhut 2014).

TRC conducted aerial surveys for big game in the Study Area and a 3-mile buffer on April 10 and 11, 2011. TRC also noted observations of big game during the aerial grouse lek survey conducted on April 22, 2011 (TRC 2012b). In addition, TRC conducted an aerial survey for wintering grouse on February 7, 2012, during which observations of big game were noted (TRC 2012c). Eleven elk (10 adults and one dead yearling) and 15 moose (13 adults and two yearlings) were observed during the 2011 big game aerial survey. Additionally, 12 adult elk and 12 moose were recorded incidentally during the 2011 aerial grouse lek survey (TRC 2012b). Twelve adult elk and 12 adult moose were also observed during the 2012 wintering grouse survey (TRC 2012c).

Elk occurred in groups of one to four individuals during the 2011 big game survey, and 12 individuals were recorded as a group during the 2011 grouse lek aerial survey. This group of elk was observed on the southwest-facing slope just below the top of a steep unnamed ridge 1 mile southwest of the Rasmussen Valley Mine area. Nine of the 11 individuals observed during the big game survey occurred in the bottoms adjacent to Sheep Creek (TRC 2012b). During the 2012 wintering grouse survey, biologists recorded elk in groups of one to six individuals (TRC 2012c).

Moose were observed predominantly as individuals or pairs, but two groups of three individuals were recorded during the 2011 big game aerial survey. Moose observations were distributed across the survey area in Rasmussen and Upper Valleys, in the lower reaches of small creek tributaries, and on west-facing slopes (TRC 2012b). During the 2012 wintering grouse survey, moose were generally observed at higher elevations along ridges compared to the more dispersed locations observed in April 2011 (TRC 2012c).

3.6.1.2 Predators

Carnivore species identified by their tracks during 2010 and 2012 winter track surveys in the Study Area included coyote, weasel (*Mustela* sp.), and red fox (TRC 2012a, 2012c). Special Status carnivore species that may occur in or pass through the Study Area are discussed in more detail in **Section 3.8**.

3.6.1.3 Bats

Habitats in the Study Area are likely to support several bat species. Roosting habitats for bats (trees and rock outcrops) may be present in the Study Area, and bats may use all of the Study Area's habitats for foraging. Wooded openings, road cuts, and riparian areas often concentrate commuting and foraging bats. Wetlands provide water sources where bats drink and are important foraging locations because of high concentrations of insects (Taylor 2006).

From June 15 to October 31, 2011, fixed-point and mobile acoustic bat monitoring studies recorded 17,512 call files containing 17,987 bat passes. In general, bat activity was greatest between 9:00 p.m. and 11:00 p.m., and overall seasonal activity peaked between late June and mid-July. The mobile survey recorded most bat activity along a road that cut through mature coniferous forest to the south of the Study Area (Rodriguez 2012; TRC 2012b).

Myotis species (with a characteristic frequency of 40 kilohertz [kHz]), comprised 55.6 percent of the combined fixed-point and mobile bat sequences, and long-legged myotis appeared to be the most commonly recorded species in that acoustic group. Other species that likely were detected (acoustic characteristics overlap, so some sequences cannot be identified to species with certainty) include pallid bat (*Antrozous pallidus*), big brown bat, silver-haired bat, hoary bat, western small-footed myotis, long-eared myotis, little brown myotis, and Yuma myotis. The occurrence of the pallid bat may be questionable because of a lack of records for the area and call characteristics that overlap those of other species (Rodriguez 2012; TRC 2012b). Special Status species of bats are discussed further in **Section 3.8**.

3.6.2 Birds

More than 220 species of birds occur or potentially occur in the Study Area and vicinity (TRC 2012c). Major groups of birds present in the Study Area include upland game birds; migratory birds; raptors, passerines, and small birds; and water birds.

3.6.2.1 Upland Game Birds

Species of upland game birds known to occur in the Study Area include the ruffed grouse (*Bonasa umbellus*), greater sage-grouse (*Centrocercus urophasianus*), dusky grouse (*Dendragapus obscrurus*), and Columbian sharp-tailed grouse (*Tympanuchus phasianellus columbianus*) (TRC 2012c). Although grouse tracks were noted during the 2010 and 2012 winter track surveys, they could not be identified to species (TRC 2012a, 2012c). Aerial surveys specifically targeting greater sage-grouse and Columbian sharp-tailed grouse (Special Status species discussed in **Section 3.8**) were conducted in spring 2011 (April 10 to 11 and April 21 to 22) and winter 2012 (February 7). Fifteen ruffed grouse were observed during the April 10 to 11, 2011 survey. The ruffed grouse were roosting on the ground at the margins of aspen groves (TRC 2012b). Ruffed grouse likely breed within the Study Area, as evidenced by observations of drumming in the area during the 2010 late winter/early spring owl surveys. Other grouse observed incidentally in the Study Area and vicinity during 2011 wildlife surveys included three dusky grouse, 19 greater sage-grouse, and one Columbian sharp-tailed grouse (TRC 2012b). The latter two species are discussed in **Section 3.8**. Eighteen Columbian sharp-tailed grouse and one dusky grouse were observed within 3 miles of the Study Area during the February 7, 2012 winter grouse survey (TRC 2012c).

3.6.2.2 Migratory Birds

Migratory birds include species that spend the winter in the southern latitudes, fly north to nest, and fledge their young in the summer. Although some migrate from the Arctic Circle to the southern tip of South America, others only move from Idaho to Arizona (Groves et al. 1997). The Migratory Bird Treaty Act (MBTA [16 U.S.C. 703-712]) is a federal statute that makes it unlawful to take any migratory bird, part, nest, egg, or product thereof, with “take” defined as to pursue, hunt, shoot, wound, kill, trap, capture, or collect; or to attempt to pursue, hunt, shoot, wound, kill, trap, capture, or collect. Most species of birds in the U.S. are legally protected under the MBTA. Exceptions to this statute include game and non-native species. An executive order was issued in 2001 (EO 13186, 66 Fed. Reg. 3853 [2001]) outlining the responsibilities of federal agencies with respect to migratory birds. In 2010, pursuant to this Order, the BLM signed a Memorandum of Understanding (MOU), with the USFWS (the agency responsible for enforcing the MBTA) to promote the conservation of migratory birds (BLM and USFWS 2010). In the MOU, the BLM, and USFWS agree to work collaboratively to identify and address issues that affect species of concern, such as migratory bird species listed in the Birds of Conservation Concern (BCCs) (USFWS 2008) and the USFWS Focal Species initiative. The USFWS signed a similar MOU with the USFS in 2008 (USFS and USFWS 2008).

BCCs are species (beyond those already designated as federally threatened or endangered) that represent the highest conservation priorities of the USFWS. In USFWS (2008), BCCs are listed by Bird Conservation Regions (BCRs), which are broad, ecologically distinct geographic regions in North America that have similar bird communities, habitats, and resource management issues. The Study Area is located within BCR 9 (Great Basin; USFWS 2008). BCCs for this BCR that have the potential to occur in the Study Area are listed in **Table 3.6-2**.

Table 3.6-2 Birds of Conservation Concern with the Potential to Occur in the Study Area

Common Name	Scientific Name
Bald eagle*	*Haliaeetus leucocephalus*
Brewer's sparrow*	*Spizella breweri*
Golden eagle*	*Aquila chrysaetos*
Greater sage-grouse*	*Centrocercus urophasianus*
Green-tailed towhee*	*Pipilo chlorurus*
Lewis's woodpecker	*Melanerpes lewis*
Loggerhead shrike	*Lanius ludovicianus*
Long-billed curlew*	*Numenius americanus*
Marbled godwit	*Limosa fedoa*
Peregrine falcon	*Falco peregrinus anatum*
Sage sparrow*	*Amphispiza belli*
Sage thrasher*	*Oreoscoptes montanus*
Virginia's warbler	*Oreothlypis virginiae*
Williamson's sapsucker	*Sphyrapicus thyroideus*
Willow flycatcher*	*Empidonax extimus*

Notes:
* Observed during baseline biological surveys
Source: TRC 2012a, 2012b, 2012c

Raptors that are known to occur in the Study Area and vicinity include five species of owls; one species of vulture; and nine species of hawk-like birds that include falcons, eagles, buteos, accipiters, and harriers (TRC 2012c). Many raptors nest in trees with large, sturdy branches or on cliff walls. Forested habitat in the Study Area suitable for nesting raptors is composed of mature aspen woodland and mixed aspen/conifer forests. Raptors may also use all of the habitats in the Study Area to hunt for prey.

An aerial survey of the Study Area and 1-mile buffer conducted on May 7, 2011 located 21 raptor and corvid (e.g., crow, raven) nests that were primarily located in aspen trees (TRC 2012b). Five nests (three of which were active) were identified as red-tailed hawk (*Buteo jamaicensis*) nests. Two of these active nests were within the Study Area. One American kestrel (*Falco sparverius*) nest was identified to the northeast of the Study Area, but activity status for this nest was undetermined. The other 15 nests did not have birds associated with them; three were recorded with undetermined activity, and 12 were recorded as inactive. An additional 104 nests of undetermined raptor/corvid species and undetermined activity were recorded incidentally during the aerial big game and grouse lek survey of the Study Area and 3-mile buffer in April 2011 (TRC 2012b).

Raptor/large bird (RLB) use surveys were conducted to evaluate use of the Study Area by raptors and other large birds from June to September 2011. At least 1,427 individuals representing 22 species were recorded. Red-tailed hawks and American kestrels were the most common species observed. Other species included the turkey vulture (*Cathartes aura*), bald eagle, northern harrier (*Circus cyaneus*), sharp-shinned hawk (*Accipter striatus*), Cooper's hawk (*Accipiter cooperii*), northern goshawk (*Accipter gentilis*), Swainson's hawk (*Buteo swainsoni*), and golden eagle. RLB use of the Study Area was almost four times higher during the spring/summer than during the fall (TRC 2012b).

In addition to the general raptor surveys described above, TRC also conducted targeted surveys for Special Status raptor species, including the great gray owl (*Strix nebulosa*), boreal owl (*Aegolius funereus*), flammulated owl (*Psiloscops flammeolus*), and northern goshawk (TRC 2012a,b,c). Use of the Study Area by Special Status species of raptors is discussed in **Section 3.8**.

3.6.2.3 Passerines and Small Birds

A variety of passerine/small bird (PSB) species use the habitats in the Study Area. The shrubland habitats provide nesting and foraging habitats for small birds that use open landscapes, whereas the aspen and aspen/mixed conifer forests provide forage and shelter for other species, including cavity-nesting birds like chickadees and woodpeckers. Riparian and wetland areas are extremely important habitats for small migratory birds. More bird species rely on riparian habitats than all other western rangeland vegetation types combined (Nicholoff 2003). Riparian areas provide crucial habitat for nesting, wintering, and migrating birds, and riparian bird diversity can be an indicator of ecosystem health. The diversity of structure and cover provides nesting habitats, hiding and thermal cover, and food (insects, seeds, and vegetation) for a variety of bird species. The water bodies provide a source of water and food for aerial insectivores. Riparian vegetation along the streams and drainages in the Study Area supports a variety of small migratory bird species, such as warblers, flycatchers, and sparrows.

PSB use surveys were conducted to evaluate use of the Study Area by passerines and other small birds from June to September 2011. At least 3,346 individuals representing 60 species were recorded, with an additional four species recorded as incidental observations. Sparrows (including chipping sparrows [*Spizella passerina*], green-tailed towhees, vesper sparrows [*Pooecetes gramineus*], white-crowned sparrows [*Zonotrichia leucophrys*], and Brewer's sparrows) were the dominant PSB group, followed by thrushes (including American robins [*Turdus migratorius*] and mountain bluebirds [*Sialia currucoides*]), blackbirds (including Brewer's blackbirds [*Euphagus cyanocephalus*] and western meadowlarks [*Sturnella neglecta*]), warblers (primarily yellow-rumped warblers [*Dendroica coronata*]), waxwings (cedar waxwings [*Bombycilla cedrorum*]), and finches (primarily American goldfinches [*Spinus tristis*]). Wet meadows supported the highest PSB use and species richness in the Study Area, whereas big sagebrush rangeland exhibited the lowest PSB use and species richness. PSB abundance was higher in the fall than during the spring/summer surveys (TRC 2012b).

3.6.2.4 Water Birds

Water birds, including gulls, herons, rails, cranes, shorebirds, and waterfowl, are unique in that they are highly adapted to surface waters and associated habitats. Water birds typically nest near and forage in open water habitats, such as lakes, ponds, rivers, streams, and wetlands. TRC recorded water birds during the 2011 RLB and PSB point-count surveys. In addition, TRC conducted three road-based waterfowl and shorebird surveys in the Study Area between early June and late July of 2011. To conduct these surveys, TRC biologists slowly drove accessible public roads within and directly adjacent to the Study Area near aquatic habitats and recorded all water bird observations (TRC 2012b).

Gulls, primarily Franklin's gulls (*Leucophaeus pipixcan*), California gulls (*Larus californicus*), and ring-billed gulls (*Larus delawarensis*), were the most numerous of all birds recorded during the combined wildlife surveys in 2011, with a total of 5,387 individuals observed (2,686 during waterfowl/shorebird surveys, 948 during RLB surveys, 691 during PSB surveys, and 880 during incidental observations). Observations of gulls during all wildlife surveys combined revealed several patterns. Gulls were recorded from June 4 through August 5, 2011, and 98 percent (5,295 individuals) of the observations were recorded in June, with 85 observations in July and 7 in August. Seventy-seven percent (4,123 individuals) were observed between 5:00 a.m. and 9:00 a.m., and those individuals were most often seen flying southeast through Rasmussen Valley or along the northeast-facing slopes of the ridge just south of the Study Area. Based on observations on several early mornings, the gulls typically came in from north and west of the Study Area and moved into the Upper Valley, probably to forage. The remaining 24 percent were observed between 10:00 a.m. and 4:00 p.m. Many of those individuals were Franklin's gulls, which tended to be seen along the south-central portion of the Study Area in Rasmussen Valley foraging in mid- to late afternoon (TRC 2012b).

Other less numerous water bird species observed in the Study Area and/or immediate vicinity during baseline surveys included the Canada goose (*Branta canadensis*), canvasback (*Aythya valisineria*), gadwall (*Anas strepera*), green-winged teal (*Anas crecca*), mallard (*Anas platyrhynchos*), common merganser (*Mergus merganser*), pied-billed grebe (*Podilymbus podiceps*), American white pelican (*Pelecanus erythrorhynchos*), great blue heron (*Ardea herodias*), snowy egret (*Egretta thula*), white-faced ibis (*Plegadis chihi*), killdeer (*Charadrius vociferous*), sandhill crane (*Grus canadensis*), spotted sandpiper (*Actitus macularia*), willet (*Tringa semipalmata*), long-billed curlew (*Numenius americana*), Wilson's phalarope (*Phalaropus tricolor*), and Wilson's snipe (*Gallinago gallinago*) (TRC 2012b). Canada goose, mallard, sandhill crane, great blue heron, killdeer, spotted sandpiper, and Wilson's snipe all showed evidence of breeding in the Study Area and immediate vicinity (e.g., paired courtship behavior, active nests, defense of nesting territories, and/or young observed). Common mergansers, which only were observed incidentally in the Narrows south of the Study Area, also were recorded breeding, with six young fledged (TRC 2012b). Special Status water bird species are discussed in **Section 3.8**.

3.7 FISHERIES AND AQUATIC RESOURCES

Surface water resources within and near the Study Area, which may provide habitat for fish and other aquatic organisms, are described in detail in **Section 3.3**, and wetlands and riparian areas are discussed in **Section 3.5.2**. These streams, wetlands, and riparian habitats provide habitats for a variety of fish, amphibians, reptiles, and benthic organisms such as macroinvertebrates. The Rasmussen Valley baseline aquatic resources study report (GEI 2012), Aquatic Biological Monitoring of No Name Creek and South Rasmussen Drainage, 2013 (GEI 2014), and the Aquatic Biological Sampling Data Report for South and Central Rasmussen Ridge Area Streams, 2014 (GEI 2015) include an assessment of the aquatic habitat, fish populations, fish tissue analysis, macroinvertebrate populations, macroinvertebrate tissue analysis, amphibian populations, and reptile populations conducted during 2009 through 2014. This section summarizes the findings of these studies for locations in and near the Study Area. The sampling area surveyed for fisheries and aquatic resources for the Rasmussen Valley baseline aquatic resources study included stream segments that are all within the Blackfoot River drainage, as well as the headwaters of the Blackfoot River, Lanes Creek, Angus Creek, and an unnamed tributary of Lanes Creek south of Sheep Creek

(GEI 2012). This baseline study sampled seven sites along these streams: AC-1, AC-2, BFR-1, BFR-2, LC-1, LC-2, and UT-1 in a sampling area that extended outside the Study Area (**Figure 3.7-1**). The South and Central Rasmussen Ridge Area Streams study included stream segments within Angus Creek, No Name Creek, Sheep Creek, South Fork Sheep Creek, Bear Canyon, Coyote Creek, South Fork Timber Creek, and Slug Creek. This study sampled 20 sites along these drainages: BAC-1, BAC-2, BAC-3, BAC-4, BNNC-1, BNNC-2, BNNC-3, BNNC-4, BSC-1, BSC-2, BSC-3, BSC-4, BSRD-1, BSRD-2, BSRD-3, BSRD-4, BBC-1, BCC-1, BSFTC-1, and BSLUG-1. Based on proximity to the Study Area, the following drainages were considered: Angus Creek, No Name Creek, Sheep Creek, and South Fork Sheep Creek. The remaining drainages are well outside the Study Area and were considered reference locations in the GEI (2015) report; therefore, they are not evaluated in this section. **Table 3.7-1** summarizes the locations and survey activities for fisheries and aquatic resources conducted within or downgradient of the Study Area.

3.7.1 Aquatic Habitat

GEI surveyed the habitat using a modified method based on the R1/R4 procedures for inventorying fish habitat developed by the USFS (Overton et al. 1997). This method includes measurements of a variety of physical parameters related to channel configuration and substrate composition. The various habitat units (e.g., riffles, runs, and pools) present at each site were identified and delineated as described in Overton et al. (1997). In addition to the habitat measurements, the IDEQ Stream Habitat Index (SHI) was also calculated at each site. The SHI was developed by the IDEQ specifically for small Idaho streams (Fore and Bollman 2002), and measures habitat variables in the field by assigning each a score from 0 to 9. Variables assessed include instream cover, amount of large organic debris, percent fines, embeddedness, number of pebble size categories, channel shape, percent bank vegetation cover, percent canopy cover, amount of disruptive pressures, and zone of influence. The SHI is calculated as the sum of the scored metrics and can be used to determine aquatic life use support. Additional detail on the methodology for the aquatic habitat surveys is provided in GEI (2012).

Habitat complexity at some sites near the Study Area was limited, with run habitat predominating at all sites surveyed (**Figure 3.7-1**) in the GEI (2012) baseline study. Pool habitat was present at all sites except for Site UT-1. Riffles were present at the Angus Creek sites and have been reported at the Blackfoot River sites. Observations of Site BFR-1 and Site BFR-2 in 2009 indicated that riffle habitat was more abundant at Site BFR-2, while Site BFR-1 was predominately composed of run habitat. The Angus Creek sites are observed to have the most diverse habitat types of the sites surveyed. Of the tributary sites, Site LC-1 was considerably deeper and wider than the other sites. A substantial percentage of the banks at sites LC-2 and AC-2 were observed to be eroding, and severe bank erosion was noted on the Blackfoot River upstream of the Angus Creek confluence. Bank vegetation throughout this area was composed of grasses, sedges, and willows. The use of the surrounding land for livestock grazing was evident at the sites on Lanes Creek and the unnamed tributary.

No Name Creek sites were dominated by fast-water habitat types such as runs and low-gradient riffles (GEI 2015). Pool habitat within No Name Creek was less frequent. Fast water habitat types, such as riffles and runs, were observed at both South Fork Sheep Creek sites during the May and September 2014 sampling events, and this type of habitat was abundant at Site BSRD-1 in both seasons and at Site BSRD-2 in September (GEI 2015). Stream habitat at all Sheep Creek sites in both seasons was dominated by fast-water habitat types, such as low-gradient riffles or runs, and low-gradient riffle habitat was the only habitat type present at the most upstream site in May 2014 (GEI 2015). A scour pool was present at this site in September 2014, and one or more scour pools were present at the other three sites during both surveys (GEI 2015).

The substrate was similar at most study sites, with fine substrates such as silt predominating. The substrate composition at all sites surveyed (other than Site AC-2) exhibited percent fines of 79 percent or higher. While fine substrates were still dominant at Site AC-2, this site also had a substantial amount of gravel present. Gravel comprised a major portion of the substrate at the Blackfoot River sites, but finer substrates predominated at Site BFR-1. Cobble was observed to be abundant at Site BFR-2 in 2009. Based on the Wolman pebble counts conducted in the riffle or run habitat at each No Name Creek site, substrate at sites BNNC-3 and BNNC-2 was dominated by small gravel or gravel, while substrate at Site BNNC 4 consisted entirely of fines during both sampling events (GEI 2015). Substrate within the riffle or run habitat used for the pebble counts was dominated by fines at Site BSRD-2 in September, with fines and gravel being present in equal amounts in May (GEI 2015). At Site BSRD-1, gravel was the most abundant substrate size in May 2014, while gravel and fines were present in similar amounts in September 2014 (GEI 2015). Fines, small gravel, small cobble, and cobble were also observed at all sites, while small boulders and boulders were only observed at the two sites bracketing the South Fork Sheep Creek confluence in May 2014 (GEI 2015).

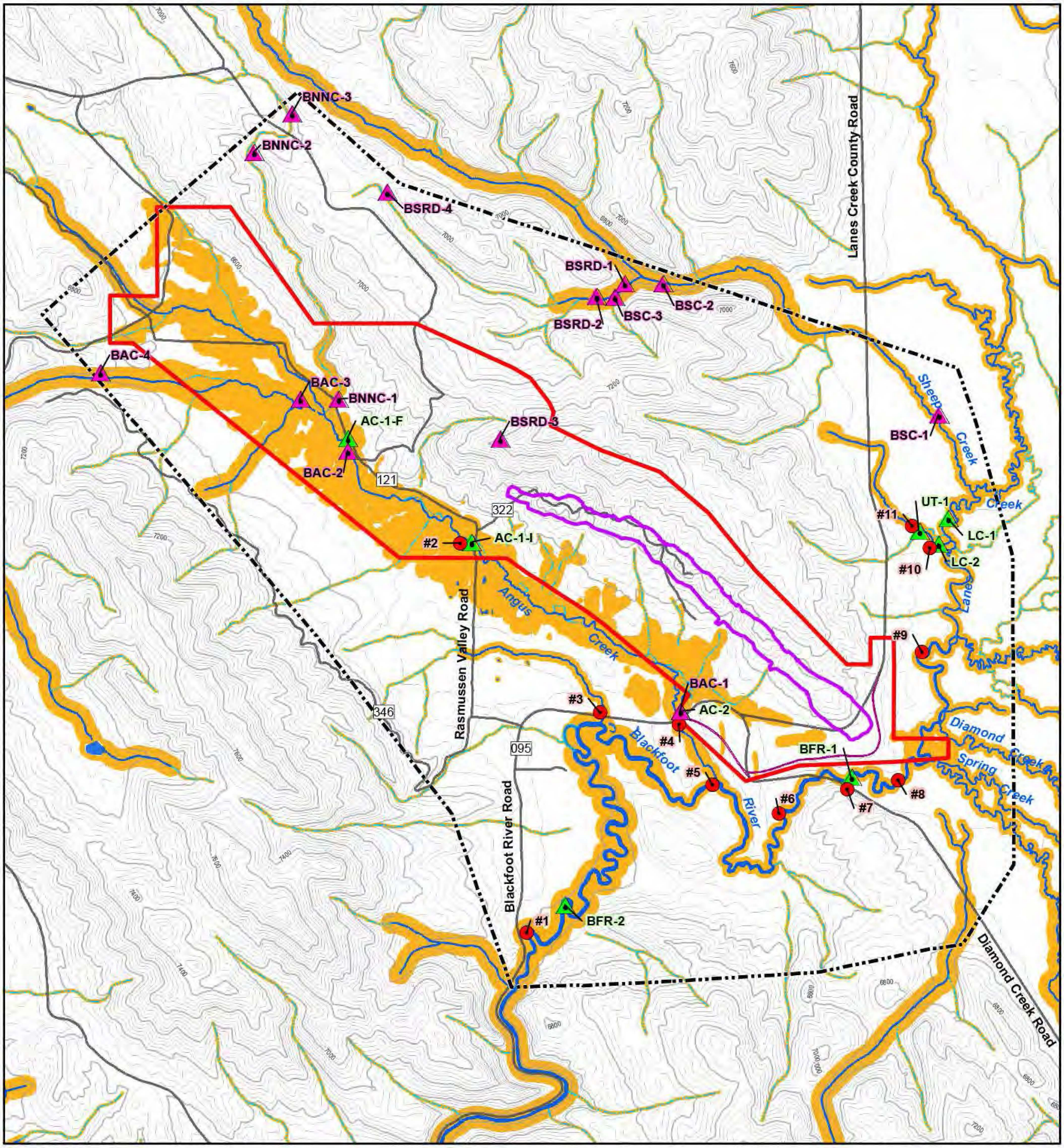
The high amount of fine substrates and lack of habitat diversity at most sites near the Study Area may be a limiting factor for the resident aquatic populations. SHI scores for the No Name Creek sites increased from upstream to downstream in May 2014, ranging from 37 at Site BNNC-4 (the most upstream site), to 61 at Site BNNC-2 (GEI 2015). SHI scores for South Fork Sheep Creek in 2014 varied from 44 at Site BSRD-2 in September 2014 to 66 at Site BSRD-1 in September 2014 (GEI 2015). SHI scores for the Sheep Creek sites in 2014 ranged from 43 at Site BSC-1 in May 2014 to 68 at Site BSC-3 in May 2014 (GEI 2015). The scores for the two downstream sites in both sampling events and Site BSC-4 (in May only) were below the 10th percentile of reference condition, indicating poor aquatic habitat (GEI 2015). The 2009 study sites had SHI scores below 58, which is in the 10th percentile of reference condition for the Northern Rockies ecoregion, indicating that habitat is poor at these sites (GEI 2012).

3.7.1.1 Aquatic Influence Zone

The aquatic influence zone (AIZ) is one of many management prescriptions outlined in the CNF RFP (USFS 2003). Each prescription embodies a set of management practices for a specific land area aimed at obtaining specific land use goals. The AIZ is the area associated with lakes, reservoirs, ponds, perennial and intermittent streams, and wetlands, which directly affects the hydrologic, geomorphic, and ecological processes controlling aquatic and riparian ecosystem health and function. Specifically, these zones provide a high level of aquatic protection, help to maintain ecological functions, and provide habitat or habitat support for aquatic and riparian-dependent organisms.

AIZ widths are defined according to the guidance provided in the CNF RFP (USFS 2003) as follows:

1. <u>Fish-bearing streams</u>: AIZs consist of the stream and whichever of the following parameters is greatest:
    - Either side of the stream extending from the edges of the active stream channel to the top of the inner gorge or the outer edges of the riparian vegetation
    - A distance equal to the height of two site-potential trees
    - 300 feet slope distance (600 feet, including both sides of the stream channel)



LEGEND

- 2013 AND 2014 AQUATIC SAMPLING LOCATION
- 2011 AMPHIBIAN AND REPTILE CALLING/VISUAL ENCOUNTER SURVEY LOCATION
- 2009 AND 2011 AQUATIC SAMPLING LOCATION
- AQUATIC INFLUENCE ZONE
- STUDY AREA
- FISHERIES AND AQUATIC SPECIES SAMPLING AREA
- PROPOSED PIT BOUNDARY
- 322 FOREST SERVICE ROAD DESIGNATION
- COUNTY ROAD REALIGNMENT
- EXISTING ROAD
- INTERMITTENT STREAM
- PERENNIAL STREAM
- TOPOGRAPHIC CONTOUR

Projection:
North America Datum 1983, Universal Transverse Mercator, Zone 12 North

NORTH

0 2,120 4,240 Feet

RASMUSSEN VALLEY MINE

FIGURE 3.7-1
Sampling Locations for Fisheries and Aquatic Species

ANALYSIS AREA: Caribou County, Idaho
Date: 6/23/2016 Prepared By: JC
File: K:\CO1553\2016_FEIS\Chapter3\Frog_AIZ_P.mxd

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Table 3.7-1 Locations and Survey Activities for Monitoring Sites on the Blackfoot River, Lanes Creek, the Unnamed Tributary, Angus Creek, No Name Creek, Sheep Creek, and South Fork Sheep Creek

Site	Start Location (NAD83 Decimal Degrees)	Survey Activities	Date
Blackfoot River			
BFR-1	N42.824 W111.320	Invertebrate Populations, Amphibians, and Reptiles	August 2009
		Fish Tissues, Amphibians, and Reptiles	September 2009
		Amphibians and Reptiles	June 2011
		Invertebrate Tissues	August 2011
BFR-2	N42.814 W111.350	Invertebrate Populations, Amphibians, and Reptiles	August 2009
		Fish Tissues, Amphibians, and Reptiles	September 2009
		Amphibians and Reptiles	June 2011
		Invertebrate Tissues	August 2011
BFR-LSC	N42.814 W111.350	Northern Leatherside Chub Survey	August 2011
Lanes Creek			
LC-1	N42.844 W111.310	Invertebrate Populations, Amphibians, and Reptiles	August 2009
		Amphibians and Reptiles	September 2009
		Amphibians and Reptiles	June 2011
		Invertebrate Tissues, IDEQ Habitat	August 2011
LC-2	N42.842 W111.311	Invertebrate Populations, Amphibians, and Reptiles	August 2009
		Fish Populations and Tissues, Amphibians and Reptiles, Standard Habitat	September 2009
		Amphibians and Reptiles	June 2011
		Invertebrate Tissues, IDEQ Habitat	August 2011
LC-LSC	N42.835 W111.309	Northern Leatherside Chub Survey	August 2011
Unnamed Tributary			
UT-1	N42.843 W111.313	Invertebrate Populations, Amphibians, and Reptiles	August 2009
		Fish Populations and Tissues, Amphibians, and Reptiles, Standard Habitat	September 2009
		Amphibians and Reptiles	June 2011
		Invertebrate Tissues, IDEQ Habitat	August 2011
UT-LSC	N42.843 W111.610	Northern Leatherside Chub Survey	August 2011
Angus Creek			
AC-1-I	N42.842 W111.360	Invertebrate Populations, Amphibians, and Reptiles	August 2009
		Amphibians and Reptiles	June 2011
AC-1-F	N42.850 W111.373	Fish Populations and Tissues, Amphibians and Reptiles, Standard Habitat	September 2009
		Invertebrate Tissues, IDEQ Habitat	August 2011
AC-2	N42.829 W111.338	Invertebrate Populations, Amphibians, and Reptiles	August 2009
		Fish Populations and Tissues, Amphibians and Reptiles, Standard Habitat	September 2009
		Amphibians and Reptiles	June 2011
		Invertebrate Tissues, IDEQ Habitat	August 2011
AC-LSC	N42.824 W111.334	Northern Leatherside Chub Survey	August 2011
BAC-4	N42.855 W111.399	Fish and Invertebrate Populations, Invertebrate Tissue, IDEQ Habitat	May 2014
		Fish and Invertebrate Populations/Tissue, IDEQ Habitat, Amphibians, and Reptiles	September 2014

Table 3.7-1 Locations and Survey Activities for Monitoring Sites on the Blackfoot River, Lanes Creek, the Unnamed Tributary, Angus Creek, No Name Creek, Sheep Creek, and South Fork Sheep Creek

Site	Start Location (NAD83 Decimal Degrees)	Survey Activities	Date
BAC-3	N42.853 W111.378	Fish and Invertebrate Populations, Invertebrate Tissue, IDEQ Habitat	May 2014
		Fish and Invertebrate Populations/Tissue, IDEQ Habitat, Amphibians, and Reptiles	September 2014
BAC-2	N42.849 W111.373	Fish and Invertebrate Populations, Invertebrate Tissue, IDEQ Habitat	May 2014
BAC-1	N42.829 W111.338	Fish and Invertebrate Populations/Tissue, IDEQ Habitat, Amphibians, and Reptiles	September 2014
No Name Creek			
BNNC-4	N42.887 W111.393	Invertebrate Population and Tissue, IDEQ Habitat	May 2014
		Invertebrate Population, IDEQ Habitat, Amphibians, and Reptiles	September 2014
BNNC-3	N42.875 W111.379	Invertebrate Population and Tissue, IDEQ Habitat	May 2014
		Invertebrate Population, IDEQ Habitat, Amphibians, and Reptiles	September 2014
BNNC-2	N42.872 W111.383	Invertebrate Population and Tissue, IDEQ Habitat	May 2014
		Invertebrate Population, Periphyton Tissue, IDEQ Habitat, Amphibians, and Reptiles	September 2014
BNNC-1	N42.853 W111.374	No Surveys Performed Because of Dry Habitat	May, September 2014
Sheep Creek			
BSC-4	N42.899 W111.398	Fish and Invertebrate Populations/Tissue, IDEQ Habitat	May 2014
		Fish and Invertebrate Populations/Tissue, IDEQ Habitat, Amphibians, and Reptiles	September 2014
BSC-3	N42.861 W111.345	Fish and Invertebrate Populations/Tissue, IDEQ Habitat	May 2014
		Fish and Invertebrate Populations/Tissue, IDEQ Habitat, Amphibians, and Reptiles	September 2014
BSC-2	N42.862 W111.340	Fish and Invertebrate Populations/Tissue, IDEQ Habitat	May 2014
		Fish and Invertebrate Populations/Tissue, IDEQ Habitat, Amphibians, and Reptiles	September 2014
BSC-1	N42.852 W111.311	Fish and Invertebrate Populations/Tissue, IDEQ Habitat	May 2014
		Fish and Invertebrate Populations/Tissue, IDEQ Habitat, Amphibians, and Reptiles	September 2014
South Fork Sheep Creek			
BSRD-4	N42.869 W111.369	Amphibians and Reptiles Benthic Population/Tissue	September 2014 June 2013
BSRD-3	N42.850 W111.357	Amphibians and Reptiles Benthic Population/Tissue	September 2014 June 2013
BSRD-2	N42.861 W111.347	Fish and Invertebrate Populations/Tissue, IDEQ Habitat	June, September 2013
		Fish and Invertebrate Population, Benthic Tissue, IDEQ Habitat	May 2014

Table 3.7-1 Locations and Survey Activities for Monitoring Sites on the Blackfoot River, Lanes Creek, the Unnamed Tributary, Angus Creek, No Name Creek, Sheep Creek, and South Fork Sheep Creek

Site	Start Location (NAD83 Decimal Degrees)	Survey Activities	Date
		Fish and Invertebrate Population, Invertebrate and Periphyton Tissue, IDEQ Habitat, Amphibians, and Reptiles	September 2014
BSRD-1	N42.862 W111.344	Fish and Invertebrate Populations/Tissue, IDEQ Habitat	June, September 2013
		Fish and Invertebrate Population, Invertebrate Tissue, IDEQ Habitat	May 2014
		Fish and Invertebrate Population, Invertebrate and Periphyton Tissue, IDEQ Habitat, Amphibians, and Reptiles	September 2014

Source: GEI 2012, 2015

2. All other permanently flowing streams: AIZs consist of the stream and whichever of the following parameters is greatest:
    - Either side of the stream extending from the edges of the active stream channel to the top of the inner gorge
    - Outer edges of the 100-year flood plain
    - Outer edges of riparian vegetation
    - A distance equal to the height of one site-potential tree
    - 150 feet slope distance (300 feet, including both sides of the stream channel)
3. Ponds, lakes, reservoirs, and wetlands larger than 1 acre: AIZs consist of the body of water or wetland and whichever of the following parameters encompasses the most area:
    - Outer edges of the riparian vegetation
    - Extent of the seasonally saturated soil
    - A distance equal to the height of one site-potential tree
    - Slope distance of 50 feet from the maximum pool elevation of the wetland, pond, or lake
4. Seasonally flowing or intermittent streams, wetlands smaller than 1 acre: This category includes features with high variability in size and site-specific characteristics. Small wetlands can be scattered across the landscape and may not have any direct connectivity with a channel system or permanent body of water. At a minimum, the AIZs must include the intermittent stream channel or small wetland and whichever of the following parameters encompasses the most area:
    - Top of the inner gorge
    - Outer edges of the riparian vegetation

- From the edges of the stream channel or wetland to a distance equal to one half the height of site-potential tree, or 50 feet slope distance

The extent of the AIZ within the Study Area has been mapped based on existing USFS data (perennial and intermittent streams) and project-collected data (wetlands), and is shown on **Figure 3.7-1**. There are 845 acres of AIZ within the Study Area.

3.7.2 Macroinvertebrate Populations

Benthic macroinvertebrates are considered indicators of aquatic ecosystem health (USEPA 2011a). Benthic macroinvertebrate populations were sampled quantitatively and qualitatively from the sites on the Blackfoot River, Lanes Creek, the unnamed tributary, and Angus Creek by GEI personnel on August 5, 2009. GEI personnel sampled No Name Creek, Angus Creek, South Fork Sheep Creek, and Sheep Creek sample areas during May and September 2014. Surveys were also conducted within South Fork Sheep Creek during June and September 2013. Detailed methodology for macroinvertebrate data collection is provided in GEI (2012, 2015). **Table 3.7-2** summarizes the metrics calculated by GEI from the results of the macroinvertebrate population sampling.

Table 3.7-2 Macroinvertebrate Metrics Calculated for Streams in the Sampling Area

Metric	Range of Values	Explanation of Metric
Shannon-Weaver Diversity Index (H')	0 to 4	Values greater than 2.5 indicate a healthy benthic macroinvertebrate community. Values less than 1.0 indicate a stream community under severe stress.
Percent EPT (Ephemeroptera [mayfly]-Plecoptera [stonefly]-Trichoptera [caddisfly]) taxa	0 to 100	These insect groups are considered sensitive to a wide range of pollutants and are indicators of water quality. Stress to aquatic systems can be evaluated by comparing the number and percent of EPT taxa.
Percent density of Ephemeroptera	0 to 100	Ephemeroptera taxa are considered relatively more sensitive to metals.
IDEQ Stream Macroinvertebrate Index (SMI)	0 to 100	This index allows comparison to regionally specific benchmarks developed to represent unimpacted or stressed streams. The score allows an evaluation of a stream's ability to support benthic invertebrate communities. The SMI has scores ranging from 0 to 100, with 0 to 19 indicating a "Very Poor" rating, 22 to 43 indicating a "Poor" rating, 40 to 58 indicating a "Fair" rating, 59 to 79 indicating a "Good" rating, and 80 and above indicating a "Very Good" rating for the central and southern mountain region in Idaho.
IDEQ River Macroinvertebrate Index (RMI)	5 to 23	This index allows comparison to regionally specific benchmarks developed to represent unimpacted or stressed rivers. The score allows an evaluation of a river's ability to support benthic invertebrate communities. Scores from 16 to 23 indicate a "Good" rating.

Source: GEI 2012

Macroinvertebrate sampling conducted in streams near the Study Area in 2009 documented 183 total taxa, representing 15 orders of macroinvertebrates collected from sites on the Blackfoot River, Lanes Creek, the unnamed tributary to Lanes Creek, and Angus Creek. Of these taxa, 17 percent were found in at least one site on all four streams, whereas 39 percent were unique to a single stream. Macroinvertebrate sampling conducted in 2013 and 2014 documented more than 220 total taxa, representing 17 orders of macroinvertebrates collected in Angus Creek, No Name Creek, Sheep Creek, and South Fork Sheep Creek.

Most macroinvertebrate metrics varied substantially among sites and streams during the 2009 surveys, with Site BFR-2 often having the highest value for many of the parameters, and sites BFR-1 and UT-1 often having the lowest values. EPT taxa represented from 13 to 32 percent of the total number of taxa collected at these sites, with ephemeropterans usually the most abundant of these groups and plecopterans absent or rare. Few differences in macroinvertebrate metrics were noted between the upstream and downstream sites on Lanes Creek, but the sites on the Blackfoot River and Angus Creek varied more, with the downstream sites on both streams exhibiting significantly higher metric values than the upstream sites for some parameters. Differences in the substrate composition, water velocities, and habitat diversity among these sites were observed, and are likely responsible for many of the differences in macroinvertebrate metrics. The site on the unnamed tributary exhibited lower values for most of the metrics than sites on other streams, but this would be expected considering that the unnamed tributary is a much smaller and shallower stream, with limited habitat complexity and availability.

Diversity index values were well above the 2.5 threshold, indicating lack of impairment at all sites surveyed near the Study Area. Additionally, SMI and RMI scores placed both the Blackfoot River sites (as well as sites LC-1 and AC-2) in the Good category, indicating that these sites support healthy macroinvertebrate communities. Sites LC-2, UT-1, and AC-1-I were categorized as Fair by their SMI scores, indicating that some factor (likely the substrate composition and other habitat parameters present at each site) may be affecting the composition of the invertebrate community. The SMI scores for sites UT-1 and AC-1-I were only marginally higher than the threshold between Fair and Poor.

During the 2013 and 2014 surveys, macroinvertebrate metrics generally varied within drainage sampling areas and with the seasons. Similar aquatic assemblages within No Name Creek were observed between the 2013 and 2014 sampling events, with the macroinvertebrate communities at most sites being dominated by true flies or aquatic segmented worms (GEI 2015). Diversity index values were below the 2.5 threshold value at BNNC-2 in September 2014, indicating potential impairment; although limited aquatic habitat was present. Similar to the scores observed in May 2014, SMI values at the No Name Creek sites in 2013 categorized sites as being in “Poor” or “Fair” biological condition. Here, the applicability of SMI is likely limited given the intermittent nature of the drainage.

Angus Creek locations BAC-1 and BAC-2 surveyed in 2013 and 2014 were in close proximity to the 2009 locations AC-2 and AC-1-I. The two additional Angus Creek locations BAC-3 and BAC-4, surveyed in 2013 and 2014, were located higher up in the watershed. Within Angus Creek, the composition of the macroinvertebrate assemblages differed somewhat among sites and seasons, but often true flies, aquatic segmented worms, or beetles were the most abundant groups (GEI 2015). SMI values categorized the Angus Creek sites as being in “Fair” or “Good” biological condition at almost all sites. Most macroinvertebrate metric values, including SMI scores, at sites downstream of the No Name Creek confluence were similar to or higher than values observed at the upstream sites in both May and September, suggesting that these assemblages were not being adversely affected by No Name Creek (GEI 2015). Aquatic segmented worms dominated the macroinvertebrate community at BSRD-2 in May and September 2014. At Site BSRD-1, true flies were the most numerically abundant group in May, while mayflies were more common in September (GEI 2015). SMI values categorized BSRD-2 as being in “Fair” biotic condition in both sampling events, while BSRD-1 was categorized as “Good” or “Very Good” (GEI 2015).

The composition of the macroinvertebrate assemblages at the two downstream sites within the perennial portion of South Fork Sheep Creek differed little between 2013 and 2014 in most respects (GEI 2015). SMI scores at the two downstream sites rated BSRD-2 as in “Poor” or “Fair” biological condition, while BSRD-1 was rated as “Good”, as it was in May 2014 (GEI 2015). The two upstream sites on South Fork Sheep Creek sampled in June 2013 (sites BSRD-4 and BSRD-3) had limited macroinvertebrate assemblages dominated by true flies. SMI values categorized both of these sites as being in “Very Poor” biological condition (GEI 2015).

At the Sheep Creek sites, the composition of the macroinvertebrate assemblages varied among sites and seasons in 2014, with mayflies, beetles, true flies, or caddisflies being the dominant group at one or more sites (GEI 2015). SMI values categorized most of the macroinvertebrate assemblages at the Sheep Creek sites as “Good”, with one site in May being characterized as “Very Good,” while one site in September was rated as “Fair”. SMI values and other metrics did not indicate any substantial change in the macroinvertebrate assemblages in Sheep Creek downstream of South Fork Sheep Creek compared to upstream (GEI 2015).

3.7.3 Fish Species

Native fish species known to occur recently or presently in the Blackfoot River and its tributaries include mountain whitefish (*Prosopium williamsoni*), Yellowstone cutthroat trout (*Onchorhynchus clarkii bouvieri*), Utah chub (*Gila atraria*), longnose dace (*Rhinichthys cataractae*), speckled dace (*Rhinichthys osculus*), redside shiner (*Richardsonius balteatus*), Utah sucker (*Catostomus ardens*), mountain sucker (*Catostomus platyrhynchus*), Paiute sculpin (*Cottus beldingii*), mottled sculpin (*Cottus bairdii*), and northern leatherside chub (*Lepidomeda copei*). Introduced species present in the watershed include the rainbow trout (*Oncorhynchus mykiss*), brook trout (*Salvelinus fontinalis*), common carp (*Cyprinus carpio*), and yellow perch (*Perca flavescens*) (IDFG 2013). Yellowstone cutthroat trout and northern leatherside chub are USFS Sensitive species and BLM Special Status species and are discussed in **Section 3.8**.

Qualitative and quantitative fish population sampling was conducted at sites LC-2, UT-1, AC-1-F, and AC-2 from September 29 to October 2, 2009 using electrofishing equipment, consistent with the IDEQ guidance and the IDFG approval (GEI 2012). Additional fish population sampling was conducted or attempted at sites BAC-1 to BAC-4 within Angus Creek, BSRD-1 and BSRD-2 within South Fork Sheep Creek, and BSC-1 to BSC-4 within Sheep Creek (GEI 2014, 2015). GEI calculated fish density and fish biomass at each sampled site, and the condition or well-being of individual fish was derived using two different indices, otherwise known as condition metrics. During these baseline surveys, GEI collected the following ten fish species from stream sites near the Study Area (GEI 2012, 2014, 2015):

- Utah chub
- Redside shiner
- Mountain sucker
- Longnose dace
- Speckled dace
- Mottled sculpin
- Paiute sculpin
- Utah sucker
- Brook trout
- Yellowstone cutthroat trout

During the 2009 fish population studies, speckled dace and mottled sculpin were collected at all sites, and Yellowstone cutthroat trout were collected at all sites except for Site BFR-2. Utah chubs and Utah suckers were collected from sites on Lanes Creek and Angus Creek and were observed on the Blackfoot River, while longnose dace were collected from the Lanes Creek site and observed on the Blackfoot River. Speckled dace were the most abundant species at most of the sites. Total fish densities and biomass were lowest at Site UT-1, likely because of the small size of this stream and the low number of species collected from this site. Total density and biomass were highest at Site AC-2, with this site also having the highest number of Yellowstone cutthroat trout collected. A direct comparison of the density and biomass at the Blackfoot River sites with the other sites could not be conducted because of differences in the methods used and the year of the sampling. However, when the population estimates for each of the tributary sites were used to determine the number of trout collected per kilometer in 2009, the Blackfoot River site appears to have exhibited a slightly higher trout density in 2008 than those observed at the other sites in 2009. Mean values for the two condition metrics evaluated for Yellowstone cutthroat trout were similar among all sites. The condition metrics for the other species were generally highest at the Angus Creek sites, indicating that fish in Angus Creek are generally in better condition than at the other sampled sites.

Based on the length-frequency analyses, Yellowstone cutthroat trout appear to be maintaining their populations through natural reproduction at sites LC-2 and AC-2. The size range of trout collected at sites UT-1 and AC-1-F was more limited than at the other sites, with all trout collected appearing to be juvenile fish. Most of the other fish species appear to be self-sustaining at the sites from which they were collected, with young and adult mottled sculpin, speckled dace, Utah suckers, and longnose dace present. Only young-of-year (YOY) and juvenile Utah chubs were collected at these sites, leading to the speculation that adult chubs may primarily reside in the Blackfoot River and use the tributaries for spawning. No northern leatherside chub were found in the Study Area during extensive surveys.

During the 2013 and 2014 fish population studies, No Name Creek study locations did not appear to support a fish population, likely because of limited habitat and intermittent flows. Within Angus Creek, seven species were collected including: Yellowstone cutthroat trout, longnose dace, mountain sucker, redside shiner, speckled dace, Utah sucker, and a sculpin species. Sculpin or speckled dace were the most abundant species collected (GEI 2015). Several large cutthroat trout in spawning condition were present at one site in May 2014, as well as juvenile trout. The size range of cutthroat trout present in September 2014 indicated that all fish were YOY or juvenile fish. Density and biomass of fish at the Angus Creek sites downstream of the No Name Creek confluence were higher than or similar to the values at the upstream sites in May and September, suggesting that no substantial changes in fish populations occurred associated with No Name Creek. Condition factor values were similar among sites in both seasons, and indicated that most fish were in average to above average condition in May 2014 (GEI 2015). Most Angus Creek sites were functioning within the 5th to 25th percentile range of reference conditions or higher (GEI 2015).

Within South Fork Sheep Creek, only brook trout and Yellowstone cutthroat trout were observed in low densities at the lower sample reaches during the 2013 and 2014 surveys. The two upstream South Fork Sheep Creek sites were not surveyed for fish populations in May 2014, and were dry in September 2014. Small ponds associated with these upstream reaches were also sampled for fish populations as part of the amphibian surveys; no fish were present. Likely the intermittent flows in these reaches of South Fork Sheep Creek limit fish populations from inhabiting this portion of the stream. Total SFI scores for the South Fork Sheep Creek sites indicated non-impairment and were within or greater than the 5th to 25th percentile range of scores for reference conditions. The size of the cutthroat trout and brook trout collected in South Fork Sheep Creek indicates that this stream reach likely does not support adult trout year-round. Instead, this portion of the stream serves as nursery habitat for young fish that would then migrate downstream into Sheep Creek or the Blackfoot River when they mature (GEI 2015).

Eight fish species were collected in Sheep Creek in 2014, including Yellowstone cutthroat trout, brook trout, longnose dace, speckled dace, mountain sucker, redside shiner, Utah sucker, and Paiute sculpin. Cutthroat trout were collected at all four sites during both sampling events, and sculpin were collected at most sites as well (GEI 2015). Adult and juvenile trout were observed in May, while YOY, juvenile, and possibly some small adults were present in September. Fish density and biomass in 2014 did not indicate any substantial changes in Sheep Creek fish populations when comparing sites upstream and downstream of the confluence of South Fork Sheep Creek. Species composition varied little among sites, and species diversity increased downstream at BSC-1. SFI scores for the Sheep Creek sites in 2014 were all within or greater than the 5^{th} to 25^{th} percentile range of reference condition scores (GEI 2015).

3.7.4 Amphibians and Reptiles

Project baseline surveys confirmed the presence of three species of amphibians and one snake: the northern leopard frog (*Rana pipiens*), boreal toad (*Bufo boreas*), boreal chorus frog (*Pseudacris triseriata maculata*), and common garter snake (*Thamnophis sirtalis*) (GEI 2012). The most commonly observed species was the northern leopard frog, which is an Idaho State Imperiled Species and the BLM Type 2 Sensitive Species. Northern leopard frogs were observed at two sites: BFR-1 and AC-2. The other two species observed were boreal toads (a USFS Sensitive and BLM Type 2 Sensitive Species) and boreal chorus frogs. Boreal toads were observed at site AC-2, and boreal chorus frogs were observed at site LC-2. The downstream site on Angus Creek (AC-2) was the only site from which more than one species was collected, and no amphibians or reptiles were observed at sites BR-2, LC-1, UT-1, AC-1-I, or AC-1-F during either survey period. Weather conditions during the September surveys of the sites on the Blackfoot River and Angus Creek were poor for herpetological surveys; temperatures were below freezing, and snow was present.

Frog and toad calling surveys and amphibian and reptile visual encounter surveys were conducted at 11 sites in 2011. Although three amphibian species were heard, no amphibians or reptiles were seen. The boreal chorus frog and boreal toad were the most common species heard. Several boreal chorus frogs were heard at every site, and boreal toads were heard at nine of 11 sites. In addition, a single northern leopard frog was heard at each of two sites. Stream flow during the June surveys was high because above average snowfall and snowmelt resulted in flooding of most lowland and several upland areas. These conditions created a considerable amount of temporary wetland habitat for amphibians.

Surveys in September 2014 confirmed the presence of only one amphibian species: the northern leopard frog. No amphibians were observed at any of the No Name Creek sites in September 2014. A single northern leopard frog was observed at the most downstream site on Angus Creek; no amphibians were observed at the other three sites (GEI 2015). No amphibians were observed at any of the South Fork Sheep Creek sites or the ponds associated with these sites during the fish population sampling or the visual encounter surveys in September 2014. In addition, no amphibians were observed at the sites on Sheep Creek (GEI 2015).

3.7.5 Tissue Analysis

Selenium in the environment has been identified as a concern in the Study Area because of its toxic and bioaccumulative properties, and because of its presence and solubility in mined overburden under certain conditions. Other constituents of potential concern (COPCs) for the Study Area are cadmium, lead, and mercury. Benthic macroinvertebrate and fish samples were collected to determine the baseline levels of selenium, cadmium, lead, and mercury in the aquatic environment and to assess if existing concentrations were potentially harmful to these populations. Additionally, periphyton and detrital composite samples were collected during September 2014 within No Name Creek, Angus Creek, South Fork Sheep Creek, and Sheep Creek. These samples were collected from the aquatic sampling locations shown on **Figure 3.7-1**. Concentrations were compared to studies that addressed the effects to aquatic macroinvertebrates or the effects to fish from dietary uptake of macroinvertebrates with known concentrations of cadmium, lead, mercury, and selenium (GEI 2012).

Dietary intake, rather than direct absorption from the water column, seems to be the main exposure pathway for macroinvertebrates. Bioaccumulation is difficult to quantify because it is affected by many variables. As a result, there is wide variation in the measured “bioaccumulation factor,” or the ratio of the concentration of selenium inside an organism to the concentration in the surrounding environment (Nagpal and Howell 2001). One laboratory study found that, on average, mayfly larvae accumulated 2.2 times the selenium concentration of their food source (periphyton, or algae), which had itself accumulated 1,113 times the selenium concentration of the water column (Conley et al. 2009). Other studies have reported similar bioaccumulation factors (Muscatello 2009; Ohlendorf 2003; Lemly 1999).

Periphyton and detritus samples collected at No Name Creek (BNNC-2) indicated a selenium concentration of 14.8 microgram per gram dry weight (µg/g dw). Within the Angus Creek locations, selenium concentrations for composite periphyton samples ranged from 0.2 µg/g dw (BAC-1) to 1.3 µg/g dw (estimated) at BAC-3. South Fork Sheep Creek selenium concentrations for composite periphyton samples ranged from 0.8 µg/g dw at BSRD-1 to 4.3 µg/g dw at BSRD-2. Sheep Creek selenium concentrations for composite periphyton samples ranged from 0.2 µg/g dw (estimated) at BSC-2 to 0.7 µg/g dw (estimated) at BSC-2.Within the 2009 tissue collections, macroinvertebrate tissue concentrations of COPCs at five of eight sites were not at levels that should be detrimental to the fish using them as a food resource. However, selenium concentrations at sites BFR-2, LC-2, and AC-2 were higher than the 3 µg/g dw threshold recommended by Lemly (1993) and Hamilton (2003), suggesting that selenium concentrations may be of concern to the health of the fish populations (GEI 2012).

Within the 2014 tissue collections, macroinvertebrate tissue concentrations of COPCs within No Name Creek showed cadmium concentrations ranging from 2.5 to 7.4 µg/g dw, selenium concentrations ranging from 1.8 to 8.6 µg/g dw, and zinc concentrations ranging from 69 to 263 µg/g dw. Selenium concentrations in macroinvertebrate tissues ranged from 0.8 µg/g dw at BNNC-4 in September 2013 to 7.6 µg/g dw at BNNC-3 in June 2013 (GEI 2015). These elevated concentrations may pose potential risks to higher trophic level organisms within the food web; however, based on limited habitat and intermittent flow conditions, direct consumption by fish is unlikely.

Macroinvertebrates were collected for tissue analysis from each Angus Creek site in both May and September 2014. Concentrations of many metals were similar among sites between the two seasons. Selenium concentrations ranged from 0.6 µg/g dw at BAC-3 in September 2014 to 1.7 µg/g dw at BAC-1 in May 2014 (GEI 2015). Concentrations of cadmium ranged from 0.1 µg/g dw at BAC-4 in September 2014 to 0.86 µg/g dw at BAC-3 in May 2014. Zinc concentrations ranged from 10.9 µg/g dw at BAC-4 in September 2014 to 48.2 µg/g dw at BAC-3 in May 2014. These COPC macroinvertebrate concentrations observed in Angus Creek likely pose low potential risks to higher trophic level organisms within the food web.

Selenium concentrations in macroinvertebrate tissues in South Fork Sheep Creek ranged from 3.9 µg/g dw at BSRD-1 in September 2014 to 7.1 µg/g dw at BSRD-2 in May 2014 (GEI 2015).

Selenium concentrations were slightly higher in May compared to September at both sites, as were cadmium and zinc concentrations (GEI 2015). Concentrations of cadmium ranged from 0.49 µg/g dw at BSRD-2 in September 2014 to 0.87 µg/g dw at BSRD-2 in May 2014. Zinc concentrations ranged from 50 µg/g dw at BSRD-2 in September 2014 to 111 µg/g dw at BSRD-1 in May 2014. Selenium concentrations ranged from 3.8 µg/g dw at BSRD-1 in June 2013 to 55.5 µg/g dw at BSRD-4 in June 2013 (GEI 2015). These COPC macroinvertebrate concentrations observed in South Fork Sheep Creek likely pose low to moderate potential risks to higher trophic level organisms within the food web.

Selenium concentrations in macroinvertebrate tissues collected in Sheep Creek during 2014 were low, ranging from 0.5 µg/g dw at BSC-3 in September 2014 to 1.5 µg/g dw at BSC-1 during the same sampling event (GEI 2015). Concentrations of cadmium ranged from 0.06 µg/g dw at BSC-3 in September 2014 to 0.76 µg/g dw at BSC-4 in May 2014. Zinc concentrations ranged from 30 µg/g dw at BSC-4 in September 2014 to 83 µg/g dw at BSC-2 in May 2014. These COPC macroinvertebrate concentrations observed in Sheep Creek likely do not pose risks to higher trophic level organisms within the food web.

The USEPA recently released draft aquatic life chronic criteria for selenium in freshwater systems, which include criteria based on two media: fish tissue and the water column (USEPA 2015a). The draft fish tissue criteria for selenium are 15.8 µg/g dw for egg/ovary tissue, 8.0 µg/g dw for whole body, and 11.3 µg/g dw for muscle tissue. Of these, the whole-body criterion of 8.0 µg/g dw is comparable to baseline fish tissue data collected in the fisheries and aquatic resources sampling area (**Figure 3.7-1**). It should be noted that these are draft criteria and therefore subject to change, but these criteria provide a frame of reference for evaluating concentrations of selenium in the sampling area.

There is uncertainty in the applicability of the USEPA (2015a) whole-body fish tissue chronic criterion because this value is driven down by the bluegill as a more sensitive warm-water fish species. This draft value is also in question, as the USEPA evaluates technical comments and potential issuing of a final standard.

Depending on dosage and exposure, selenium is toxic to fish and highly bioaccumulative in aquatic food chains (Ohlendorf 2003). Selenium bioaccumulation factors reported for fish in field studies range from 273 to 6,538 (the selenium concentration in fish ranges from 273 to 6,538 times the concentration in water), with an average of 1,900 (Muscatello 2009; USEPA 2004; Lemly 1999).

Geometric mean whole-body selenium values for all fish species collected in 2009 ranged from 5.0 µg/g dw (in mottled sculpin at site UT-1) to 16.1 µg/g dw (in mottled sculpin at site BFR-2). Selenium concentrations were generally lowest in Yellowstone cutthroat trout and highest in mottled sculpin. When all fish selenium data were pooled for each site, statistical analyses indicated that selenium concentrations were significantly higher in fish from Site BFR-1 and BFR-2 than in fish from the other sites ($p < 0.01$). The only deformities observed in fish from these sites that could be related to selenium toxicity were shortening of the operculum of some trout. Some effects, if present, may not be physically visible, such as reproductive effects. However, cutthroat trout densities were generally low, and no trout were observed at the downstream Blackfoot River site in 2009 (GEI 2012).

Geometric mean selenium values for all fish species collected in 2013 and 2014 ranged from 0.8 µg/g dw at BSC-3 in September 2014 to 10.9 µg/g dw at BSRD-2 in September 2013. In Angus Creek individual whole-body trout tissue concentrations of selenium ranged from 1.3 µg/g dw at

BAC-3 to 2.2 µg/g dw at BAC-1 in September 2014. Sculpin tissue concentrations of selenium were similar to trout and ranged from 1.0 µg/g dw at BAC-3 to 2.4 µg/g dw at BAC-2 in September 2014. Speckled dace collected at BAC-1 indicated the highest selenium concentrations, ranging from 2.0 to 4.1 µg/g dw in September 2014. The geometric mean of selenium tissue concentrations in whole-body trout fish tissues was lower at BSRD-1 than Site BSRD-2 during both events, and ranged from 2.8 µg/g dw at Site BSRD-1 in June 2013 to 10.9 µg/g dw at Site BSRD-2 in September 2013 (GEI 2014). Cutthroat trout and sculpin collected in Sheep Creek indicated lower geometric mean selenium concentrations, than the South Fork Sheep Creek fish, ranging from 0.8 µg/g dw at BSC-3 to 1.7 µg/g dw at BSC-2 in September 2014. In general, most whole-body fish tissue concentrations of selenium found within these tributaries were below the proposed threshold value of 8.0 µg/g dw. High selenium concentrations have been shown to cause deformities of larval fish and mortality of fish in all life stages (Ohlendorf 2003; Lemly 1999; Lemly 1997). Using a compilation of field and laboratory data, Lemly (1997) described the relationships among whole-body selenium concentrations in fish populations, percentage of deformities, and percentage of associated mortalities. According to Lemly's data, there is an exponential relationship between whole-body selenium concentration and percentage of deformed fish in a population, with the effects being more severe for larvae and fry than for juveniles and adults.

The existing effects on the surveyed fish communities in Angus Creek during 2009 only indicated one potential deformity associated with selenium at AC-2 for a cutthroat trout. Mean relative weights (Wr) and condition factor were not optimal (Wr less than 95 percent and condition factor below 1.0) for cutthroat trout at the Angus Creek locations. However, during 2014 fish population studies in Angus Creek, condition factors for cutthroat trout in May indicated average to above average condition, with slightly below average condition in September (GEI 2015). The 2014 fish population studies in Angus Creek indicated only two potential deformities for a sculpin with a spinal anomaly and a cutthroat trout with a shortened operculum; resulting in an overall index of 1.2 or less, well below the 20 percent rate of occurrence that would be anticipated to have a negligible impact on fish populations (Lemly 1997).

Concentrations of cadmium, lead, and mercury in fish tissues collected from study sites were consistently low, with all concentrations falling below the screening levels, maximum allowable concentrations, and criteria set for these metals. These results indicate that these metals are not likely currently limiting fish populations at the sample sites, and that the risk to human health from these metals through fish consumption from these streams is currently negligible.

3.8 THREATENED, ENDANGERED, OR SENSITIVE SPECIES

3.8.1 Threatened, Endangered, Proposed, and Candidate Species

Based on review of information available on the USFWS Information for Planning and Conservation (IPaC) website (USFWS 2016), Canada lynx (*Lynx canadensis*) and North American wolverine (*Gulo gulo luscus*) are currently the only federally listed species with potential to occur in Caribou County, Idaho and therefore the Study Area. Detailed accounts of Canada lynx and North American wolverine are provided in the Biological Assessment (BA) (BLM and USFS 2016). A summary of the affected environment for the species is provided below.

3.8.1.1 Canada Lynx

The Canada lynx is a predator of the northern boreal forest, including portions of the Rocky Mountains and Cascade Mountains. The historical range of the Canada lynx extended from

Alaska across much of Canada, with southern extensions into parts of the western U.S., the Great Lakes states, and New England (McKelvey et al. 1999; Ruediger et al. 2000). The USFWS listed the Canada lynx as Threatened under the Endangered Species Act of 1973 (ESA) in the contiguous U.S. in March 2000 (USFWS 2000).

The distribution of lynx is associated with boreal forest and closely follows that of the snowshoe hare (Ruggiero et al. 1994). Snowshoe hares are the primary prey of lynx; thus, lynx foraging habitat coincides with the dense understory shrub and sapling habitats used by snowshoe hares (Ruggiero et al. 1994). Preferred habitats include coniferous boreal forests with openings, bogs, and thickets; old growth taiga; mixed or deciduous forest; and wooded steppe. Lynx denning habitat is found in mature forests with high horizontal cover provided by coarse woody debris (Ruggiero et al. 1994; Ruediger et al. 2000). Suitable travel corridors consist of a closed canopy of coniferous or deciduous vegetation taller than 6 feet. Lynx avoid large openings where they cannot stalk their prey or stay hidden from larger predators (Ruggiero et al. 1994).

Lynx populations persist in a boreal forested landscape that contains large, contiguous patches of suitable habitat (home ranges reportedly range from 31 to 216 square km [12 to 83 miles]). At the landscape scale, suitable lynx habitat must consist of appropriate forest types (including a mixture of early to late-successional forests), areas with deep snow (which excludes many competitors), and high snowshoe hare densities. Lynx are also highly mobile and have a propensity to disperse long distances, particularly when prey becomes scarce; they can make long-distance exploratory movements outside their home ranges (Interagency Lynx Biology Team 2013; USFWS 2005). Linkage areas are habitat corridors that facilitate these exploratory movements and are also important for dispersal and breeding season movements. Note that linkage areas may encompass areas of non-lynx habitat (Interagency Lynx Biology Team 2013).

As previously described, the Canada lynx is listed as potentially occurring in Caribou County (USFWS 2016). There is no critical habitat (USFWS 2014) and there is no suitable denning habitat (TRC 2012a, 2012c) for Canada lynx in the Study Area. Project-level surveys of the Study Area indicate that lynx use thereof, if any, is limited to occasional use by individuals dispersing among more suitable habitat patches. Figure 1-1 of the Northern Rockies Lynx Management Direction EIS (USFS 2007) corroborates this and shows the project location as occurring in potential lynx linkage habitat.

TRC conducted winter track surveys in the Study Area three times between February 26 and April 11, 2010, and three times between February 27 and March 25, 2012, to evaluate use of the Study Area by large mammals, including lynx (TRC 2012a, 2012c); biologists did not observe any Canada lynx or signs thereof. In 2005, a female Canada lynx and two cubs were spotted 15 miles northeast of Soda Springs in Caribou County (BLM 2013). The USFS and BLM met with the USFWS on July 19, 2013 for another mining project effort and agreed that the aforementioned lynx observations were likely part of a Colorado reintroduction program that began circa 2000 (BLM 2013). Several lynx associated with the reintroduction effort returned northward; occasionally passing through the CTNF. Other than the family observed in 2005, no other reintroduced lynx have been reported on the Soda Springs or Montpelier Ranger Districts (BLM 2013).

Annual winter tracking surveys conducted by the USFS from 2003 to 2013 to monitor carnivore presence in the CTNF did not detect lynx (BLM 2013). The FEIS for the CNF RFP (USFS 2003) states that there the paucity of historical lynx occurrence records suggests that there has never been a viable population of lynx in the forest. The CNF RFP also states that no lynx hair samples had been identified during lynx hair snare grid surveys on the CNF (USFS 2003). Finally, review of the Idaho Fish and Wildlife Information System (IFWIS) website (2016) indicates that there have been historical lynx sightings in Caribou County; however, public wildlife and plant observations records available for review on the website indicate that there have been no recent public lynx observations in Caribou County (IFWIS 2016).

Based on the aforementioned habitat information and survey data/observation information, Canada lynx occurrence in the Study Area is expected to be limited, if any, to transient use of linkage habitat.

3.8.1.2 North American Wolverine

The North American wolverine is proposed for federal listing under the ESA as a threatened species and is also a USFS Sensitive Species. Wolverines prefer large contiguous tracts of coniferous forest habitat and tend to avoid grasslands and shrublands (Copeland et al. 2007, Copeland 1996). A study in central Idaho found that wolverines prefer elevations above 7,200 feet (Copeland et al. 2007). In Idaho, natal den sites occur above 8,200 feet (USFWS 2010). Wolverines use talus slopes as denning sites, and talus is considered a special denning habitat component for this species (USFWS 2010). Individual wolverines may possibly occur in the Study Area. However, the forests in the Study Area are naturally patchy and are at lower elevations than what wolverines prefer. There is no potential for denning because the Study Area is located below 8,200 feet and lacks talus slopes that could provide denning habitat. No wolverine tracks were observed in the Study Area during baseline wildlife surveys (TRC 2012a, c). However, individual wolverines may intermittently travel through patchy forests in the Study Area based on verified observations of wolverines in Caribou County in the vicinity of the Study Area (IDFG 2014).

Although wolverines are known to occur in Caribou County (IDFG 2014), the lack of individual wolverine or track observations during baseline surveys (TRC 2012a, c) in conjunction with a lack of denning habitat indicate that RCA impacts would likely be limited to individual wolverines that may occasionally travel through the area.

3.8.2 USFS Sensitive and Management Indicator Species and BLM Sensitive Wildlife Species

The Regional Forester identifies Sensitive and Management Indicator Species (MIS). Sensitive Species are identified as those for which population viability in the region is a concern as indicated by current or predicted downward trends in population numbers, density, or habitat capability. Sensitive Species receive special management emphasis to ensure their viability and to prevent the need for listing of the species as Threatened, Endangered, and Proposed Candidate Species. The BLM also recognizes Sensitive Species as those that are range-wide or globally imperiled, regionally or state imperiled, or peripheral species (species that are generally rare in Idaho, with the majority of their breeding range outside the state).

MIS are species that are sensitive to habitat changes that the USFS designates as indicators of the health of habitats. The CTNF recognizes greater sage-grouse as an MIS for sagebrush habitats and Columbian sharp-tailed grouse as an MIS for grassland and open-canopy sagebrush habitats. It also recognizes the northern goshawk as an MIS for mature and old-forest habitats.

Greater sage-grouse was previously a candidate for listing under status review by the USFWS and was therefore previously included in **Section 3.8.1** of the Draft EIS. Since the time of the Draft EIS, the species has been precluded from listing. Because of the large amount of information already amassed for the greater sage-grouse, it is described separately from other species in this section. **Table 3.8-1** identifies all other MIS and Sensitive Species that occur or potentially occur in the Study Area. In addition to identifying the species, the table summarizes the species' habitat preferences and the known or likely potential for occurrence.

3.8.2.1 Greater Sage-Grouse

The greater sage-grouse was a candidate for listing under status review by the USFWS. On October 2, 2015, the USFWS announced a 12-month finding on petitions to list the species, both range-wide and for the Columbian Basin population, as Endangered or Threatened species under the ESA. After review of best available scientific literature and commercial information, the USFWS found that the Columbia Basin population does not qualify as a distinct population segment, and that listing of the greater sage-grouse is not warranted at this time. The greater sage-grouse is, however, currently a BLM and USFS Sensitive Species, a USFS MIS for sagebrush habitats, and a state-protected game bird managed in accordance with the 2006 Conservation Plan for the Greater Sage-grouse in Idaho (Idaho Sage-grouse Advisory Committee 2006).

In August 2011, the BLM convened the Sage-Grouse National Technical Team (NTT), which developed a series of science-based conservation measures for greater sage-grouse to be considered and analyzed through the land use planning process. As a result of meeting and coordination, the NTT released A Report on National Greater Sage-Grouse Conservation Measures (NTT 2011). On December 27, 2011, the BLM released two Instructional Memoranda (IM 2012-043 and IM 2012-044) that provide direction to the BLM on how to consider the NTT conservation measures in the land use planning process and that provide interim management policies and procedures for greater sage-grouse.

In September 2015, the BLM and USFS released an Approved Resource Management Plan Amendment (ARMPA) for managing greater sage-grouse in Idaho and southwestern Montana. The ARMPA adopts the management described in the Idaho and Southwest Montana Greater Sage-Grouse Proposed Resource Management Plan Amendment and Final EIS (BLM and USFS 2015a), with modifications and clarifications as described in the record of decision (ROD) for the ARMPA (BLM and USFS 2015b).

The ARMPA recognizes five conservation areas in Idaho and Montana: Mountain Valleys Conservation Area, Desert Conservation Area, West Owyhee Conservation Area, Southern Conservation Area, and Southwestern Montana Conservation Area. The Study Area is located in the Southern Conservation Area. Within each conservation area, the ARMPA designates greater sage-grouse habitat management areas. Priority Habitat Management Areas (PHMAs) encompass areas with the highest conservation value to greater sage-grouse, based on the presence of larger leks, habitat extent, important movement and connectivity corridors, and winter habitat. Important Habitat Management Areas (IHMAs) contain additional habitat and populations that provide a management buffer for the PHMA and connect patches of PHMA. IHMAs also encompass areas of generally moderate to high conservation value habitat and/or populations, and, in some conservation areas, include areas beyond those identified by USFWS as necessary to maintain redundant, representative, and resilient populations. General Habitat Management Areas (GHMAs) encompass habitat outside of PHMAs or IHMAs that contains 10 percent of the occupied leks that are also of relatively low male attendance compared to leks in PHMAs or IHMAs. GHMAs are generally characterized by lower quality disturbed or patchy habitat of low lek connectivity (BLM and USFS 2015b). PHMAs, IHMAs, and GHMAs were delineated based on the best available information and encompass the vast majority of known habitat and leks in the sub region; however, areas of occasional or intermittent use by greater sage-grouse were omitted (BLM and USFS 2015b). None of the aforementioned greater sage-grouse habitat management areas overlap the Study Area, as shown on **Figure 3.8-1**; the nearest management area (GHMA) occurs 5 to 6 miles to the south.

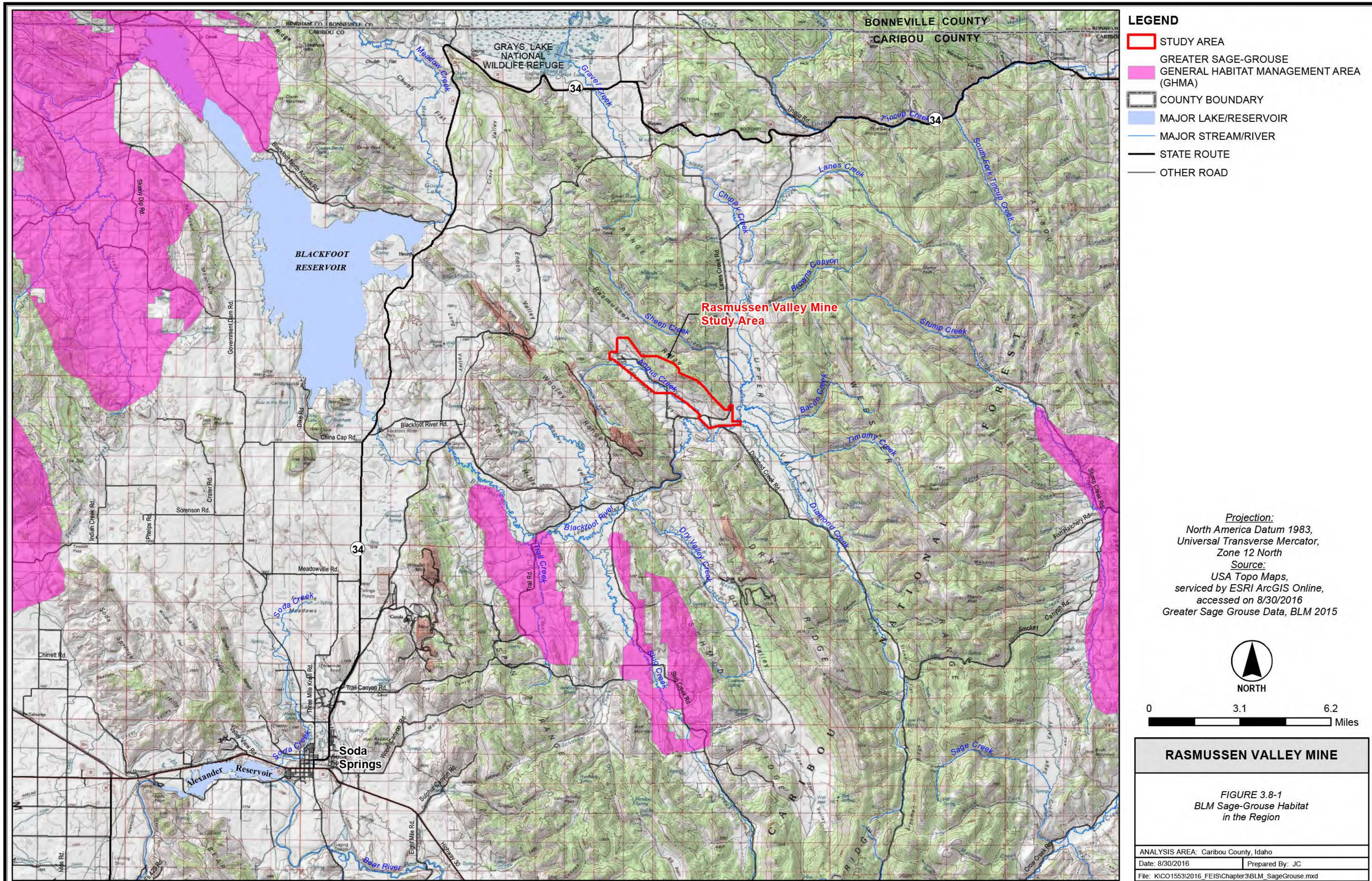

FIGURE 3.8-1
BLM Sage-Grouse Habitat in the Region

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Populations of greater sage-grouse are allied closely with sagebrush (Connelly et al. 2000). They use sagebrush for breeding, roosting, cover, and food. As Connelly et al. (2004) summarize, greater sage-grouse breeding habitats typically consist of sagebrush-dominated rangelands with extensive, relatively contiguous sagebrush stands, predominately on gentle terrain (less than 10 percent slope) and with relatively short distances to water (less than 2,000 meters). Leks (breeding display grounds) are situated in relatively open areas with less herbaceous and shrub cover than surrounding areas. Leks may be located in dry stream channels, on the edges of stock ponds, on ridges, in grassy meadows, in burned areas, in gravel pits, on sheep bedding grounds, in plowed fields, and on roads. Leks are typically adjacent to or surrounded by dense sagebrush stands, which are used for escape and feeding cover.

Nesting habitat includes sagebrush with horizontal and vertical structural diversity. Preferred understory is composed of native grasses and forbs, which provide food sources, among larger shrubs, under which nests are placed (Connelly et al. 2004). Nesting and early brood-rearing habitat, which is used in May and June, typically consists of big sagebrush communities with 15 to 25 percent canopy cover, sagebrush height of 15 to 30 inches, and a grass and forb understory (Gillan and Strand 2010). For late brood-rearing activities, which occur from July to September, greater sage-grouse prefer moist habitats including riparian areas, wet meadows, lakebeds, and uplands with sagebrush and areas that were recently burned (Gillan and Strand 2010; Stiver et al. 2010).

During winter, greater sage-grouse feed almost exclusively on sagebrush. They tend to frequent areas with a canopy cover of 10 to 30 percent sagebrush, preferably tall enough to remain at least 10 inches above the snow layer. They prefer areas with south- and southwest-facing aspects and gentle slopes (Gillan and Strand 2010).

The CNF RFP states that projects within 10 miles of an active sage-grouse lek should be considered further for suitability as sage-grouse habitat. The IDFG has records for ten leks within 10 miles of the Study Area. Three of these have a Management Status of “undetermined”, meaning that lek status has not been verified within the past 5 years. Five of the leks within 10 miles have a status of “unoccupied”, meaning that there have been 5 consecutive years of observation with no evidence of activity. This includes the closest recorded lek to the Study Area, located near Angus Creek 0.8 mile to the southwest. One lek within 10 miles has a status of “not verified.” This is a historical observation with no recent sightings on the ground or in the air, and not confirmed with a consecutive flight or ground observation by a professional. Finally, one lek within 10 miles has a status of “occupied”, meaning that two or more male grouse were observed from the ground displaying within the past 5 years. This occupied lek is located 7.8 miles southwest of the Study Area (IDFG 2015). In addition to these lek records, in 2015, a USFS employee reported sage-grouse displaying in the Blackfoot River WMA within 1 mile to the southeast of the Study Area. In 2015, sage-grouse were also heard displaying in Dry Valley, 4 miles south of the Study Area, but a visual confirmation was never obtained (IDFG 2015).

Grouse tracks were noted by TRC during the 2010 and 2012 winter track surveys; however, these tracks could not be identified to species (TRC 2012a, 2012c). Aerial surveys were conducted on April 10, 11, 21, and 22, 2011 to search for leks within the Study Area and a 3-mile buffer. No activity was observed at the Angus Creek lek, and no additional leks or sage-grouse were observed in the Study Area or 3-mile buffer (TRC 2012b). TRC also conducted an aerial survey on February 7, 2012 to evaluate sage-grouse winter use of the Study Area and 3-mile buffer. No greater sage-grouse were observed during this survey (TRC 2012c). TRC recorded incidental observations of 19 greater sage-grouse during summer 2011 wildlife surveys in the Study Area and vicinity. Two of the individuals were males, one was a juvenile, and the remaining 16 were adult females. Seventeen of the birds were observed between June 14 and 17, 2011, with a single observation of two individuals on August 5, 2011.

Given the limited dates on which greater sage-grouse were observed, and the fact that no more than three individuals ever were observed at any one time, it is possible that the observations represent repeat instances of a small group of grouse that used the Study Area briefly for foraging before moving on. No indication of breeding or nesting activity was recorded, and habitats in the Study Area are marginal for sage-grouse, as they are patchy (TRC 2012b) and do not meet the definitions of any of the USFS and BLM's (2015b) three habitat management area categories.

Table 3.8-1 USFS Sensitive and Management Indicator Species for Caribou National Forest and BLM Sensitive Species for the Pocatello Field Office

Common Name	Scientific Name	Status	Preferred Habitat[1]	Potentially Occurs in Study Area?
Pygmy rabbit	*Brachylagus idahoensis*	USFS Sensitive; BLM Sensitive	This species uses dense stands of tall sagebrush with a high amount of woody cover in areas with deep soils.	Unlikely. TRC evaluated the Study Area for suitability for pygmy rabbits in summer 2011, and determined that the Study Area lacks the preferred microhabitat characteristics (e.g., mounds or inclusions of taller, denser sagebrush, often with characteristic mounding of soil at the base of the shrubs) that would indicate potential current or past use of the area by pygmy rabbits (TRC 2012b).
Uinta chipmunk	*Tamias umbrinus*	BLM Sensitive	Found at 6,500 to 11,150 feet, in coniferous forests, often near logs and brush in open areas, and at edges of forests.	Unlikely. There is no suitable coniferous forest habitat for this species in the Study Area.
Gray wolf	*Canis lupus*	USFS Sensitive	Occurs in a wide variety of habitats; prefers landscapes with minimal human disturbance and abundant ungulate prey (NatureServe 2014). The 2014 range map for gray wolves indicates known wolf packs dispersed throughout the northern two thirds of Idaho, with a scattering of packs also recorded in the northeastern corner of eastern Idaho. The closest of the known packs (the Tex Creek pack) is 40 miles north-northwest of the Study Area (Husseman and Struthers 2015).	Unlikely but possible. No gray wolf tracks were observed in the Study Area during baseline winter track surveys (TRC 2012a, 2012c). However, an incidental observation of a possible gray wolf was recorded on top of a ridge 3 miles northwest of the Study Area during the February 2012 aerial survey for wintering grouse (TRC 2012c). This observation indicates that individual wolves may occasionally disperse through the area.
Wolverine	*Gulo gulo*	USFS Sensitive, ESA Proposed Threatened	See **Section 3.8.1.2.**	Unlikely but possible. See **Section 3.8.1.2**.

Table 3.8-1 USFS Sensitive and Management Indicator Species for Caribou National Forest and BLM Sensitive Species for the Pocatello Field Office

Common Name	Scientific Name	Status	Preferred Habitat[1]	Potentially Occurs in Study Area?
Spotted bat	*Euderma maculatum*	USFS Sensitive; BLM Sensitive	Uses a variety of habitats including ponderosa pine, desert scrub, pinyon-juniper, open pasture, and hay fields. Roosts alone in rock crevices high up on steep cliff faces. Cracks and crevices ranging in width from 0.8 to 2.2 inches in limestone and sandstone cliffs are critical roosting sites.	Unlikely. No USFS/BLM sensitive bat species were detected during the 4.5-month baseline acoustic monitoring period. The spotted bat has low intensity calls that make acoustic detection difficult. Thus, the presence or absence of this species in the Study Area cannot be fully confirmed based solely on the results of this study (Rodriguez 2012, TRC 2012b). However, the project is located outside of this species' known range in Idaho, and the Study Area lacks steep cliff faces that could provide roosting habitat.
Townsend's big-eared bat	*Corynorhinus townsendii*	USFS Sensitive; BLM Sensitive	Occupies moist forests, as well as arid savannah and shrub-steppe. It has been found foraging over sagebrush-grasslands, riparian areas, open pine forests, and arid scrub within the Greater Yellowstone Ecosystem. Caves and mines are used for both summer roosts and winter hibernacula.	Yes; the Study Area contains potentially suitable habitat for this species. No USFS/BLM sensitive bat species were detected during the 4.5-month baseline acoustic monitoring period. However, Townsend's big-eared bat has low intensity calls that make acoustic detection difficult. Thus, the presence or absence of this species in the Study Area cannot be fully confirmed based solely on the results of this study (Rodriguez 2012, TRC 2012b).
Boreal owl	*Aegolius funereus*	USFS Sensitive; BLM Sensitive	Prefers mature to old-growth Douglas-fir, mixed conifer, spruce-fir, and aspen forests. Mature forests are required for nesting, because the owls require large nesting cavities (3-inch-diameter openings and 12- to 15-inch-diameter trees). Nesting habitat structure consists of forests with a relatively high density of large trees, open understory, and multi-layered canopy.	Yes. TRC conducted three nocturnal calling surveys for the boreal owl between late February and the end of April in 2010 and 2012. One boreal owl was heard during the 2012 surveys, but no evidence of nesting was found in the area (TRC 2012c).

Table 3.8-1 USFS Sensitive and Management Indicator Species for Caribou National Forest and BLM Sensitive Species for the Pocatello Field Office

Common Name	Scientific Name	Status	Preferred Habitat[1]	Potentially Occurs in Study Area?
Flammulated owl	*Otus flammeolus*	USFS Sensitive; BLM Sensitive	Found in mixed pine forests, from pine mixed with oak and pinyon at lower elevations to pine mixed with spruce and fir at higher elevations. They have also been found in aspen and second-growth ponderosa pine; however, preferred habitat is mature ponderosa pine/Douglas-fir forests and mixed conifer forests with open canopies.	Unlikely but possible. Has been found nesting in aspen in the CNF. TRC conducted three nocturnal calling surveys for the flammulated owl between May 1 and June 30, 2010 and between May 1 and early June 2012. No flammulated owls were heard or observed during the surveys (TRC 2012a, 2012c).
Great gray owl	*Strix nebulosa*	USFS Sensitive; BLM Sensitive	Found in coniferous and hardwood forests, especially pine, spruce, paper birch, and poplar; also found in second growth, especially near water. In Idaho, found at lower elevations and in agricultural areas during winter and in conifer forests in spring and summer, most commonly near extensive meadows.	Yes. TRC conducted three nocturnal calling surveys for the great gray owl between late February and the end of April in 2010 and 2012. Great gray owls were heard during each survey in 2010, and were noted at eight locations during the 2012 surveys. No active nests were discovered during a follow-up nest survey in 2012; however, the Study Area contains suitable nesting and foraging habitat for great gray owls, and it appears that at least one and possibly two nesting territories occur within the Study Area and 0.5-mile buffer (TRC 2012a, 2012c).
Bald eagle	*Haliaeetus leucocephalis*	USFS Sensitive; BLM Sensitive	Found primarily near seacoasts, rivers, and reservoirs and lakes, where it roosts and nests in large trees.	Yes. Bald eagles are not known to nest within the Study Area or vicinity, but they were observed using the Study Area during baseline RLB surveys in 2011 (TRC 2012b) and during the during the February 7, 2012 aerial winter grouse survey (TRC 2012c).
Northern goshawk	*Accipiter gentilis*	USFS Sensitive; USFS Management Indicator Species; BLM Sensitive	Uses a variety of forest types, forest ages, structural conditions, and successional stages. Has been found nesting in Douglas-fir, mixed conifer, and lodgepole pine cover types. Suitable breeding habitat includes three components: 1) nesting areas, which typically have a relatively high tree canopy	Yes. TRC conducted diurnal calling surveys for the northern goshawk in May and June 2010 and June and July 2011. While no active northern goshawk nests were identified during these surveys, one individual northern goshawk was observed in 2010, and two individual northern goshawks were observed in 2011 (TRC

Table 3.8-1 USFS Sensitive and Management Indicator Species for Caribou National Forest and BLM Sensitive Species for the Pocatello Field Office

Common Name	Scientific Name	Status	Preferred Habitat[1]	Potentially Occurs in Study Area?
			cover, high density of large trees, and are usually mature or older forested stands; 2) post-fledging area (PFA), which surrounds the nest area and includes a variety of forest conditions, typically with well developed understory; and 3) foraging areas, which includes a greater diversity of land forms, forest cover types, and vegetation structural stages. Important habitat components include snags, downed logs, woody debris, openings, large trees, herbaceous and shrubby understories, and interspersion of vegetation structural/ successional stages.	2012a, 2012b). In addition, a northern goshawk was detected calling 1 mile south of the Study Area during March 2012 winter tracking surveys (TRC 2012c).
Peregrine falcon	*Falco peregrinus*	USFS Sensitive; BLM Sensitive	Occupy a wide range of habitats and are typically found in open country near rivers, marshes, lakes, and coasts. Foraging habitat includes wetlands and riparian areas, meadows and parklands, croplands, gorges and mountain valleys, and lakes. Cliffs are preferred nesting sites.	Unlikely but possible. TRC did not observe any peregrine falcons within or near the Study Area during any of the baseline wildlife surveys (TRC 2012c). There is no suitable nesting habitat for peregrine falcons within the Study Area, but this species may pass through the area during migration.
Prairie falcon	*Falco mexicanus*	BLM Sensitive	Found in open situations in mountainous shrub steppe or grasslands. In Idaho, breeds in shrub steppe and dry mountainous habitat, and winters at lower elevations.	Unlikely but possible. TRC did not observe any prairie falcons within or near the Study Area during any of the baseline wildlife surveys (TRC 2012c). The Study Area contains marginal nesting habitat for this species. Prairie falcons may move through the area during migration.
Greater sage-grouse	*Centrocercus urophasianus*	BLM Sensitive; USFS Sensitive; USFS Management Indicator Species; State	See more information at beginning of this section (**Section 3.8.2)** and in the subsection (unnumbered) Greater Sage-grouse.	See more information at beginning of this section (**Section 3.8.2)** and in the subsection (unnumbered) Greater Sage-grouse.

Table 3.8-1 USFS Sensitive and Management Indicator Species for Caribou National Forest and BLM Sensitive Species for the Pocatello Field Office

Common Name	Scientific Name	Status	Preferred Habitat[1]	Potentially Occurs in Study Area?
		Protected Game Bird		
Columbian sharp-tailed grouse	*Tympanuchus phasianellus columbianus*	USFS Sensitive; USFS Management Indicator Species; BLM Sensitive	Summer and brood-rearing habitat generally consists of shrub-steppe vegetation with 20 to 40 percent shrub cover interspersed with a high diversity of forb and bunchgrasses, generally composed of 60 to 80 percent grass/forb cover. Summer habitat generally consists of grasslands or habitat edges during morning hours, moving to shrub cover during mid-day, then back to more open vegetation types toward evening. During winter, closely associated with deciduous trees and mountain shrubs in upland and riparian areas.	Yes. TRC incidentally observed a single adult sharp-tailed grouse during the 2011 wildlife surveys conducted for the project (TRC 2012b). No Columbian sharp-tailed grouse leks were observed during the 2011 aerial grouse lek surveys (TRC 2012b). Eighteen Columbian sharp-tailed grouse were observed during the February 2012 winter grouse survey. These grouse were observed in two groups. One group of five individuals was located 2 miles northwest of the Study Area, and one group of 13 individuals was located 2.3 miles northwest of the Study Area (TRC 2012c).
American three-toed woodpecker	*Picoides tridactylus*	USFS Sensitive	Found in northern coniferous and mixed forest types up to 9,000 feet in elevation. They use forests of spruce, ponderosa pine, and lodgepole pine. Nests are found in spruce, pine, and aspen trees, as well as in willow riparian, high-elevation aspen groves, in swamps, and burned-over coniferous forests.	Unlikely. TRC conducted diurnal calling surveys for the American three-toed woodpecker in May and June 2010 and June and July 2011. No three-toed woodpeckers were observed during these surveys (TRC 2012a, 2012b). Three-toed woodpeckers were also not observed during PSB surveys in the spring, summer, or fall of 2011 (TRC 2012b).
Lewis's woodpecker	*Melanerpes lewis*	BLM Sensitive	Found in open forests and woodlands (often logged or burned), including oak, coniferous forests (primarily ponderosa pine), and riparian woodlands and orchards.	Unlikely. TRC did not observe any Lewis's woodpeckers in the Study Area during PSB or any other surveys (TRC 2012b, 2012c). The preferred habitat of this species (open coniferous forests and riparian woodlands) is absent from the Study Area.
Williamson's sapsucker	*Sphyrapicus thyroideus*	BLM Sensitive	Found in montane coniferous forests, especially fir and lodgepole pine. During migration and in winter, also found in lowland forests.	Unlikely. TRC did not observe any Williamson's sapsuckers in the Study Area during PSB or any other surveys (TRC 2012b, 2012c). The preferred habitat of this species (coniferous forests) is absent from the Study Area.

Table 3.8-1 USFS Sensitive and Management Indicator Species for Caribou National Forest and BLM Sensitive Species for the Pocatello Field Office

Common Name	Scientific Name	Status	Preferred Habitat[1]	Potentially Occurs in Study Area?
Willow flycatcher	*Empidonax trailii*	BLM Sensitive	Found in thickets, scrubby and brushy areas, open second growth, swamps, and open woodlands. In an Idaho study of riparian birds, willow flycatchers were intermediate in association with mesic and xeric willow habitats.	Yes. There is suitable shrubby riparian habitat in the Study Area for this species, and willow flycatchers were observed in the Study Area during baseline PSB surveys (TRC 2012c).
Hammond's flycatcher	*Empidonax hammondii*	BLM Sensitive	Found in coniferous forests and woodlands. During migration and in winter, found in deserts and scrub, and in pine and pine/oak associations. In preliminary results of Idaho-Montana study, Hammond's flycatchers were found to be old-growth associates in Douglas-fir/ponderosa pine forests.	Unlikely. TRC did not observe any Hammond's flycatchers in the Study Area during PSB or any other surveys (TRC 2012b, 2012c). The preferred habitat of this species (coniferous forests and woodlands) is absent from the Study Area.
Olive-sided flycatcher	*Contopus borealis*	BLM Sensitive	Found in forests and woodlands (especially in burned-over areas with standing dead trees) such as taiga, subalpine coniferous forests, mixed forests, boreal bogs, muskeg, and borders of lakes and streams. Idaho study found species responded positively in numbers to single-tree logging.	Unlikely. TRC did not observe any olive-sided flycatchers in the Study Area during PSB or any other surveys (TRC 2012b, 2012c). The preferred habitat of this species (burned-over or logged coniferous forests) is absent from the Study Area.
Loggerhead shrike	*Lanius ludovicianus*	BLM Sensitive	Found in open country with scattered trees and shrubs, in savannas, desert scrub, and occasionally in open juniper woodlands. Often found on poles, wires, or fence posts.	Unlikely but possible, as there is potentially suitable habitat in the Study Area. TRC did not observe any loggerhead shrikes in the Study Area during PSB or any other surveys (TRC 2012b,c).
Sage sparrow	*Amphispiza belli*	BLM Sensitive	Found in sagebrush, saltbush brushlands, and chaparral. During migration and in winter, also found in arid plains with sparse bushes, in grasslands, and in open situations with scattered brush. One Idaho study found that nesting occurred in areas where sagebrush coverage was sparse but clumped. A recent southwestern Idaho study concluded that	Yes. Sage sparrows were observed using the sagebrush habitats in the Study Area during the baseline 2011 PSB point-count surveys (TRC 2012b).

Table 3.8-1 USFS Sensitive and Management Indicator Species for Caribou National Forest and BLM Sensitive Species for the Pocatello Field Office

Common Name	Scientific Name	Status	Preferred Habitat[1]	Potentially Occurs in Study Area?
			distribution of sage sparrows was influenced by both local vegetation cover and landscape features such as patch size.	
Brewer's sparrow	*Spizella breweri*	BLM Sensitive	Usually found in association with sagebrush. During migration and in winter, also found in desert scrub and creosote bush. Idaho study found that Brewer's sparrows prefer large, living sagebrush for nesting. A recent study in southwestern Idaho concluded that their distribution was influenced by both local vegetation cover and landscape-level features such as patch size.	Yes. Brewer's sparrows were commonly observed using the sagebrush habitats in the Study Area during the baseline 2011 PSB point-count surveys (TRC 2012b).
Virginia's warbler	*Vermivora virginiae*	BLM Sensitive	Breeds in deciduous woodlands on steep mountain slopes. Also found along mountain streams in sagebrush, or in cottonwood and willow habitat at 5,900 to 9,200 feet. Winters in arid scrub. In Idaho, species is most closely associated with pinyon/juniper woodlands and nearby riparian areas.	Unlikely. TRC did not observe any Virginia's warblers in the Study Area during PSB or any other surveys (TRC 2012b,c). The preferred habitat of this species (pinyon/juniper woodlands) is absent from the Study Area.
Trumpeter swan	*Cygnus buccinator*	USFS Sensitive; BLM Sensitive	Nesting habitat consists of marshes, lakes, beaver ponds, and oxbows and backwaters of rivers. They prefer quiet, shallow water with dense aquatic plant and invertebrate growth. Tall emergent vegetation is essential for cover. In winter, they require ice-free rivers with available aquatic vegetation.	Yes. Three trumpeter swans were incidentally observed during the February 2012 winter grouse survey. The swans were in the Upper Valley near a tributary of Diamond Creek 0.8 mile east of the Study Area (TRC 2012c). No trumpeter swans were observed during the 2011 RLB or water bird surveys conducted for the project (TRC 2012b).
Harlequin duck	*Histrionicus histrionicus*	USFS Sensitive	Usually found in streams with gradients of less than 3 degrees, greater than 50 percent streamside shrub cover, and less than three loafing sites (e.g., mid-stream boulders) every 33 feet of stream.	No. Harlequin ducks are considered unlikely to occur on the CNF. The only potential area where they may occur is McCoy Creek, which is more than 20 miles to the north of the Study Area.

Table 3.8-1 USFS Sensitive and Management Indicator Species for Caribou National Forest and BLM Sensitive Species for the Pocatello Field Office

Common Name	Scientific Name	Status	Preferred Habitat[1]	Potentially Occurs in Study Area?
American white pelican	*Pelecanus erythrorhynchos*	BLM Sensitive	Found on rivers, lakes, estuaries, and bays. In Idaho, found on large inland reservoirs and island nests.	Yes. Nine American white pelicans were observed just south of the Study Area during baseline water bird surveys conducted in June 2011 (TRC 2012b).
White-faced ibis	*Plegadis chihi*	BLM Sensitive	Found mostly in freshwater areas, marshes, swamps, ponds, and rivers. In Idaho, prefers shallow-water areas.	Yes. White-faced ibis were incidentally observed in the general vicinity of the Study Area during baseline wildlife surveys in 2011 (TRC 2012b).
Black tern	*Chlidonias niger*	BLM Sensitive	Prefers sheltered, offshore waters and bays. Found along seacoasts, bays, estuaries, lagoons, lakes, and riverschiefly during migrations or when breeding.	Unlikely but possible, as there is potentially suitable riverine habitat near the Study Area. TRC did not observe any black terns in the Study Area during RLB or any other surveys (TRC 2012b,c).
Calliope hummingbird	*Stellula calliope*	BLM Sensitive	Found in mountains (along meadows, canyons, and streams), in open montane forests, and in willow and alder thickets. During migration and in winter, found in chaparral, lowland brushy areas, and deserts.	Unlikely but possible, as there is potentially suitable habitat in the Study Area. TRC did not observe any calliope hummingbirds in the Study Area during PSB or any other surveys (TRC 2012b,c).
Columbia spotted frog	*Rana luteiventris*	USFS Sensitive	Found near permanent water such as marshy edges of ponds or lakes, algae-grown overflow pools of streams, and near springs with emergent vegetation during the breeding period. May move through mixed conifer and subalpine fir forest, grasslands, and brushlands of sage and rabbitbrush.	Unlikely. There is potentially suitable aquatic habitat within and near the Study Area; however, no Columbia spotted frogs were observed during baseline amphibian surveys conducted by GEI (GEI 2012). Furthermore, Columbia spotted frogs are not known to occur in the CNF.
Boreal toad	*Bufo boreas boreas*	USFS Sensitive; BLM Sensitive	Occupies a range of habitats including wetlands, forests, woodlands, sagebrush, meadows, and floodplains in mountains and valleys. Generally found near water, but inhabits a variety of habitat types, from sagebrush desert to mountain meadows. This species generally occurs between 7,400 and 11,800 feet in elevation (Keinath and McGee 2005).	Yes. Two boreal toads (an adult and a juvenile) were recorded at site AC-2 during August 2009 visual encounter surveys conducted by GEI (GEI 2012). Small numbers of boreal toads were also heard during spring 2011 amphibian calling surveys at every station except Stations #4 and #7 (sites AC-2 and BFR-1, respectively) (GEI 2012).

Table 3.8-1 USFS Sensitive and Management Indicator Species for Caribou National Forest and BLM Sensitive Species for the Pocatello Field Office

Common Name	Scientific Name	Status	Preferred Habitat[1]	Potentially Occurs in Study Area?
Northern leopard frog	*Rana pipiens*	BLM Sensitive	In Idaho, this species lives in marshes and wet meadows from low valleys to mountain ridges. Often associated with beaver ponds. It winters in the bottoms of ponds and lakes.	Yes. Five northern leopard frogs were collected at sites AC-2 and BFR-1 over two sampling periods in August and September 2009 during baseline visual encounter surveys (GEI 2012). A single northern leopard frog was heard at Stations #3 and #6 during spring 2011 amphibian calling surveys (GEI 2012).
Common garter snake	*Thamnophis sirtalis*	BLM Sensitive	Inhabits any type of wet or moist habitat throughout range.	Yes. One snake was observed near site BFR-1 during baseline amphibian and reptile visual encounter surveys performed by GEI in 2009. This snake escaped before it could be positively identified, but it was believed to be a common garter snake (GEI 2012).
Yellowstone cutthroat trout	*Oncorhynchus clarki bouveri*	USFS Sensitive; BLM Sensitive	Adapted to cold water. Water temperatures between 4.5 and 15.5 °C appear to be optimum for this subspecies. Spawning streams are commonly low gradient perennial streams, with groundwater- and snow-fed water sources, with gravel between 12 and 85 millimeters in diameter and water temperatures between 5.5 and 15.5°C. Large boulders and instream vegetation and woody debris are important for shade and cover (Gresswell 2011).	Yes. During baseline fish population surveys, GEI collected Yellowstone cutthroat trout from all sampled sites except for Site BFR-2 (GEI 2012). The highest density of Yellowstone cutthroat trout was observed at site AC-2. Based on the length-frequency analyses, Yellowstone cutthroat trout appear to be maintaining their populations through natural reproduction at sites LC-2 and AC-2. The size range of trout collected at sites UT-1 and AC-1-F was more limited than at the other sites, with all trout collected appearing to be juvenile fish (GEI 2012).
Northern leatherside chub	*Lepidomeda copei*	USFS Sensitive; BLM Sensitive	Prime northern leatherside chub habitat generally occurs at a lower elevation in the watershed than prime cutthroat trout habitat. Chubs have not been observed in high gradient stream reaches. They inhabit clear, cool streams and prefer a pool environment. Depends on channel complexity for cover,	Unlikely but possible. Fish sampling for this project included surveys specifically searching for northern leatherside chub. This species was historically present in Angus Creek. Northern leatherside chub have not been reported in the area in recent years, and initial sampling did not identify this species (GEI

Table 3.8-1 USFS Sensitive and Management Indicator Species for Caribou National Forest and BLM Sensitive Species for the Pocatello Field Office

Common Name	Scientific Name	Status	Preferred Habitat[1]	Potentially Occurs in Study Area?
			including large instream wood and undercut banks, particularly with overhanging vegetation. Unlikely to be found in areas with a high frequency of surface fine sediment deposition. Seldom found in eroded, heavily silted stream reaches or in areas that have been channelized.	2012). After these northern leatherside chub surveys were completed, the USFWS determined that the northern leatherside chub was not warranted protection under the ESA (76 FR 63444-63478).

Notes:
1 Information from USFS 2003 and Groves et al. 1997 except where noted.

3.8.3 Special Status Plant Species

A review of the USFWS, Idaho Fish and Wildlife Office Endangered, Threatened, Proposed, and Candidate Species List with associated proposed and critical habitats in Idaho identified no occurrences of plant species listed as Threatened, Endangered, or Proposed under the ESA in Caribou County (USFWS 2014).

Three plant species are listed as Sensitive for the CNF, and another six species are on the CNF "Forest Watch" list of rare plants. **Table 3.8-2** lists these species and each species' potential to occur in the Study Area. BC performed a focused field survey for species with potential habitat in the Study Area. None of the species listed on the USFS Sensitive Species or Forest Watch List were recorded during 2009-2012 field surveys performed by BC (2012a,b,c).

Table 3.8-2 USFS Sensitive and Forest Watch Plant Species on the CNF

Scientific Name	Common Name	Habitat	Potential to Occur in Study Area	Documented in Study Area during 2009-2012 Field Surveys
USFS Sensitive Plant Species				
Astragalus jejunus var. *jejunus*	Starveling milkvetch	Shale of the Twin Creek Limestone Formation (Mancuso and Moseley 1990)	No, there is no suitable habitat in the Study Area.	No
Lesquerella paysonii	Payson's bladderpod	Ridges and high peaks of the Snake River Range above the Snake River; also on Caribou Mountain (Moseley 1996)	No, there is no suitable habitat in the Study Area.	No

Table 3.8-2 USFS Sensitive and Forest Watch Plant Species on the CNF

Scientific Name	Common Name	Habitat	Potential to Occur in Study Area	Documented in Study Area during 2009-2012 Field Surveys
USFS Sensitive Plant Species				
Penstemon compactus	Cache beardtongue	High-elevation limestone substrates, on bedrock, outcrops, or cliff bands ranging from 8,800 to 9,300 feet in elevation (Moseley and Mancuso 1990)	No, there is no suitable habitat in the Study Area.	No
USFS Watch Plant Species				
Asplenium septentrionale	Grass-like spleenwort	High-elevation rocky areas	No, there is no suitable habitat in the Study Area.	No
Asplenium tricomanes-ramosum	Green spleenwort	Moist limestone or other basic substrates at high elevations (Moseley and Mancuso 1990)	No, there is no suitable habitat in the Study Area.	No
Carex idahoa	Idaho sedge	Low, level wetland transition zones within the Blackfoot River watershed	The IDFG recorded Idaho sedge within the southern boundary of the Study Area in 2010 (**Figure 3.5-1**).	The August 2011 survey did not locate the occurrences noted by the IDFG, nor did it find any new occurrences of Idaho sedge in the Study Area (BC 2012a).
Ericameria discoidea var. *winwardii*	Winward's goldenbush	Only on barren Twin Creek Limestone outcrops on the Montpelier Ranger District	No, there is no suitable habitat in the Study Area.	No
Musineon lineare	Rydberg's musineon	Ledges and crevices on near-vertical outcrops between 8,200 and 9,000 feet in elevation (Moseley and Mancuso 1990; Mancuso 2003)	No, there is no suitable habitat in the Study Area.	No
Salicornia rubra	Red glasswort	Low-elevation flats; prefers basic, saline soils	Yes	No

Source: BC 2012a

Sixteen species of plants that the BLM lists as Sensitive or Species of Concern are known to occur within the area managed by the PFO. These species, along with a preliminary assessment regarding their potential occurrence within the Study Area, are listed in **Table 3.8-3**. A field survey was performed for the four species identified as having potential habitat in the Study Area (**Table**

3.8-3). None of these species were recorded during 2009-2012 field surveys performed by BC (2012a,b,c).

Table 3.8-3 BLM Pocatello Office Sensitive Plant Species and Species of Concern

Scientific Name	Common Name	Habitat	Potential to Occur in Study Area	Documented in Study Area during Field Surveys
Type 2 Plant Species (Rangewide/Globally Imperiled Species – High Endangerment)				
Astragalus jejunus var. *jejunus*	Starveling milkvetch	Shale of the Twin Creek Limestone Formation (Mancuso and Moseley 1990)	No, there is no suitable habitat in the Study Area.	No
Eriogonum hookeri	Hooker's buckwheat	Sandy washes, flats, and slopes in saltbush, greasewood, sagebrush, and mountain mahogany communities at 4,200 to 8,200 feet in elevation (SEINet 2011)	No, this species is not known to occur in Caribou County.	No
Type 3 Plant Species (Rangewide/Globally Imperiled Species – Moderate Endangerment)				
Aspicilia fruticulosa	Coral lichen	Calcareous soil in black sagebrush or badland communities (Hagwood 2006)	No, there is no suitable habitat in the Study Area.	No
Cryptantha breviflora	Uinta Basin cryptantha	Shale of the Twin Creek Limestone Formation (Mancuso and Moseley 1990)	No, there is no suitable habitat in the Study Area.	No
Ericameria discoidea var. *winwardii*	Winward's goldenbush	White clay-shale slopes and outwash (Kinter 2009)	No, there is no suitable habitat in the Study Area.	No
Eriogonum desertorum	Great Basin desert buckwheat	Silty or gravelly to clayey flats, slopes, and ridges, often on limestone soils, in mixed grassland, saltbush, and sagebrush communities from 4,900 to 9,800 feet in elevation (eFloras.org 2005)	No, this species is not known to occur in Caribou County.	No
Type 4 Plant Species (Species of Concern)				
Carex tumulicola	Foothill sedge	Dry slopes and meadows (Moseley 1992)	No, this species is not known to occur in Caribou County.	No

Table 3.8-3 BLM Pocatello Office Sensitive Plant Species and Species of Concern

Scientific Name	Common Name	Habitat	Potential to Occur in Study Area	Documented in Study Area during Field Surveys
Cercocarpus montanus	Birchleaf mountain-mahogany	Sagebrush, mountain shrublands, and pinyon-juniper woodlands; also openings of ponderosa pine, mixed conifer, and aspen forests (Kitchen date unknown)	No, this species is not known to occur in Caribou County.	No
Cryptantha caespitosa	Tufted cryptantha	Exposed ridgelines with shallow, shaly soils in low sagebrush (*Artemisia arbuscula*) or black sagebrush (*Artemisia nova*) communities (Moseley 1991)	Yes	No
Cryptantha sericea	Silky cryptantha	Heavy clay soils, 4,200 to 7,000 feet in elevation (Higgins 1971)	No, this species is not known to occur in Caribou County.	No
Cymopterus ibapensis	Ibapah spring parsley	No information available	No, this species is not known to occur in Caribou County.	No
Hymenoxys cooperi var. *canescens*	Cooper's rubber-plant	No information available	No, this species is not known to occur in Caribou County.	No
Muhlenbergia racemosa	Green muhly	Dry to moist sites, streambanks, lake margins, irrigation ditches, and dry slopes from 4,100 to 10,400 feet in elevation (Zouhar 2011)	Yes	No
Nassella viridula	Green needlegrass	Plains, prairies, foothills, mountain meadows, open woodlands, and hillsides (Mancuso and Moseley 1992)	Yes	No
Salicornia rubra	Red glasswort	Low-elevation flats; prefers basic, saline soils	Yes	No
Salix candida	Hoary willow	Bogs, fens, marshes, pond edges, and seepage areas (IDFG 2011)	Yes	No

Source: BC 2012a

3.9 VISUAL RESOURCES

Visual resources are a composite of terrain, geologic features, water features, vegetative patterns, structures, and land use activities that typify an area. The intrinsic beauty of the Study Area is valued by visitors and residents. The character of the landscape, potential viewing locations, and number of viewers are important factors to consider when describing the visual resources of an area.

Visual resources are important to the expectations and experiences of visitors and residents. Scenic landscapes contribute to the quality of life for local communities and can provide economic benefits to communities when they provide high-quality scenic settings for outdoor recreational experiences.

The analysis area for visual resources is the Study Area and the surrounding areas and vantage points from which the public may view portions of the Study Area. The analysis area for visual resources is shown on **Figure 3.9-1**.

3.9.1 Visual Resource Management Agencies

Portions of the Study Area are located on the CTNF lands managed by the USFS, BLM lands managed by the PFO, land within the Blackfoot River WMA managed by the IDFG, and private lands. The affected environment description for visual and aesthetic resources distinguishes among the USFS lands, BLM lands, and non-federal lands. Land management objectives for USFS and BLM lands are summarized in the following subsections.

3.9.1.1 USFS Visual Management System

The CTNF lands in the Study Area have been classified by Visual Quality Objectives (VQOs) in the USFS' Visual Management System (VMS). VQOs are assigned using guidelines established for scenic quality, visual sensitivity, and visibility. The main objective is maintaining and enhancing the natural appearance of the characteristic landscape while actively managing for various benefits. These benefits can include timber production, livestock grazing, wildlife habitat, mineral extraction, and dispersed recreation.

The VMS has five VQOs, each of which represents a different degree of acceptable alteration of the natural-appearing landscape. From most restrictive to least restrictive, the VQOs are:

- 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 adopt 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.

The CTNF lands within the Study Area and the area that encompasses the South and Central Rasmussen Ridge Mines are classified as Modification (**Figure 3.9-2**). Accordingly, management activities may dominate the original characteristic landscape. No scenic trails or scenic byways have been designated within the Study Area.

3.9.1.2 BLM Visual Resource Management

The BLM's Visual Resource Management (VRM) system is used to identify and protect scenic lands, especially those viewed most by the public. The BLM uses the VRM system to inventory, classify, and manage visual resources. In part, VRM classes define the amount of disturbance an area can tolerate before it no longer meets the visual quality of that class. The four VRM classes and objectives for acceptable levels of change are:

- Class I Objective: To preserve the existing character of the landscape. The level of change to the characteristic landscape should be low and must not attract attention.
- Class II Objective: To retain the existing character of the landscape. The level of change to the characteristic landscape should be low.
- Class III Objective: To partially retain the existing character of the landscape. The level of change to the characteristic landscape should be moderate.
- Class IV Objective: To provide for management activities which require major modification of the existing character of the landscape. The level of change to the characteristic landscape can be high.

Although most of the Study Area is not BLM-administered land, there is some BLM-administered land within Section 9 in the southeastern portion of the Study Area. The BLM-administered lands in the southeastern portion of the Study Area are located within areas designated as VRM Class III (**Figure 3.9-2**).

Landscapes are subdivided into three distance zones based on relative visibility from travel routes or observation points. The zones are foreground-middleground, background, and seldom-seen. The foreground-middleground zone includes areas seen from highways, rivers, or other viewing locations that are less than 3 to 5 miles away. Areas beyond the foreground-middleground zone, but usually less than 15 miles away, are in the background zone. Areas not seen as foreground-middleground or background are in the seldom-seen zone because they are typically hidden from view.

3.9.2 Existing Landscape Character

Landscape character creates a "sense of place" and describes the overall impression created by natural biophysical attributes, natural processes, and human influences on a geographic area. Natural attributes include geology, soils, landforms, vegetation, and water features. No designated scenic trails, highways, or byways exist in or near the Study Area. The existing landscape character of the Study Area, described in the following paragraphs, is typical of the region.

The existing landscape character of the Study Area is characterized by a combination of rolling plains, foothills, and rugged ridges typical of the region. The Study Area is characterized by a series of north- to northwest-trending mountain ranges separated by broad valleys. The northeastern portion of the Study Area rises to the crest of Rasmussen Ridge, characterized by moderate to steep slopes.

The Blackfoot River bends around the southeast end of the Study Area. Lanes Creek is located east of the Study Area. The southwestern portion of the Study Area in the Rasmussen Valley includes Angus Creek.

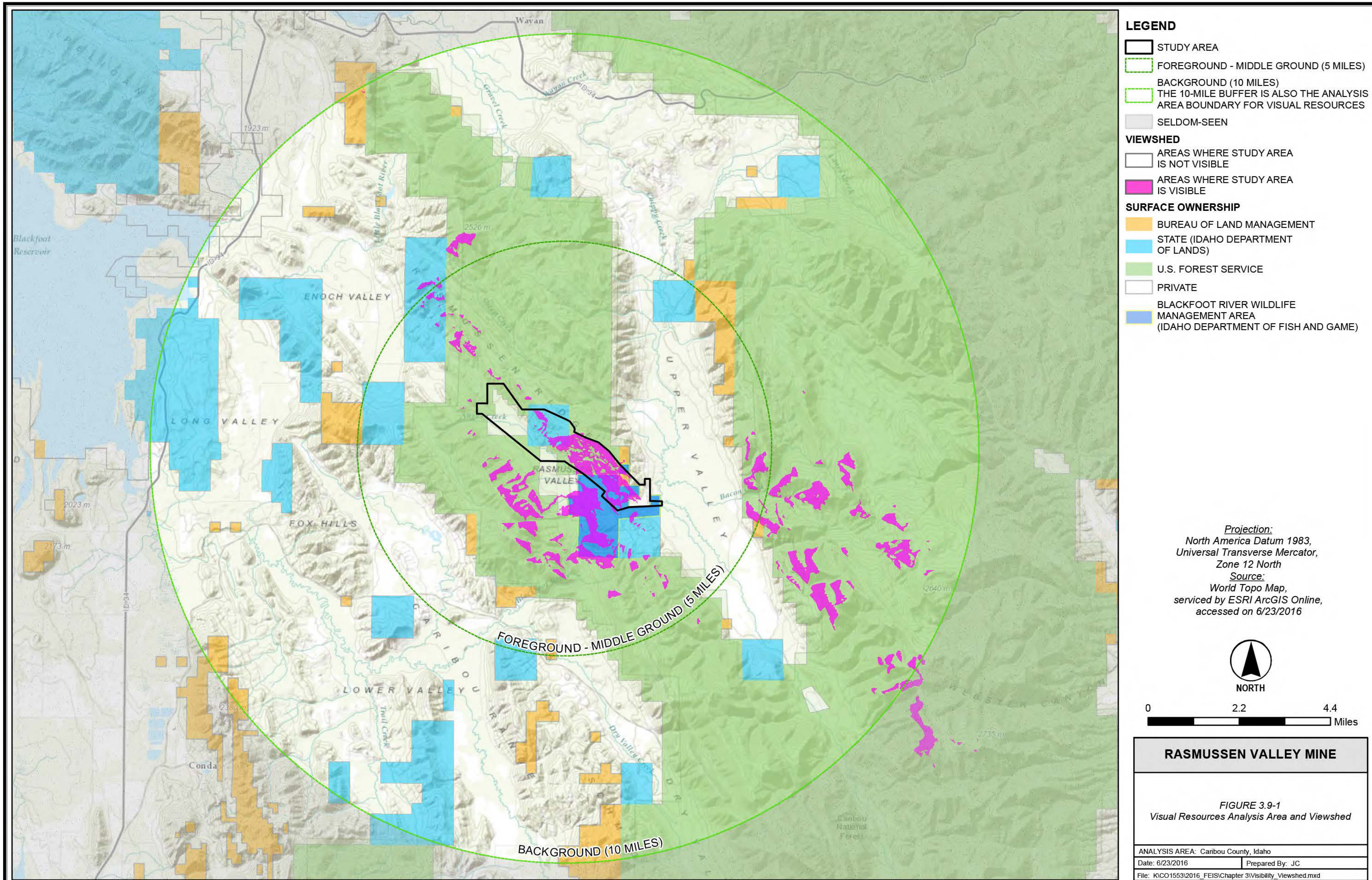
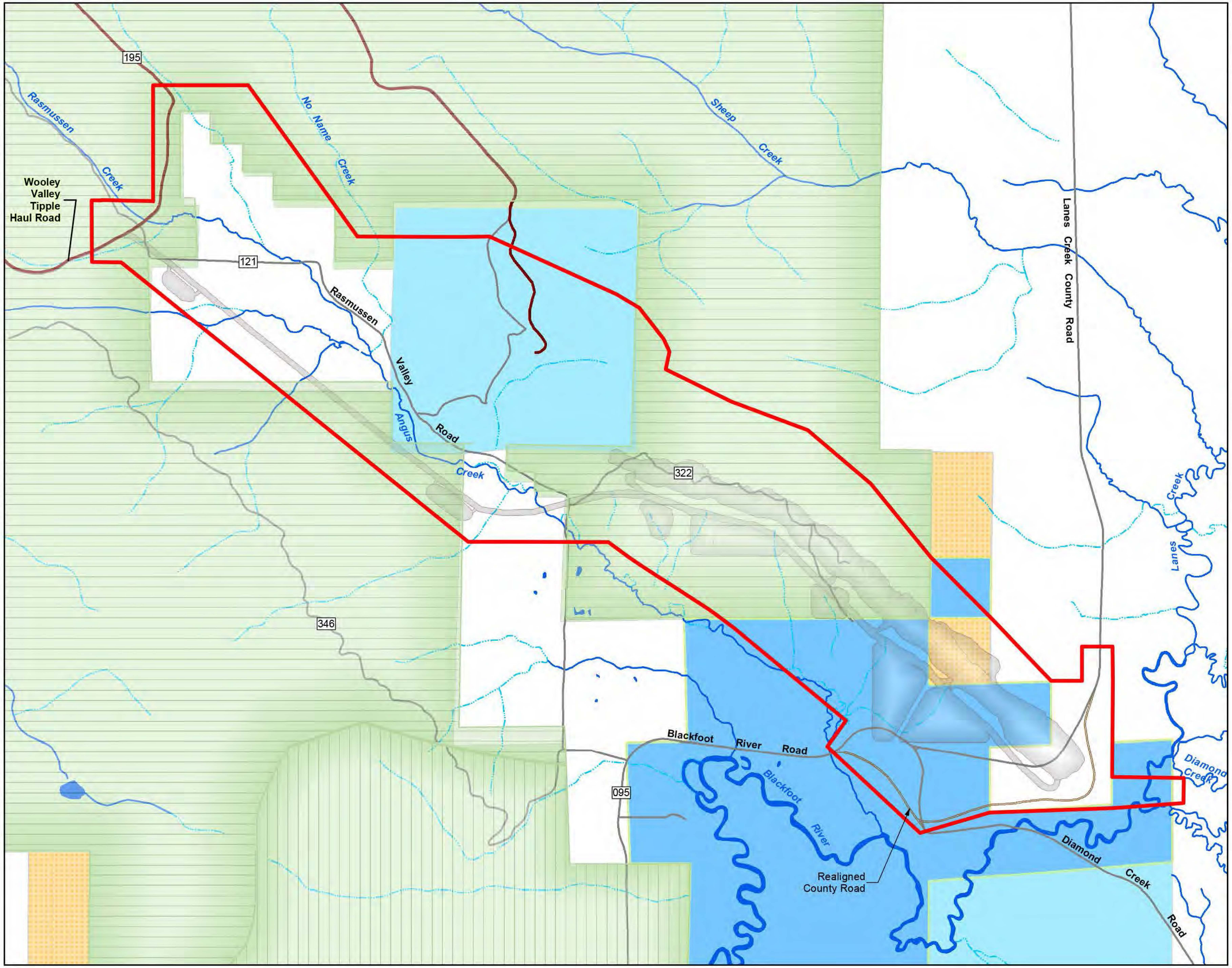


FIGURE 3.9-1
Visual Resources Analysis Area and Viewshed



RASMUSSEN VALLEY MINE

FIGURE 3.9-2
Visual Resource Management Classes and Visual Quality Objectives

ANALYSIS AREA: Caribou County, Idaho
Date: 6/23/2016 | Prepared By: JC
File: K:\CO1553\2016_FEIS\VQO_n_VRM.mxd

There is a broad band of aspen woodland on the upper slopes of Rasmussen Ridge. The aspen woodland includes four strata as described in **Section 3.5.1.1.** Big sagebrush rangeland occupies the high plains and the arid lower mountain slopes. Grasses and forbs grow in moderate to sparse quantities between sagebrush on arid rangeland. High-sagebrush rangeland occupies the high plains and the arid lower mountain slopes. Grasses and forbs grow in moderate to sparse quantities between sagebrush on arid rangeland. High-elevation rangeland is a vegetation cover type that occurs at higher elevations than big sagebrush rangeland, typically above 6,600 feet in elevation. Many of the same plant species are present in the high-elevation rangeland cover type, but increased moisture at higher elevations also favors a greater diversity of shrubs and some trees. Silver sagebrush rangeland occupies an elevation zone between mesic emergent/ponded wetland and big sagebrush rangeland near the valley bottom. The Angus Creek stream channel and extended floodplain are dominated by a mix of forbs and sedge/grass wetland meadows and silver sagebrush rangeland. Relatively narrow willow corridors occur along Angus Creek and tributaries; however, in some areas, intensive grazing by cattle has removed all woody vegetation. Study Area vegetation is described in detail in **Section 3.5**.

Mining and mineral exploration have modified the landscape character of the analysis area. Phosphate mining and exploration have occurred in the region since 1912. Modifications to the landscape character of the analysis area include the Enoch Valley Mine, located on the western flank of Rasmussen Ridge at the north end of the Rasmussen Valley, 0.33 mile west of the Rasmussen Ridge Mines. Additional modifications to the landscape character of the analysis area include the construction of P4's South Rasmussen Mine (largely within the north-central portion of the Study Area), a haul road to service the Rasmussen Ridge Mines and South Rasmussen Mine immediately north of the Study Area, and stripping of topsoil at P4’s South Rasmussen Mine.

In addition to mining and exploration activities, existing visual modifications to the landscape in and near the analysis area have resulted from livestock grazing, housing developments, timber harvests, and vegetation treatments which have modified the natural landscape. Man-made features currently visible in the Study Area include mining and exploration facilities, livestock corrals and fences, stock watering ponds, roads, trails, signs, utilities, buildings, homesteads, and developed recreational facilities.

Low-light condition, or dark skies, is one of the most important properties for viewing stars, constellations, and other astronomical features. The analysis area is relatively remote and rural, with few existing light sources. Existing sources of artificial nighttime light within the Study Area include the lights from vehicles traveling on Blackfoot River Road (FR 095), Rasmussen Valley Road (FR 121), and Diamond Creek Road (FR 102). In addition, lights from mining equipment and rural residences are visible from publicly accessible roads in and near the Study Area.

3.9.3 Visual Sensitivity

“Visual sensitivity” is a measure of public concern for scenic quality and existing or proposed visual change. Areas that are visible from many locations or at close range are more sensitive to modifications of the characteristic landscape. Aesthetic value and visual appeal are inherently subjective. Viewing distance and screening by vegetation or topography are aspects considered in evaluating the sensitivity of the landscape. Factors typically considered when measuring public concern include type of users, degree of public access and use of an area (number of viewers), public interest, and adjacent land uses.

The analysis area is sparsely populated; therefore, the Study Area is visible to a few casual observers traveling on Blackfoot River Road, Rasmussen Valley Road, Diamond Creek Road, and Lanes Creek Road. Based on the results of the viewshed analysis (as discussed in the introduction to **Section 3.9**), the areas within the Study Area that are potentially visible from public roads are shown in purple on **Figure 3.9-1**. Views of the Study Area are limited by mountain ranges, rugged terrain, and forested areas.

Seasonal residents, such as those who reside seasonally along Lanes Creek and Rasmussen Valley Roads in particular, value the visual beauty of the area. The backdrop for these ranches and summer homes is one of brush-covered hills and steep, forested slopes; therefore, the area retains its rural, agricultural setting. Several homes and outbuildings, as well as fences, gates, a power line, and pasturelands, are evident along the road.

In general, users of the Study Area are accustomed to viewing mineral resource development; however, visual quality is an important part of the recreational experience for many users. Recreationists who hike, fish, or camp regularly in this portion of the CTNF or the Blackfoot River WMA are likely to value the scenic quality of the surrounding landscapes. Public use of the Study Area is highest during elk and deer hunting seasons. Hunters would also value the scenic landscape as a part of their recreational experience; however, a successful hunt would not necessarily depend on the scenic quality of the surrounding landscapes.

3.10 LAND USE, ACCESS, AND TRANSPORTATION

The analysis area includes the footprint of the Proposed Action and adjacent land accessible by roads that may be used to access the Proposed Action as described in **Chapter 1** (**Figure 1.2–2**).

3.10.1 Land Status/Ownership

Surface ownership in the region is a mix of federal, state, tribal, and private lands. The Proposed Action is primarily located within the Caribou portion of the CTNF on land administered by the Soda Springs Ranger District. Portions also involve federal lands administered by the BLM, state lands administered by the IDFG, state lands administered by the IDL, and private lands. The mine pit and Lease are located within the known phosphate leasing area (KPLA) boundaries. Support features, such as haul roads, extend off the KPLA area onto federal and private lands.

3.10.2 Land Use Regulations/Management

The project must comply with the land use regulations, policies, plans, and programs of the various land management agencies. As described in **Section 1.5**, the CNF RFP (USFS 2003) and the PFO ARMP (BLM 2012a) guide land use development on federal lands in the Land Use Study Area. Note that seasonal activity restrictions to protect wildlife contained in the ARMP generally do not apply to mining activities. (Action PP-ME-2.5.5 -Seasonal restrictions would not apply to the operation and maintenance of solid leasable mineral production facilities unless the findings of analysis demonstrate the continued need for such mitigation and that less stringent, project-specific mitigation measures would be insufficient.)

3.10.3 Existing Land Uses

Existing land uses within the analysis area include commercial mining, timber management, domestic livestock grazing, and recreation. The current and historical land use for federal and state lands within the analysis area is primarily rangeland used for livestock grazing except the WMA, which does not allow livestock grazing. The state section in north-central portion of the

Study Area is dominated by the South Rasmussen Mine, which has ceased production and is undergoing reclamation.

3.10.3.1 Commercial Mining

Exploration for and mining of phosphate, which has occurred since the early 1900s, has disturbed land within the analysis area. Since 2008, Agrium has been systematically exploring Federal Phosphate Lease I-05975 and the federal phosphate split estate on Agrium property immediately south of the Lease. Exploratory activities have disturbed 28 acres of the analysis area (**Section 2.2**).

Agrium has several phosphate operations nearby. Agrium's CPO fertilizer manufacturing plant is located at Conda, 12 miles southwest of the analysis area. The plant produces phosphate fertilizers from phosphate ore currently obtained from Agrium's North Rasmussen Ridge Mine, located north of the analysis area. The Proposed Action would use the Wooley Valley Tipple Haul Road, which is currently used to haul phosphate ore from the North Rasmussen Ridge Mine and for access to existing shop and maintenance facilities that currently support the North Rasmussen Ridge Mine.

Other active, abandoned, idled, or reclaimed phosphate mines also exist in the region including the 490-acre South Rasmussen Mine, which extends into the northern portion of the Study Area, and the 42-acre Lanes Creek Mine, which is on private land east of the Study Area.

3.10.3.2 Timber Management

The analysis area is not used for the harvest of timber. The CNF RFP states that lands within the analysis area are "removed from the suitable timber base"; in addition, lands within the analysis area are labeled as "National Forest Land that is not Tentatively Suitable Timber". No commercial timber harvest is known to occur on the Blackfoot River WMA, and no timber sales have occurred on other state lands within the Study Area since at least 2010.

3.10.3.3 Livestock Grazing

Livestock grazing has been a historical and traditional use of lands in the region surrounding the Study Area. Sheep were brought into the area as early as the 1830s by missionaries and emigrants, and small herds of cattle were driven into the region during the 1860s.

The Taylor Grazing Act of 1934 created grazing districts throughout the west. Grazing districts are further divided into grazing allotments to provide for the orderly administration and proper grazing use of public lands. The Study Area is located within Angus Creek Unit 3A in the northern portion of the CTNF Rasmussen Valley Cattle Allotment (RVCA). This USFS grazing allotment does not include adjacent BLM, state, or private lands. The BLM lands in Section 9 do not include a grazing allotment. The Blackfoot River WMA can allow livestock grazing, but does not currently support any. There are no grazing leases on other adjacent state lands.

Under the terms of the Annual Operating Instructions (AOIs) for the 2013 grazing season, the RVCA lessee was limited to 378 cattle (cows and calves) from June 11 to September 30 (USFS 2013). The AOIs include stipulations concerning grazing in riparian areas, the potential for selenium uptake, restricted grazing on wildlife winter range, control of noxious weeds (including use of certified weed-free hay), limited off-road travel, fence maintenance standards, and water control. The number of animals approved for the allotment has remained the same since at least 2011.

3.10.3.4 Recreation

Public lands administered by the CTNF and BLM provide a wide variety of opportunities for year-round recreation. Recreational opportunities include camping, hiking, fishing, hunting, snowmobiling, horseback riding, and mountain biking.

Recreation sites and activities are divided into two broad categories: developed and dispersed. Developed recreation sites are areas of concentrated development, such as a campground or trailhead with improvements. No developed campgrounds exist within the analysis area. The closest developed campground is the Mill Canyon National Forest Campground 2 miles west of the Study Area.

Dispersed recreation requires few, if any, improvements and occurs typically in conjunction with roads or trails. Dispersed activities are often day-use oriented and involve many types of activities. Examples of dispersed recreation include fishing, hunting, berry picking, off-road vehicle use, hiking, horseback riding, picnicking, camping, viewing and photographing scenery, and snowmobiling. Hunting, fishing, and other outdoor activities account for most recreational uses in Caribou County.

Existing roadways provide access for recreational uses within the analysis area. These roadways include FR 322, a trail that branches east from Rasmussen Valley Road (**Figure 1.2-2**). This trail is open only to vehicles less than 50 inches wide.

The CTNF uses a planning tool, the Recreation Opportunity Spectrum (ROS) to inventory and manage recreational areas and activities. The ROS categorizes recreational settings by the amount of development and other attributes. ROS classes help visitors find the setting that best provides for their desired experience. Two ROS categories occur in the analysis area: Semi-Primitive Motorized (SPM) and Roaded Modified (RM).

The setting for SPM lands includes a moderate probability of solitude, closeness to nature, a high degree of challenge and risk using motorized equipment, a predominantly natural-appearing environment, few users (but evidence shows on trails), and few vegetation alterations that are widely dispersed and visually subordinate. SPM areas range in size from 2,500 to 5,000 acres that are screened by vegetation or topography, creating a “buffer” from surrounding development. The USFS lands east of the state section that includes the Lease and adjacent areas are designated as SPM.

The setting for RM lands includes the opportunity to be with others in developed sites, little challenge or risk, relatively natural-appearing environment as viewed from roads and trails, moderate evidence of human activity, and access and travel by standardized motor vehicles. Although resource modification and utilization are evident, they generally harmonize with the natural environment. RM areas in the project generally follow Blackfoot River Road.

Hunting is a major recreational use, as well as a tribal treaty right use of the analysis area. The IDFG manages hunting and game populations in game management units or hunt units. Hunting seasons for big game occur from late August through mid-December. Seasons include archery, any weapon, and controlled hunts. Major species of big game are mule deer and elk. Although they occur in the area, white-tailed deer and pronghorn are scarce. Limited hunting of black bear and mountain lion also occurs.

The Proposed Action is in the northern part of Game Management Unit 76 and in the larger Diamond Creek Elk Zone. The Blackfoot River WMA is also at the south end of the analysis area.

Hunters enter the area near the proposed mine from Rasmussen Valley Road, Blackfoot River Road where it runs along the edge of the WMA, Lanes Creek Road, the CTNF, or across private land with permission of the landowner.

Although fishing is popular along portions of Angus Creek, most fishing occurs farther down on the Blackfoot River and at the Blackfoot Reservoir. No quantitative data exist on use of the analysis area by anglers or hunters. The IDFG has collected some data for the Blackfoot River WMA, which includes part of the analysis area. This WMA has experienced 400 to 500 angler days, 50 to 75 big game hunter days, 30 to 40 waterfowl hunter days, and 25 to 30 upland game hunter days (IDFG 1999). In addition, it is used for "outdoor appreciation and trapping."

The Shoshone and Bannock Tribes (Tribes) have reserved treaty rights that they exercise to hunt and fish on unoccupied public lands in the general area. The Tribes establish the hunting and fishing seasons to be followed by their members.

3.10.3.5 Off-highway Vehicle and/or All-terrain Vehicle Use

Off-highway vehicles (OHVs) are defined as any vehicle designed to travel off paved roadways. They include full-sized four-wheel-drive vehicles, motorcycles, all-terrain vehicles (ATVs), and snowmobiles. OHV use on public lands has been a concern since the 1970s. This concern was reflected in EOs 11644 and 11989, which established policies and procedures to control and direct the use of OHVs on federal lands and directed agency heads to close areas or trails if OHVs were causing considerable adverse effects. USFS motorized ATV trails 322 and 322B currently are located on the Proposed Action.

In 2005, the USFS issued a travel management regulation, in part to standardize the process that individual national forests and grasslands use to designate the roads, trails, and areas that will be open to motorized travel. In response, the CTNF implemented its Revised Caribou Travel Plan. This plan identifies the opportunities for and restrictions on public travel on lands in the analysis area during both winter and summer.

The EIS prepared during the development of the Revised Caribou Travel Plan notes that use of ATVs on the CTNF grew in the early 2000s, and that ATV use in remote areas increased from 1995 through 2005 (USFS 2005). This increased use is a reflection of the 350-percent increase in the number of OHVs registered in the State of Idaho over the same period (State of Idaho 2011). The CTNF estimates that, during that time, 11 percent of its visitors participated in snowmobiling, and 5 percent engaged in motorized trail activity and OHV use. Nine percent of visitors indicated that snowmobiling was the main activity they pursued during a visit, making it the fourth most popular main activity on the CTNF (USFS 2014c). No public OHV use is permitted on the Blackfoot River WMA (IDFG 2014).

3.10.3.6 Special Designation Lands

Specially designated federal lands include Inventoried Roadless Areas, Wilderness Areas, Recommended Wilderness Areas, Research Natural Areas, and Wild and Scenic Rivers. No lands with these designations occur in or near the analysis area. The Blackfoot River WMA is the only specially designated state land in or near the analysis area.

3.10.4 Transportation and Access

The analysis area can be accessed by State Highway 34, county roads, and forest roads (FRs). State Highway 34 is a two-lane, paved arterial roadway connecting Soda Springs at U.S. Highway

30 with recreation areas at Blackfoot Reservoir and with western Wyoming. Blackfoot River Road (FR 095) and Lanes Creek Road are paved two-lane roads. Rasmussen Valley Road (FR 121) is an unpaved road that links the project to Long Valley Road and Blackfoot River Road, and thus to State Highway 34. These roads near the Proposed Action provide access to existing phosphate mining operations, ranches, dispersed rural residences, and dispersed recreation in the CTNF and surrounding areas.

Annual average daily traffic (AADT) is defined as the total volume of vehicle traffic on a road for 1 year, divided by 365 days. **Table 3.10-1** provides the AADT for State Highways 30 and 34 at several locations near the analysis area and along potential commuting routes from surrounding communities. Traffic count stations have not been installed on the roads that provide direct access to the Proposed Action. There is no public transportation in the analysis area.

Table 3.10-1 Annual Average Daily Traffic

Location	AADT, 1990	AADT, 2000	AADT, 2010	AADT, 2012
Highway 30, East of Soda Springs	5,140	6,400	5,700	5,600
Highway 34, Between Soda Springs and Conda	2,690	2,600	2,800	2,400
Highway 34, Between Conda and Henry	770	1,000	610	610
Highway 30 at Georgetown	2,230	3,800	2,800	2,700
Highway, 30 at Montpelier	3,560	4,800	3,900	3,700

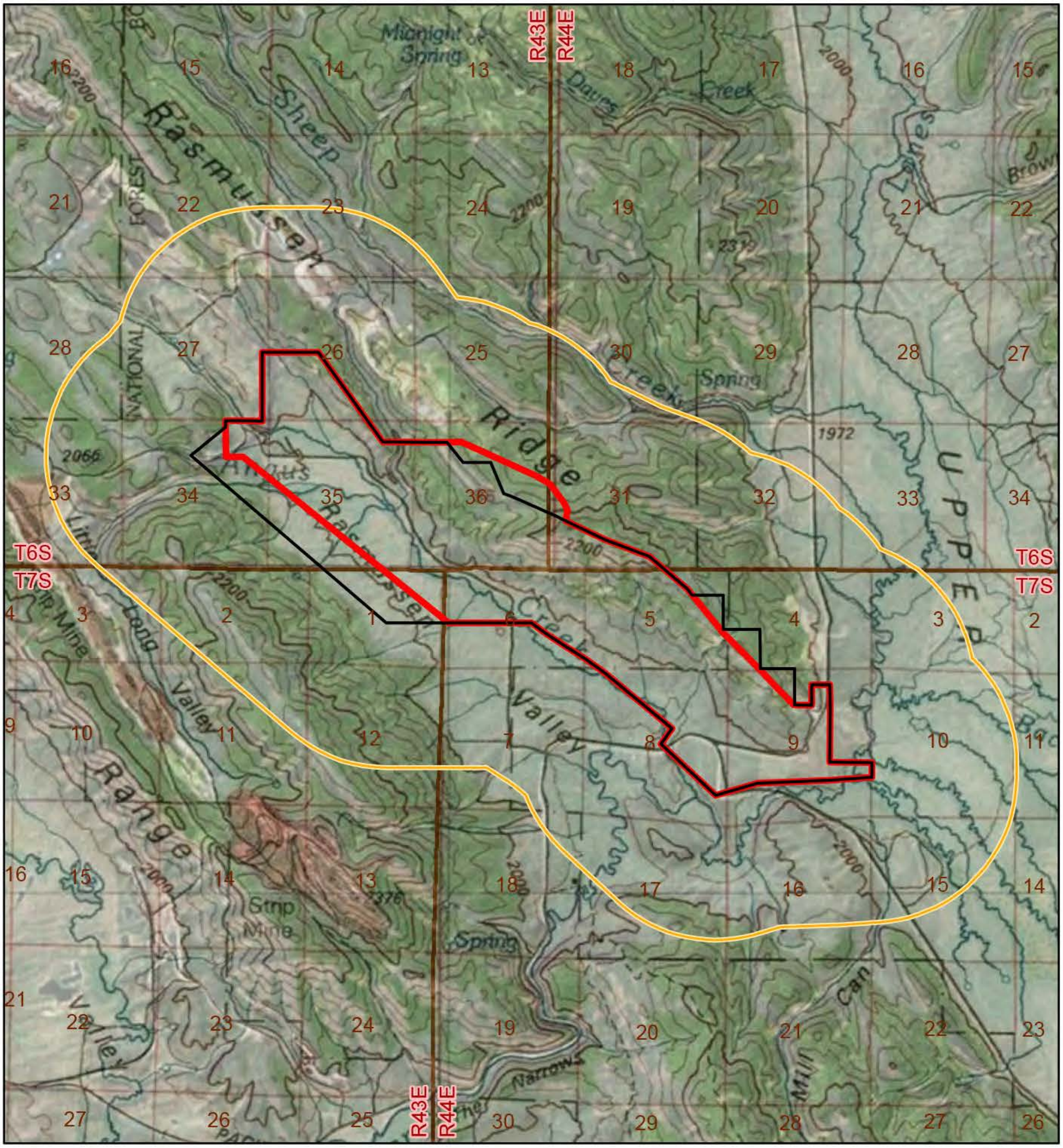
Source: Idaho Department of Transportation (IDOT) 1990, 2000, 2010, 2012

3.11 CULTURAL RESOURCES

The analysis for cultural resources anticipated several potential alternative elements that were not carried through for detailed analysis. Consequently, there is a cultural resources Survey Area that is different from and slightly larger than the Study Area defined in **Chapter 2**. In addition, the cultural resources analysis area for which a records search and background documentary review was completed was the Survey Area and a 1-mile buffer in all directions (**Figure 3.11-1**). Several previous baseline cultural resource surveys had been completed in the Survey Area for this Proposed Action, and an additional baseline survey was completed (Späth 2012) to fill in gaps in survey coverage and to resolve outstanding issues.

Cultural resources are the material remains of past human activities and locations or landmarks associated with important historical or traditional events. They may include buildings, structures, landscape modifications, traditional locations or landmarks, cultural features, or portable artifacts (objects of human manufacture). Cultural sites (locations of past human activity) consisting of surface or buried features and artifacts without buildings or standing structures are referred to as archaeological sites. Cultural resources can be prehistoric, historic, or both, meaning that the remains may date from before or after the beginning of European settlement in the region.

Cultural resources can include resources, landscape features, or traditional locations that are important to the heritage and identity of existing cultural groups, such as traditional cultural properties (TCPs). In most cases, TCPs are also Native American religious or traditional values. Evaluation and management of TCPs, tribal historic and archaeological sites, or traditional locations and landscapes ideally involves agency coordination with the Tribes, integration with tribal treaty rights and interests, and the opportunity for the Tribes to participate in the identification and interpretation of cultural resources.



LEGEND

- STUDY AREA
- CULTURAL RESOURCES SURVEY AREA
- CULTURAL RESOURCES ANALYSIS AREA

Projection:
North America Datum 1983, Universal Transverse Mercator, Zone 12 North
Source:
World Imagery Map (with 50% transparency) and USA Topo Map; both serviced by ESRI ArcGIS Online, accessed on 8/30/2016

NORTH

0 2,750 5,500 Feet

RASMUSSEN VALLEY MINE

FIGURE 3.11-1
Cultural Resources Survey Area and Analysis Area in Comparison to the Study Area

ANALYSIS AREA: Caribou County, Idaho
Date: 8/30/2016 | Prepared By: JC
File: K:\CO1553\2016_FEIS\Chapter3\Cultural.mxd

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3.11.1 Prehistoric Context

Southeastern Idaho is in the Snake and Salmon River culture area of the northern Great Basin (Butler 1986). The analysis area is in the Central Rocky Mountains at the eastern edge of this area, and comparative materials of the Mountain Tradition must be considered. The prehistory of the region is typically divided into three broad periods: (1) Paleoindian (12,000 to 7,800 years ago); (2) Archaic (7,800 to 300 years ago); and (3) Protohistoric (from about 300 years ago to European settlement of the area in the 1840s). Each of these periods is characterized by distinct artifact types and by different settlement and subsistence patterns. Because there were no prehistoric sites in the Survey Area that could be identified to a specific period, the defining characteristics of these periods are not discussed here. More detail is available in the initial baseline cultural resources inventory report (Ferriman 2011).

3.11.2 Historic Context

The earliest documented accounts of Euroamericans in southeastern Idaho are of fur trappers and explorers in the early 1800s. By the 1840s, emigrants to the West Coast were following the trails identified by the earlier explorers and fur trappers. The Hudspeth Cutoff of the Oregon and California Trail passed through Soda Springs 18 miles southwest of the Study Area. The improved Lander Road branch of the Oregon and California Trail crossed the Caribou Range from the Star Valley in western Wyoming and descended to Lanes Creek 7 miles north-northeast of the Survey Area. From there, the Lander Road passed between Grays Lake and Grays Range and continued west to Fort Hall, rejoining the main route of the Oregon and California Trail. The Lander Road diverged from the more heavily travelled variants of the trail in Wyoming east of South Pass bypassing the popular waypoint of Fort Bridger, and was a shorter route from the Sweetwater Valley in Wyoming to Fort Hall in Idaho. Thus, the Survey Area is located between two major east-west branches of the Oregon and California Trail, and lesser trails may have connected these branches where the terrain was favorable.

In the 1860s, Mormon pioneers established settlements in southeastern Idaho. The discovery of gold in the Idaho panhandle in 1861 brought an influx of miners to the region. Subsequent discovery of gold near the Caribou Mountains drew some of that activity to the Caribou Mountains. The regional mining boom continued into the 1890s. From 1870 to 1920, Soda Springs was a major supply point for mining camps in the Caribou Mountain area. With the building of the transcontinental railroad in the 1860s, railroad workers also entered the region. Tie hack camps supplied ties for the transcontinental railroad, and the timber industry supplied the mines and the growing towns. Even though the timber resources of southeastern Idaho are not as abundant as in other parts of the state, they played a key role in the development of the region. Cattlemen entered the region in the 1860s to supply the mines and eastern markets. Precious metal mining around Soda Springs was followed by phosphate exploration and mining, which continues to this day.

Although sheep had been brought into the region along the emigrant trails, large herds were not established in Caribou County until the 1890s. The mining opportunities and railroad construction also attracted Chinese emigrants, and later, Japanese. Some homesteading took place in southeastern Idaho in the 1890s and early 1900s, but many of those homesteads failed in the 1920s and 1930s and reverted to federal control. Much of Idaho is public land including extensive National Forests. The CNF, established in 1907, covers most of the Caribou Mountains and Webster Ridges in eastern Caribou County. These forests are part of the Greater Yellowstone Ecosystem. Most of the readily visible historic resources around the upper Blackfoot River in eastern Caribou County are dominated by farming, ranching, mining, scattered timber harvesting, and recreation associated with the Blackfoot River, Blackfoot Reservoir, and the CNF.

3.11.3 Previous Studies and Known Resources

A baseline cultural resources inventory of the Study Area as defined in 2010 was completed in the fall of 2010 (Ferriman 2011). Cultural resources inventories had been completed for Agrium the previous year for exploratory drilling in the valley bottom (Mason 2009) and for the phosphate lease area (Harding 2009). The records review completed by Ferriman (2011) indicated that an additional 13 previous investigations had included areas within or near the Study Area as defined at that time. The Tribes had been informed in staff-to-staff meetings with the BLM on January 10, 2011 and February 9, 2012 that baseline investigations would be conducted but did not participate in any of the studies.

All three of the current surveys for this Proposed Action revisited the reported location of the same prehistoric lithic scatter just outside their survey areas and concurred with the earlier recommendation that the site was not eligible for the National Register of Historic Places (NRHP). However, some inconsistencies remained in the reports, and State Historic Preservation Office (SHPO; 2011) recommended additional documentation of the site location. Two other previously recorded sites within or near the survey areas were not found.

The three surveys together (Ferriman 2011; Harding 2009; Mason 2009) documented 23 new cultural resources within the Study Area. SHPO requested additional documentation and evaluation of a previously recorded historic cabin. All of the sites in the Study Area were evaluated as not eligible for the NRHP, and SHPO concurred. The 21 previously and newly recorded cultural resources that are evaluated as not eligible include nine prehistoric isolated finds, four historic isolated finds, the remains of two historic bridges, two historic trash scatters, a cabin or ranch site with associated features, a historic ditch feature, an isolated piece of farm equipment, and a scatter of historic boards.

After the completion of the 2010 cultural resource inventory (Ferriman 2011), a larger Survey Area was defined to include project features and potential project alternatives that were outside the previously defined Study Area. These changes added 609 acres to the previously defined Study Area for a total area of 2,793 acres for the newly defined Survey Area. An updated records search was completed for the expanded analysis area, which included the Survey Area plus a 1-mile buffer in all directions (Idaho SHPO Records Search No. 12342). The SHPO record search and the CTNF records indicated that 24 previous cultural resource investigations have included portions of the cultural resources analysis area. Four of these investigations were not listed in the SHPO records (Polk 1990; Harding 2009; Ferriman 2011; Crockett 2011). Previous surveys, some of which overlapped, had covered all but 567 acres of the expanded Survey Area. Späth (2012) inventoried this final acreage. Consequently, the entire Survey Area as defined in 2012 has been surveyed for cultural resources or excluded from survey because of previous mine disturbance.

The Study Area was changed again in 2015 to accommodate the Proposed Action, adding another 106 acres for a total of 2,567 acres. This additional acreage was predominantly mined and reclaimed areas associated with the P4 South Rasmussen Mine and did not require additional survey. The cultural resource Survey Area had covered additional areas southwest of Angus Creek that were not included in the Study Area. This had been done in part to assess the feasibility of an alternative haul road that was not carried forward for analysis.

The updated records search included 37 cultural resource sites or isolated finds within the analysis area. These cultural resource sites are the 30 addressed by Ferriman (2011), two sites to the south that were outside Ferriman's search area, and five sites that were recorded by Crockett (2011) near Ferriman's survey area. These cultural resources include seven prehistoric lithic or artifact scatters, seven prehistoric isolated lithic artifacts, one site with both prehistoric and historic artifacts, four houses or cabins with associated materials, three historic structures, two clusters of farm equipment and associated materials, four historic artifact scatters, two clusters of carved aspen trees (arborglyphs), six isolated historic artifacts, and a ditch segment.

All but nine of the sites in the updated records search are within the Survey Area, and the majority are in Rasmussen Valley. The sites and isolated finds have been found predominantly in the valley bottoms along Angus Creek, Lanes Creek, the Blackfoot River, and minor tributaries. A smaller number have been found on ridges and lower slopes overlooking these drainages. No cultural resources have been identified on the crest or steep slopes of Rasmussen Ridge.

Ferriman (2011) provides a comprehensive summary of sites recorded within the analysis area through 2009. Späth (2012) addresses sites added by the expansion of the Survey Area in 2012, survey of previously unsurveyed portions, and re-evaluation of incompletely documented sites.

None of the cultural resources identified in the Survey Area have been recommended as eligible for the NRHP. The CTNF (Abusaidi 2013) and the BLM (Lapp 2013) submitted Determinations of Significance and Effect to SHPO agreeing with these recommendations, and SHPO has concurred. There are no identified historic properties within the Survey Area.

3.12 TRIBAL TREATY RIGHTS AND INTERESTS

The NHPA and its implementing regulations (36 Code of Federal Regulations [CFR] 800) require consultation with federally recognized Indian tribes to identify TCPs and consider potential effects on such properties because of a federal undertaking. In addition, the American Indian Religious Freedom Act of 1978 (AIRFA), EO 13175: Consultation and Coordination with Indian Tribal Governments, and EO No. 13007: "Indian Sacred Sites" contain requirements for consulting with tribes on the potential effects of federal actions on tribal interests. TCPs are cultural sites of religious or cultural importance that may also be eligible for the NRHP because of their importance in the traditions and cultural identity of a cultural group. Areas of traditional use may include areas used to gather plants, animals, or fish for subsistence or for ceremonial or medicinal purposes. National Register Bulletin No. 38 provides guidance for identification and evaluation of such TCPs and traditional use areas. The Native American Graves Protection and Repatriation Act (NAGPRA) requires that concerned tribes be consulted if human remains that may be Native American or objects of cultural patrimony are discovered.

The 1868 Fort Bridger Treaty, between the United States and the Shoshone and Bannock Tribes, reserves the Tribes right to hunt, fish, gather, and exercise other traditional uses and practices on unoccupied federal lands. In addition to these rights, the Shoshone Bannock have the right to graze tribal livestock and cut timber for tribal use on those lands of the original Fort Hall Reservation that were ceded to the federal government under the Agreement of February 5, 1898, ratified by the Act of June 6, 1900. The Study Area is not within the area ceded to the federal government under the Agreement of February 5, 1898.

Under this treaty and those agreements, the federal government has a unique trust relationship with the Shoshone-Bannock Tribes. BLM has a responsibility and obligation to protect Tribal treaty rights and to consider and consult on potential effects to natural resources related to the Tribes treaty rights or cultural use.

Even though the native groups have relinquished legal ownership of the lands outside the reservations, they continue to actively use the lands and resources to the extent possible, retain traditions and connections with the lands, and maintain connections with sacred sites. These sacred sites include burials, rock art, monumental rock features, natural features, rock structures or rings, sweat lodges, timber and brush structures, eagle traps, and prayer and offering localities. Much of the landscape itself figures prominently in the identity and traditions of the native groups, and sacred places are not necessarily defined by archaeological remains.

The federal government has a unique trust relationship with federally recognized American Indian tribes including the Shoshone and Bannock Tribes. The BLM and the CTNF have a responsibility and obligation to consider and consult on potential effects to natural resources related to the Tribes' treaty rights, uses, and interests under the federal laws, EOs, and treaties noted above. Resources or issues of interest to the Tribes that could have a bearing on their traditional use or treaty rights include tribal historic and archaeological sites, sacred sites and TCPs, traditional use sites, fisheries, traditional animal species, culturally significant plants, vegetation (including noxious and invasive, non-native species), air and water quality, wildlife, access to lands and continued availability of traditional resources, land status, and the visual quality of the environment (additional information is provided for these resources in other resource sections of this chapter). The BLM and the CTNF recognize the Shoshone-Bannock Tribes Policy for Management of Snake River Basin Resources including the Tribes' determination to pursue and promote efforts to restore the Snake River systems and affected unoccupied lands to a natural condition, and their desire to ensure the protection, preservation, and enhancement of tribal treaty rights and interests. The BLM and the CTNF are engaged in ongoing staff-to-staff consultation with the Tribes. To date, the Tribes have not identified any sacred sites in the Study Area.

3.13 SOCIAL AND ECONOMIC CONDITIONS

The Proposed Action is located in northeast Caribou County, Idaho, near the northern end of the Southeast Idaho Phosphate District. Caribou County is the economic center of this phosphate district, which is historically one of the largest and most productive areas of mineral production in the State of Idaho. The county is heavily affected by phosphate mining.

The communities located nearest to the Proposed Action are the City of Soda Springs (the Caribou County seat) and the Town of Grace, which is located 8 miles southeast of Soda Springs. Mining and related industries comprise the economic base of the county, and are a major source of employment for residents of both communities. The two communities are the largest in Caribou County, and together account for nearly 60 percent of the population in the county. Cities with the easiest access to Soda Springs and the Proposed Action are located along U.S. Highway 30. These include Montpelier and Pocatello. The City of Montpelier in Bear Lake County is nearly 30 miles southeast of Soda Springs on U.S. Highway 30. Pocatello is located nearly 60 miles northwest in Bannock County. Several small communities along the highway and connecting roads are within a 1- to 1.5-hour commuting distance of the Proposed Action, including several small communities in the Star Valley in Lincoln County, Wyoming.

This section describes the existing socioeconomic structure of Caribou County, Idaho and the communities of Soda Springs and Grace, Idaho, including population, economy, housing, and community services. Other counties in southeast Idaho and western Wyoming would provide a portion of the workforce at the Rasmussen Valley Mine. Therefore, in addition to Caribou County, the analysis area includes Bear Lake County and Bannock County, Idaho, and Lincoln County, Wyoming. The analysis focuses primarily on Caribou County because that is where the Proposed Action is located. The majority of effects to existing social and economic conditions, including effects to community services and fiscal impacts, would occur in the county because most of the mine's employees likely would reside there (Qu and Anderson 2014).

3.13.1 Phosphate Mining/Manufacturing Industry

Phosphate mining and the associated manufacturing industry are a backbone of the economy of southeastern Idaho, and drive the economy of Caribou County. In Caribou County, where many of the mines and two of the manufacturing facilities are located, mining and manufacturing account for more than half of the wages earned in the county, while accounting for only one third of jobs. Each direct mining or manufacturing position is estimated to create two additional jobs in the economy (Peterson 2013).

The project Proponent's mining and manufacturing activities in southeastern Idaho alone employ approximately 480 people, paying approximately $30 million in wages and benefits. This accounts for nearly 20 percent of all wages paid in Caribou County. Factoring in the indirect and induced jobs created throughout the local economy, the Proponent's activities account for 912 jobs in Caribou County and nearly $65 million in compensation (approximately 30 percent of all jobs and 27 percent of the total compensation in the county). Looking beyond Caribou County, the Proponent's operations generate 777 jobs elsewhere in Idaho, creating almost $58 million in total compensation. The Proponent's operations generate approximately $212 million in gross regional product, spend more than $85 million in the local economy, and pay approximately $5 million per year in state taxes and more than $3.8 million annually in royalty payments (Peterson 2013).

3.13.2 Population

The current and historical populations of the four counties and their communities are shown in **Table 3.13-1**. The rural/urban distribution of the population is shown in **Table 3.13-2**, and the age distribution of the population is shown in **Table 3.13-3**.

Historically, population gains and losses in the analysis area have been tied to resource development, including mining. As mines have opened and closed in response to resource exhaustion or economics, Caribou County and Bear Lake County have lost and gained population. The larger, more diversified economy of Bannock County accounts for the positive growth over time, even during periods when other counties were losing population. As presented in **Table 3.13-2**, the populations of Idaho as a whole and Bannock County have become more urbanized over time. Conversely, the percentage of the population of Caribou County and Bear Lake County living in rural areas has increased over the same period. As seen in **Table 3.13-3**, the median age in Caribou County and Lincoln County is roughly equivalent, the population of Bear Lake County skews slightly older, and the population of Bannock County skews younger.

3.13.3 Economy and Employment

The economies of Bear Lake County, Caribou County, and Lincoln County are characterized by a dependence on natural resources, including mining, phosphate processing, and agriculture. **Table 3.13-4** presents the numbers of workers employed in each industrial sector and the annual average wage paid in each sector.

The importance of natural resources-related jobs to the economies of Bear Lake, Caribou, and Lincoln Counties can be seen in the high average annual wages associated with mining and manufacturing in Caribou County. While relatively few in number, these high-wage jobs generate economic impacts throughout the economy.

Tourism is an increasingly important economic sector, particularly in Bear Lake County. However, many positions in this sector are seasonal, which is reflected in the low average annual wage for that type of employment. Government employment accounts for more than 20 percent of the jobs in all four counties, with a particularly large number of jobs in Bannock County associated with the Idaho State University. The local, state, and federal government agencies in all four counties offer stable employment.

The following sections provide an overview of income and employment in the four counties, as well as information on local government revenue sources.

3.13.3.1 Unemployment and Labor Force

Labor force, employment, and unemployment data are presented in **Table 3.13-5**. Employment in the four counties is seasonal, with employment peaks in the summer months corresponding with construction work and the tourist season, as well as increased work in the oil and gas fields in the area.

3.13.3.2 Income

Per capita income in the four counties is presented in **Table 3.13-6**. Information for the States of Idaho and Wyoming is also provided for comparative purposes. Of the four counties, only Caribou County displays a net outflow of personal income, which indicates that individuals work in Caribou County but live elsewhere (the outflow of personal income represents money earned in Caribou County flowing to other counties where individuals reside). Approximately 21 percent of the income earned within Caribou County is earned by those living elsewhere (i.e., those who commute to jobs in Caribou County while residing outside the county).

3.13.3.3 Bannock County Profile

Bannock County has a larger, more diverse economy than the other counties. In the analysis area, the economy is driven by trade and the presence of Idaho State University. The trade and service industries provide nearly half the jobs in Bannock County, while government provides almost a quarter of the jobs (**Table 3.13-4**). Although mining operations in the county have decreased over the past decade, leading to a loss in relatively high-paying jobs in the county, food manufacturing and construction activity have increased because of the construction of manufacturing facilities that have relocated to the county.

As presented in **Table 3.13-5**, over the past two decades, Bannock County's unemployment rates have approximated or been lower than that for the State of Idaho. The unemployment rate fell to 2.7 percent in 2007, rising to 7.9 percent in 2010, and has decreased since to 6.3 percent in 2013 (IDoL 2013). **Table 3.13-6** shows an inflow of personal income for Bannock County, indicating that workers commute to jobs outside the county.

Approximately 53 percent of Bannock County's revenues are sourced from property taxes, with approximately 23 percent coming for charges for services. The county has a policy of reducing, where possible, property taxes and replacing that income stream with additional charges for services. Operating grants and other taxes each account for approximately 10 percent of revenue (Bannock County 2012). Bannock County received $486,380 in Payment In Lieu of Taxes (PILT) payments from the federal government in fiscal year (FY) 2014 (USDI 2014).

Table 3.13-1 Population and Population Growth in the Analysis Area Counties and the States of Idaho and Wyoming, 1970 to 2010

	1970	1980	% Change, 1970-1980	1990	% Change, 1980-1990	2000	% Change, 1990-2000	2010	% Change, 2000-2010
State of Idaho	713,015	944,038	32.4	1,006,734	6.6	1,293,953	28.5	1,567,582	21.1
Caribou County	6,534	8,695	33.1	6,963	-19.9	7,304	4.9	6,963	-4.7
Soda Springs	3,540	4,051	14.4	3,111	-23.2	3,381	8.7	3,058	-9.6
Grace	826	1,216	47.2	973	-20.0	990	1.7	915	-7.6
Bear Lake County	5,801	6,931	19.5	6,084	-12.2	6,411	5.4	5,986	-6.6
Montpelier	2,604	3,107	19.3	2,656	-14.5	2,785	4.9	2,597	-6.8
Bannock County	52,200	65,421	25.3	66,026	0.9	75,565	14.4	82,839	9.6
Pocatello	40,636	46,724	15.0	46,080	-1.4	51,605	12.0	54,255	5.1
State of Wyoming	332,416	469,557	41.3	453,588	-3.4	493,782	8.9	563,626	14.1
Lincoln County	8,640	12,177	40.9	12,625	3.7	14,573	15.4	18,106	24.2

Sources:U.S. Census Bureau (USCB) 1981, 2001, 2012b

Table 3.13-2 Rural and Urban Distribution of Population by Percentage of Populace, 1970 to 2010

	1970		1980		1990		2000		2010	
	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban
State of Idaho	45.9	54.1	46	54	42.6	57.4	33.6	66.4	29.4	70.6
Caribou County	54.4	45.6	53.4	46.6	55.3	44.7	58.4	41.6	59.9	40.1
Bear Lake County	55.1	44.9	55.2	44.8	56.3	43.7	57.5	42.5	100	0
Bannock County	17.7	82.3	18.4	81.6	16.4	83.6	17.3	82.7	15.7	84.3
State of Wyoming	39.5	60.5	44.1	55.9	35.0	65.0	34.9	65.1	35.2	64.8
Lincoln County	100	0	68.2	31.8	76.1	23.9	79.9	20.1	82.7	17.3

Sources:USCB 1981, 2001, 2012b

Table 3.13-3 Age Distribution in Analysis Area Counties (2010)

Age	Caribou County, ID		Bear Lake County, ID		Bannock County, ID		Lincoln County, WY	
	Number	% of Total	Number	% of Total	Number	% of Total	Number	% of Total
0-4	597	7.4	410	6.8	6,971	8.4	1,449	8.0
5-19	1,605	23.1	1,357	22.7	18,561	22.4	4,014	22.2
20-44	1,877	27.0	1,483	24.8	29,081	35.1	5,287	29.2
45-64	1,831	26.3	1,632	27.3	18,983	22.9	5,115	28.3
65+	1,103	15.8	1,104	18.4	9,243	11.2	2,241	12.4
Median age	37.7		40.5		31.4		37.4	

Source: USCB 2012a

Table 3.13-4 Employment and Wages by Economic Sector in Caribou, Bear Lake, Bannock, and Lincoln Counties (2012)

Economic Sector	Caribou County, ID		Bear Lake County, ID		Bannock County, ID		Lincoln County, WY	
	Average Employment	Average Wages	Average Employment	Average Wages	Average Employment	Average Wages	Average Employment	Average Wages
Total Employment (Covered)	3,094	$45,136	1,677	$24,330	30,543	$32,535	5,685	$42,395
Agriculture	112	$24,247	*	*	91	$26,497	18	$24,028
Mining	361	$62,381	4	$100,135	*	*	623	$93,928
Construction	339	$48,701	41	$30,191	1,540	$41,955	637	$42,660
Manufacturing	665	$81,944	42	$26,557	2,157	$50,397	133	$33,871
Trade, Utilities, & Transportation	389	$30,827	432	$21,497	5,746	$28,411	1,078	$39,827
Information	19	$18,526	20	$9,446	365	$32,326	159	$43,190
Financial Activities	95	$32,048	46	$26,508	1,517	$41,097	122	$38,484
Professional and Business Services	112	$32,465	98	$34,270	3,007	$30,764	295	$36,061
Educational and Health Services	102	$16,338	97	$16,344	5,094	$33,557	1,469	$37,554
Leisure and Hospitality	180	$9,805	216	$11,366	3,346	$11,791	481	$10,771
Other Services	53	$22,360	27	$16,642	738	$24,793	146	$20,196
Government	667	$29,618	653	$29,833	6,933	$37,349	1,758	$40,903

Note:

* indicates where data have been withheld

Source: Idaho Department of Labor (IDoL) 2013; Bureau of Labor Statistics (BLS) 2013

Table 3.13-5 Labor Force Characteristics in Caribou, Bear Lake, Bannock, and Lincoln Counties

	US	Idaho	Caribou (ID)	Bear Lake (ID)	Bannock (ID)	Lincoln (WY)
1990						
Total Labor Force	118793000	492490	2965	2379	31319	5778
Employed	111746000	465255	2824	2255	29194	5413
Unemployed	7047000	27235	141	124	2125	365
Unemployment Rate	5.6	5.5	4.8	5.2	6.8	6.3
2000						
Total Labor Force	136891000	659824	3273	2960	38370	7357
Employed	131199000	628844	3109	2817	36618	7072
Unemployed	5692000	30980	164	143	1752	285
Unemployment Rate	4.0	4.7	5.0	4.8	4.6	3.9
2010						
Total Labor Force	139064000	761056	3769	3259	40136	8366
Employed	124239000	692826	3485	3057	36981	7576
Unemployed	14825000	68230	284	202	3155	7890
Unemployment Rate	9.6	9.0	7.5	6.2	7.9	9.4
2013						
Total Labor Force	143929000	771154	3956	3321	39990	7810
Employed	132469000	724121	3745	3173	37490	7348
Unemployed	1460000	47033	211	148	2500	462
Unemployment Rate	7.4	6.1	5.3	4.5	6.3	5.9

Source: BLS 2013

Table 3.13-6 Income and Outflow in Idaho, Wyoming, and in the Analysis Area (2012)

	Per Capita Income	Personal Income	Income Inflow/Outflow
State of Idaho	$35,142	$56,071,934,000	
Bannock County	$30,251	$2,531,478,000	$75,772,000 inflow
Bear Lake County	$33,754	$199,286,000	$35,831,000 inflow
Caribou County	$40,190	$272,408,000	$55,557,000 outflow
State of Wyoming	$52,469	$30,255,128,000	
Lincoln County	$41,293	$741,615,000	$46,888,000 inflow

Source: Bureau of Economic Analysis (BEA) 2014a, 2014b

Table 3.13-7 Major Employers in the Analysis Area.

Bannock County	Bear Lake County	Caribou County	Lincoln County
Beacon Health Services	Alco Discount Store	Agrium	Westmoreland Coal Company
Belmont Care Center	Bear Lake County	Broulims Foodtown	PacifiCorp
Convergys Customer Management	Bear Lake County School District #33	Degerstrom-Dravo	ExxonMobil
Farmers Insurance	Bear Lake Memorial Hospital	J.R. Simplot Co., Smoky Mine	Williams
Amy's Kitchen	Broulims Foodtown	Kiewit	Enterprise
Idaho State University	IVI Hotel Management	Mark III	BTI
Portneuf Medical Center	U.S. Forest Service	Monsanto Company	Lincoln County
ON Semiconductor, Inc.	Walton Feed, Inc.	Mullen Crane & Transport	Lincoln County School Districts #1 and #2

Note:
Alco Discount Store has, as of 2015, ceased to operate.
Source: IDoL 2013; Zions Bank Public Finance 2012

3.13.3.4 Bear Lake County Profile

The economy of Bear Lake County is dominated by government employment and tourism-related employment; each accounted for approximately 40 percent of the jobs in 2012. Tourism-related employment increased through the 1990s as Bear Lake County became an increasingly popular locale for recreational and second homes. Bear Lake County is a source of labor for projects in neighboring counties. As a result, employment rates in the county are subject to changes in neighboring counties to a greater degree than for Caribou or Bannock Counties. For example, when oil and gas exploration and development projects in neighboring Utah and Wyoming counties decreased in the 1990s, and when mining positions in Caribou County decreased in the early 2000s, the unemployment rate in Bear Lake County rose (IDoL 2013).

During the last 10 years, Bear Lake County's unemployment rates have been consistently lower than those for the State of Idaho and the U.S., with the unemployment rate falling as low as 2.2 percent in 2007. The rate stood at 6.2 percent in 2010, and fell to 4.5 percent in 2013. Because of Bear Lake County's tourism-based economy, wages in Bear Lake County are lower than in most of the state. **Table 3.13-6** shows an inflow of personal income for Bear Lake County, indicating that workers commute to jobs outside the county. Bear Lake County received $556,564 in PILT payments from the federal government in FY2014 (USDI 2014).

3.13.3.5 Caribou County Profile

The economy of Caribou County is based on agriculture, phosphate mining, and manufacturing. Consequently, the county's economy (and population) is subject to national and global economic forces. As commodity prices trend up and down, so do the economy and population. As a result, unemployment rates in the county tend to vary more substantially than those for the state or the U.S. (IDoL 2013).

Nearly half the jobs in Caribou County involve the production of fertilizer and phosphorus. In 2012, manufacturing accounted for 21 percent of employment and paid the best wages. Mining and construction accounted for 23 percent of employment, and government provided 22 percent of non-farm jobs (**Table 3.13-4**). Wages in Caribou County are higher than for most of the state because of the high wages paid in the phosphate mining and manufacturing industries. Caribou County received $359,964 in PILT payments from the federal government in FY2014 (USDI 2014).

3.13.3.6 Lincoln County Profile

The primary drivers of Lincoln County's economy include mining, construction, government, education, transportation, trade, and utilities, which is reflected in the largest employers listed in **Table 3.13-7**. As shown in **Table 3.13-4**, the mining and construction sector accounts for approximately 11 percent of jobs and very high annual average earnings per job. Other generators of large numbers of jobs include the trade, utilities, and transportation, educational and health services, and government sectors. Lincoln County has historically been a net exporter of labor to surrounding counties, as represented in **Table 3.13-6**, which shows an inflow of personal income for Lincoln County.

Taxes comprise the largest source of revenue for the county. Property and motor vehicle taxes account for 47 percent of total revenues. Sales and use taxes account for 22 percent of total revenues. Operating grants and capital grants represent 12 and 8 percent of total revenues, respectively. Intergovernmental transfers account for approximately 3.5 percent of total revenue, and charges for services represent approximately 5 percent of total revenue. Property, sales, and use tax revenues have increased recently because of increased oil and gas activity in the southern portion of the county (Lincoln County 2012). Lincoln County received $1,214,569 in PILT payments from the federal government in FY2014.

3.13.4 Housing

The characteristics of housing in the analysis area are presented in **Table 3.13-8**. The housing stock in all four counties is relatively concentrated. Approximately 63 percent of the total housing units in Caribou County are located in the Soda Springs Census Designated Place (Soda Springs CDP), approximately 68 percent of housing units in Lincoln County are located in the Afton Census County Division (Afton CCD), and approximately 86 percent of the housing units in Bannock County are located in the Pocatello CCD.

Table 3.13-8 Housing Characteristics in the Analysis Area (2010)

Housing Unit Type	Bannock County, ID	Bear Lake County, ID	Caribou County, ID	Lincoln County, WY
Total Housing Units	33,191	3,914	3,226	8,946
Occupied	30,682	2,281	2,606	6,861
Vacant	2,509	1,633	620	2,085
Vacant for Rent	864	81	94	319
Vacant for Sale	501	92	42	238
Vacant for Seasonal Use	444	1,226	288	1,186
Rental Vacancy Rate (percentage)	8.0	15.8	14.8	17.8
Owner Occupied	20,817	2,281	2,067	5,410
Renter Occupied	9,865	426	539	1,451

Source: USCB 2012c

Increasing demand in Bannock County has resulted in rising costs for land and housing, and increased concern about the affordability of housing. Such issues have not been documented for the other three counties in the analysis area. The housing stock in Bear Lake County differs from the other counties in the large percentage of seasonal-use houses. The housing stock in Bear Lake County is relatively old, with more than 37 percent of houses built before 1940 (Bear Lake County 2002). In a similar vein, the existing housing stock in Soda Springs has been characterized as degraded (IRP 2007).

3.13.5 Community Services

3.13.5.1 Schools

There are two school districts in Bannock County (Marsh Valley School District and Pocatello/ Chubbuck School District No. 25), three school districts in Caribou County (Grace School District, North Gem School District, and Soda Springs School District), and one district in Bear Lake County (Bear Lake School District). There are two school districts in Lincoln County (Lincoln County School Districts #1 and #2). The attendance in these districts for selected years is presented in **Table 3.13-9**.

Communities nearest the analysis area are served by three school districts: the Soda Springs School District #150, the Grace School District #148, and North Gem School District #149. There are three schools in Soda Springs School District #150 (Thirkill Elementary School, Tigert Middle School, and Soda Springs High School), three schools in Grace School District #148 (Thatcher Elementary School, Grace Elementary School, and Grace Junior/Senior High School), and three schools in North Gem School District #149 (North Gem Elementary School, North Gem Middle School, and North Gem High School).

Table 3.13-9 School Enrollment in the Analysis Area

	1991-1992	2001-2002	2011-2012	2012-2013
Caribou County, ID				
Soda Springs School District	1,324	1,060	803	800
Grace School District	719	547	426	464
North Gem School District	230	194	196	217
Bannock County, ID				
Marsh Valley School District	1,590	1,471	1,260	1,258
Pocatello/Chubbuck School District No. 25	13,839	12,370	12,900	12,816
Bear Lake County, ID				
Bear Lake School District	1,734	1,501	1,088	1,101
Lincoln County, WY				
Lincoln County School District #1	--	724	612	603
Lincoln County School District #2	--	2,386	2,601	2,559

Note:
ND = No Data
Source: Idaho Department of Education 2013, Wyoming Department of Education 2013

Adult education in the region is provided through the College of Southern Idaho, a community college in Twin Falls, and Idaho State University in Pocatello.

3.13.5.2 Law Enforcement

The Caribou County Sheriff's Department provides law enforcement for Caribou County; enforcement in Soda Springs is provided by the Soda Springs Police Department (IDC 2006). The Bannock County Sheriff's Office provides law enforcement throughout the county from its Office in Pocatello. Law enforcement within Pocatello is provided by the Pocatello Police Department. The Bear Lake County Sheriff's Office, located in Paris, provides law enforcement for the county. Detention facilities are located in Pocatello, Soda Springs, and Montpelier. The Idaho State Patrol also provides law enforcement services in the region, with officers stationed in all three counties.

The Lincoln County Sheriff's Office provides public safety and law enforcement to all unincorporated areas of Lincoln County. The office maintains facilities (including jail facilities) in Kemmerer, and has a branch office in Afton. The Kemmerer Police Department and Afton City Police Department provide law enforcement within their respective cities.

3.13.5.3 Fire and Emergency Medical Services

Caribou County has a volunteer fire department that serves the unincorporated areas of the county. Fire protection services in Soda Springs are provided by the Soda Springs Fire Department, which is manned by volunteer personnel (IDC 2006), and fire protection in Grace is provided by a volunteer fire department (GCC 2008). Caribou County Emergency Medical Services provides EMT services to the county.

Unincorporated Bannock County is served by the Pocatello Valley, Inkom, McCammon, Lava, Arimo, and Downey Fire Districts. These are volunteer districts. The Pocatello Fire Department provides service within the city. There are eight licensed emergency medical services providers in Bannock County, including both private and public entities.

Bear Lake County is covered by two fire districts: Bailey Creek and Bear Lake. The Bailey Creek Fire District contracts its fire protection service from Caribou County. The Bear Lake County Fire District is an all-volunteer district. It operates stations in Paris, Dingle, Ovid, Georgetown, Pegram, Geneva, Fish Haven, St. Charles, Bennington, and Nounan (Bear Lake County 2002). The Bear Lake County Ambulance Service provides EMT services in the county.

The Bear River Fire District's all-volunteer force provides fire protection services in southwest Lincoln County. Its single station is located in Cokeville. The Alpine Fire Department is a volunteer force providing fire protection and emergency medical services in that community. Kemmerer and Afton each have a volunteer fire department. South Lincoln Emergency Medical Services provides EMT services in southern Lincoln County, and Star Valley Medical Center Emergency Medical Services provides EMT services to Afton and surrounding areas.

3.13.5.4 Medical Services

The Caribou County Hospital and Nursing Home in Soda Springs provides comprehensive health care facilities, including a full-service hospital with 25 beds, emergency care, and industrial testing. The hospital also provides a 30-bed skilled nursing home. There are also a variety of health practitioners and specialists in the area (CMH 2013).

In Bannock County, the Portneuf Medical Center is located in Pocatello. The county's population is also served by a number of other medical providers, including community health centers, hospices, and skilled nursing facilities.

Bear Lake Memorial Hospital in Montpelier includes a skilled nursing facility and an assisted living center. In addition, the population of the county is served by three rural health clinics.

In Lincoln County, the South Lincoln Hospital District operates the South Lincoln Medical Center, which is a designated Critical Access Hospital. The facility includes an emergency room, intensive care unit, medical clinic, and a nursing home among other services. In Afton, the Star Valley Medical Center includes an emergency room, hospital facility, and a long-term care facility among others.

3.13.5.5 Utilities and Public Services

The Rocky Mountain Power Company provides residential electricity in Bannock County, Bear Lake County, Lincoln County, and much of Caribou County. Electric service in Soda Springs is provided by Soda Springs Municipal Light and Power.

Communities in the four counties generally have a centralized water transmission and distribution system and wastewater system. Outside the communities, water is generally sourced from wells or springs, and septic systems are used (Bear Lake County 2002).

Caribou County operates a landfill located near Grace. Bannock County operates the Fort Hall Canyon Landfill (Bannock County 2010; Caribou County 2013). Bear Lake County operates a solid waste landfill located 2 miles east of Montpelier. The county owns and operates the solid waste pickup service that provides service throughout the incorporated and unincorporated parts of the county (Bear Lake County 2002). Lincoln County operates landfills near Kemmerer, Cokeville, and Thayne (Lincoln County 2013).

3.13.6 Public Finance

Public finance activities, lease fees, taxes, and other fees paid to the federal, state, and local entities impact Caribou County, the State of Idaho, and the federal government. Because facilities associated with the Proposed Action are not proposed in Bear Lake, Bannock, or Lincoln Counties, fees associated with mining would not apply. Therefore, the following discussion is restricted to Caribou County.

The taxes and royalties assessed on mineral development and production are an important source of revenue for the State of Idaho and local governments including Caribou County. Property taxes on Agrium-owned property generate approximately $1.1 million annually. An additional $650,000 in property taxes is generated from other properties (e.g., contractor properties, employee properties) associated with the mining activities; in total, these property taxes account for 28 percent of Caribou County's total property tax receipts (Peterson 2013).

In addition to property taxes, the project proponent paid approximately $3.8 million in royalties, $19.5 million in federal corporate tax, and $4.9 million in state corporate tax in 2012 (Peterson 2013).

There are currently three mines actively extracting phosphate in Idaho, all located in Caribou County east and northeast of Soda Springs. Ninety-seven percent of federal receipts from mining fees, leases, and permits that originate in Caribou County are from phosphate mining production. In FY 2013, the total reported royalty revenue, including rents and bonuses, from phosphate operations in Idaho was $9,927,290.

The Federal Mineral Leasing Act of 1920 directs that half of all federally collected rents and royalties be distributed to the individual states where production occurred. Ten percent of this amount is earmarked to be given to the county where production occurred.

A mine license tax of 1 percent is collected by the state for the value of ores mined or extracted. In FY 2013, the state collected revenues of $959,166 from the mine license tax, a decrease of $2,261,279 from the 2012 revenues of $3,220,445 (ISTC 2013).

Property taxes are levied by Caribou County on facilities and improvements constructed by companies. The average 2013 tax rate for rural areas in Caribou County was 1.054 percent (ISTC 2013).

3.14 ENVIRONMENTAL JUSTICE

U.S. EO 12898: Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations directs federal agencies to assess whether the Proposed Action or alternatives would have disproportionately high and adverse human health or environmental impacts on minority or low-income populations.

Data in this section are presented for several different geographies. The Wayan CCD is the smallest geographic area that has a population and for which racial, ethnic, and poverty status data are available. Census Tract 9602 encompasses the Wayan CCD and that portion of Caribou County in which the Proposed Action is located. Caribou County and the State of Idaho represent larger geographic areas that are useful for comparison purposes. None of the Census Blocks nearest the mine site are populated, and thus data for these Census Blocks are not presented.

3.14.1 Minority Populations

The Rasmussen Valley Mine site is located in a sparsely populated rural area of eastern Caribou County. The site is located in Census Tract 9602 in the Wayan CCD. Most of the Proposed Action is located in Census Block 1416. Census 2010 data indicate that Census Block 1416 and the adjoining Census Blocks are unpopulated. Demographic information for the Wayan CCD and Census Tract 9602 is provided in **Table 3.14-1**. Information for the State of Idaho and the Fort Hall Reservation and Off-Reservation Trust Land is provided for comparative purposes.

Because the Census Blocks nearest the Proposed Action are unpopulated, and given the information presented in **Table 3.14-1**, those identifying as minorities or as Hispanic or Latino do not comprise a majority in or near the Proposed Action. The Wayan CCD has a higher percentage of those identifying as a minority, Hispanic, or Latino than the larger Census Tract (9602) in which the CCD is located. The demographic composition of the Wayan CCD approximates that of the State of Idaho as a whole.

Table 3.14-1 Racial and Ethnic Composition

	Wayan CCD		Census Tract 9602		State of Idaho		Fort Hall Reservation and Off-Reservation Trust Land, ID	
Race or Ethnic Group	**Number**	**%**	**Number**	**%**	**Number**	**%**	**Number**	**%**
Total Population	232	100.0	2,872	100.0	1,567,652	100.0	5,337	100.0
White	214	92.2	2,755	95.9	1,396,487	89.1	1,838	34.4
Black or African American	0	0.0	2	0.1	9,810	0.6	0	0.0
American Indian or Alaskan Native	0	0.0	5	0.2	21,441	1.4	3,352	62.8
Asian	0	0.0	4	0.1	19,069	1.2	6	0.1
Native Hawaiian or Other Pacific Islander	0	0.0	12	0.4	2,317	0.1	0	0.0
Other Single Race	21	9.1	52	1.8	79,523	5.1	20	0.4
Two or More Races	3	1.3	42	1.5	38,935	2.5	121	2.3
Hispanic or Latino*	23	9.9	108	3.8	175,901	11.2	617	11.6

Notes:
* People who identify their origin as Hispanic or Latino may be of any race.
Source: USCB 2012a

The Fort Hall Indian Reservation is located 30 miles west of the Proposed Action. As shown in **Table 3.14-1**, those identifying as minorities comprise a majority on the Fort Hall Reservation and Off-Reservation Trust Lands. The Shoshone-Bannock Tribes represent both a population (readily identifiable collection of persons) and a community (readily identifiable social group who reside in a specific locality, share government, and have a common cultural and historical heritage). The Proposed Action is not directly associated with or located in proximity to the Fort Hall Indian Reservation; however, because of treaty rights and tribal interests in public lands in the region, the Fort Hall Indian Reservation is addressed in **Section 3.12**.

3.14.2 Low-Income Populations

Data on low-income populations near the Proposed Action are presented in **Table 3.14-2**. These data indicate that the numbers of people living in Caribou County and in Census Tract 9602 whose income is below the poverty level is lower than that of the State of Idaho as a whole, and that there are no individuals living in the Wayan CCD whose income is below the poverty level.

Table 3.14-2 Low-Income Population Data

	Total Population		Low Income Population		Percentage	
	2010 Estimate[1]	2007-2011 5-Year Estimate[2]	2010 Estimate[1]	2007-2011 5-Year Estimate[2]	2010 Estimate[1]	2007-2011 5-Year Estimate[2]
State of Idaho[1]	1,544,361	1,519,070	244,009	216,734	15.8	14.3
Caribou County[1]	6,884	6,780	833	635	12.1	9.4
Soda Springs School District[1]	879 (students)	NA	101 (students)	NA	11.5	NA
Census Tract 9602[2]	NA	2,755	NA	242	NA	8.8
Wayan CCD[2]	NA	141	NA	0	NA	0.0
Fort Hall CDP[2]	NA	2,727	NA	673	NA	24.7

Notes:

CCD – Census County Division

CDP – Census Designated Place

NA – not analyzed

Population data may differ from other USCB data as a result of differing data collection and analysis

Sources:

1 USCB 2013a

2 USCB 2013b

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CHAPTER 4
ENVIRONMENTAL CONSEQUENCES

This chapter presents the potential direct and indirect effects of the Proposed Action and alternatives. This chapter also identifies irreversible and irretrievable commitments of resources and residual adverse effects. Mitigation measures that have been developed to reduce or eliminate potential impacts are also described. The alternatives for which effects are presented are described in **Chapter 2**. These alternatives address the issues and indicators identified during the scoping process and are presented at the beginning of each resource section of this impact assessment.

Effects are described in terms of context (site-specific, local, or regional effects), duration (short- or long-term), and intensity (negligible, minor, moderate, or major).

Duration of effects is defined as:

- Short-term - Short-term effects are defined as those effects that would not last longer than the life of the project, including initial reclamation.
- Long-term - Long-term effects are effects that would remain following completion of the project.

The thresholds of change for the intensity of an impact are defined as:

- **Negligible** - the impact is at the lowest levels of detection.
- **Minor** - the impact is slight, but detectable.
- **Moderate** - the impact is readily apparent.
- **Major** - the impact is a severe or adverse impact or is of exceptional benefit.

Analysis of the Proposed Action and alternatives was limited to the Study Area as defined in **Chapter 1**. Some discussions may address a larger analysis area that includes adjacent areas to establish a broader context.

This chapter is organized to inform the understanding of direct and indirect effects. Alternatives are divided into their individual elements, which are each presented separately. The effects of the alternative elements are presented to provide the Agencies with flexibility in selecting elements out of the alternatives.

In addition, the effects of each element and alternative are presented in two ways. First, the actual impact of each element or alternative is compared to the baseline condition. In most cases, this is the same as the comparison of the impact with the No Action Alternative. Second, the impacts of each element or alternative are compared with the Proposed Action to inform the reader how the element or alternative would differ from the Proposed Action. The Agency-Preferred Alternative, identified in **Section 2.7**, is the Rasmussen Collaborative Alternative (the RCA).

For the Rasmussen Valley Mine, up to 28 acres of additional disturbance in the Study Area are being considered for Point of Compliance (POC) monitoring well pads (**Section 3.3.2.3.1**) and access roads (8 acres) and potential pit layback areas (20 acres) for both the Proposed Action and RCA (**Tables 2.3-2** and **2.5-2**). The location of this disturbance had not been finalized at the time this Final Environmental Impact Statement (Final EIS) was prepared, because they depend upon subsequent approvals, or pit stability conditions that would be revealed as mining progresses. Baseline conditions are known for the potential areas of disturbance and the expected impacts to resources in these areas will be similar to the impacts on adjacent areas, and would not substantially change the overall intensity or timeframe of the project impacts.

As discussed in **Section 1.5** regarding conformance with the Caribou National Forest (CNF) Revised Forest Plan (RFP), in addition to the forest-wide direction and desired future conditions (DFCs) for ecological processes and patterns in the CNF RFP, management prescription areas have been identified that have goals, objectives, standards, and guidelines for specific resources that may be in addition to or override forest-wide direction. The RCA is entirely within Prescription 8.2.1 - Inactive Phosphate Leases, and all but 0.56 acre of the Proposed Action are also within this prescription (**Figure 4.0-1**). At the time that the RFP was prepared, this prescription area was defined as a 0.5-mile buffer around all known phosphate leasing areas (KPLAs) and inactive leases. The same area also overlaps with other prescription areas, specifically for the Study Area, Prescription 2.7.2(d) - Elk and Deer Winter Range, and Prescription 6.2(b) - Rangeland Vegetation Management (**Figure 4.0-1**). As long as the KPLA or lease area is inactive, it is managed under the overlapping prescriptions. When a mine becomes active, Prescription 8.2.1 for the area of the mine plan converts to Prescription 8.2.2(g) - Phosphate Mine Areas. Any project components that extend outside the Prescription 8.2.1 0.5-mile buffer are managed under the existing prescription. Activities within the Federal Lease, and any lease modifications, will be managed under Prescription 8.2.2(g) – Phosphate Mine Areas. Four small areas (**Figure 4.0-1**) along the Proposed Action haul road totaling 0.56 acre would be outside of the Prescription 8.2.1 buffer and within Prescription 6.2(b). If the Proposed Action were selected, these areas would have to be modified to remain within Prescription 8.2.2(g).

4.1 GEOLOGY, MINERALS, AND PALEONTOLOGY

Issue: How does apparent geotechnical instability of portions of the Study Area affect the stability of the proposed external overburden piles, growth medium (GM) stockpiles, haul roads, and other mine facilities?

Indicators:

- Quantifiable geotechnical stability safety factors or equivalent stability analysis for overburden piles
- Predicted slope stability
- Delineation of areas of unstable landforms and soil map units containing unstable landforms

Issue: How would slope stability downslope of the external overburden piles be affected by the overburden piles?

Indicators:

- Predicted slope stability
- Delineation of areas of unstable landforms and soil map units containing unstable landforms

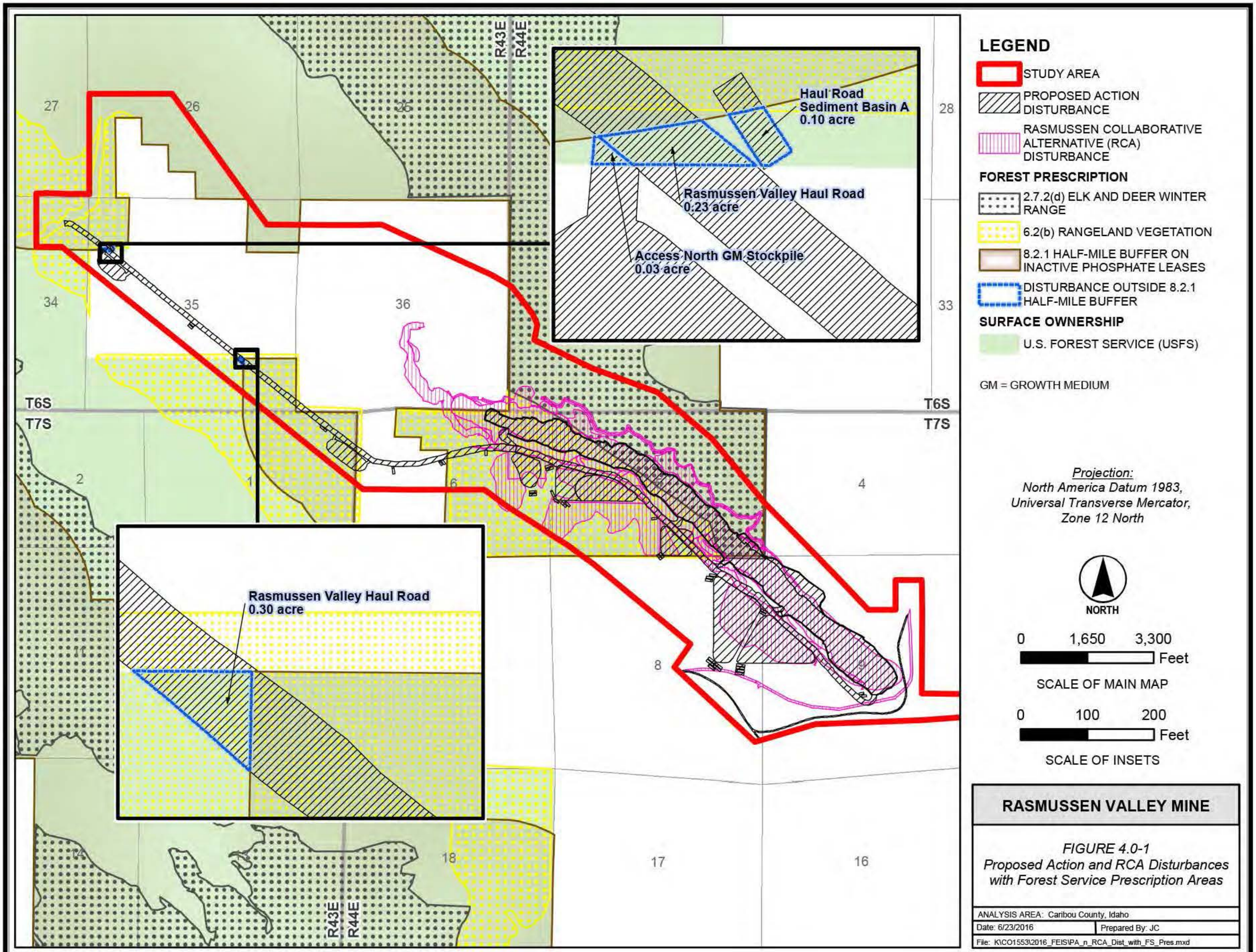

FIGURE 4.0-1
Proposed Action and RCA Disturbances with Forest Service Prescription Areas

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Issue: What are the potential effects on paleontological resources?

Indicators:

- Disturbance of significant fossil-producing deposits or covering of potential fossil-bearing areas, removing them from access for research

Under the CNF RFP DFCs for minerals and geology are:

- Mineral resources are available for development, consistent with other resource uses.
- Paleontological resources are properly managed to provide for preservation and use of these resources for current and future generations.
- Drastically disturbed sites are reclaimed so that natural recovery to pre-disturbed conditions is most likely. Reclamation emphasizes: 1) suitable topsoil preservation; 2) use of native plant species; and 3) stabilizing lands to a topographic relief (landform) that conforms to natural surroundings.
- Drastically disturbed lands are reclaimed to prescribed post-disturbance land uses as soon after disturbance as is practical.

Most of the general standards and guidelines for minerals and geology apply to the management and protection of other resources. As with the general standards and guidelines, most of the standards and guidelines for Prescription 8.2.2(g) address the management and protection of resources other than minerals and geology such as water resources, soils, vegetation, and wildlife. One general standard applying to paleontology is "When surface disturbing activities are proposed within geologic units having a moderate or high potential for the occurrence of vertebrate fossils (other than fish or sharks), a field survey of the area shall be made prior to, and if possible, during the proposed activities."

Before submittal of the Mine and Reclamation Plan (Agrium 2011), most of the Study Area was within the 0.5-mile buffer area of Prescription 8.2.1, but was managed under the overlapping Prescriptions 2.7.2(d), 6.2(b). Once the Mine and Reclamation Plan was submitted, Prescription 8.2.2(g), including any applicable standards or guidelines for drastically disturbed lands, went into effect within the Lease. Any standards and guidelines associated with this prescription would then override the general standards and guidelines. Any components of the approved alternative on National Forest Service- (NFS-) administered land that fall outside the 0.5-mile buffer of the 8.2.2(g) prescription area would continue to be managed under the previous prescription. This would include portions of the Rasmussen Valley Haul Road under the Proposed Action. As with the general standards and guidelines, most of the standards and guidelines for Prescription 8.2.2(g) address the management and protection of resources other than minerals and geology such as water resources, soils, vegetation, and wildlife.

4.1.1 Direct and Indirect Impacts

4.1.1.1 Proposed Action

4.1.1.1.1 Geotechnical

<u>Residual Pit Wall Stability</u>

Residual pit walls would remain on the central and northern portions of the pit after backfill and reclamation is completed for the Proposed Action. The stability of the pit wall is controlled by several factors including the type and strength of rock, degree of rock alteration, steepness of the final pit wall slope, presence of any groundwater, spacing and orientation of fractures and faults, and blasting practices (BLM and USFS 2007).

For the same rock type, less fractured and altered rock would produce more stable pit walls compared to altered or fractured rock. Geotechnical boring data indicate that rock formations underlying the mine pit are highly fractured (CNI 2011). Rocks are generally considered to have very poor integrity because of fractures if the rock quality designation (RQD) is less than 25 percent. The rock formations at Rasmussen Valley are highly fractured with mean RQD values typically less than 10 percent. In the north end, where the residual pit walls will be, RQD values are zero, while in the central portions, the pit wall is less fractured, with RQD values of 10 to 20 percent. Because portions of the pit wall would remain exposed in the North End after reclamation, RQD data and the presence of faults in that area indicate that natural rock fracturing would likely contribute to instability in the North End following reclamation. Areas of exposed pit wall in the northern pit are less fractured and would have lower potential instability; however, fracturing and instability hazards would increase to the south along the northern pit.

Pit wall instability can also be promoted by groundwater discharges from the pit wall. Given the relatively small pit wall exposures, and the expected overall permeability of the fractured rock reducing the risk of pore pressure buildup, large-scale slope instability is not expected to occur. The pit wall slopes may occasionally slough material, but the effect on resources would be minimal. These areas are not expected to affect post-reclamation pit wall instability. Surface water (runon) draining down the west flank of Rasmussen Ridge over the pit crest may infiltrate existing fractures and contribute to minor amounts of post-reclamation pit wall instability during freeze-thaw cycles.

Other Mine Facilities

Geotechnical factors may also affect the stability of mine features other than remaining pit walls. Mine features that add material to an area or excavate material (leaving steeper slopes) can potentially induce geotechnical instability in accordance with topography of the surface underlying the pile; stress, such as shock loading or overloading; slope heights; reduction of material strength by introduction of water; and the scheduling of reclamation contouring (BLM and USFS 2007). In particular, overburden piles or GM stockpile slopes were identified as facilities with potential geotechnical instability during project scoping.

A geotechnical engineering evaluation of the conditions in the Study Area was completed (STRATA 2013). Factors of safety (FOS) were calculated and compared to design factors of safety (**Table 4.1-1**) to evaluate whether certain project facilities (e.g., piles and haul roads) are likely to be stable (**Table 4.1-1**). FOS for short-term (life-of-mine), long-term (post-reclamation), and seismically induced (earthquake) conditions were calculated. Calculated FOS were greater than design FOS for most stockpiles and fill features; therefore, those facilities are expected to exhibit acceptable slope stability. The exceptions were the calculated FOS for the South Main and North Overburden Piles over the short term and long term. Shallow groundwater near the toe of these two facilities is expected to contribute to their instability. The calculations predict that instability would be increased by surcharge loading during construction, resulting in increased pore pressure and a decrease in effective shear strength and stability below that acceptable.

The presence of landslide deposits currently exhibiting movement near the toe of the North Overburden Pile area also indicates conditions that could cause instability of that facility (STRATA 2013). The boundary of this landslide area is consistent with the boundary of soil map unit HPM and extends south of the North Overburden Pile footprint. The HPM soil unit consists of old slips and slumps and commonly has seep and pond areas (AECOM 2012). Soil unit HPM is also present beneath the western portion of the North Overburden Pile and near the western edge of the South Main Overburden Pile. STRATA (2013) concluded that the South Main and North Overburden Piles would require engineering controls to provide an adequate FOS. Without engineering controls, these two features are anticipated to exhibit moderate to major impacts as a result of geotechnical instability, which would potentially result in overburden sliding outside of the designed footprint, covering water management features, and potentially resulting in adverse effects on surface water and groundwater quality.

Table 4.1-1 Geotechnical Stability Factors of Safety

Proposed Project Facility	Short-Term Factor of Safety	Long-Term Factor of Safety	Seismically Induced Factor of Safety
Design Factor of Safety	**1.3**	**1.5**	**1.1**
Access North GM Stockpile	1.856	1.963	NA
Access South GM Stockpile	1.346	1.575	NA
North GM Stockpile	1.393	1.581	NA
North Overburden Pile	1.011	1.211	0.667
Ore Stockpile	2.042	2.070	NA
Pit Backfill and South External Overfill Pile	2.584	2.584	1.491
Sediment Retention Basin 4	1.646	1.717*	1.114
South Main Overburden Pile	0.923	1.271	NA
South-South Overburden Pile	1.536	2.645	1.196
Haul Road Design Factor of Safety	1.6	NA	1.1
Haul Road Cut Slope	1.633	NA	1.109

Notes:
NA = Not Assessed
* Runoff Event FOS, not Long-Term FOS. Design FOS is 1.5 for this scenario.
Source: STRATA 2013

Haul roads and monitoring well roads constructed in soil map units HAX, PCM, and RDX are likely to experience minor cut slope similar to those observed in existing exploratory roads within the Study Area (AECOM 2012). The number and types of slope failures associated with existing exploratory roads have not been documented. Minor cut slope failures can generally be remedied by removal of debris and loose material using standard mining or construction equipment and are anticipated to have negligible to minor adverse effects on mine features. Under the Proposed Action, haul roads would occupy 17.8 acres of map unit HAX and 12.8 acres of map unit PCM. Proposed monitoring well roads would use existing infrastructure and would not create new disturbances that would be prone to slope failure. Calculated FOS for haul road cut slopes are greater than design factors of safety (**Table 4.1-1**), indicating that, although cut slope failures may occur, such failures are likely to be minor. Overall potential effects of slope and pit wall instability under the Proposed Action would be short-term and minor.

4.1.1.1.2 Geochemistry

Percolation of meteoric water through the proposed overburden disposal facilities and optional ore stockpile would generate seepage with elevated concentrations of metals and other constituents of potential concern (COPCs) that could be released into groundwater or surface water. The expected chemistry of this seepage was evaluated using U.S. Environmental Protection Agency (USEPA) method 1312 (synthetic precipitation leaching procedure [SPLP]) and column leaching tests (Whetstone 2015a). SPLP tests are screening-level tests performed by leaching samples of rock and soil in a solution of weakly acidified water. They can be used to determine which constituents would be readily dissolved and mobile in seepage, but cannot be used to evaluate the effects of reactions like sulfide mineral oxidation that may release previously insoluble constituents with time as overburden and ore weather in near surface storage facilities. The time-dependent (kinetic) release of constituents in seepage by weathering reactions was evaluated using column leaching tests performed in accordance with Bureau of Land Management (BLM) and U.S. Forest Service (USFS) guidelines for the Southeast Idaho Phosphate District (Whetstone 2013).

SPLP Tests

One hundred and fifty samples of overburden and ore were evaluated by SPLP tests for the Baseline Geochemistry Study (Whetstone 2015a). The tests were performed by tumbling the samples in a solution of weakly acidified deionized water for 18 hours at a solution-to-rock ratio of 20:1. The resultant leachates were then filtered and analyzed for a suite of 65 parameters that included major ions, nutrients, and metals. The results of the SPLP tests are compared to numerical water quality standards in **Table 3.3-2** and **Table 3.3-17,** and indicate that 16 COPCs (aluminum, antimony, arsenic, cadmium, chromium, copper, fluoride, iron, lead, manganese, nickel, selenium, sulfate, total dissolved solids [TDS], thallium, and zinc) are likely to be mobile in seepage from overburden and ore storage facilities at levels of regulatory concern. Summary statistics for the SPLP tests are presented in **Table 4.1-2**. Complete data and analysis of the SPLP test results are presented in the Baseline Geochemistry Study Report (Whetstone 2015a).

Table 4.1-2 Summary Statistics for Mobile Constituents in SPLP Leachates

			Aluminum[2] mg/L	Antimony[3] mg/L	Arsenic[3] mg/L	Cadmium[4] mg/L	Chromium[5] mg/L	Copper[4] mg/L	Fluoride[5] mg/L	Iron[2] mg/L
Unit[1]	**Number of Samples**	**Lowest Standard**	**0.2**	**0.0056**	**0.010**	**0.0006**	**0.1**	**0.011**	**4**	**0.3**
ALV	17	Average	0.45	0.0005	0.002	0.0008	0.0101	0.0035	0.50	0.34
		Min.	<0.03	<0.0004	0.0006	<0.0001	<0.0005	<0.0005	0.11	<0.02
		Max.	1.70	0.0011	0.003	0.0027	0.0503	0.0070	0.97	1.10
		Std. Dev.	0.49	0.0003	0.001	0.0009	0.0138	0.0019	0.27	0.34
BST	6	Average	0.50	0.0004	0.0009	<0.0001	0.0005	0.0019	0.21	0.28
		Min.	0.28	<0.0004	0.0004	<0.0001	<0.0005	0.0010	<0.10	0.15
		Max.	0.82	0.0005	0.0022	<0.0001	0.001	0.0026	0.35	0.54
		Std. Dev.	0.18	0.0001	0.0007	0	0.0003	0.0006	0.09	0.14
DCS	14	Average	0.69	0.0005	0.0013	0.0004	0.0132	0.0083	0.36	0.64
		Min.	<0.03	<0.0004	0.0004	<0.0001	<0.0005	0.0019	<0.2	<0.02
		Max.	1.53	0.0010	0.0026	0.0035	0.0332	0.0328	0.71	1.52
		Std. Dev.	0.49	0.0002	0.0006	0.0009	0.0107	0.0089	0.18	0.51
REX	16	Average	0.51	0.0006	0.0010	0.0007	0.0105	0.004	0.20	0.44
		Min.	0.18	0.0004	0.0003	0.0001	0.0005	0.0013	0.10	0.12
		Max.	1.04	0.0015	0.0028	0.0060	0.0263	0.0070	0.395	0.82
		Std. Dev.	0.26	0.0003	0.0007	0.0015	0.0072	0.002	0.1	0.23
HWM	13	Average	0.75	0.0014	0.0015	0.0434	0.005	0.0115	1.14	0.74
		Min.	<0.03	<0.0004	<0.0002	<0.0001	<0.0005	<0.0005	<0.5	<0.02
		Max.	4.63	0.0039	0.0038	0.3160	0.024	0.0586	4.43	4.28
		Std. Dev.	1.35	0.0009	0.0010	0.0937	0.007	0.0186	1.11	1.31
UO	6	Average	0.57	0.0035	0.0051	0.0046	0.0543	0.0064	1.25	0.32
		Min.	<0.03	0.0015	0.0028	0.0002	0.0013	0.0011	0.87	<0.02
		Max.	1.34	0.0067	0.0087	0.0097	0.1496	0.0130	1.68	0.58
		Std. Dev.	0.49	0.0019	0.0027	0.0034	0.0569	0.0045	0.34	0.24
UOP	6	Average	0.54	0.0016	0.0048	0.0014	0.0196	0.0035	1.44	0.33
		Min.	0.06	0.0007	0.0025	<0.0001	0.0014	0.0016	0.93	0.02

Table 4.1-2 Summary Statistics for Mobile Constituents in SPLP Leachates

		Max.	0.95	0.0041	0.0075	0.0022	0.0295	0.0056	2.24	0.80
		Std. Dev.	0.39	0.0013	0.0020	0.0007	0.0121	0.0015	0.45	0.27
CW	22	Average	0.14	0.0053	0.0029	0.0103	0.0029	0.0098	1.24	0.09
		Min.	<0.03	0.0008	0.0007	0.0001	<0.0005	<0.0005	0.47	<0.02
		Max.	2.76	0.0221	0.0114	0.1219	0.0129	0.0863	3.96	1.38
		Std. Dev.	0.59	0.0045	0.0024	0.0274	0.0029	0.0234	0.87	0.30
LO	9	Average	0.08	0.0039	0.0078	0.0070	0.0286	0.0053	0.91	0.22
		Min.	<0.03	0.0016	0.0029	0.0004	0.0018	0.0006	0.43	<0.02
		Max.	0.49	0.0088	0.0136	0.0240	0.0933	0.0140	1.40	0.68
		Std. Dev.	0.32	0.0023	0.0037	0.0069	0.0380	0.0050	0.30	0.30
LOP	9	Average	0.07	0.0019	0.0043	0.0015	0.0065	0.0029	0.68	0.04
		Min.	<0.03	0.0005	0.002	<0.0001	0.0032	0.0008	0.35	<0.02
		Max.	0.21	0.0040	0.0068	0.0037	0.0176	0.0056	1.07	0.25
		Std. Dev.	0.06	0.0013	0.0018	0.0012	0.0046	0.0015	0.24	0.08
FWM	8	Average	0.12	0.0033	0.0047	0.0044	0.0057	0.0022	0.54	0.09
		Min.	<0.03	0.0004	0.0023	0.0004	0.0017	0.0009	<0.20	<0.02
		Max.	0.21	0.0089	0.0072	0.0129	0.0124	0.0034	0.98	0.17
		Std. Dev.	0.07	0.0030	0.0017	0.0041	0.0040	0.0011	0.23	0.06
GDT	18	Average	<0.03	0.0004	0.0015	0.0001	0.0010	0.0007	0.20	0.02
		Min.	<0.03	<0.0004	0.0006	<0.0001	<0.0005	<0.0005	0.11	<0.02
		Max.	<0.03	0.0012	0.0033	0.0003	0.0025	0.0013	0.46	0.04
		Std. Dev.	0	0.0003	0.0007	0.0000	0.0005	0.0002	0.09	0.00
WEL	6	Average	0.06	0.0007	0.0011	0.0001	0.0006	0.0010	0.27	<0.02
		Min.	<0.03	<0.0004	0.0005	<0.0001	<0.0005	0.0009	<0.10	<0.02
		Max.	0.12	0.0017	0.0026	0.0002	0.0008	0.0013	0.75	<0.02
		Std. Dev.	0.03	0.0005	0.0008	0.0000	0.0001	0.0002	0.23	0.00

Notes:

1 Abbreviations: ALV = alluvium, BST = basalt, DCS = Cherty Shale, REX = Rex Chert, HWM = hanging wall mud, UO = upper ore, UOP = upper ore partings, CWS = center waste, LO = lower ore, LOP = lower ore partings, FWM = footwall mud, GTD = Grandeur Tongue, WEL = Wells Formation

2 Lowest numerical standard is the Idaho secondary groundwater standard

3 Lowest numerical standard is the Idaho aquatic standard for consumption of water and organisms

4 Lowest numerical standard is the Idaho cold-water biota criterion continuous concentration (CCC) based on a hardness of 100 milligrams per liter (mg/L) total harness and a water effect ratio of 1

5 Lowest numerical standard is the Idaho primary groundwater standard

6 Lowest numerical standard is the Idaho cold-water biota CCC

Column Leaching Tests

Ten column leaching tests were performed to evaluate the kinetic leaching characteristics of overburden and ore that would be produced under the Proposed Action (Whetstone 2015a). The results of the tests were used to specify input concentrations (source terms) for numerical modeling of contaminant fate and transport from the proposed overburden and ore storage facilities (**Section 4.3**). A summary of the column leaching tests prepared for the Baseline Geochemistry Study is presented in (**Table 4.1-3**).

Column testing guidelines for the Southeast Idaho Phosphate District recommend that monolithologic (single rock type) columns be prepared for each rock type that represents more than 5 percent of the overburden material balance (Whetstone 2013). The planned percentages of Cherty Shale (13.2 percent), Rex Chert (15.5 percent), hanging wall mud (7.0 percent), center waste (34.9 percent), combined ore partings (6.7 percent), and Grandeur Tongue (14.4 percent) exceed this threshold and were evaluated using monolithologic columns. The remaining overburden geochemical testing units, including basalt (0.7 percent), alluvium (3.8 percent), footwall mud (1.4 percent), and Wells Formation (2.5 percent), would each form less than 5 percent of the material balance and were not tested as individual units. Column testing guidelines also recommend that mixed-lithology columns be prepared to model the average run-of-mine composition of the proposed overburden and ore storage facilities (Whetstone 2013). Four columns were constructed for this purpose, including one column for pit backfill that would be placed below the regional water table, one column for pit backfill that would be placed above the regional water table water, one column for non-Meade Peak overburden that would be placed in the North and South-South Overburden Piles, and one column for material that would be placed in the ore stockpile (**Table 4.1-3**). Mixed-lithology columns were not prepared for the South Main Temporary Overburden Pile or the North and South Temporary Overburden Piles because the material in these facilities would be re-handled into the pit backfill.

Table 4.1-3 Column Summary

Column Designation	Tested Material	Leaching Condition	Comment
Monolithologic Columns			
CS-U1	Cherty Shale	Unsaturated	13.2 percent[2] of the overburden material balance
REX-U1	Rex Chert	Unsaturated	15.5 percent[2] of the overburden material balance
HWM-U1	Hanging wall mud	Unsaturated	7.0 percent[2] of the overburden material balance
CW-U1	Center waste	Unsaturated	34.9 percent[2] of the overburden material balance
COP-U1	Combined ore partings[1]	Unsaturated	6.7 percent[2] of the overburden material balance
GDT-U1	Grandeur tongue	Unsaturated	14.4 percent[2] of the overburden material balance
Mixed Lithology Columns			
BROM-U1	Run-of-mine overburden	Unsaturated	Average composition of pit backfill for the Proposed Action
BROM-S1	Run-of-mine overburden	Saturated	Average composition of pit backfill for the Proposed Action
OROM-U1	Run-of-mine non-Meade peak overburden	Unsaturated	Average composition of proposed North and South-South Overburden Piles
ORE-U1	Combined upper and lower ore	Unsaturated	Average composition of the proposed ore stockpile

Notes:

1 Combined ore partings include material from the upper ore partings (82 percent) and the lower ore partings (18 percent). This column is included with the monolithologic columns to differentiate it from mixed lithology columns that were used to directly model mine facilities.

2 Percent by weight

Two column testing methods were used for the Baseline Geochemistry Study: an unsaturated method that was used to evaluate the leaching characteristics of material to be placed above the regional water table and a fully saturated method that was used to evaluate the characteristics of material to be placed below the regional water table. Pit backfill is the only material proposed for placement below the regional water table and was the only material evaluated using the saturated testing method.

Unsaturated Column Testing Method

Partially saturated columns were packed with 20 kilograms (kg) of material representing the average compositions of overburden or ore that would be placed in the modeled mine facilities. The samples were placed in random lifts that were gently compacted by tapping on the sides of the columns with a rubber mallet. A layer of glass beads (3 to 4 inches) was placed at the top and bottom of each column as packing material.

With the exception of column REX-U1, the unsaturated columns were operated for eight leaching cycles. Column REX-U1 was operated for four additional cycles (12 total) to evaluate a trend of decreasing pH observed in the leachates from the column. Each leaching cycle required 19 days to complete and included a solution application period (14 days), a drain-down period (2 days), and an aeration period (3 days). The head solution, distilled water from a common reservoir open to the atmosphere, had a pH that varied from 5.9 to 6.4 s.u. was applied to the top of each column at a rate of about 15 milliliters per hour (mL/hr). The columns were allowed to drain freely, and the leachates were collected at the bottom. Five liters of solution were applied to each column per cycle (0.25:1 solution to sample weight ratio). At the end of the application period, the columns were allowed to drain for 48 hours before circulating dry air (up-flow) through the material at a flow rate of about 0.5 liter per minute.

The unsaturated columns were inspected daily for evidence of ponding, channelized flow, and biofilms. These conditions were not observed. Leachates for Cycles 0.5 through 8 were monitored for solution parameters (volume, temperature, pH, electrical conductivity [EC], dissolved oxygen [DO], and oxidation-reduction potential [ORP]) at the time of collection and submitted for laboratory analysis of 65 parameters including dissolved and total metals. Column REX-U1 was operated for an additional four cycles after Cycle 8, and leachates for Cycles 9, 10, and 12 were analyzed for solution parameters and total and dissolved iron. The leachate from Cycle 11 was analyzed for solution parameters and the full laboratory suite of 65 parameters.

<u>Saturated Column Construction and Testing Method</u>

The saturated column representing pit backfill that would be placed below the water table (BROM-S1) was packed with 20 kg of material using same material percentages and stacking order that was used for the corresponding unsaturated backfill column (BROM-U1). BROM-S1 was operated for a total of eight cycles. Each leaching cycle was 19 days long and included a 14-day solution application and collection period followed by a 5-day rest period. BROM-S1 was operated under up-flow conditions, and the head solution (distilled water from the same source as the unsaturated columns) was applied to the bottom of the column at a rate of 15 mL/hr. Five liters of solution were applied to the column during each leaching cycle. Leachates from BROM-S1 were analyzed for the same suite of solution and laboratory parameters evaluated for the unsaturated columns.

<u>Column Results</u>

Data from the column tests indicate that many constituents exhibit different mobility depending on whether the material is leached under saturated or unsaturated conditions. In general, the columns demonstrated an initial flushing effect in which leachates from the first one to three cycles had higher concentrations of TDS, sulfate, and metals than leachates from subsequent cycles (**Figure 4.1-1)**. Most metals were more mobile under unsaturated leaching conditions, with iron and manganese being notable exceptions. The observed lower mobility of selenium, sulfate, and possibly some other metals under saturated conditions is interpreted to be a function of bacterial reduction (Whetstone 2015a). This interpretation is consistent with work by Bithell Kirk (2014), who identified a number of bacteria in phosphate mine overburden that can rapidly reduce soluble selenium to insoluble minerals.

The leachates produced by the columns were typically moderately to well buffered solutions with calcium-sulfate compositions and alkaline to near-neutral pH. The Rex Chert column (REX-U1) was an exception to this generalization and produced leachates with acidic pH and low alkalinity during later cycles (**Figure 4.1-1**). The major ion composition of column leachates evolved from calcium-sulfate compositions during the initial cycles to calcium-bicarbonate compositions during subsequent cycles.

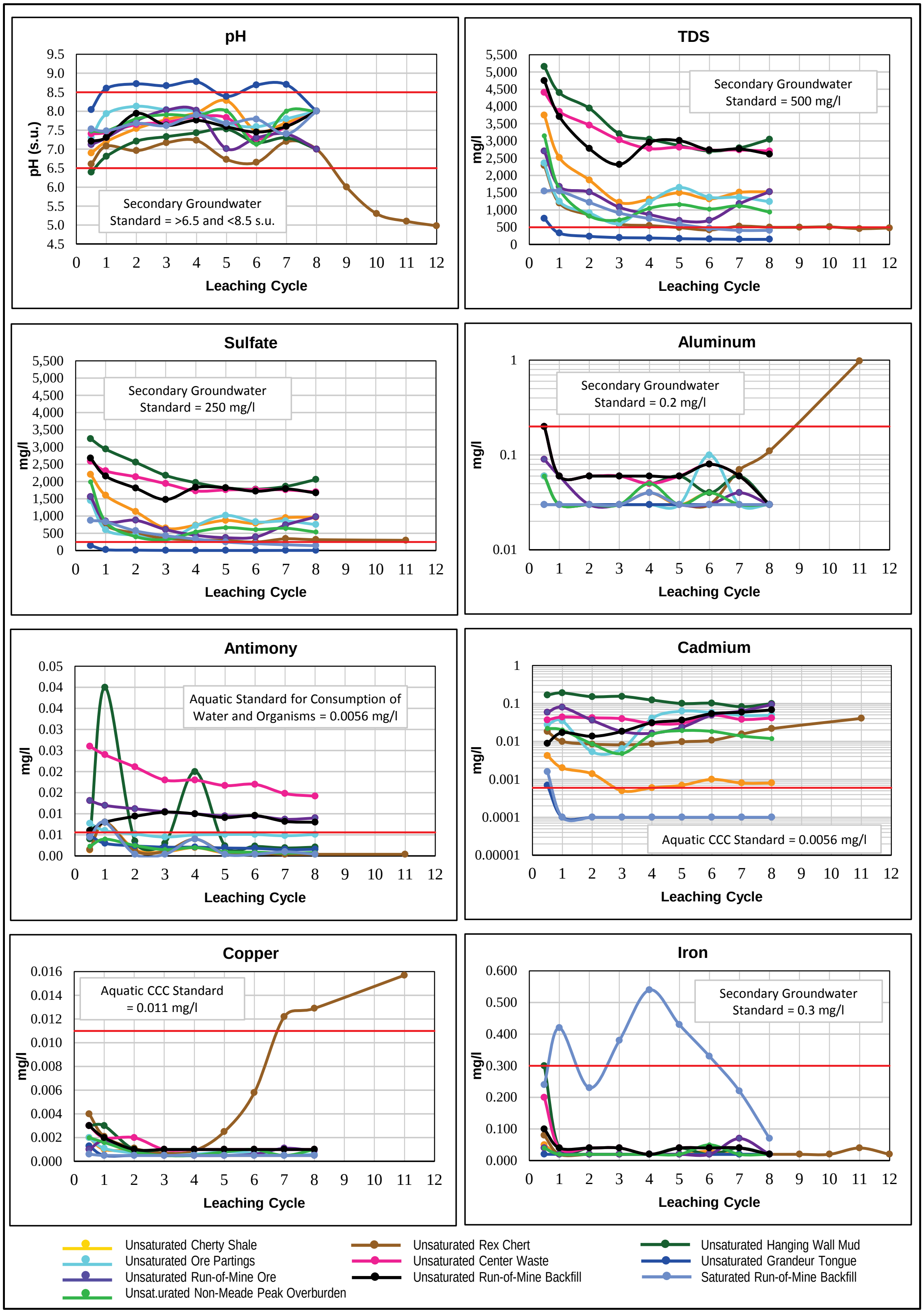

Figure 4.1-1 Concentrations Plots for Constituents Mobile in Column Leachates above Numerical Water Quality Standards

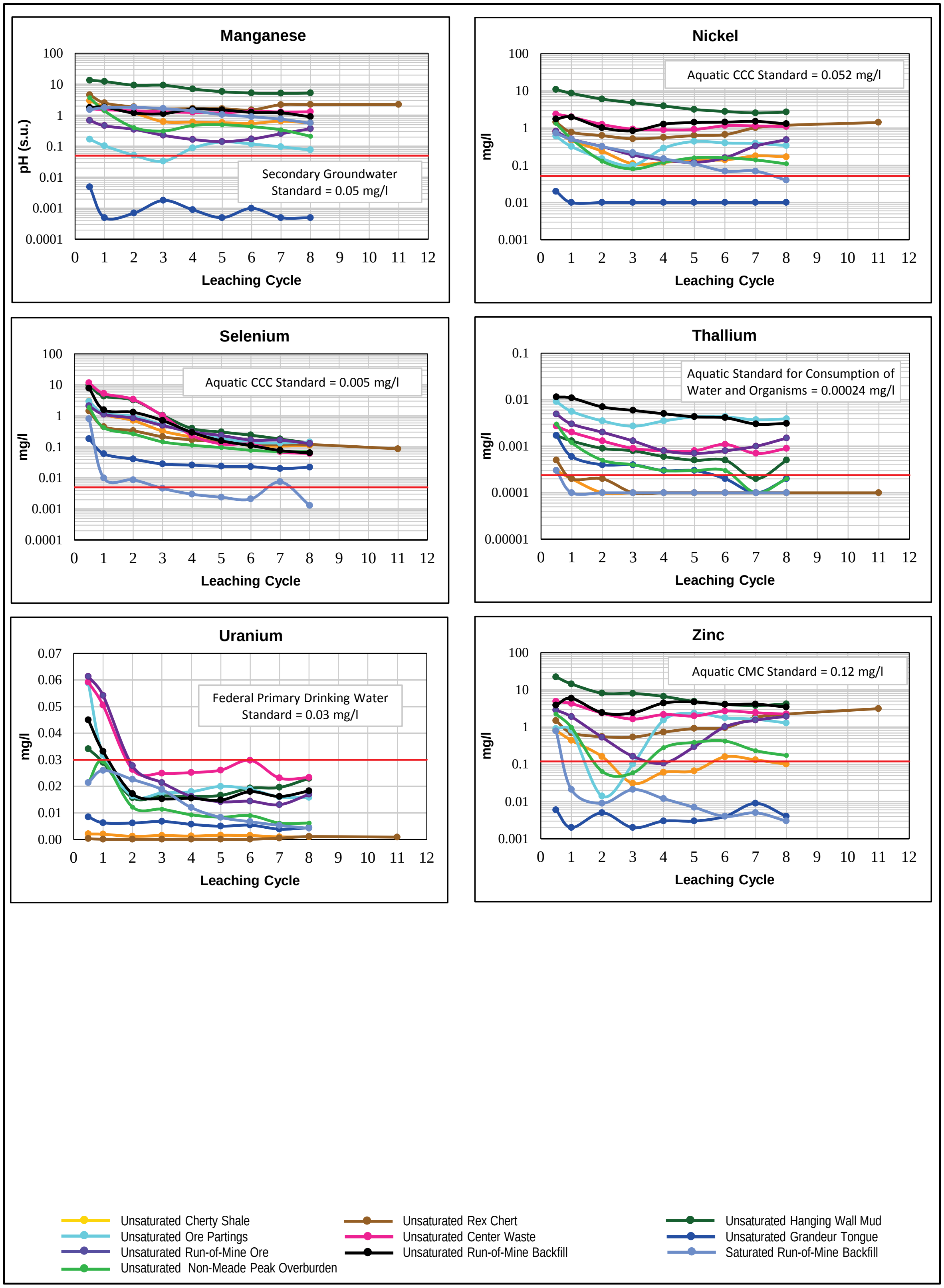

Figure 4.1-1 Concentration Plots for Constituents Mobile in Column Leachates above Numerical Water Quality Standards *(continued)*

Thirteen constituents from the column leaching tests exceeded one or more of the numerical water quality standards in **Table 3.3-2** and **Table 3.3-17**. These constituents included TDS, sulfate, aluminum, antimony, cadmium, copper, iron, manganese, nickel, selenium, thallium, uranium, and zinc (**Figure 4.1-1**). COPC concentrations in column leachate generally decreased rapidly during the first several cycles before becoming asymptotic in later cycles. Cadmium was the primary exception to this trend, with concentrations remaining relatively stable or increasing in most columns. In addition, leachates from several columns yielded concentrations that increased toward the end of testing for TDS, thallium, uranium, and zinc. COPC concentrations were typically highest in leachates from Meade Peak-containing rocks, especially center waste shale and hanging wall mud.

Leachates from the Rex Chert column (REX-U1) displayed somewhat different behavior with respect to pH and alkalinity than the other unsaturated columns (**Figure 4.1-1**). Alkalinity and pH in leachates from REX-U1 decreased during late cycles, with alkalinity falling below the detection limit of 2 mg/L calcium carbonate equivalent (mg $CaCO_3$/L) by Cycle 9, and pH decreasing to 5.0 s.u. during Cycle 12. These observations are consistent with results of acid-base accounting (ABA) testing (**Section 3.1.3.3.2**), which indicate that material from the Rex Chert has weak potential to generate acidic leachate. Many metals are more mobile under acidic conditions, and a corresponding increase in aluminum, cadmium, copper, manganese, nickel, uranium, and zinc was observed in leachates from later cycles of REX-U1.

4.1.1.1.3 Paleontology

Excavation of the pit and construction of facilities could directly affect paleontological resources if fossils are excavated without detection. Contextual geologic setting of the fossils would also be affected if fossils are found in the excavated overburden. The presence or absence of scientifically significant fossils within areas of disturbance (e.g., pit, borrow areas) cannot be determined at this time. Effects cannot be fully determined until excavation and construction expose rock strata that may contain scientifically significant fossils. However, as summarized in **Section 3.1.4**, the potential for encountering such resources is known. For example, construction could disturb 60 acres of the Meade Peak Member of the Phosphoria Formation, which has a very high potential to contain scientifically significant fossils (Potential Fossil Yield Classification [PFYC] Class 5a). In addition, pit excavation would produce 57.1 million tons of overburden consisting of PFYC Class 5a formations (Brown and Caldwell [BC] 2014b).

Construction of facilities could disturb 25 acres of the Dinwoody and Wells Formations, which are considered to have moderate potential to contain scientifically significant fossils within the analysis area (PFYC Class 3a). In general, paleontological resources contained in these formations are invertebrate fossils not generally considered to be important or restricted to the analysis area, and are likely to be found throughout the outcrop areas of these formations in southeastern Idaho and adjacent areas. Early Triassic invertebrates from the Dinwoody Formation of the Aspen Range west of the analysis area, however, are rare, scientifically significant, and may occur within the analysis area (Smith 1914). Negligible volumes of PFYC Class 3b formations would be excavated as overburden (BC 2014b).

Overall, the Proposed Action has a moderate to high potential for beneficially affecting paleontological resources by encountering and documenting resources that would not otherwise have been discovered. The Proposed Action also has a moderate to high potential for adverse effects (i.e., damage or destruction) on scientifically significant paleontological resources, including rare invertebrate fossils. The Agencies have identified a number of requirements that would be implemented to mitigate the potential for adverse effects as described in **Section 4.1.4.2**.

In contrast to the potential direct effects, development of the Proposed Action is not expected to increase indirect effects, notably because roads already provide access to the mine site, and development of the mine would not increase public access. In addition, the area lacks the unvegetated outcrops preferred for prospecting and collecting fossils. Consequently, fossil collection is not expected to increase, and indirect effects from prospecting on scientifically significant fossils would be negligible. Overall effects to paleontology under the Proposed Action would be long-term and minor.

4.1.1.2 Rasmussen Collaborative Alternative

4.1.1.2.1 Geotechnical

Residual pit walls under the RCA would be similar in nature to those included in the Proposed Action; therefore, slope stability concerns would be the same.

Elimination of the North Permanent, North Temporary, and South Main Temporary and South-South Permanent Overburden Piles under the RCA is expected to eliminate the potential for problems related to geotechnical overburden pile stability when compared to the Proposed Action. Under the RCA, a portion of the areas originally planned for the external overburden piles and North GM stockpile would instead be used to borrow and store GM and alluvium for use in backfill and overburden cover construction. GM from the area would be used for overall reclamation. The North Main Borrow and Storage Area would overlap with an area of landslide deposits currently exhibiting movement (STRATA 2013) and soil map unit HPM. If the North Main Borrow and Storage Area is used for GM stockpiles, engineering controls may be required to provide an adequate FOS. Without engineering controls, storage areas could exhibit minor impacts as a result of geotechnical instability, which would potentially result in GM and alluvium sliding outside of the designed footprint, covering water management features, and potentially resulting in adverse effects on surface water quality. However, the maximum GM, alluvium, and colluvium material needed for the cover and other reclamation, and the GM, alluvium, and colluvium to be handled, would be less than 25 percent of the volume proposed for the overburden piles in the Proposed Action. It would also be expected to be much less than this amount because the GM and alluvium would typically be excavated and used as it was needed rather than stockpiling all of it at once. Thus, the potential for and effects of slope and pile geotechnical failures is considered.

Stability of Overfill Piles 1, 2, and 3 was not assessed quantitatively. However, similar material type, slope angle, and topographic position indicate that FOS would likely be similar to those calculated for the Pit Backfill and the South External Overfill Pile in the Proposed Action (**Table 4.1-1**). The FOS of the overfill piles would be enhanced because the downhill toes of the overfill piles would be buttressed by the pit backfill, which in turn would be buttressed by the southwest pit walls.

HR-5 traverses steeper side slopes than the Proposed Action Haul Road and would carry a higher potential for minor cut slope failures. Under the RCA, haul roads would occupy 19.6 acres of map unit HAX and 11.8 acres of map unit PCM. If additional monitoring well roads are needed, they would carry a minimal potential for minor cut slope failures during mining, and would be reclaimed by backfilling the road prism, which would eliminate the exposed cut slope and the corresponding potential of failure. The RCA would not have permanent external overburden piles downslope of the mine, thus eliminating the potential of overburden pile stability failure. Construction of a runon diversion ditch parallel to the access road upslope of the pit would reduce potential surface water runon draining down the west flank of Rasmussen Ridge over the pit crest compared to the Proposed Action, and would reduce the minor amounts of post-reclamation pit wall instability contributed by freeze-thaw cycles. Overall potential effects of slope and pit wall instability under the RCA would be negligible.

4.1.1.2.2 Geochemistry

The geochemical characteristics of each rock type that would be produced from the open pit under the RCA would be the same as for the Proposed Action, but the volumes and percentages would change because of the changes in pit configuration, location, and depth. The volumes and percentages of each rock type that would be placed as backfill in the RCA pit would also change because of elimination of the external overburden piles and placement of a portion of the overburden in the South Rasmussen Mine pit. These changes affect the predicted source term concentrations of seepage from pit backfill that are applied in the contaminant fate-and-transport model and eliminate source terms associated with the external overburden piles. The overburden and ore material balances for the RCA are compared to the Proposed Action in **Table 4.1-4**.

4.1.1.2.3 Paleontology

Overall, the RCA has a moderate to high potential for beneficially affecting paleontological resources by encountering and documenting resources that would not otherwise have been discovered. The RCA also has a moderate to high potential for adverse effects (i.e., damage or destruction) on scientifically significant paleontological resources, including rare invertebrate fossils.

Under the RCA, the mine pit would be expanded north, and a higher volume of PFYC Class 5 geologic units would be disturbed by excavations than under the Proposed Action. Surface disturbances in areas of the Meade Peak Member of the Phosphoria Formation would affect 67 acres, 7 acres more than under the Proposed Action. Surface disturbances would affect 81 acres of the Dinwoody and Wells Formations, 56 acres more than under the Proposed Action. As a result, the potential for permanent impacts to paleontological resources would also be marginally higher. The RCA could have a beneficial effect for paleontology through the discovery and documentation of previously undocumented paleontological resources. The Agencies have identified a number of requirements that would be implemented to mitigate the potential for adverse effects as described in **Section 4.1.4.2**. With implementation of these measures, effects to paleontological resources under the RCA would be long-term and minor.

4.1.1.3 No Action Alternative

Current geologic, mineral, and paleontological resource trends within the analysis area would continue under the No Action Alternative. No direct or indirect impacts to geologic or mineral resources would occur as a result of implementation of the No Action Alternative.

4.1.2 Irreversible and Irretrievable Commitment of Resources

Under the Proposed Action or the RCA, removal of phosphate ore from the Rasmussen Valley Mine would represent an irreversible and irretrievable commitment of resources. Similarly, removal of geologic materials for cover system construction under the RCA and removal, combination, and alteration of separate and intact geologic rock types as overburden would be irreversible. Impacted mineral resources represent a small percentage of resources available for future use in southeastern Idaho.

Any loss of paleontological resources that would occur under the Proposed Action or the RCA would be irreversible and irretrievable. Paleontological resources discovered, documented, salvaged, and curated by the Agencies or surface owners during operations would not be lost.

Table 4.1-4 Material Balance Comparison for the Proposed Action and the RCA

Mine Facility		Million Tons of Material[4] Fullest Extent[1]	Permanent[2]	Material Balance[3] (%) BST	ALV	DCS	REX	HWM	CWS	COP	FWM	GTD	WEL
North Overburden Pile	PA[3]	3.44	1.13	4.4	6.8	41.5	26.5	---	---	---	---	20.1	0.8
	RCA[3]	0	0	---	---	---	---	---	---	---	---	---	---
South-South Overburden Pile	PA	4.61	4.61	5.4	6.3	47.1	25.8	---	---	---	---	15.2	0.2
	RCA	0	0	---	---	---	---	---	---	---	---	---	---
South Main Temporary Overburden Pile	PA	6.20	0	---	---	---	---	13.8	67.5	16.2	2.6	---	---
	RCA	0	0	---	---	---	---	---	---	---	---	---	---
North/Central and South Temporary Overburden Piles	PA	0.85	0	---	---	---	---	13.8	67.5	16.2	2.6	---	---
	RCA	7.33	0	---	6.5	1.4	9.5	4.9	33.8	8.9	2.7	18.5	13.7
Total Rasmussen Valley Mine Pit Backfill	PA	56.55	56.55	0.2	3.9	10.3	15.9	7.2	35.8	6.4	1.5	15.7	3.0
	RCA	70.39	70.39	1.0	4.5	6.0	18.6	5.3	29.8	7.4	1.6	15.5	10.2
Total P4 South Rasmussen Mine pit Backfill	PA	0	0	---	---	---	---	---	---	---	---	---	---
	RCA	13.17	13.17	---	8.0	4.1	16.0	7.8	29.3	6.9	1.9	8.8	17.1
Final Reclaimed Total	PA[5]	---	62.29	0.7	3.8	13.2	15.5	7.0	34.9	6.7	1.4	14.4	2.4
	RCA	---	83.57	0.8	5.1	5.7	18.2	5.7	29.7	7.3	1.6	14.4	11.3

Notes:

1 Difference between fullest extent and permanent is material that would be re-handled into pit backfill at the end of mining

2 Million tons of material at final reclamation

3 Abbreviations: PA = Proposed Action, RCA = Rasmussen Collaborative Alternative, ALV = alluvium, BST = basalt, DCS = Cherty Shale, REX = Rex Chert, HWM = hanging wall mud, COP = combined ore partings CWS = center waste, FWM = footwall mud, GTD = Grandeur Tongue, WEL = Wells Formation

4 May range from 0.57 to 0.71 loose cubic yards per ton (or million loose cubic yards [MLCY] per million tons) depending on type of material

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4.1.3 Unavoidable Residual Adverse Effects

Local geologic and mineral resources would be unavoidably impacted. Ore within the tract would be depleted by mining and, to a lesser extent, by the excavation and relocation of geologic material for the construction of support facilities under the Proposed Action and the RCA. Residual adverse effects to the availability of phosphate ore and other mineral and geological resources would be negligible in a regional (southeast Idaho) context.

Excavation and curation of any significant fossils encountered during construction or operation under the Proposed Action and the RCA would decrease the potential for adverse impacts to scientifically significant paleontological resources, but would not guarantee that all adverse impacts would be avoided.

Unavoidable adverse impacts of the RCA would be expected to be greater than those associated with the Proposed Action and No Action Alternative because of the greater volume of material that would be excavated under the RCA.

4.1.4 Mitigation Measures

4.1.4.1 Proposed Action

4.1.4.1.1 Geotechnical

Mine designs (such as overall slope and catch bench width) would be adapted as needed to respond to indications of pit wall instability.

A geotechnical engineering evaluation of the conditions in the Study Area was completed (STRATA 2013) which focused on the Proposed Action. This study identified the proposed South Main and North Overburden Piles as not exhibiting satisfactory slope stability. Three types of engineering mitigation measures were discussed to address slope instability: structural stabilization, dewatering, and earthwork. Overburden pile reconfiguration was mentioned, but dismissed without discussion.

Structural stabilization could be achieved by installing structural features such as retaining structures, drilled shafts, or driven piles. However, these engineering measures are generally used to stabilize existing landslides, not to provide a stable base for new material piles. In addition, structural stabilization for storage piles of the sizes proposed would be cost-prohibitive.

The FOS for the foundation and piles could be increased by dewatering the foundation soil or by providing subsurface drainage control to reduce subsurface pore water pressure buildup. Dewatering can be implemented before pile construction and can be monitored for effectiveness. Because of insufficient permeability of soils in the foundation analysis area, horizontal dewatering drains would provide the most effective form of foundation drainage control (STRATA 2013).

In addition to dewatering, a portion of the existing near surface foundation soil could be excavated and replaced with soil that exhibits more favorable engineering characteristics. Considering the large volume of material to be generated by mining and the proposed extent of external overburden storage piles, replacement of a portion of the existing soil below the storage piles with compacted mine material may be feasible. Replacement of a portion of the near surface subgrade with compacted mine material would reduce the pile size and surcharge loading, and would reduce the estimated settlement and pile deformation.

4.1.4.2 Rasmussen Collaborative Alternative

Mine designs (such as overall slope and catch bench width) for the RCA would be adapted as needed to respond to indications of pit wall instability.

Instability of overburden piles could be reconfigured to reduce pile height and pile slope, improving pile stability and reducing surcharge loading, but this option was not evaluated. Instead, the RCA was chosen (which eliminates the pile altogether), thus eliminating the potential impacts from pile instability.

4.1.4.2.1 Paleontology

Discovery of vertebrate macro fossils or unusual invertebrate fossils that may be scientifically significant would result in suspension of operations in that affected area until the appropriate BLM Authorized Officer (AO) is notified. The BLM or a BLM-designated paleontologist would evaluate the discovery and identify what course of action should be taken.

4.2 AIR RESOURCES, CLIMATE, AND NOISE

Issue: *What is the potential for emission of air pollutants, including those associated with airborne particulate matter from mining operations and mine traffic on haul roads and access roads?*

Indicators:

- Increased emissions of fugitive dust (airborne particulate matter) from proposed mining activities

Issue: *What is the potential to increase emissions from construction and operation and release greenhouse gas (GHG) emissions, which have been implicated in climate change?*

Indicators:

- Levels of carbon dioxide (CO_2), nitrous oxide (N_2O), and methane (CH_4) emissions from proposed mining activities; predicted cumulative effects
- Changes in global climate affecting operations and reclamation including cover performance

Issue: *What is the potential for noise impacts at sensitive receptors as a result of mine operations, mine traffic on haul and access roads, and blasting?*

Indicators:

- Predicted noise levels from mining operations, haul truck traffic related to mining, and access road traffic that are 1) experienced at sensitive receptors and residences and 2) at outdoor areas where people spend widely varying amounts of time
- The CNF RFP does not contain DFCs or general standards and guidelines for air resources, climate, or noise under forest-wide guidance or specific standards and guidelines under Prescription 8.2.(g). The DFC for air quality in Forest-wide direction is that "Air quality complies with Clean Air Act and other state requirements for Utah, Wyoming and Idaho." Compliance with these standards and requirements is discussed in this section.

4.2.1 Direct and Indirect Impacts

4.2.1.1 Proposed Action

4.2.1.1.1 Air Resources

Air resource impacts for the Proposed Action include fugitive dust and gaseous emissions that would occur during drilling, blasting, excavation, materials handling, vehicle operations, ore screening, haul road usage, ore transportation, wind erosion, a boiler, and other generators. The equipment used for the Proposed Action would be obtained from the Rasmussen Ridge Mines as operations there gradually conclude. Generators at the Rasmussen Ridge Mine Shop would continue to operate for the life of proposed mining activities. The difference would be that the location of the emissions would move 6 miles to the southeast, and differences in terrain and haul distances would affect the emission levels. Generally, the air resource impacts generated during the normal operations from the Rasmussen Ridge Mines would represent similar levels of noise and emissions for the Proposed Action. The Proposed Action and the Rasmussen Ridge Mines operate at similar levels and would use the same operating equipment; therefore, the emissions would be comparable.

The majority of impacts to air quality result from fugitive dust and emissions generated from both mobile and stationary equipment. Emissions from these types of operations are controlled by a fugitive dust control plan and equipment manufacturers' emission control standards.

Proposed Action Emissions

Mining operations would produce fugitive dust emissions. Particulate matter with a particle diameter of 10 microns and smaller (PM_{10}) size range is the measure of dust particulates that are considered respirable. The Proposed Action would include implementing several measures to control fugitive dust emissions that result from mining operations. These measures include use of water sprays at the screening operations; use of water sprays or chemical dust suppressants to minimize dust generation from vehicle and equipment traffic on roadways and exposed areas; and implementation of a phased mining approach such that excavation, haulage of ore and overburden, placement of materials in overburden piles, backfilling of pits, and capping of overburden and backfill would be timed to minimize the amount of acreage and material exposed to wind erosion.

Table 4.2-1 presents estimated worst-case annual controlled emissions for the Proposed Action. Emission estimates were developed using published USEPA air pollutant emission factors known as AP-42 (USEPA 2009), and stationary combustion emissions are referenced from the Rasmussen Ridge Mines air permit application (Agrium 2013). The Rasmussen Ridge Mines air permit application included emission estimates produced by the same fleet of stationary combustion sources to be relocated and used for the Proposed Action. The hours of operations and equipment fleet for both the Rasmussen Ridge Mines and Proposed Action are nearly identical; therefore, the emissions estimates are assumed to be comparable. AP-42 emissions factors were used to estimated fugitive emissions based on the Proposed Action mining operations.

Point-source emissions used in the emission estimates are referenced from the North Rasmussen Ridge Mine air permit application because the same equipment would be used for the Rasmussen Valley Mine. The emissions were calculated using AP-42 emission factors and engine emission certificates where applicable. The North Rasmussen Ridge Mine equipment would be reassigned to the Proposed Action; therefore, the impacts from stationary combustion sources would generally remain the same but would relocate 6 miles southeast of the North Rasmussen Ridge Mine.

Mobile tailpipe emission estimates were calculated using USEPA NONROAD engine modeling emission factors (USEPA 2010). Emission sources for the Proposed Action include the mobile equipment fleet for loaders, dozers, excavators, graders, water trucks, welding trucks, backhoes, school busses, blasting trucks, fuel trucks, service trucks, and other vehicles.

Mining operation emissions for the Proposed Action include blasting and explosives, drilling, screening, hauling, material handling, and wind erosion. AP-42 emission factors and emission estimating methods were used to calculate mining emissions.

The Pocatello Field Office (PFO) Approved Resource Management Plan (ARMP) and the CNF RFP, Prescription Areas 2.7.2(d), 6.2(b) and 8.2.2(g) were reviewed for any standards or guidelines applicable to air impacts other than compliance with state and federal regulations that have been discussed. There were no standards or guidelines for air emissions.

The majority of air emission impacts are produced during mobile transport. Control measures would be applied to mitigate emissions during mobile transport by means of water spray applied to haul roads and by vehicle manufacturer catalytic converters and air fuel controllers. The Proposed Action would impact the existing environment at similar levels compared to the existing Rasmussen Ridge Mines with the exception that the air impacts would shift 6 miles southeast because the equipment fleet and operations from Rasmussen Ridge Mine would essentially be reassigned and used for the Proposed Action. The impacts from the Proposed Action to air resources would be short-term and negligible.

4.2.1.1.2 Climate

Mining involves combustion of diesel and gasoline fuel for operation of mining and support equipment, which contribute GHG emissions to the atmosphere. Projected fuel consumption for the Proposed Action is estimated to be 3.5 million gallons annually (BC 2014c).

In accordance with 40 Code of Federal Regulations (CFR) Part 98, which finalized GHG reporting requirements for regulated sources, facilities must report GHG emissions if they meet the definition of one of the identified industry segments and emit 25,000 metric tons of CO_2 equivalent (CO_2e) or more per year in combined GHG emissions. An estimated air emission inventory for GHGs was performed for the Proposed Action and is estimated to emit 15,000 metric tons per year of CO_2e for the life-of-mine. CO_2e is a standard unit for measuring carbon footprints. Each gas has its own global warming potential (GWP) as a relative measure of warming impacts compared to carbon dioxide. CH_4 has a GWP of 21; therefore, 1 pound of CH_4 has a CO_2e of 21 pounds. N_2O has a GWP of 298. **Table 4.2-2** presents the estimated CO_2e emissions, which includes estimated impacts from CO, CH_4, and N_2O, for the Proposed Action applicable to the GHG reporting requirements. This value represents the potential to emit CO_2e assuming 8,760 operating hours per year. Given the estimated GHG emissions, the Proposed Action is not subject to the GHG reporting program because facility emissions are projected to be less than 25,000 metric tons per year.

The assessment of GHG emissions and their relationship to climate change is in its formative phase; therefore, it is not yet possible to know with confidence the net impact to climate from the Proposed Action. The lack of scientific tools designed to predict climate change on regional or local scales limits the ability to quantify potential future impacts with a strong degree of certainty.

Table 4.2-1 Potential Controlled Emissions Summary, Rasmussen Valley Mine Proposed Action[1]

Emission Source	PM_{10}		$PM_{2.5}$		SO_2		NO_X		CO		VOC	
	lb/hr	tons/yr	lb/hr	tons/yr	lb/hr	tons/yr	lb/hr	tons/yr	lb/hr	tons/yr	lb/hr	tons/yr
Stationary Fuel Combustion Sources												
Main Generator	0.44	1.9	0.37	1.6	0.44	1.9	4.7	20.4	1.3	5.6	0.14	0.63
Mine Shovel	0.032	0.14	0.032	0.14	0.14	0.60	0.52	2.3	0.55	2.4	0.52	2.26
Support Generator	0.85	3.7	0.85	3.7	0.79	3.5	4.1	18.0	2.2	9.7	4.11	18.0
Well Pump	0.22	1.0	0.22	0.96	0.21	0.90	3.1	13.6	0.67	2.9	0.25	1.1
Seasonal run-off Control Generators	0.082	0.36	0.08	0.36	1.0	4.4	2.7	11.9	0.48	2.1	2.7	11.9
Night Shift Light Plants	0.34	1.5	0.27	1.2	0.56	2.5	3.7	16.4	2.9	12.6	3.2	13.9
Steam Generation/Hot Water Boiler	0.23	1.0	0.011	0.050	0.00036	0.0016	0.23	1.02	0.13	0.59	0.018	0.080
Dust Suppression Generator	0.027	0.12	0.027	0.12	0.20	0.88	0.45	2.0	0.192	0.84	0.47	2.0
Contractor Building Generator	0.059	0.26	0.059	0.26	0.18	0.81	0.69	3.0	0.73	3.2	0.69	3.04
Mine Pit Equipment Generator	0.11	0.50	0.11	0.50	0.11	0.47	1.6	7.1	0.35	1.5	0.13	0.57
Mobile Fuel Combustion Sources												
Mobile Equipment Engines	14.8	64.7	14.8	64.7	15.8	69.1	447.8	1961.3	255.8	1120.5	23.6	103.2
Mining												
Blasting & Explosives	0.0024	0.011	0.00014	0.00061	0.089	0.39	0.75	3.30	2.97	13.0	--	--
Drilling	0.069	0.30	0.069	0.30	--	--	--	--	--	--	--	--
Screening	0.030	0.13	0.0020	0.0088	--	--	--	--	--	--	--	--
Hauling	67.4	295.1	6.7	29.5	--	--	--	--	--	--	--	--
Material Handling	0.074	0.33	0.011	0.049	--	--	--	--	--	--	--	--
Wind Erosion	0.82	3.6	0.12	0.54	--	--	--	--	--	--	--	--
Tanks												
Storage Tanks	--	--	--	--	--	--	--	--	--	--	0.0065	0.028
Project Total	**86**	**375**	**24**	**104**	**19**	**85**	**470**	**2,060**	**268**	**1,175**	**36**	**157**

Notes:

1 Units are pounds per hour (lb/hr) and short tons per year (tons/yr)

Source: Agrium 2013, Arcadis 2015f

Abbreviations: PM_{10} – particulate matter less than 10 microns in diameter; $PM_{2.5}$ - particulate matter less than 2.5 microns in diameter; SO_2 – sulfur dioxide; NO_x – oxides of nitrogen; CO – carbon monoxide; VOC – volatile organic compound

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Table 4.2-2 Stationary Sources of Greenhouse Gas Emissions[1]

Emission Source	CO_2e	
	lb/hr	**tons/yr**
Main Generator	1,252	5,483
Mine Shovel	77	336
Support Generator	444	1,946
Well Pump	115	502
Seasonal Runoff Control Generators	1,082	2,435
Night Shift Light Plants	1,151	3,781
Steam Generation/Hot Water Boiler	197	862
Dust Suppression Generator	112	491
Contractor Building Generator	114	498
Mine Pit Equipment Generator	60	261
Project Total	**4,603**	**16,595**
	15,054 metric tons/yr	

Notes:
1 Units are pounds per hour (lb/hr) and short tons per year (tons/yr)
Source: Arcadis 2015f

The Proposed Action anticipates nearly identical GHG-emitting stationary sources to the Rasmussen Ridge Mines during the active mining period of 3.9 years. There is an addition of 1 year before and 1 year subsequent to the active mining period to account for infrastructure development and final reclamation, respectively. During these periods, there would be less equipment operating and therefore less GHG emissions. Conclusions demonstrate that the emissions from the Proposed Action would not increase the annual GHG emissions but only extend the duration of emissions by 5.8 years. Effects of the Proposed Action on GHG emissions and climate change would continue after the mine is closed as a result of the long (estimated 100 years) residence time for certain GHGs in the atmosphere. The effects of the Proposed Action on climate change would be long-term and negligible.

The effects of climate change on the Proposed Action would be long-term. The U.S. Global Change Research Program (USGCRP) states "Changes in the timing of streamflow related to changing snowmelt are already observed and will continue, reducing the supply of water for many competing demands and causing far-reaching ecological and socioeconomic consequences" (Mote et al. 2014). Current climate models for the northwestern U.S. indicate that warmer winter temperatures will shift the average timing of snowmelt and surface water runoff to earlier in the year. Runoff and infiltration for the proposed cover systems is expected to increase during the winter months and early spring, but will be lower during the late spring and summer. Climate models also predict a 13 percent increase in storms with precipitation greater than 1 inch. This change would increase the average volume of runoff and infiltration generated by individual storms, but it is uncertain if the total volume of runoff and infiltration during an average year would be greater or less than currently predicted. These trends are projected starting several decades in the future and extending to the end of the century. The duration of the project, including initial reclamation, would be 5.8 years for the Proposed Action and 7.1 years for the RCA. Projected changes in climate over this period would not be expected to have appreciable impacts on the operation of the mine or initial reclamation activities.

An increase in precipitation may increase percolation rate and site-related COPC leaching through the proposed cover systems. However, increased infiltration will also increase groundwater flux, resulting in greater dilution of leaching COPCs in the underlying aquifer systems. For decrease in precipitation under assumed global climate change, the overall rate of precipitation infiltrating the cover may be lower, but it may be offset by the increased percentage of storms with precipitation of more than 1 inch. Long-term changes in the frequency and timing of precipitation and snow melt could affect how the Proposed Action cover performs, and could cause adjustments in the plant community. These long-term changes could be moderate.

4.2.1.1.3 Noise Resources

Noise from equipment operation, vehicle use (both on site and on the area road system), and blasting can affect the environment for humans and wildlife, including the quality of the recreational user's experience on a given property, potentially diminishing the quality of that site for a particular endeavor.

Noise from activity during the operations of the Proposed Action would primarily be generated by site equipment, blasting, drilling, and traffic to and from the site.

Noise may also affect wildlife usage of the property. Chronic or episodic noise-related disturbance may result in wildlife movement away from the source of disturbance, as well as the quality of wildlife-based recreation for hunting, trapping, and nature study.

Predicted noise levels from mining experienced at sensitive receptors and residences are considered adverse if they are higher than the USEPA guideline of 55 A-weighted decibels (dBA), and those experienced at outdoor areas where people spend widely varying amounts of time are also considered adverse if they are higher than the USEPA guideline of 55 dBA. The USEPA identifies outdoor noise limits to protect against effects on public health and welfare by an equivalent sound level (L_{eq}), which is an A-weighted average measure over a given time. Outdoor limits of 55 dBA L_{eq} have been identified as desirable to protect against speech interference and sleep disturbance for residential areas and areas with educational and healthcare facilities. Site noise levels are generally acceptable to most people if they are exposed to outdoor noise levels of 65 dBA L_{eq} or less, potentially unacceptable if they are exposed to levels of 65 to 75 dBA L_{eq}, and unacceptable if exposed to levels of 75 dBA L_{eq} or more (USEPA 1981).

Most of the equipment that would be on site at the Proposed Action generates sound levels at or below 90 dBA L_{eq} at 50 feet. **Table 4.2-3** summarizes estimated noise levels at 50 feet generated by intermittent activity at the mine. To calculate the impact of a point source, the noise levels are mathematically propagated using the Inverse Square Law of Noise Propagation (Harris 1991). This formula states that noise decreases by 6 dBA with every doubling of the distance from the source.

Table 4.2-3 Sound Levels for Applicable Noise Sources

Noise Source	Mean Noise Level at 50 Feet Lmax (dBA)
Haul Truck	80
Blasting	94
Front End Loader	80
Generators	82
Excavator	85
Blast Hole Drill	85

Source: U.S. Department of Transportation (USDOT) 2006

Noise levels drop progressively with distance from the source. There are few sensitive receptors in the vicinity. The nearest residence or area of human activity is a seasonal residence 0.5 mile south of the Study Area. Current mine activities cause only minor noise impacts on any off-site human receptors because the distances to the nearest occupied areas are sufficient to attenuate the noise of the heavy equipment to near background levels. Intermittent blasting can be audible, but is at low enough volume and frequency to be considered minor.

An L_{eq} for blasting is not typically used as a measurement. Instead, a maximum sound level (L_{max}) was used to determine a noise estimate. This estimate does not account for natural attenuation of noise when blasting is occurring below grade in the pit or additional attenuation of noise as a result of natural topography and vegetation. Topographic and vegetative features would further decrease noise levels.

Noise levels at other operating phosphate mines in the area would represent typical noise levels for the Proposed Action. The effect of multiple noise sources is not a simple addition, but rather a logarithm. For example, if two identical and adjacent sources each produce a noise level of 65 dBA at 50 feet from the source, the total noise produced by both sources would be 68 dBA at 50 feet.

The PFO ARMP and the CNF RFP, Prescription Areas 2.7.2(d), 6.2(b) and 8.2.2(g) were reviewed for any standards or guidelines applicable to noise impacts other than compliance with state and federal regulations that have been discussed. There were no standards or guidelines for noise impacts.

Based on doubling distances of the L_{eq}, sensitive noise receptors would not be impacted by noise generated at the mine. Even without attenuation of noise by natural and man-made barriers, noise levels would be lower than the USEPA guideline of 55 dBA for each source at a distance less than 0.5 mile. The L_{eq} for most noise sources are below 85 dBA at 50 feet; therefore, based on the Inverse Square Law of Noise Propagation, the noise would disseminate below the USEPA guideline of 55 dBA for acceptable environmental noise at 0.3 mile. The noise effects from the Proposed Action would be short-term and negligible or minor at the closest residence as a result of the distance from the mine.

4.2.1.2 Rasmussen Collaborative Alternative

4.2.1.2.1 Air Resources

Annual air emission impacts for the RCA are similar to those associated with the Proposed Action for gaseous emissions but would produce higher particulate emissions. The mining equipment and operating hours for the RCA would remain the same as those for the Proposed Action; therefore, the tailpipe and stationary air emission impacts are estimated to be the same. The RCA would reduce overburden and ore stockpiles from the Proposed Action, therefore reducing potential fugitive dust emissions from wind erosion and material handling. The RCA alters the haul route from the Proposed Action, increasing the ore hauling distance, potentially increasing the fugitive dust emissions. Generally, the impacts between the RCA and the Proposed Action would be from fugitive particulate emissions related to mining operations such as hauling, material handling, and wind erosion. As presented in **Table 4.2-4**, the estimated potential controlled emissions for the RCA would increase from the Proposed Action by 50 tons of PM_{10} and 5 tons of $PM_{2.5}$ per year.

The RCA includes direct placement of Rasmussen Valley Mine overburden in the South Rasmussen Mine backfill area, thus eliminating the need for stockpiles downslope of the pit. This reduces the overburden pile area and reduces the frequency of overburden pile disturbance, resulting in reduced particulate emissions compared to the Proposed Action.

The maximum project-related surface disturbance of the RCA is 73 acres more than that calculated for the Proposed Action; therefore, particulate emissions generated from surface wind erosion are estimated to be higher for the RCA. However, the disturbance from the project under the RCA would be spread over an additional 1.3 years (7.1 years in comparison to 5.8 years for the Proposed Action).

The RCA haul route extends 3 miles longer than the Proposed Action route. Compared to the Proposed Action, an additional 6 vehicle miles of hauling emissions from the mine pit to the Wooley Valley Tipple Area are associated with the RCA. Particulate emissions from haul trucks would increase as a result of this haul route change.

Although potential particulate air impacts from wind erosion are reduced from the Proposed Action impacts, the overall annual potential particulate air emissions for the RCA would be higher as a result of the increase in total vehicle miles traveled for hauling material under the RCA plan.

The impacts from the RCA to air resources would be short-term and negligible.

4.2.1.2.2 Climate

The RCA anticipates nearly identical GHG-emitting stationary sources to the Rasmussen Ridge Mine during the active mining period of 4.8 years. There is an addition of 1 year before and 1 year subsequent to the active mining period to account for infrastructure development and final reclamation, respectively. During these periods, there would be less equipment operating and therefore less GHG emissions. Therefore, we concluded that the emissions from the RCA would not increase the annual GHG emissions but only extend the duration by 7 years beyond those of the North Rasmussen Mine. The estimated contribution to climate change for the RCA would be approximately 20 percent more than the levels described in the Proposed Action as a result of the longer life-of-mine. **Table 4.2-2** presents GHG emissions for the Proposed Action, which are representative of the annual RCA impacts. The effects of the RCA on climate change would be long-term and negligible.

As discussed in **Section 4.2.1.1.2**, regardless of the effects of RCA on climate change, there are observable trends in climate change. These changes will be negligible over the 7.1-year RCA life-of-mine. Long-term changes in the frequency and timing of precipitation and snow melt could affect how the RCA cover performs, and could cause adjustments in the plant community. These long-term changes could be moderate.

4.2.1.2.3 Noise Resources

Although the haul routes have changed in the RCA, there are still very few sensitive receptors in the RCA Study Area that would be noticeably impacted differently from the Proposed Action. As explained in the Proposed Action, noise is directly related to distance from the source to the receptors. The sensitive receptors would continue to maintain a very similar distance to the RCA noise sources. The noise impacts from the RCA are expected to be short-term and negligible or minor at the closest residence as a result of the distance from the mine.

Table 4.2-4 Potential Controlled Emissions Summary, Rasmussen Valley Mine under the RCA

Emission Source	PM_{10}		$PM_{2.5}$		SO_2		NO_X		CO		VOC	
	lb/hr	tons/yr	lb/hr	tons/yr	lb/hr	tons/yr	lb/hr	tons/yr	lb/hr	tons/yr	lb/hr	tons/yr
Stationary Fuel Combustion Sources												
Main Generator	0.44	1.9	0.37	1.6	0.44	1.9	4.7	20.4	1.3	5.6	0.14	0.63
Mine Shovel	0.032	0.14	0.032	0.14	0.14	0.60	0.52	2.3	0.55	2.4	0.52	2.26
Support Generator	0.85	3.7	0.85	3.7	0.79	3.5	4.1	18.0	2.2	9.7	4.11	18.0
Well Pump	0.22	1.0	0.22	0.96	0.21	0.90	3.1	13.6	0.67	2.9	0.25	1.1
Seasonal run-off Control Generators	0.082	0.36	0.08	0.36	1.0	4.4	2.7	11.9	0.48	2.1	2.7	11.9
Night Shift Light Plants	0.34	1.5	0.27	1.2	0.56	2.5	3.7	16.4	2.9	12.6	3.2	13.9
Steam Generation/Hot Water Boiler	0.23	1.0	0.011	0.050	0.00036	0.0016	0.23	1.02	0.13	0.59	0.018	0.080
Dust Suppression Generator	0.027	0.12	0.027	0.12	0.20	0.88	0.45	2.0	0.192	0.84	0.47	2.0
Contractor Building Generator	0.059	0.26	0.059	0.26	0.18	0.81	0.69	3.0	0.73	3.2	0.69	3.04
Mine Pit Equipment Generator	0.11	0.50	0.11	0.50	0.11	0.47	1.6	7.1	0.35	1.5	0.13	0.57
Mobile Fuel Combustion Sources												
Mobile Equipment Engines	14.8	64.7	14.8	64.7	15.8	69.1	447.8	1961.3	255.8	1120.5	23.6	103.2
Mining												
Blasting & Explosives	0.0024	0.011	0.00014	0.00061	0.089	0.39	0.75	3.30	2.97	13.0	--	--
Drilling	0.069	0.30	0.069	0.30	--	--	--	--	--	--	--	--
Screening	0.030	0.13	0.0020	0.0088	--	--	--	--	--	--	--	--
Hauling	78.7	344.9	7.9	34.5	--	--	--	--	--	--	--	--
Material Handling	0.071	0.31	0.011	0.047	--	--	--	--	--	--	--	--
Wind Erosion	0.76	3.3	0.11	0.50	--	--	--	--	--	--	--	--
Tanks												
Storage Tanks	--	--	--	--	--	--	--	--	--	--	0.0065	0.028
Project Total	**97**	**424**	**25**	**109**	**19**	**85**	**470**	**2,060**	**268**	**1,175**	**36**	**157**

Source: Agrium 2013; Arcadis 2015f

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4.2.1.3 No Action Alternative

Under the No Action Alternative, direct impacts of air emissions and noise from the Proposed Action would not occur; therefore, air, and noise quality would remain at ambient levels.

Under the No Action Alternative, indirect impacts to climate would remain at ambient levels as North Rasmussen Mine concludes operation.

Under the No Action Alternative, noise associated with the Proposed Action would not occur, and ambient noise levels would remain unchanged in the analysis area. Under the No Action Alternative, the federal phosphate leases would not be developed; however, this does not preclude future development of the federal phosphate leases under a different mine plan.

4.2.2 Irreversible and Irretrievable Commitment of Resources

The Proposed Action and the RCA would include development of permanent external overburden piles. These piles could potentially generate fugitive dust emissions from wind erosion. To mitigate irreversible air quality impacts from these piles, the reclamation plan for both the Proposed Action and RCA includes revegetation on these disturbed areas. Vegetation on the surface of the disturbed areas will reduce potential fugitive dust emissions and minimize irreversible air quality conditions. Once the active mining period is complete and the reclamation of the mine is complete, the air resources will potentially be restored and recovered to its natural state. There are no implications leading to irreversible and irretrievable commitment of the air quality.

The estimated contribution to climate change for the RCA are estimated to be similar to the current levels, as described in the Proposed Action impacts. GHG emissions from both the RCA and Proposed Action are estimated below the federal reporting limit and are considered to have negligible impact to irreversible and irretrievable commitments on climate change.

Noise impacts from the Proposed Action and the RCA are expected to be short-term and unnoticeable or minor at the closest residence to the mine. Under either the Proposed Action or the RCA, once the active mining period is completed, the noise condition would be restored to its natural state, and there would be no irreversible and irretrievable commitment of resources.

4.2.3 Unavoidable Residual Adverse Effects

For the Proposed Action and the RCA, an unavoidable residual adverse impact to air resources would occur if revegetation efforts were not successful, thus resulting in a greater potential to generate particulate emission caused by wind erosion. The effects of both the Proposed Action and the RCA to climate would be long-term and negligible and to noise resources would be short-term and negligible and would have no residual adverse effects.

For the Proposed Action and the RCA, an unavoidable residual adverse impact on climate change is not expected to occur because climate change impacts will cease when the active mining period is completed.

For the Proposed Action and the RCA, an unavoidable residual adverse impact on noise is not expected to occur because noise impacts will cease when the active mining period is completed.

4.2.4 Mitigation Measures

To minimize impacts to air resources to an acceptable level, Agrium would apply mitigation measures to reduce or avoid impacts to air quality. Agrium would mitigate particulate emissions by application of water or supplementary dust suppressants, such as magnesium chloride or calcium chloride, as necessary, and liquid dust suppressants would be used for all blast hole drilling operations (Agrium 2011). Dust abatement techniques would be general mitigation practices and principles followed by Agrium. These techniques include keeping soils moist while loading into dump trucks, covering construction materials and stockpiled soils if they are a source of fugitive dust, controlling speed limits to reduce airborne fugitive dust cause by vehicular traffic, and revegetating disturbed areas as soon as possible after disturbance. No additional mitigation measures would be needed for air resources.

Portions of the Mine Reclamation Plan are elements of the Proposed Action and RCA designed to reduce environmental impacts. The Mine Reclamation Plan includes general mitigation measures for backfill sequence, haul roads, store-and-release cover, revegetation, and removal of all mine equipment and facilities. The plan includes actions to seed, fertilize, and covered disturbed areas with GM. No mitigation measures are defined in the Mine Reclamation Plan for noise impacts, but individual sources employ several physically attachments to reduce noise impacts. Mufflers on engines, shields on particular pieces of equipment, and enclosures surrounding specific operation areas are all examples of mitigation measures for noise.

4.3 WATER RESOURCES

Issue: *What is the potential for changes to the volume and timing of surface water runoff and flow patterns to impact the Lanes Creek, Angus Creek, and Blackfoot River drainages and local, intermediate, and regional aquifers?*

Indicators:

- Changes in volume, rates, or timing of runoff of runoff, flow patterns, base and peak flows, recharge rates, or volume or rates to local, intermediate, and regional aquifers

Issue: *What is the potential for changes in sediment, turbidity, and COPC loading to impact Lanes Creek, Angus Creek, Blackfoot River, wetlands, ponds, and springs and the impacts of those changes to surface water quality accessed by humans, wildlife, and aquatic organisms or cause non-compliance of the water bodies with applicable water quality standards?*

Indicators:

- Predicted changes in sediment loads, turbidity, concentrations of COPCs in springs, wetlands and waters of the U.S. (WOUS), ponds, Lanes Creek, Angus Creek, and Blackfoot River

Issue: *What is the potential for changes in concentrations of COPCs downgradient of the proposed mine facilities to impact the quality of groundwater accessed by humans and create non-compliance of the groundwater with applicable water quality standards?*

Indicators:

- Changes in concentrations of COPCs in groundwater

Issue: What is the potential that reduction in groundwater discharge to Lanes Creek, Angus Creek, Blackfoot River, ponds, springs, and wetlands would affect water availability for humans, wildlife, and aquatic organisms?

Indicators:

- Estimated changes to base flow in streams, pond water levels, spring flows, and wetland areas
- Increased depth to groundwater

The CNF RFP (USFS 2003) contains goals, standards, and guidelines specific to managing surface water resources under various types of activities that may occur on the CNF. For mining and road construction, forest-wide guidance and DFCs that apply to water resources are reviewed and evaluated. On a watershed basis for surface waters, the CNF guidelines specify that not more than 30 percent of any of the principal watershed or their sub-watersheds (6th level hydrologic unit code [HUC]) should be in a hydrologically disturbed condition at any one time. Hydrologically disturbed conditions for the Proposed Action and alternatives are evaluated in the following sections.

The CNF RFP (USFS 2003) notes that the USEPA and U.S. Geological Survey (USGS) assessed the upper Blackfoot River watershed (5th HUC) with rating 5, on their 1 to 6 Index of Watershed Indicators (IWI). This rating indicates "more serious water quality problem, low vulnerability", which means the existing condition may not meet the designated uses, but the vulnerability to additional stressors (such as pollutant loadings) is low. The IWI assesses two different aspects of aquatic resource health: condition and vulnerability. Condition indicators are designed to show existing water quality across the country. These indicators include such things as waters meeting state or tribal designated uses, contaminated sediments, ambient water quality, and wetlands loss. Vulnerability indicators are designed to indicate where pollution discharges and other activities put pressure on the watershed. These could cause future problems to occur. Activities in this category include pollutant loads discharged in excess of agency-approved levels, pollution potential from urban and agricultural lands, and changes in human population levels.

4.3.1 Direct and Indirect Impacts

Potential impacts to water resources were evaluated using numerical models to estimate seepage rates from the proposed mine facilities and to simulate the transport of COPCs in groundwater and surface water. The models were based on data and analysis presented in Whetstone (2015a,b) and (BC 2015a,b). Supporting documentation for the numerical models and the water resources impact evaluation are presented in the Groundwater Modeling Report (Arcadis 2015g), Cap and Cover Alternatives Analysis Report (BC 2015a), and the Source Term Report (Whetstone 2015c).

4.3.1.1 Proposed Action

4.3.1.1.1 Conceptual Hydrologic and Geochemical Models for Mine Facilities

Open Pit and Backfill

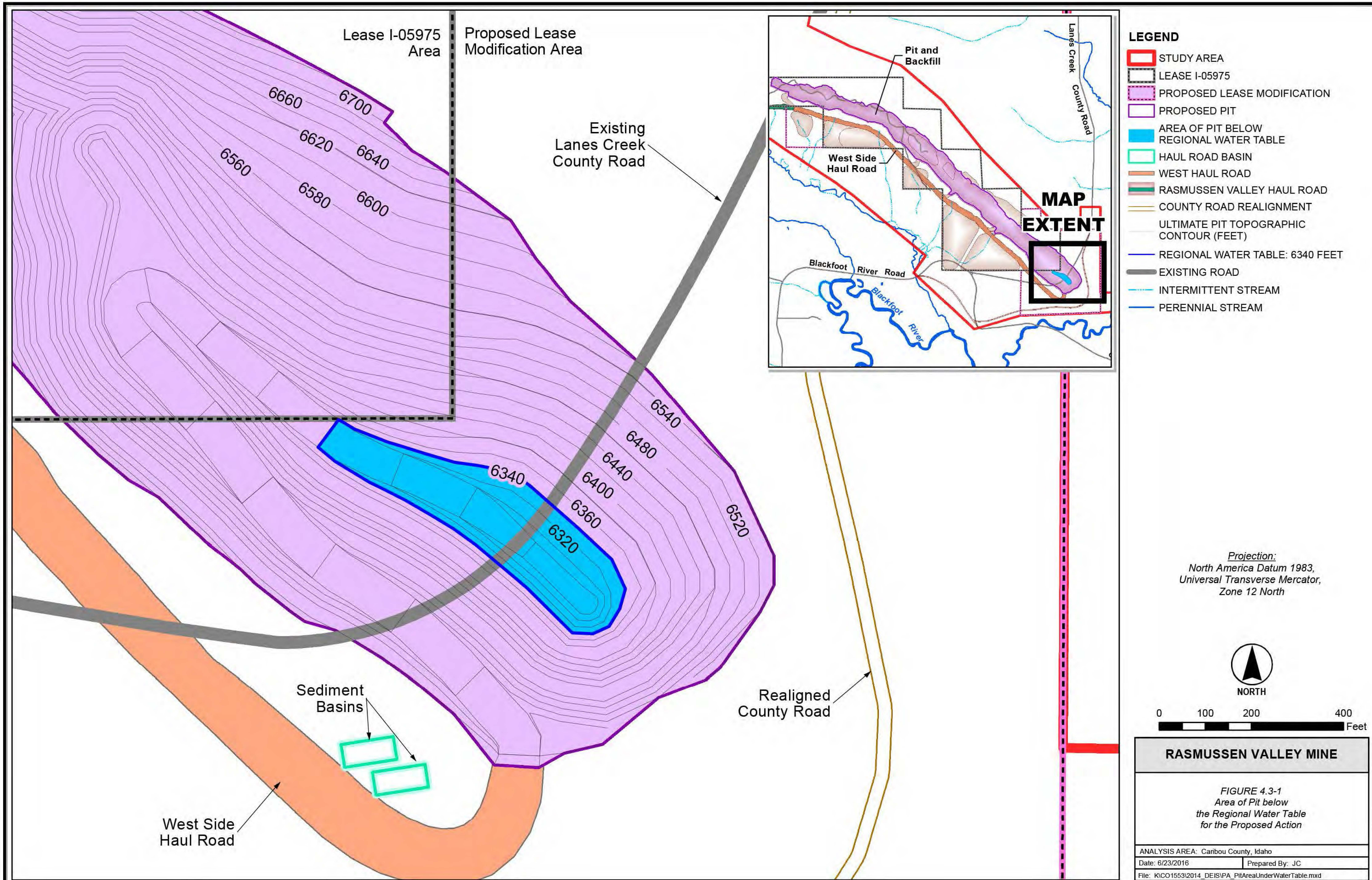
The open pit and backfill, including the North and South External Overfill areas, would have a length of 2.4 miles and a footprint of 195.4 acres (**Figure 2.3-2**). Excavation of the pit would progress from southeast to northwest and would be completed in six phases over 3.9 years. The elevation of the pit floor would decrease to the southeast and have a minimum level of 6,280 feet above mean sea level (amsl).

Mining below 6,340 feet amsl would be below the water table in the Wells Regional Aquifer, and dewatering using an in-pit sump would be required to facilitate excavation of the pit below this level (**Figure 4.3-1**). Numerical modeling by Arcadis (2015g) indicates that the dewatering discharge rate would need to be 4,300 gallons per minute (gpm) for 7 to 8 months during Phase 1 mining to keep excess water from collecting in the bottom of the pit. Groundwater levels in the Wells Regional Aquifer are projected to rebound to the pre-mining level in 3 months once pumping stops after the completion of Phase 1 mining.

Limited volumes of groundwater would also be encountered at higher elevations in the pit. This inflow would originate from alluvium, the Rex Chert, and to a lesser extent the Meade Peak Member. These strata would drain rapidly after being opened, but would generate water intermittently during the spring snowmelt or in response to precipitation events. Agrium's proposal to handle water that accumulates in the pit from runoff, precipitation, or groundwater inflow would be to collect it in a sump at the bottom of the pit. The sump water would then be allowed to infiltrate or pumped or hauled to unreclaimed backfill areas, where it would be dispersed and allowed to infiltrate. However, it is noted that, because of the south-to-north mining sequence, no areas of backfill would exist during Phase 1 mining to disperse and infiltrate the sump water, which would include an estimated 4,300 gpm inflow from the regional aquifer.

Backfilling of the pit would start by placing Phase 2 overburden into the Phase 1 pit concurrent with mining of Phase 2. The process of backfilling previous open pits with backfill from newly mined areas of the pit would continue as mining progressed north. Two external overburden overfill areas (North and South External Overfill) would be located on the east side of the pit and would be contiguous with the backfill. A total of 36.9 MLCY of material would be placed as backfill and overfill including basalt (0.2 percent), alluvium (3.9 percent), Cherty Shale (10.3 percent), Rex Chert (15.9 percent), Meade Peak (51.0 percent), Grandeur Tongue (15.7 percent), and Wells Formation (3.0 percent). The backfilled pit would be contoured to resemble the surrounding topography, capped with a minimum of 36 inches of non-Meade-Peak-containing material and 24 inches of GM, and re-vegetated. A portion of the northeast pit wall consisting of Grandeur Tongue or Wells Formation would remain exposed after final reclamation.

Precipitation falling on the capped backfill and overfill would either run off or evaporate, or infiltrate where it would either be stored in soil pore spaces, transpired by vegetation, or continue percolation downward below the cap. The backfill would also receive runoff from a 394-acre slope area on the northeast side of the pit. Runoff from upslope area would be allowed to enter the open pit during mining, but Agrium would have the option to intercept the flows from drainage areas 3 and 4 and divert it to drainage area 20, which drains into Lower Lanes Creek sub-watershed (**Figure 2.3-5**). Runoff from the unreclaimed backfill during construction would be captured in a collection ditch on the downslope side of the backfill and would be routed to the pit sump. The collection ditch would be located within the footprint of the pit to minimize infiltration to the alluvial aquifer. The final reclamation surface of the backfill would be graded to re-establish natural drainage patterns similar to the pre-mining configuration of the site. The proposed cover system is designed to limit the amount of meteoric water that would infiltrate through the overburden and prevent root uptake of selenium in cover vegetation. Runoff from the reclaimed backfill and overfill areas would have chemical characteristics similar to runoff from undisturbed ground, but may have increased turbidity and suspended solids during construction and initial reclamation that would be mitigated through the use of best management practices (BMPs) such as silt fences, straw wattles, and sediment basins.


Lease I-05975 Area
Proposed Lease Modification Area
Existing Lanes Creek County Road
6700
6660
6620
6640
6560
6580
6600
6540
6480
6440
6400
6360
6340
6320
6520
Sediment Basins
West Side Haul Road
Realigned County Road
Pit and Backfill
West Side Haul Road
Lanes Creek County Road
Blackfoot River Road
Blackfoot River
MAP EXTENT
LEGEND
STUDY AREA
LEASE I-05975
PROPOSED LEASE MODIFICATION
PROPOSED PIT
AREA OF PIT BELOW REGIONAL WATER TABLE
HAUL ROAD BASIN
WEST HAUL ROAD
RASMUSSEN VALLEY HAUL ROAD
COUNTY ROAD REALIGNMENT
ULTIMATE PIT TOPOGRAPHIC CONTOUR (FEET)
REGIONAL WATER TABLE: 6340 FEET
EXISTING ROAD
INTERMITTENT STREAM
PERENNIAL STREAM
Projection:
North America Datum 1983,
Universal Transverse Mercator,
Zone 12 North
NORTH
0 100 200 400
Feet
RASMUSSEN VALLEY MINE
FIGURE 4.3-1
Area of Pit below the Regional Water Table for the Proposed Action
ANALYSIS AREA: Caribou County, Idaho
Date: 6/23/2016
Prepared By: JC
File: K:\CO1553\2014_DEIS\PA_PitAreaUnderWaterTable.mxd

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Meteoric water that percolates through the cover and overburden would leach metals and other constituents from the overburden and continue downward into the Wells Regional Aquifer, where the contaminants would be transported to the northwest by the natural groundwater flow. The regional flow system does not discharge to surface water within the Study Area. The concentrations of metals and other constituents transported in groundwater away from the facility may be attenuated along the flow path by dilution, precipitation, or adsorption (Fuller and Davis 1987; Zachara et al. 1993; Hayes et al. 1987; Balistrieri and Chao 1990; Rajan 1979). A conceptual diagram illustrating the release of contaminants from the pit backfill is shown on **Figure 4.3-2**.

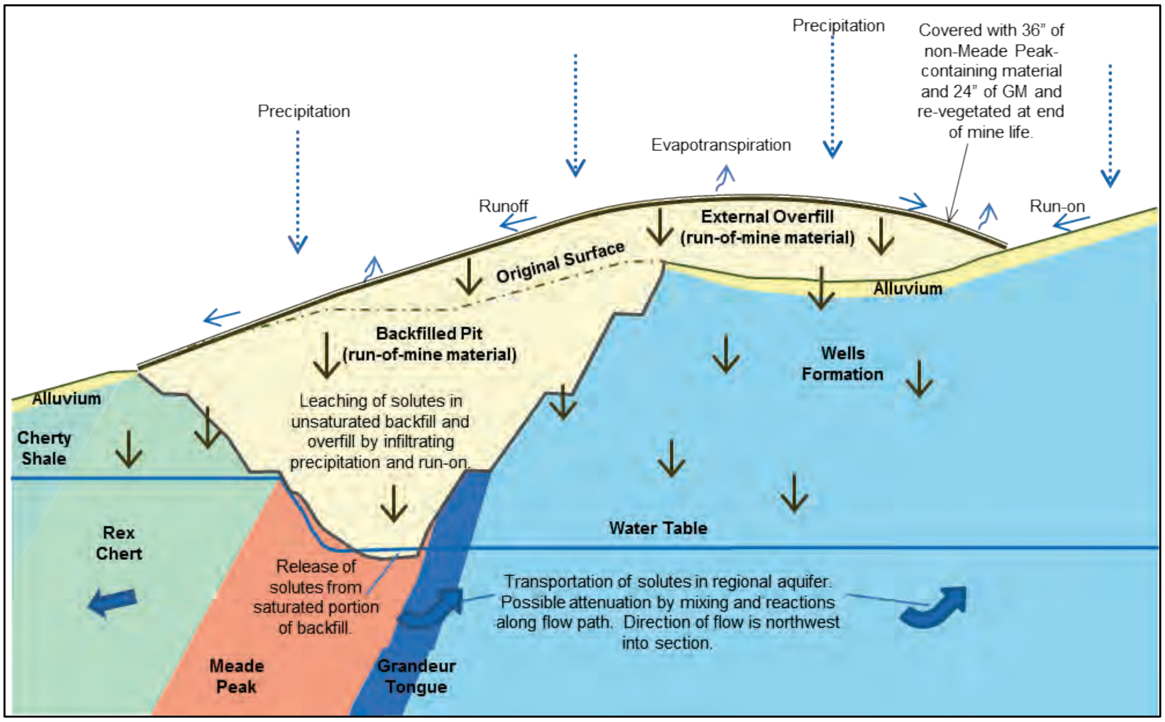


Figure 4.3-2 Conceptual Diagram Showing Runoff, Infiltration, and Solute Transport for Proposed Action Pit Backfill after Reclamation

North Overburden Pile

The North Overburden Pile would be located on the west (downslope) side of the pit near its northern extent (**Figure 2.3-2**). The North Overburden Pile would contain 2.1 MLCY of non-Meade-Peak overburden at its largest extent, including basalt (4.4 percent), alluvium (6.8 percent), Cherty Shale (41.5 percent), Rex Chert (26.5 percent), Grandeur Tongue (20.1 percent), and Wells Formation (0.8 percent). Construction of the North Overburden Pile would start during Phase 1 and continue through Phase 6. The majority of the pile would be re-handled and placed in the pit as backfill during Phase 6, and the remainder of the pile would remain in place as a permanent overburden pile that would remain after the end of mining. The final pile volume would be 0.7 MLCY. The permanent overburden pile would be reclaimed during Phase 6 with a final slope of 3H:1V and would be covered with no less than 12 inches of GM and re-vegetated.

Precipitation falling on the North Overburden Pile would either run off; evaporate; or infiltrate to be stored in soil pore spaces, transpired by vegetation, or continue percolating downward beyond the cap. Runoff from the facility during operation would be captured in a runoff collection ditch at the base of the pile and would be routed to sediment basins near the southwest corner of the pile, where it would infiltrate, evaporate, or be transported to other available approved storm water storage and infiltration areas. A ditch would also be located along the upslope edge of the pile to intercept and route runon to the storm water sediment basins. The ditch and basin locations overlie alluvium and alluvial aquifers such that water that infiltrates from the sediment basins is expected to percolate to the alluvial aquifers, have chemical characteristics similar to those of the seepage from the pile, and be transported west in the shallow alluvial aquifers toward Angus Creek. Storm water management structures would be designed to accommodate runoff from the 100-year, 24-hour storm event and would be reclaimed at the end of mining.

Meteoric water that percolates through the cover and overburden pile would leach metals and other contaminants into the alluvial aquifer, where they would be transported west in groundwater toward Angus Creek. The depth to groundwater below the North Overburden Pile ranges from 30 to 57 feet (**Table 3.3-16**) depending on location and season. Gain-loss studies (**Table 3.3-5**) and baseline monitoring data indicate that the upper sections of Angus Creek lose flow to groundwater during late summer and fall. The concentrations of metals and other constituents transported in groundwater away from the facility may be attenuated along the flow path by dilution, precipitation, or adsorption (Fuller and Davis 1987; Zachara et al. 1993; Hayes et al. 1987; Balistrieri and Chao 1990; Rajan 1979). A conceptual diagram illustrating the release of solutes from the North Overburden Pile is shown on **Figure 4.3-3**.

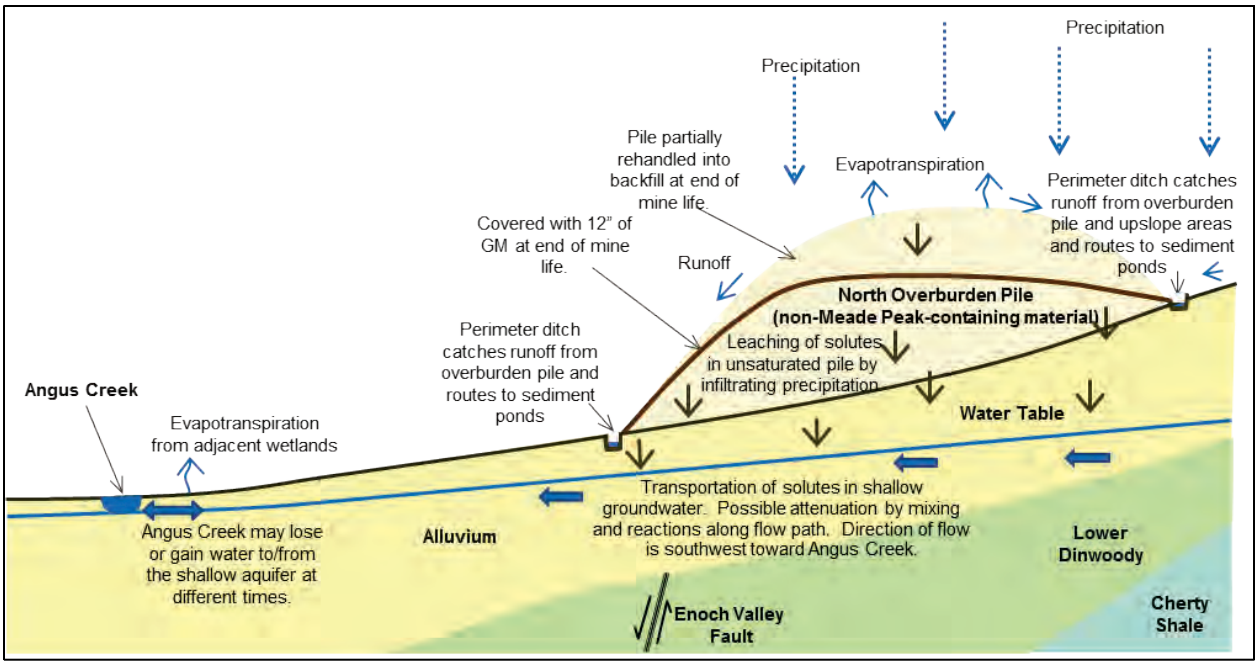


Figure 4.3-3 Conceptual Diagram Showing Runoff, Infiltration, and Solute Transport from the North Overburden Pile of the Proposed Action during Mining and after Reclamation

South-South Overburden Pile

The South-South Overburden Pile would be located on the west side of the pit and haul road, 800 feet to the east of Angus Creek (**Figure 2.3-2**). The facility would contain 2.8 MLCY of non-Meade Peak overburden and have a footprint of 32.8 acres. The projected material balance for the facility includes basalt (5.4 percent), alluvium (6.3 percent), Cherty Shale (47.1 percent), Rex Chert (25.8 percent), Grandeur Tongue (15.2 percent), and Wells Formation (0.2 percent). Construction of the South-South Overburden Pile would occur during Phase 1, with reclamation starting in Phase 2. The reclaimed pile would be contoured to a 3H:1V slope, covered with 12 inches of GM, and re-vegetated. The South-South Overburden Pile would be a permanent facility that would remain in place after the end of mining.

Precipitation falling on the South-South Overburden Pile would either run off, evaporate, be stored in soil pore spaces, or continue percolation downward below the cap. Runoff from the facility during operation would be captured in a runoff collection ditch at the base of the pile and would be routed to sediment basins near the southwest corner of the pile, where it would infiltrate, evaporate, or be transported to other available approved storm water storage and infiltration areas. A ditch would also be located along the upslope edge of the pile to intercept and route runon to the sediment basins. The ditch and basin locations overlie alluvium and alluvial aquifers. Water that infiltrates from the sediment basins is expected to percolate to the alluvial aquifers, have chemical characteristics similar to seepage from the pile, and be transported west in the shallow alluvial aquifers toward Angus Creek. Storm water management structures would be designed to accommodate runoff from the 100-year, 24-hour storm event and would be reclaimed at the end of mining.

Meteoric water that percolates into the South-South Overburden Pile would leach metals and other constituents into the underlying alluvial aquifers, where they would be transported west in groundwater toward Angus Creek. The depth to water below the South-South Overburden Pile ranges from 2 to 56 feet (**Table 3.3-16**) depending on location and season. Gain-loss studies (**Table 3.3-5**) and baseline monitoring data indicate that the lower sections of Angus Creek lose flow to groundwater during late summer and fall. The concentrations of metals and other constituents transported in groundwater away from the facility may be attenuated along the flow path by dilution, precipitation, or adsorption (Fuller and Davis 1987; Zachara et al. 1993; Hayes et al. 1987; Balistrieri and Chao 1990; Rajan 1979). A conceptual diagram showing the release of solutes from the South-South Overburden Pile is presented on **Figure 4.3-4**.

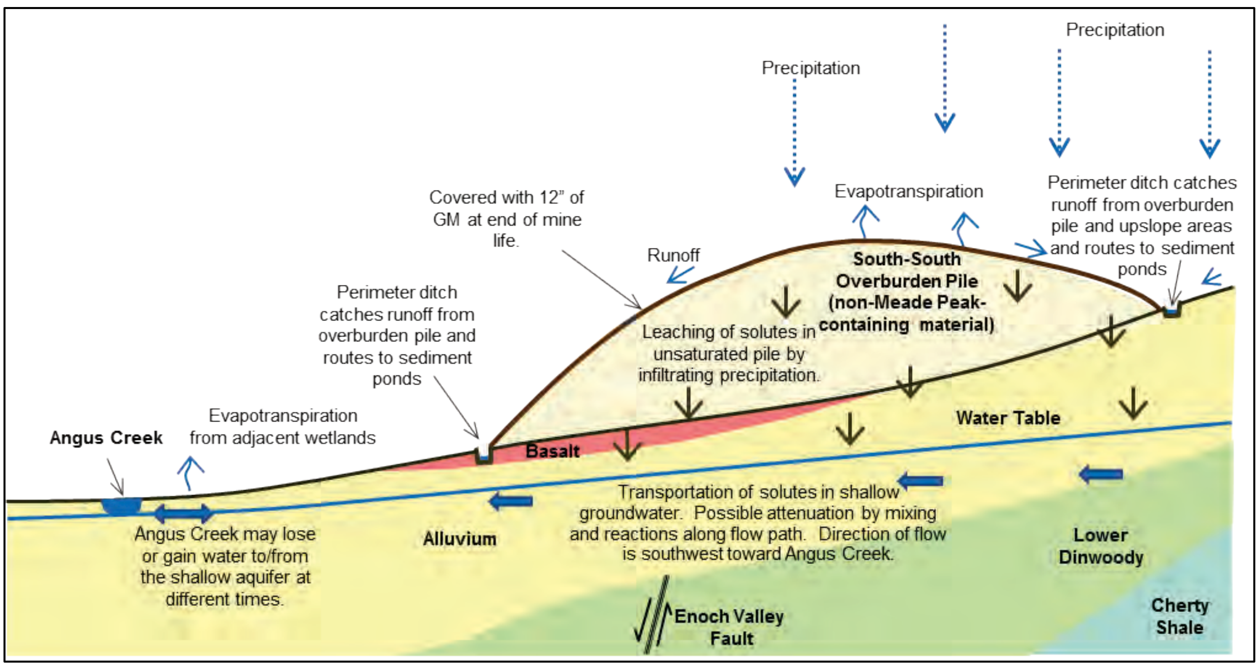


Figure 4.3-4 Conceptual Diagram Showing Runoff, Infiltration, and Solute Transport from the South-South Overburden Pile of the Proposed Action after Reclamation

South Main Temporary Overburden Pile

The South Main Overburden Pile would be a temporary facility located on the west side of the pit and haul road, 650 feet east of Angus Creek (**Figure 2.3-2**). The facility would contain 4.1 MLCY of Meade Peak overburden at its maximum extent, and would have a maximum footprint of 37.9 acres. The projected material balance includes hanging wall mud (13.8 percent), center waste (67.5 percent), upper and lower ore partings (16.2 percent), and footwall mud (2.6 percent). Construction of the South Main Temporary Overburden Pile would start during Phase 1 and continue through Phase 6. The pile would be removed and placed into the pit as backfill at the end of mining, and the site would be re-graded, covered with 12 inches of GM, and re-vegetated.

Precipitation falling on the South Main Temporary Overburden Pile would either run off, evaporate, or would infiltrate. Infiltration would be transpired by vegetation, stored in soil pore spaces, or continue percolation downward into the overburden. Runoff from the facility during operation would be captured in a perimeter ditch at the base of the pile and would be routed to sediment basins near the southwest corner of the facility, where it would infiltrate or evaporate or be transported to other available approved storm water storage and infiltration areas. A ditch would also be located along the upslope edge of the pile to intercept and route runon to the sediment basins. The ditch and basin locations overlie alluvium and alluvial aquifers. Water that infiltrates from the sediment basins is expected to percolate to the alluvial aquifers, have chemical characteristics similar to seepage from the pile, and be transported west in the shallow alluvial aquifers toward Angus Creek. Storm water management structures would be designed to accommodate runoff from the 100-year, 24-hour storm event and would be reclaimed at the end of mining.

Meteoric water that percolates into the South Main Temporary Overburden Pile would leach metals and other constituents into the alluvial aquifers, where they would be transported southwest in groundwater toward Angus Creek. The depth to water below the South Main Temporary Overburden Pile is 2 to 56 feet (**Table 3.3-16**) depending on season and location. Gain-loss studies (**Table 3.3-5**) and baseline monitoring data indicate that the lower sections of Angus Creek lose flow to groundwater during late summer and fall. The concentrations of metals and other constituents transported in groundwater away from the facility may attenuate along the flow path via dilution, precipitation, or adsorption (Fuller and Davis 1987; Zachara et al. 1993; Hayes et al. 1987; Balistrieri and Chao 1990; Rajan 1979). A conceptual diagram showing the release of solutes from the South Main Temporary Overburden Pile is shown on **Figure 4.3-5**.

Optional Ore Stockpile/Overburden Storage Area

The Optional Ore Stockpile/Overburden Storage Area, if constructed, would be located on the west side of the pit and haul road, between the South Main and North Overburden Piles, 1,200 feet east of Angus Creek (**Figure 2.3-2**). The facility would have a storage capacity of 0.18 MLCY and may be used to store ore or overburden depending on timing of ore transport and available backfill locations. The base of the facility would be constructed using 0.16 MLCY of non-Meade-Peak overburden. The material balance for the Optional Ore Stockpile/Overburden Storage Area has not been determined, but it may contain any rock type that is produced from the mine. All material in the facility would be removed at the end of mining, and the site would be re-graded, covered with 12 inches of GM, and re-vegetated.

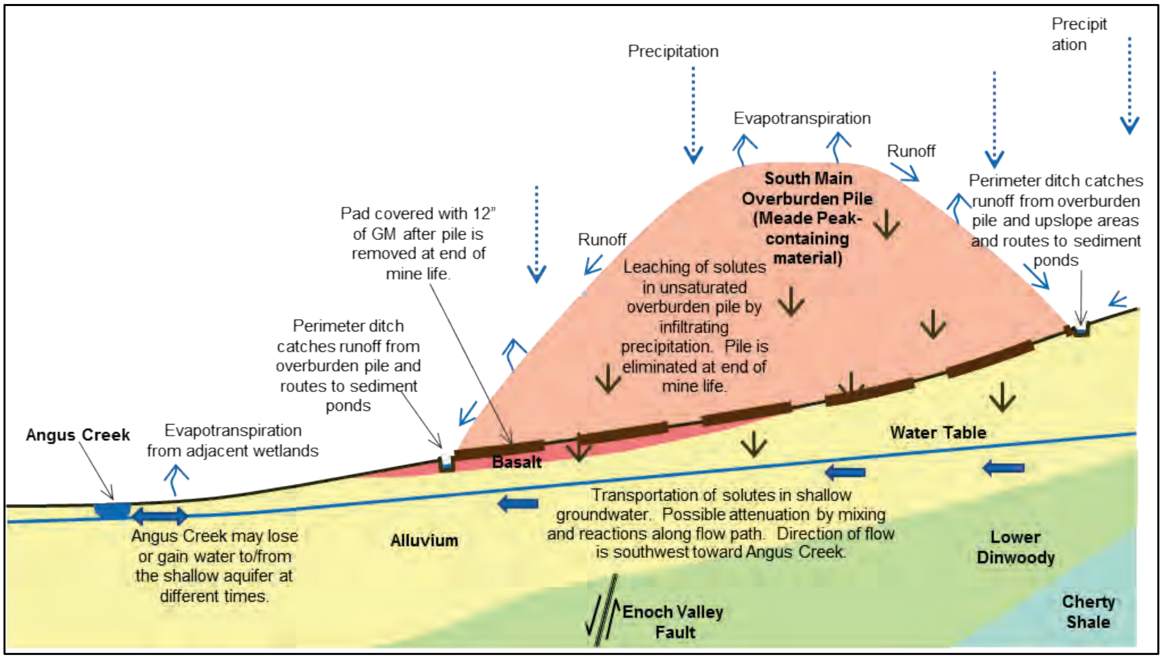


Figure 4.3-5 Conceptual Diagram Showing Runoff, Infiltration, and Solute Transport from the South Main Overburden Pile of the Proposed Action during Mining

Precipitation falling on the Optional Ore Stockpile/Overburden Storage Area while it is being used for ore would either run off, evaporate, or infiltrate. Infiltration would either be stored in ore pore spaces or continue percolation downward. No transpiration would occur because the piles would not be vegetated. If the Optional Ore Stockpile/Overburden Storage Area were used to permanently store overburden and was reclaimed, precipitation would either run off, evaporate, or infiltrate. The infiltration would either be stored in the soil pore space, be transpired by the re-vegetation plants, or continue percolation downward in much the same way as with the other external overburden stockpiles. Runoff from the facility during operation would be captured in a runoff collection ditch at the base of the pile and would be routed to sediment basins near the south corner of the stockpile, where it would infiltrate, evaporate, or be transported to other available approved storm water storage and infiltration areas. A ditch would also be located along the upslope edge of the pile to intercept and route runon to the sediment basins. The ditch and basin locations overlie alluvium and alluvial aquifers. Water that infiltrates from the sediment basins is expected to percolate to the alluvial aquifers, have chemical characteristics similar to seepage from the pile, and be transported west in the shallow alluvial aquifers toward Angus Creek. Storm water management structures would be designed to accommodate runoff from the 100-year, 24-hour storm event and would be reclaimed at the end of mining.

Meteoric water that percolates into the Optional Ore Stockpile/Overburden Storage Area would leach metals and other constituents into the alluvial aquifers, where they would be transported southwest in groundwater toward Angus Creek. The depth to water below the Optional Ore Stockpile is 22 to 56 feet depending on season and location (**Table 3.3-16**). Gain-loss studies (**Table 3.3-5**) and baseline monitoring data indicate that Angus Creek loses flow to groundwater during late summer and fall. The concentrations of metals and other constituents transported in groundwater away from the facility may be attenuated along the flow path by dilution, precipitation, or adsorption (Fuller and Davis 1987; Zachara et al. 1993; Hayes et al. 1987; Balistrieri and Chao 1990; Rajan 1979). A conceptual diagram illustrating the release of solutes from the Optional Ore Stockpile/Overburden Storage Area is shown on **Figure 4.3-6**.

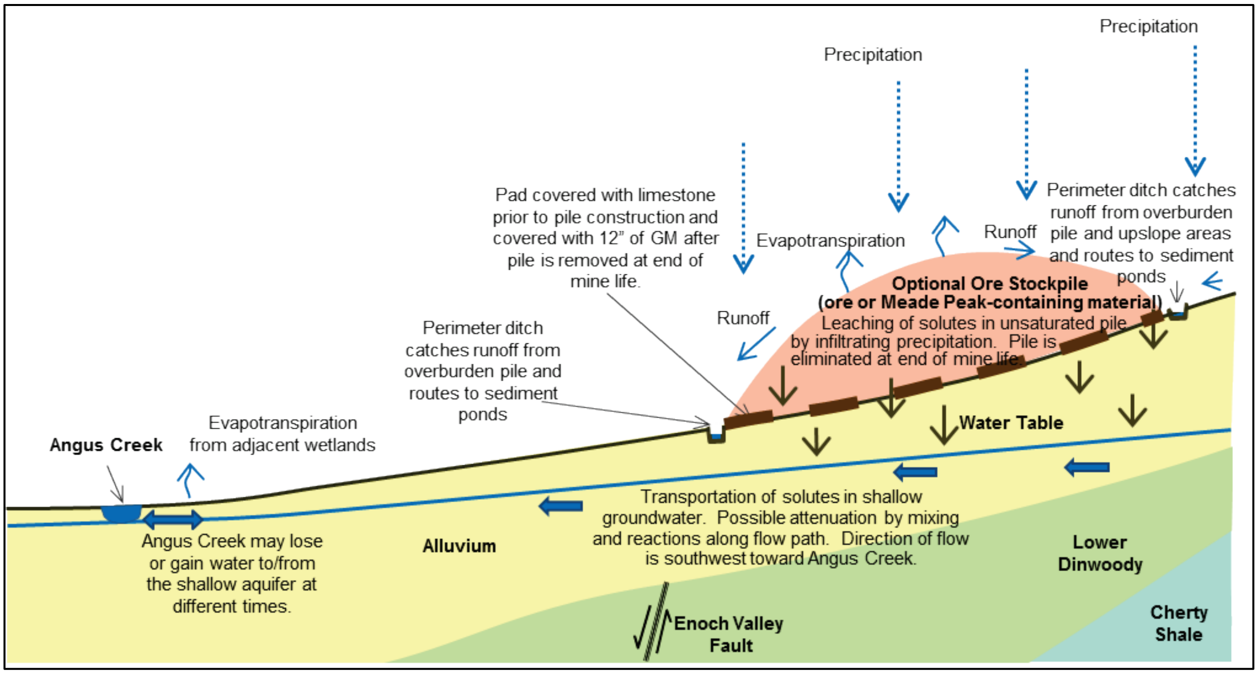


Figure 4.3-6 Conceptual Diagram Showing Runoff, Infiltration, and Solute Transport from the Optional Ore Stockpile of the Proposed Action during Mining

North and South Temporary Overburden Piles

The North and South Temporary Overburden Piles would be located within the footprint of the pit prior to mining that pit (**Figure 2.3-2**). Construction of the temporary overburden piles would start during Phase 1 mining and would continue through Phase 3. Material from the piles would be re-handled into the backfill during mining of Phases 4 and 5. The maximum time during which the piles would be present is 30 months. The temporary overburden piles would contain a combined total of 0.56 MLCY of Meade Peak overburden and have a maximum footprint of 15.1 acres. The projected material balance of the temporary piles include hanging wall mud (13.8 percent), center waste (67.5 percent), upper and lower ore partings (16.2 percent), and footwall mud (2.6 percent).

Precipitation falling on the North and South Temporary Overburden Piles would either run off, evaporate, or infiltrate. Infiltration would either be transpired by vegetation, be stored in soil pore spaces, or continue percolation downward into the overburden. Runoff from the facilities would be captured in the collection ditch on the southwest side of the pit and routed to a system of sediment basins, where it would infiltrate, evaporate, or be transported to other available approved storm water storage and infiltration areas. A ditch would also be located along the upslope edge of the pile to intercept and route runon to the sediment basins. The ditch and basin locations overlie alluvium and alluvial aquifers. Water that infiltrates from the sediment basins is expected to percolate to the alluvial aquifers, exhibit chemical characteristics similar to seepage from the pile, and be transported west in the shallow alluvial aquifers toward Angus Creek. Storm water management structures would be designed to accommodate runoff from the 100-year, 24-hour storm event and would be reclaimed at the end of mining.

Meteoric water that percolates into the temporary overburden piles would leach metals and other constituents into unsaturated bedrock. Because these temporary overburden piles are located within the pit footprint, bedrock and associated leachate below the piles would subsequently be mined and placed as backfill during mining of Phases 4 and 5. A conceptual diagram showing the impacts from the North and South Temporary Overburden Piles is shown on **Figure 4.3-7**.

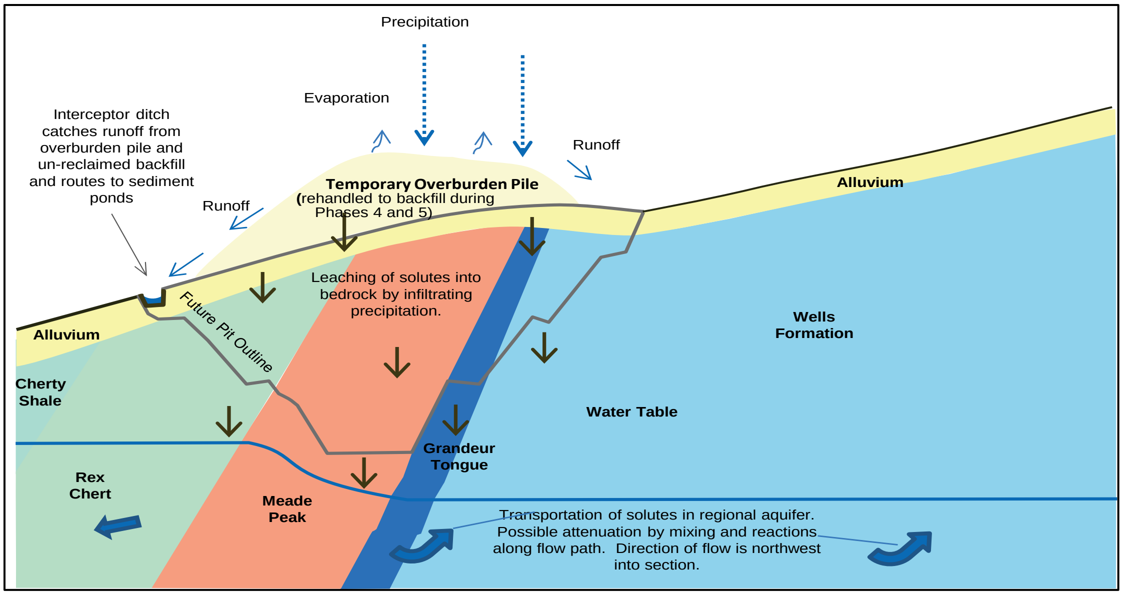


Figure 4.3-7 Conceptual Diagram Showing Runoff, Infiltration, and Solute Transport from the North and South Temporary Overburden Piles of the Proposed Action during Mining

Growth Medium Stockpiles

Three GM Stockpiles (Access North, Access South, and North GM Stockpiles) would be located along the haul road on the southwest side of the pit (**Figure 2.3-2**). The piles would contain soil from mining disturbance areas that is suitable as GM in reclamation activities. It is estimated that a total of 1.7 MLCY of GM would be removed from the disturbed areas over the life-of-mine. The stockpiles would vary in size and volume over time as disturbance areas expand and material is removed for concurrent reclamation. Reclamation of mine facilities would require 90,000 LCY of GM. Excess GM in the stockpiles would be left in place or distributed along haul roads or other areas that may require in-filling during final reclamation.

Precipitation that falls onto the GM stockpiles would run off, evaporate, or infiltrate and be stored in soil pore spaces, be transpired, or continue percolation downward. GM percolation is expected to exhibit characteristics similar to percolation through undisturbed soils; thus, runoff and seepage from the piles are expected to meet applicable water quality standards with the exception of TDS and total suspended solids (TSS), which would be mitigated by the use of BMPs such as silt fences, straw wattles, and sediment basins. A conceptual diagram showing the impacts from the GM stockpiles is shown on **Figure 4.3-8**.

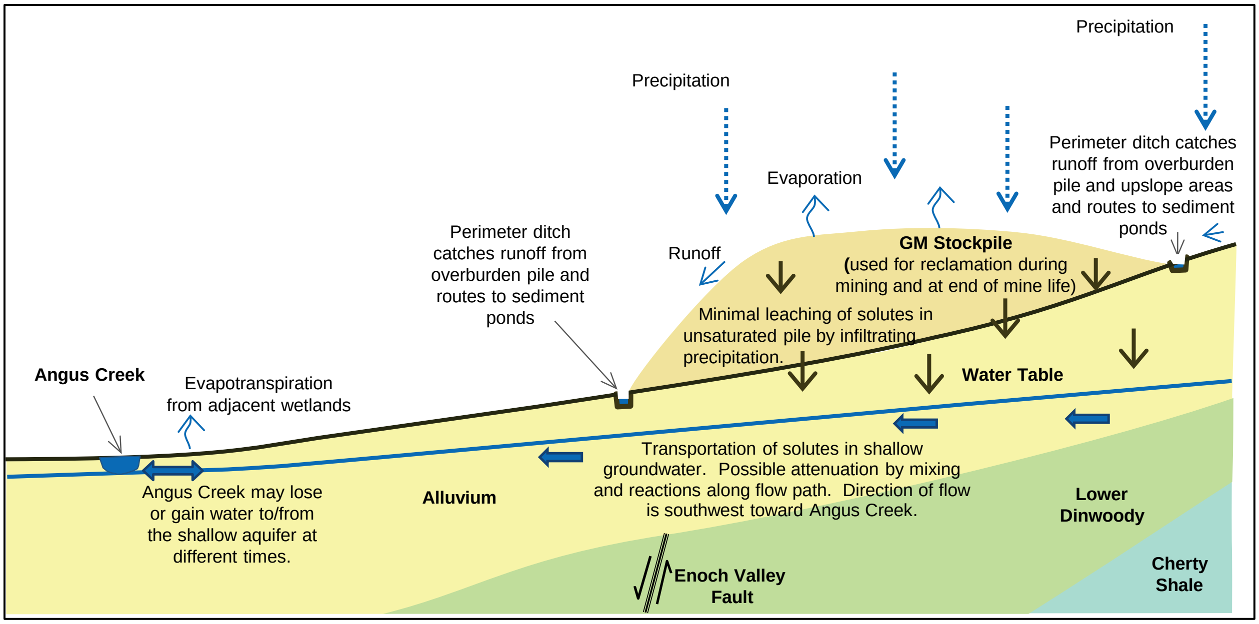


Figure 4.3-8 Conceptual Diagram Showing Runoff, Infiltration, and Solute Transport from GM Stockpiles of the Proposed Action and RCA during Mining

<u>Seepage Chemistry and Constituents of Potential Concern</u>

COPCs in seepage from the proposed mine facilities were determined by comparison of the column leachates (**Section 4.1.1.1.2**) to numerical standards for surface water and groundwater (**Table 3.3-2** and **Table 3.3-17**). In general, concentrations of most COPCs were highest in leachates from columns that contained Meade Peak rocks followed by leachates from columns containing Cherty Shale and Rex Chert. Leaching under unsaturated conditions typically resulted in higher metal mobility than leaching under saturated conditions. Iron and manganese were exceptions to this generalization and were more mobile under saturated leaching conditions. COPCs carried forward in the contaminant fate-and-transport model for the proposed Rasmussen Valley Mine (Arcadis 2015g) are presented in **Table 4.3-1**.

Table 4.3-1 Constituents of Potential Concern for Surface Water and Groundwater

COPC	Concentration in Column Leachate Exceeded Groundwater Standard[1]	Concentration in Column Leachate Exceeded Lowest Surface Water Standard[2]
Aluminum	x	
Antimony	x	x
Cadmium	x	x
Copper		x
Iron	x	
Manganese	x	
Nickel		x
Selenium	x	x
Sulfate	x	
TDS	x	
Thallium	x	x
Uranium	x[3]	
Zinc	x	x

Notes:
1 Idaho Groundwater Standards (Idaho Administrative Procedures Act [IDAPA] 58.01.11); see **Table 3.3-17**
2 Idaho Surface Water Standards (IDAPA 58.01.02); see **Table 3.3-2**
3 Federal Primary Drinking Water Standard

4.3.1.1.2 Numerical Models

Numerical models were developed to quantify seepage from the proposed mine facilities and to evaluate the loading and transport of COPCs in groundwater and surface water. The model results were then used to predict compliance of each alternative with water quality protection statutes for the proposed mine, e.g. the Clean Water Act and Idaho Groundwater Quality Rule. The effectiveness and adequacy of water quality protection measures and the need for additional or more robust mitigation measures was also assessed, in part, using these numerical model results. The models were based on hydrologic and geochemical data from site-specific baseline studies (Whetstone 2014) and the conceptual geochemical and hydrologic models discussed in **Sections 3.1.3, 3.3.1, 3.3.2,** and **4.3.1.1.1**.

Infiltration and Seepage Modeling

The software package SVFlux (Soil Vision 2005, 2012) was used to model infiltration and percolation of meteoric water through the proposed cover systems for pit backfill and overburden (BC 2015a). SVFlux is a finite-element code that uses the Richard's Equation to calculate variably saturated flow in soil and other geologic materials. The software evaluates the effects of seasonal surface storage, ground frost, snowmelt, runoff, infiltration, evapotranspiration, vegetative growth, soil moisture storage, lateral subsurface drainage, and seepage through various types of cover layers.

Seepage through the proposed cover systems was simulated either by one-dimensional vertical flow (e.g., for store-and-release cover alternatives), or by two-dimensional flow assuming a 1-meter width (e.g., for compacted barrier and geosynthetic clay laminated liner [GCLL] designs). Input to the models included the estimated hydraulic properties of the proposed cover materials (hydraulic conductivity and soil moisture characteristics), climatic data (precipitation, temperature, relative humidity, wind speed, and solar radiation), and information about planned reclamation vegetation (root depth over time, root distribution, leaf area index, and wilting point). The hydraulic properties of the cover materials input to the model were calculated from site-specific investigations and laboratory testing by BC (2014d). The computer code WGEN (Richardson and Wright 1984), was used to generate daily climate input based on monthly precipitation and temperature averages, the latitude of the Study Area (42° 50' 20" or 42.8389°), and distribution parameters from a nearby analog city, specifically Pocatello Idaho (Whetstone 2014). Vegetation properties were based on the proposed reclamation seed mixture (Great Ecology 2015) and literature estimated values (Clark and Seyfried 2001; Finzel et al. 2012; Iio and Ito 2014; Law and Waring 1994; Link et al. 1996; Naylor-Murphy 2012; Allen and Robinson 2012).

A total of seven cover designs were evaluated for the Proposed Action and the RCA. The cover model for the Proposed Action was based on the cover design identified in the Mine and Reclamation Plan (Agrium 2011). The cover designs modeled for the RCA included three store-and-release covers (A, B, and C), a capillary break cover (essentially a store-and-release cover), a compacted alluvium barrier layer cover with a drainage layer, and a GCLL cover with a drainage layer. The covers are described in **Sections 2.8.5** through **2.8.9**.

Based on review of the modeling results and a cost/construction feasibility analysis, the capillary break cover was omitted from further consideration because coarse grained materials suitable for capillary break cover construction were not readily available on-site and other less expensive but similarly effective covers were available for consideration. Capillary break covers depend on retarding downward water movement resulting in saturation of the soil above the capillary break material. This saturation would exhibit lateral flow which, on a large sloping cover would potentially require additional design and water handling components to address so the saturated conditions do not reduce soil strength properties to the extent that cover movement occurs. The preferred Cover C is not predicted to exhibit these issues. The compacted alluvium barrier layer cover was also omitted because infiltration modeling results indicated that it would have a higher net percolation rate than the other designs. The Agencies remain concerned about a GCLL because of its technical challenges and high costs to construct and maintain. It also carried higher costs per unit of reduction in seepage rate compared to the other covers. Finally, Store-and-Release Covers A and B were omitted from further consideration because they exhibited higher net percolation rates than Store-and-Release Cover C. Store-and-Release Cover C appears to meet water quality criteria and site re-vegetation criteria, but at a much lower cost than the other covers that also met the criteria and thus was selected to perform the impact analysis for the RCA. Details of the infiltration analysis for the evaluated cover designs are presented in the Cap and Cover Alternatives Analysis Report (BC 2015a).

The hydrologic characteristics of the proposed cover construction materials used as input parameters for the infiltration model are summarized in **Table 4.3-2**. K_{sat} is the estimated saturated hydraulic conductivity of the materials. The variables α and N relate hydraulic conductivity to the water content of the material. Sat VWC is the saturated volumetric water content of the material at the saturation suction pore pressure.

Table 4.3-2 Model Input Parameters for the Proposed Cover Construction Materials

Cover Material Type	K_{sat} (cm/sec)	α (1/kPa)	N (dimensionless)	Sat VWC (dimensionless)
Pit Growth Medium	3.59E-05	0.088	1.276	0.396
Pit Alluvium/Colluvium	9.96E-06	0.050	1.263	0.377
External Combined Growth Medium and Alluvium/Colluvium	2.51E-06	0.074	1.279	0.367
Non-Meade-Peak Overburden	7.00E-04	0.430	1.528	0.389

Abbreviations: cm/sec = centimeters per second, kPa = kiloPascals

The model's upper physical boundary was defined as ground surface and was used to define climatic conditions and variables that add or remove water at the surface. Input data for the upper boundaries included daily precipitation, temperature, net solar radiation, relative humidity, and wind speed. Plant transpiration was modeled based on the planned reclamation vegetation type, which was assumed to be a grassland cover in good condition (Arcadis 2014b). This type of vegetation guided the determination of input values related to leaf area index, rooting depth, and root distribution. WGEN (Richardson and Wright 1984) was used to stochastically generate 100 years of daily precipitation, temperature, and solar radiation data for model input (Whetstone 2014). Daily values for minimum and maximum relative humidity were derived from the analysis performed by O'Kane (2009) for the Blackfoot Bridge Mine. A constant wind speed value of 5.4 miles/hour was used for all simulations. Albedo values (incident light reflected at the surface), used to calculate solar radiation inputs for the model, were based on a grassland cover and varied seasonally. Fully mature root systems were assumed for each cover system. In general, grasses reach maturity in 2 to 5 years, forbs in 1 to 2 years, and shrubs in 5 to 10 years. The root system for the Proposed Action cover was assigned a depth of 2 feet assuming that the plant roots would not grow into the non-Meade-Peak overburden underlying the 2-foot soil layer. The root system for the RCA cover (Store-and-Release Cover C) was assigned a depth of 3 feet to correspond to the maximum practical rooting depth given the type of vegetation proposed for the reclamation of the cover and the water storage functionality of the upper 3 feet of cover. The lower boundaries of the models were specified to have a unit gradient, which allowed free drainage of water downward out of the models.

Simulations for the Proposed Action and RCA cover systems evaluated net percolation rates once model stabilization occurred (BC 2015a). These rates are considered to be representative of the long-term annual infiltration and percolation rates. **Table 4.3-3** provides a summary of ranges in annual average values (in inches) of various output parameters as obtained from the infiltration modeling for the Proposed Action and RCA cover designs. Details on seasonal variations are included in Appendix G of the Cap and Cover Alternatives Analysis Report (BC 2015a). The sublimation values were calculated outside of SVFlux, assuming that 20 percent of the precipitation falling on the covers when the temperature is below freezing is lost to sublimation from snowpack. This assumption is consistent with empirical data from a test plot at the Enoch Valley Mine (O'Kane 2013), which has a similar elevation and slope aspect, and with a snow sublimation study by Reba et al. (2011).

Table 4.3-3 SVFlux Modeling Results for the Proposed Action and the RCA Covers

Cover	Precipitation (inches)	Sublimation (inches)	Runoff (inches)	Evaporation (inches)	Transpiration (inches)	Change in Storage (inches)	Net Percolation[3] (inches)
Proposed Action[1]							
Range of Monthly Values	0.01 to 4.37	0.00 to 0.86	0.00 to 1.15	0.00 to 2.22	0.00 to 2.56	3.84 to 3.80	0.39 to 2.37
Yearly Total	23.44	2.82	1.4	10.7	6.18	0.00	2.40
RCA Cover C[2]							
Range of Monthly Values	0.01 to 4.37	0.00 to 0.86	0.00 to 1.97	0.00 to 2.21	0.00 to 3.19	-3.90 to 2.97	-0.33 to 0.11
Yearly Total	23.44	2.82	3.47	10.66	6.41	0.02	0.14

Notes:

1 The Proposed Action Cover would consist of 2 feet of pit GM over 3 feet of non-Meade-Peak overburden

2 The RCA cover would consist of 1 foot of pit GM atop 2 feet of either external alluvium or external GM, underlain by 3 feet of pit alluvium

3 The modeled RCA Cover C net percolation was multiplied by 1.5 (i.e., increased by 50 percent) for the fate and transport modeling to account for expected increases in percolation as a result of cover weathering and soil structure development.

Development of the infiltration model required the use of simplifying assumptions about material properties and climatic conditions that should be considered when interpreting the results. These assumptions include:

- The properties of the cover materials are assumed to be homogeneous for each layer and material type. While it is expected that this assumption is mostly correct, some variation in soil properties and imperfections in layer thicknesses would be present in the constructed cover system.
- The infiltration model uses the expected characteristics of construction materials based on the results of laboratory testing and does not account for changes in material properties that would occur over time with the development of soil structure.
- The model does not consider potential long-term shifts in weather patterns that may occur because of climate change.

Sensitivity analysis of Cover C was performed by varying root growth and depth, saturated hydraulic conductivity of the surface layer, saturated conductivity of the middle layer, thickness of the surface layer, and thickness of the middle layer.

Modeling the infiltration while the vegetation establishes roots to 2 feet deep over a year's growing season results in a predicted net percolation of 1.06 inches for that year. This could be representative of the percolation the first year the cover is placed and as the reclamation vegetation is establishing.

Varying the 1-foot surface GM layer to represent weathering did not have significant effect on the predicted net percolation rate. The predicted percolation rate varied by 0.01 in/yr.

Varying the saturated conductivity of the middle GM/alluvium layer had a substantial effect on the net percolation rate. Increasing the saturated conductivity by an order of magnitude increased the predicted percolation rate by 1.42 inches.

Changing middle layer thicknesses did not have a substantive effect on net percolation as long as the middle layer was not less than 1 foot thick.

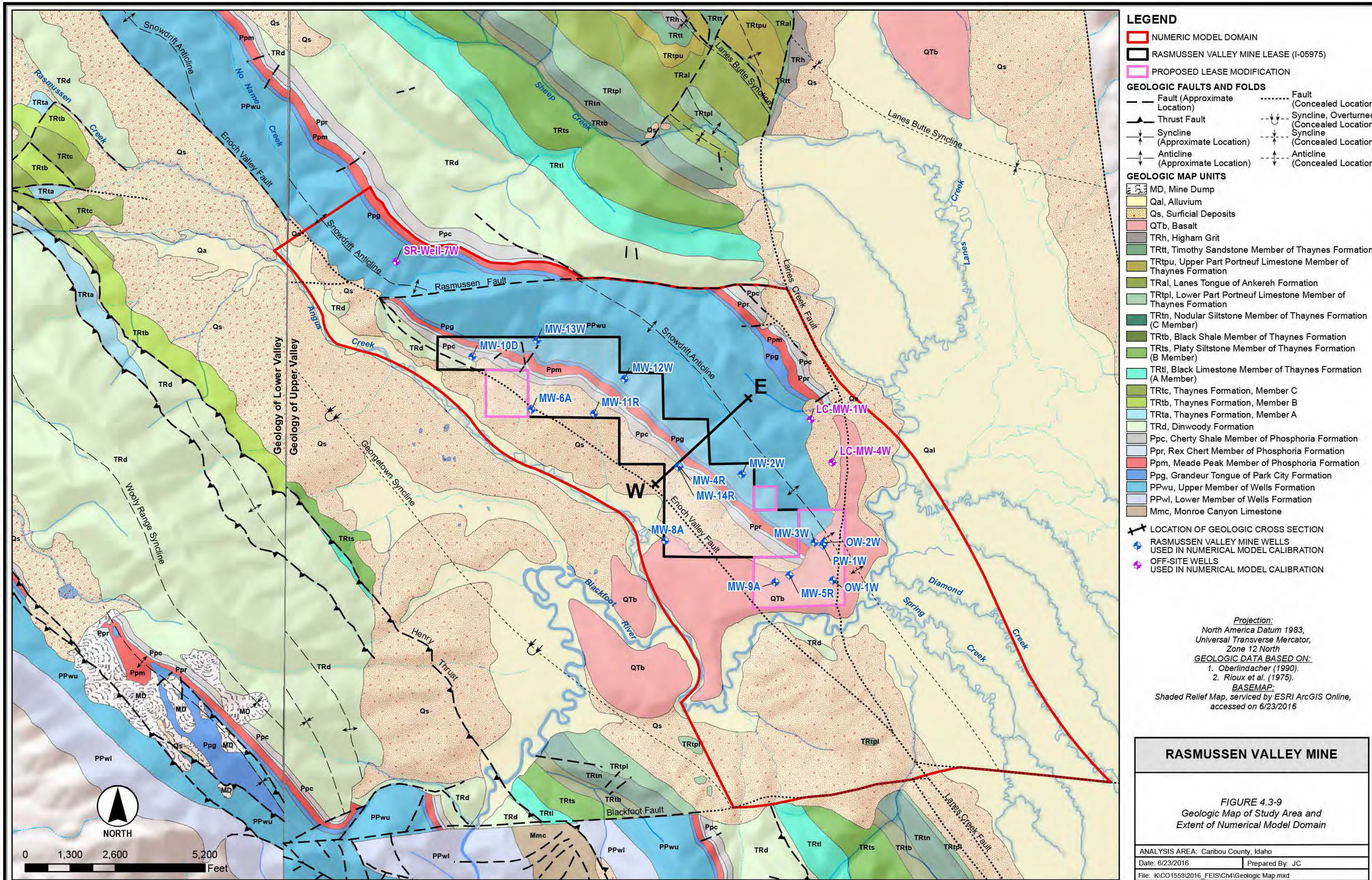
It should be noted that the laboratory analyses of material properties cannot completely account for potential heterogeneity in the sources of soil and alluvium that would be used to construct the covers. Cover effectiveness would also be affected by the development of soil structure after placement. Soil structure is a required component for heathy vegetation and is characterized by the formation of clods separated by cracks that become preferential pathways for infiltration and percolation. The development of soil structure also broadens the distribution of pore sizes, causing decreased air entry suction pressure and increased saturated hydraulic conductivity, particularly in the vertical direction (Taylor 1972, Brady 1974, Hillel 1980, NRCS 2001). Soil structure is formed by root penetration and die-back, repeated freeze-thaw cycles, worms, microbial activity, capillarity, and wet-dry cycles that are enhanced by root water uptake. Structure may also be developed by the action of swelling and shrinking clays, where present.

The effects of soil structure on the properties of the proposed cover construction materials could not be directly evaluated by laboratory testing because the structure of the materials was disrupted by excavation and preparation of the samples for testing. This disruption is similar to what would occur during cover construction, and the modeled net percolation rates of 2.40 inches per year for the Proposed Action and 0.14 inch per year for the RCA represent the effectiveness of the covers at the time of placement. Given that the formation of soil structure is expected to increase the permeability of the near surface layers of the covers with time, the modeled net percolation rate of 0.14 inch per year for the RCA cover was multiplied by a factor of 1.5 (giving an estimated rate of 0.21 inch per year) for use in the contaminant transport model discussed in the following section. This factor was not applied to the net percolation value for the Proposed Action (2.40 inches per year) because its magnitude relative to the adjusted net percolation value of the RCA (0.21 inch per year) was sufficiently larger to not affect the Agency's selection of the RCA over the Proposed Action.

Groundwater Flow and Solute Transport Modeling

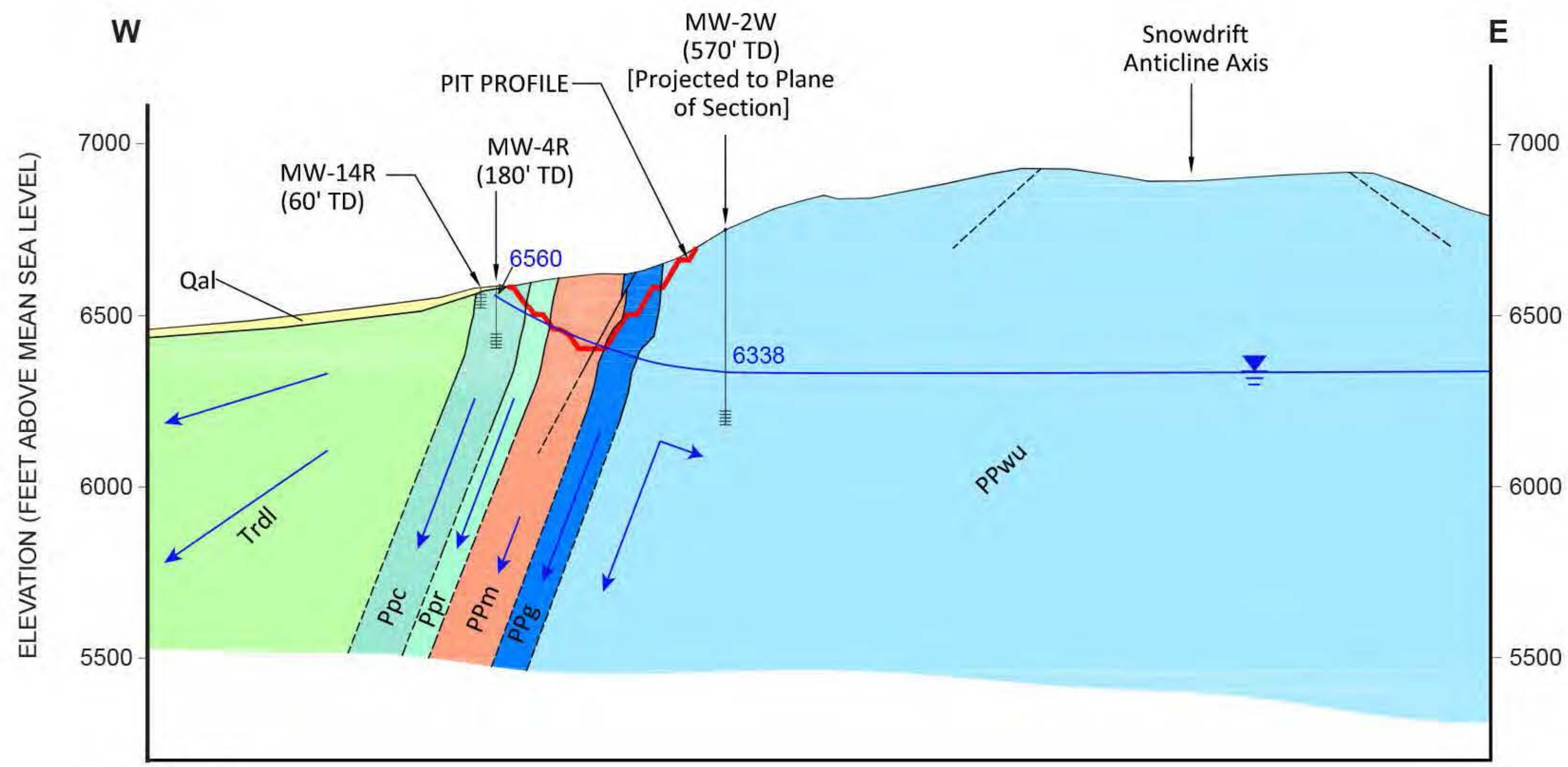
A three-dimensional numerical groundwater flow and contaminant transport model (groundwater model) was prepared to evaluate the potential impacts to water resources from the proposed mining operation (Arcadis 2015g). The model was prepared using MODFLOW-SURFACT (HydroGeologic 2011). MODFLOW-SURFACT is a finite-difference modeling package that is functionally identical to the USGS code MODFLOW (Harbaugh 2005) but has several enhancements that improve its numerical stability and ability to solve matrices with steep gradients.

The groundwater model domain covers an area of 9 square miles (**Figure 4.3-9**). The model extends 4.5 miles northwest along the axis of the Snowdrift Anticline from the Blackfoot Fault. The northwestern boundary of the model was extended approximately 0.6 mile northwest of the Rasmussen Valley Fault to allow for extended downgradient evaluation of fate of COPCs in the Wells Regional Aquifer. The southwest-northeast extent of the model is 2 miles and extends from Angus Creek to Upper Valley. Twelve model layers are used to simulate the folded and faulted


LEGEND
NUMERIC MODEL DOMAIN
RASMUSSEN VALLEY MINE LEASE (I-05975)
PROPOSED LEASE MODIFICATION
GEOLOGIC FAULTS AND FOLDS
Fault (Approximate Location)
Fault (Concealed Location)
Thrust Fault
Syncline, Overturned (Concealed Location)
Syncline (Approximate Location)
Syncline (Concealed Location)
Anticline (Approximate Location)
Anticline (Concealed Location)
GEOLOGIC MAP UNITS
MD, Mine Dump
Qal, Alluvium
Qs, Surficial Deposits
QTb, Basalt
TRh, Higham Grit
TRtt, Timothy Sandstone Member of Thaynes Formation
TRtpu, Upper Part Portneuf Limestone Member of Thaynes Formation
TRal, Lanes Tongue of Ankereh Formation
TRtpl, Lower Part Portneuf Limestone Member of Thaynes Formation
TRtn, Nodular Siltstone Member of Thaynes Formation (C Member)
TRtb, Black Shale Member of Thaynes Formation
TRts, Platy Siltstone Member of Thaynes Formation (B Member)
TRtl, Black Limestone Member of Thaynes Formation (A Member)
TRtc, Thaynes Formation, Member C
TRtb, Thaynes Formation, Member B
TRta, Thaynes Formation, Member A
TRd, Dinwoody Formation
Ppc, Cherty Shale Member of Phosphoria Formation
Ppr, Rex Chert Member of Phosphoria Formation
Ppm, Meade Peak Member of Phosphoria Formation
Ppg, Grandeur Tongue of Park City Formation
PPwu, Upper Member of Wells Formation
PPwl, Lower Member of Wells Formation
Mmc, Monroe Canyon Limestone
LOCATION OF GEOLOGIC CROSS SECTION
RASMUSSEN VALLEY MINE WELLS USED IN NUMERICAL MODEL CALIBRATION
OFF-SITE WELLS USED IN NUMERICAL MODEL CALIBRATION
Projection:
North America Datum 1983, Universal Transverse Mercator, Zone 12 North
GEOLOGIC DATA BASED ON:
1. Oberlindacher (1990).
2. Rioux et al. (1975).
BASEMAP:
Shaded Relief Map, serviced by ESRI ArcGIS Online, accessed on 6/23/2016
NORTH
0 1,300 2,600 5,200
Feet
Geology of Lower Valley
Geology of Upper Valley
Snowdrift Anticline
Rasmussen Fault
Enoch Valley Fault
Lanes Butte Syncline
Lanes Creek Fault
Georgetown Syncline
Henry Thrust
Wooly Range Syncline
Blackfoot Fault
Blackfoot River
Diamond Spring Creek
Lanes Creek
Sheep Creek
No Name Creek
Rasmussen Creek
Angus Creek
W
E
SR-Well-7W
MW-13W
MW-10D
MW-12W
MW-6A
MW-11R
LC-MW-1W
LC-MW-4W
MW-2W
MW-4R
MW-14R
MW-8A
MW-3W
OW-2W
PW-1W
MW-9A
MW-5R
OW-1W
RASMUSSEN VALLEY MINE
FIGURE 4.3-9
Geologic Map of Study Area and Extent of Numerical Model Domain
ANALYSIS AREA: Caribou County, Idaho
Date: 6/23/2016
Prepared By: JC
File: K:\CO1553\2016_FEIS\Ch4\Geologic Map.mxd

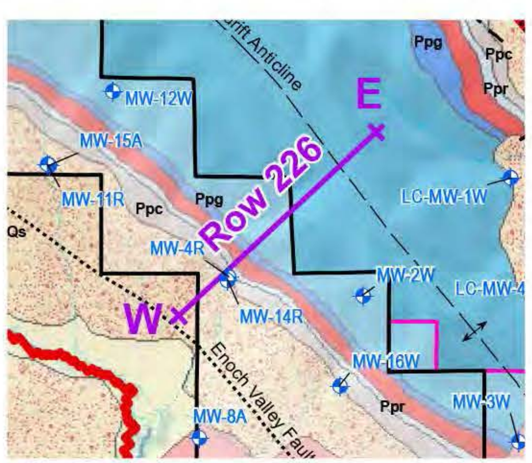
MODEL CROSS SECTION ROW 226

GEOLOGIC CROSS SECTION W-E



LOCATION OF GEOLOGIC/MODEL CROSS SECTION

SEE FIGURE 4.3-9 FOR LEGEND EXPLANATION



LEGEND

- Qal — SURFICIAL DEPOSITS (QUATERNARY)
- Trdl — LOWER DINWOODY FORMATION (LOWER TRIASSIC)
- GROUNDWATER FLOW DIRECTION
- WATER TABLE
- TD = TOTAL DEPTH

PHOSPHORIA FORMATION (PERMIAN)

- Ppc — CHERTY SHALE MEMBER
- PPr — REX CHERT MEMBER
- PPm — MEADE PEAK MEMBER
- PPg — GRANDEUR TONGUE (PERMIAN)
- PPwu — WELLS FORMATION (PERMIAN-PENNSYLVANIAN)

Sources:
Geology based on Agrium exploration borings and well logs, Rioux et al. (1975), and professional judgement.

RASMUSSEN VALLEY MINE

FIGURE 4.3-10
Model and
Geologic Cross Section E-W

ANALYSIS AREA: Caribou County, Idaho
Date: 03/16/2016 | Prepared By: JC
File: K:\CO1553\2016_FEIS\EIS_Model and Geologic XS E-W.ai

geologic strata that form the groundwater flow system. The model includes representations of the Wells Regional Aquifer, Phosphoria Formation (Meade Peak, Rex Chert, and Cherty Shale Members), Dinwoody Formation, basalt, and alluvium (**Figure 4.3-10**). Hydrologically important faults and zones of increased fracturing are simulated according to the conceptual hydrogeologic model developed by Arcadis (2015g). Zones of high hydraulic conductivity were assigned to the Enoch Valley Fault and hinge of the Snowdrift Anticline to simulate their function as conduits for groundwater flow. The Blackfoot Fault is represented as a strong barrier (no-flow) between groundwater systems in the Study Area and Dry Valley.

The Rasmussen Fault is represented as a leaky barrier near the northwestern edge of the model. Flow enters the model in the Wells Regional Aquifer at the southeastern edge and exits northwest. The average regional gradient across the model domain is 0.0008 ft/ft, consistent with water level data developed during the Baseline Water Resources Study (Whetstone 2015b). Recharge is variably assigned using PRISM precipitation distribution patterns (Daly et al. 2013; Whetstone 2014) scaled for recharge using the approach developed by Buck and Mayo (2004; **Table 3.3-10**). Blackfoot River is simulated as a surface water feature that either adds or removes water from the model, depending on the simulated groundwater levels in adjacent cells. Angus Creek, intermittent streams, and springs are modeled as features that remove water from the model if the simulated groundwater level is above the streambed or ground surface. Evapotranspiration is variably assigned to simulate wetland and upland areas.

Modeled values for hydraulic conductivity, storage, and porosity are distributed by geologic unit. The Meade Peak is simulated as an aquitard, having a low hydraulic conductivity of 0.001 ft/d. The other formations are simulated as aquifers, having hydraulic conductivities between 0.002 and 150 ft/d. The assigned hydraulic conductivities are consistent with site-specific testing and other regional hydrologic data (Whetstone 2015b). Modeled specific storage values range from 1.0E-5 to 4.85E-5, and reflect differences in rock type and confining conditions. Assigned effective porosity values ranged from 10 percent for alluvium to 1 percent for fractured bedrock.

The groundwater model was prepared in four steps including an initial steady-state simulation calibrated to the existing (pre-mining) base flow condition, a transient (time-dependent) simulation calibrated to reproduce groundwater drawdowns from the PW-1W pumping test, a second transient simulation used to qualitatively assess the models ability to reproduce observed seasonal fluctuations in water levels across various hydrogeologic units, and predictive simulations to evaluate the potential physical and chemical changes that could occur in groundwater and surface water from the Proposed Action and the RCA. The steady-state simulation was calibrated to match groundwater levels in baseline monitoring wells and measured discharges to springs and seeps. Data from gain-loss surveys on Blackfoot River and Angus Creek were also used to calibrate the steady-state model. The initial transient calibration used the steady-state run as the starting point and simulated the 72-hour aquifer test performed in the Wells Regional Aquifer near the proposed pit (BC 2013c). Calibration of the transient model was an iterative process requiring simultaneous recalibration of the steady-state model to the adjusted input parameters. Following the steady-state and transient calibrations, a second transient run was prepared to evaluate the model's ability to match seasonal water level fluctuations observed in baseline groundwater monitoring data. This run was an independent demonstration of the model's ability to accurately simulate groundwater response to changes in hydrologic stress. A complete discussion of the groundwater model calibration procedure is presented in the Groundwater Modeling Report (Arcadis 2015g).

Predictive simulations were performed for the Proposed Action and the RCA. The predictive runs used the final calibrated steady-state model as the starting point and simulated the proposed mining and reclamation conditions. COPC loads to groundwater from the Proposed Action were simulated according to the conceptual models presented in **Sections 4.3.1.1.1** and **4.3.1.2.1**. Input concentrations and volumes (source terms) for the COPC loads were developed from column leaching tests described in **Section 4.1.1.1.2** and infiltration modeling described in **Section 4.3.1.1.2**. Modeled sources of COPC loading under the Proposed Action include the North, South Main Temporary, and South-South Overburden Piles; the optional Temporary Ore Stockpile and Overburden Pile; and the pit backfill and External Overfill Piles. COPC loading under the RCA was developed using the model described above for the pit backfill, and COPC loading under the RCA was developed using the model described above for the pit backfill and overfill.

Modeling of COPC loading from the South Rasmussen Mine is discussed further in **Section 4.3.1.2.3**. The GM stockpiles were not modeled because potential seepage from this material is expected to exhibit characteristics similar to water infiltrating through undisturbed soils. Temporary piles internal to the pit footprint also were not modeled. The source term for the pit backfill simulates COPC loading by percolation of meteoric water through unsaturated backfill for both the Proposed Action and the RCA and by groundwater leaching of material that would be placed below the regional water table under the Proposed Action. Seepage originating from percolation of meteoric water through unsaturated mine facilities was applied to the simulated water table as recharge (a volume of water with a specified concentration over a period of time). Leaching of backfill by groundwater was simulated as a mass COPC load with negligible volume applied in the area of the pit that would be excavated below the water table.

Potential changes in COPC loading over time were simulated using a pore volume approach where concentrations from each source changed as successive volumes of water equal to the estimated pore space were modeled to move through the material. Backfill and external overburden piles were assumed to have an effective porosity of 15 percent. Pore volume times for the unsaturated source terms were calculated based on the volume of material that would be stored in each facility, the assumed effective porosity of 15 percent, and percolation rates developed by BC (2015a). Concentrations for each pore volume were specified based on the results of column leaching tests (Whetstone 2015a). Source terms for permanent facilities and the ore stockpile were developed using the results of run of mine (ROM) columns prepared to match the material balances of the facilities. Source terms for temporary facilities were developed by mathematically weighting leachates from the monolithologic columns in proportion to the material balances of the modeled facilities. To be conservative, COPC transport in groundwater was simulated without attenuation by precipitation or adsorption. The time period for each predictive simulation was divided into "stress periods," within which physical and chemical stresses, such as seepage rates and contaminant loading from source areas, were maintained constant. The starting concentrations of COPCs in groundwater were assumed to be 0 milligrams per liter (mg/L). Simulated pore volume times for the Proposed Action are summarized in **Table 4.3-4**. COPC source term concentrations are presented in **Table 4.3-5**.

Table 4.3-4 Pore Volume Times for Modeled Source Terms for the Proposed Action

Mine Facility	Percolation Rate (in/yr)	Facility Footprint (acres)	Seepage Rate (ft^3/day)	Material Volume (LCY)	Effective Porosity (%)	Pore Volume Time (years)
North Overburden Pile (Permanent)[1]	2.4	26.0	620	689,000[1]	15	12.3
South-South Overburden Pile	2.4	32.8	782	2,842,000	15	40.3
South Main Overburden Pile	2.4	37.9	904	4,052,000	15	[2]
Pit Backfill and External Overfill, Unsaturated	2.4	174.8	4,169	36,921,000	15	98.2
Pit Backfill, Saturated	2.4	2.4	400	108,689	15	3.0
Optional Ore Stockpile/Overburden Storage Area	2.4	[3]	[3]	[3]	[3]	[3]

Table 4.3-4 Pore Volume Times for Modeled Source Terms for the Proposed Action

Mine Facility	Percolation Rate (in/yr)	Facility Footprint (acres)	Seepage Rate (ft^3/day)	Material Volume (LCY)	Effective Porosity (%)	Pore Volume Time (years)

Notes:

1 The maximum volume of the North Overburden Pile during mining is 2,132,000 LCY. 1,443,000 LCY would be re-handled into pit backfill.

2 Pore volume times were not calculated because the entire pile would be re-handled into the pit backfill at the end of mining. The modeled seepage from the South Main Temporary Overburden Pile was assumed to be represented by pore volume 1.

3 Pore volume times were not calculated because material would be continuously added and removed from stockpile during mining. The modeled seepage from the ore stockpile is assumed to be represented by pore volume 1.

Table 4.3-5 Modeled Source Concentrations (mg/L) for the Proposed Action

Waste Facility	Pore Volume	North Overburden Pile	South-South Overburden Pile	South Main Overburden Pile	Pit Backfill, Unsaturated	Optional Ore Stockpile	Pit Backfill, Saturated
Sulfate (mg/L)	PV-1	1,420	1,420	2,327	2,393	1,216	852
	PV-2	428	428	1,889	1,739	804	568
	PV-3	332	332	1,684	1,595	551	416
	PV-4	506	506	1,613	1,828	413	315
	PV-5	646	646	1,637	1,788	384	240
	PV-6	625	625	1,616	1,745	533	177
	PV-7	635	635	1,615	1,738	852	147
Total Dissolved Solids (mg/L)	PV-1	2,389	2,389	3,883	4,157	2,183	1,550
	PV-2	870	870	3,048	2,681	1,398	1,206
	PV-3	729	729	2,638	2,529	1,005	886
	PV-4	997	997	2,584	2,972	789	710
	PV-5	1,141	1,141	2,603	2,925	695	565
	PV-6	1,062	1,062	2,509	2,751	891	422
	PV-7	1,088	1,088	2,516	2,705	1,344	410
Total Aluminum (mg/L)	PV-1	0.045	0.045	0.134	0.131	0.071	0.030
	PV-2	0.030	0.030	0.055	0.060	0.030	0.030
	PV-3	0.030	0.030	0.054	0.060	0.034	0.032
	PV-4	0.047	0.047	0.049	0.060	0.036	0.038
	PV-5	0.033	0.033	0.062	0.066	0.030	0.030
	PV-6	0.038	0.038	0.073	0.073	0.034	0.030
	PV-7	0.034	0.034	0.050	0.047	0.035	0.030
Total Antimony (mg/L)	PV-1	0.0031	0.0031	0.0212	0.0071	0.0125	0.0063
	PV-2	0.0026	0.0026	0.0157	0.0096	0.0110	0.0006
	PV-3	0.0016	0.0016	0.0139	0.0103	0.0103	0.0010
	PV-4	0.0019	0.0019	0.0157	0.0098	0.0098	0.0031
	PV-5	0.0012	0.0012	0.0128	0.0093	0.0095	0.0004
	PV-6	0.0009	0.0009	0.0127	0.0091	0.0092	0.0009
	PV-7	0.0008	0.0008	0.0112	0.0081	0.0088	0.0005
Total Cadmium (mg/L)	PV-1	0.0210	0.0210	0.0565	0.0126	0.0630	0.0008
	PV-2	0.0092	0.0092	0.0512	0.0146	0.0311	0.0001
	PV-3	0.0052	0.0052	0.0496	0.0225	0.0176	0.0001
	PV-4	0.0136	0.0136	0.0455	0.0324	0.0196	0.0001
	PV-5	0.0186	0.0186	0.0483	0.0420	0.0358	0.0001
	PV-6	0.0186	0.0186	0.0564	0.0557	0.0549	0.0001
	PV-7	0.0155	0.0155	0.0468	0.0627	0.0776	0.0001

Table 4.3-5 Modeled Source Concentrations (mg/L) for the Proposed Action

Waste Facility	Pore Volume	North Overburden Pile	South-South Overburden Pile	South Main Overburden Pile	Pit Backfill, Unsaturated	Optional Ore Stockpile	Pit Backfill, Saturated
Total Copper (mg/L)	PV-1	0.0018	0.0018	0.0025	0.0024	0.0012	0.0005
	PV-2	0.0008	0.0008	0.0016	0.0010	0.0007	0.0005
	PV-3	0.0005	0.0005	0.0009	0.0010	0.0005	0.0005
	PV-4	0.0005	0.0005	0.0009	0.0010	0.0005	0.0005
	PV-5	0.0007	0.0007	0.0010	0.0010	0.0005	0.0005
	PV-6	0.0010	0.0010	0.0009	0.0010	0.0008	0.0005
	PV-7	0.0007	0.0007	0.0009	0.0010	0.0010	0.0005
Total Iron (mg/L)	PV-1	0.0301	0.0301	0.1330	0.0702	0.0302	0.3304
	PV-2	0.0200	0.0200	0.0367	0.0400	0.0200	0.2443
	PV-3	0.0200	0.0200	0.0338	0.0335	0.0200	0.4072
	PV-4	0.0200	0.0200	0.0237	0.0247	0.0200	0.5126
	PV-5	0.0200	0.0200	0.0364	0.0400	0.0200	0.4096
	PV-6	0.0427	0.0427	0.0341	0.0400	0.0399	0.2420
	PV-7	0.0305	0.0305	0.0335	0.0313	0.0466	0.0850
Total Manganese (mg/L)	PV-1	2.5330	2.5330	2.9121	1.7446	0.5574	1.6406
	PV-2	0.4546	0.4546	2.2904	1.1692	0.3172	1.7976
	PV-3	0.3225	0.3225	2.1694	1.2773	0.2047	1.5959
	PV-4	0.4451	0.4451	1.8470	1.5587	0.1550	1.2979
	PV-5	0.4907	0.4907	1.6848	1.4112	0.1556	1.0194
	PV-6	0.4465	0.4465	1.6815	1.2259	0.2040	0.7793
	PV-7	0.3719	0.3719	1.6268	1.0658	0.3077	0.5762
Total Nickel (mg/L)	PV-1	0.9397	0.9397	2.9648	1.7848	0.6428	0.6144
	PV-2	0.1510	0.1510	1.7004	0.9912	0.2841	0.3171
	PV-3	0.0858	0.0858	1.3343	0.9907	0.1723	0.2081
	PV-4	0.1137	0.1137	1.2299	1.3131	0.1310	0.1400
	PV-5	0.1532	0.1532	1.1917	1.4295	0.1390	0.1018
	PV-6	0.1600	0.1600	1.2629	1.4747	0.2275	0.0700
	PV-7	0.1470	0.1470	1.2175	1.4291	0.4048	0.0430
Total Selenium (mg/L)	PV-1	1.147	1.147	7.901	4.724	1.584	0.409
	PV-2	0.271	0.271	2.730	1.189	0.753	0.008
	PV-3	0.160	0.160	0.819	0.575	0.426	0.004
	PV-4	0.119	0.119	0.240	0.262	0.274	0.003
	PV-5	0.099	0.099	0.157	0.143	0.202	0.002
	PV-6	0.082	0.082	0.136	0.099	0.167	0.006
	PV-7	0.073	0.073	0.095	0.071	0.148	0.002
Total Thallium (mg/L)	PV-1	0.0021	0.0021	0.0031	0.0109	0.0038	0.0002
	PV-2	0.0005	0.0005	0.0016	0.0068	0.0018	0.0001
	PV-3	0.0004	0.0004	0.0012	0.0056	0.0011	0.0001
	PV-4	0.0003	0.0003	0.0013	0.0048	0.0008	0.0001
	PV-5	0.0003	0.0003	0.0014	0.0042	0.0007	0.0001
	PV-6	0.0003	0.0003	0.0015	0.0037	0.0009	0.0001
	PV-7	0.0002	0.0002	0.0012	0.0030	0.0012	0.0001
Total Uranium (mg/L)	PV-1	0.0253	0.0253	0.0498	0.0378	0.0543	0.0237
	PV-2	0.0131	0.0131	0.0231	0.0168	0.0260	0.0224
	PV-3	0.0115	0.0115	0.0225	0.0154	0.0196	0.0176
	PV-4	0.0096	0.0096	0.0230	0.0153	0.0153	0.0111
	PV-5	0.0086	0.0086	0.0243	0.0158	0.0143	0.0080

Table 4.3-5 Modeled Source Concentrations (mg/L) for the Proposed Action

Waste Facility	Pore Volume	North Overburden Pile	South-South Overburden Pile	South Main Overburden Pile	Pit Backfill, Unsaturated	Optional Ore Stockpile	Pit Backfill, Saturated
	PV-6	0.0089	0.0089	0.0257	0.0174	0.0139	0.0056
	PV-7	0.0072	0.0072	0.0215	0.0171	0.0149	0.0043
Total Zinc (mg/L)	PV-1	1.6223	1.6223	5.8538	4.6170	2.2280	0.4042
	PV-2	0.1142	0.1142	2.7522	2.4357	0.4320	0.0101
	PV-3	0.0597	0.0597	2.3888	3.0843	0.1448	0.0195
	PV-4	0.2443	0.2443	2.6941	4.5186	0.1926	0.0108
	PV-5	0.3711	0.3711	2.5416	4.5350	0.6404	0.0064
	PV-6	0.4157	0.4157	2.7160	4.1077	1.2265	0.0048
	PV-7	0.3007	0.3007	2.4640	3.8542	1.7316	0.0032

Source: Whetstone 2015a

Predictive simulations for the Proposed Action were performed for the COPCs listed in **Table 4.3-1**. The simulations considered a 700-year time span based on the time required for COPCs to reach their maximum modeled concentrations in groundwater at observation points located on the Blackfoot River and the Rasmussen Fault.

It should be noted that, although COPC loading rates from the proposed mine facilities can be estimated from laboratory tests, uncertainty exists in the source terms because scale-dependent factors (such as the volume and frequency of infiltration and percolation, residence time of pore water, presence of preferential flow pathways, microbiological activity, and spatial variability of redox conditions) exert significant control over concentrations in overburden seepage (Whetstone 2013, 2015a). The Agencies currently consider column leaching tests to be the best method available to predict overburden seepage chemistry, but the accuracy of the predictions under real-world conditions is difficult to evaluate. Numerical model predictions are also affected by uncertainty related to the input hydrologic parameters. Arcadis (2015g) evaluated this uncertainty and addressed it, in part, by calibrating the model to existing site conditions and observed hydrologic stresses. However, given the potential uncertainty associated with input parameters, model results in the following sections should not be interpreted as absolute numerical values, but rather in broader terms, with the simulated scenarios being either unlikely to have impacts at levels of regulatory concern, likely to have impact at or near levels of regulatory concern, or as being likely to have impacts above levels of regulatory concern. Overall effects to water resources under the Proposed Action would be long-term and moderate and would differ in duration and intensity between surface water and groundwater.

4.3.1.1.3 Impacts to Groundwater Resources

The Proposed Action would have direct impacts to groundwater resources in the Study Area. The impacts would include changes in groundwater levels and availability and increased loading of COPCs to groundwater.

Impacts to Groundwater Levels

The Proposed Action would require pumping for pit dewatering to facilitate mining below the regional groundwater table near the southern end of the excavation (**Figure 4.3-1**). The elevation of the regional water table within the pit footprint is near 6,340 feet amsl (Whetstone 2015b). The lowest portion of the pit, at 6,280 feet amsl, would extend 60 feet below the regional water table. Dewatering was modeled assuming a complete hydraulic connection of the pit with the regional water table.

Pit dewatering model results for the Proposed Action indicate that an average pumping rate of

4,300 gpm would be required for 7 to 8 months to temporarily lower water levels in the Wells Regional Aquifer and permit Phase 1 mining below 6,340 feet amsl. According to the Mine and Reclamation Plan (Agrium 2011), dewatering discharge would be pumped from the working area to an unreclaimed area of backfill for re-infiltration. However, because the mining sequence would be south-to-north, no areas of backfill would exist during Phase 1 mining. Therefore, re-infiltration of the dewatering discharge would not be possible and was not simulated. The RCA solves the issue by eliminating dewatering because there would be no mining below the regional water table. If a viable method of handling dewatering water were proposed and dewatering occurred, modeling results indicate that, upon cessation of pumping, the water level in the regional aquifer would return to the pre-pumping elevation in 3 months. The projected maximum drawdown in the Wells Regional Aquifer is 60 feet centered on the south end of the pit (**Figure 4.3-11**). Temporary drawdown of several feet in the Wells Regional Aquifer would extend north into the South Rasmussen Mine area, where it could impact water levels in monitoring wells or industrial supply wells. Temporary drawdown of shallow groundwater levels west of the pit near Angus Creek is predicted to be negligible because the predicted and modeled low hydraulic conductivity of the Meade Peak (0.001 ft/d) limits propagation of the cone of depression from the Wells Regional Aquifer into the alluvium, Rex Chert, and the Dinwoody Formations. Up to 10 feet of drawdown is predicted along a narrow band of shallow groundwater in alluvium southeast of Blackfoot River. Drawdown in this area would be propagated along the buried hinge of the Snowdrift Anticline, which extends below the alluvium and basalt cover. The hinge of the Snowdrift Anticline is conceptualized to be a fracture zone with higher permeability than the surrounding bedrock based on pumping test data from well PW-1W (BC 2013c). The numerical simulation by Arcadis (2015g) indicates that pit dewatering under the Proposed Action is expected to result in localized moderate impacts to water levels in the Wells Regional Aquifer for 10 to 11 months starting during Phase 1 mining. Impacts to shallow groundwater levels in alluvium and bedrock west of the mine pit and south of Blackfoot River would be negligible to minor, localized, and would have a similar duration to those projected for the Wells Regional Aquifer.

The pit excavation would also intersect localized pockets of groundwater at elevations higher than the regional water table. These perched groundwater zones would be quickly drained after they are opened and would not result in significant long-term inflow to the pit. Draining of the perched water would result in moderate localized impacts to groundwater levels in unconsolidated deposits and the Rex Chert that may persist after final reclamation of the pit backfill. These impacts could result in minor reductions in the volume of groundwater that would be available to seasonal springs and wetlands downslope from the pit during operation and after reclamation. The pit excavation and backfill could provide a permanent pathway for the transfer of groundwater from the local- and intermediate-scale aquifers to the Wells Regional Aquifer.

It is anticipated that capping of the permanent overburden piles and pit backfill under the Proposed Action would permanently reduce the amount of recharge reporting to groundwater by 8 percent from a pre-mining 2.6 inches per year to a permanent 2.4 inches per year for those areas of covered overburden and backfill. Modeling results indicate that, under post-reclamation conditions, groundwater levels in the shallow, intermediate, and regional groundwater systems near the reclaimed mine facilities would decrease by 1 to 5 feet, 0.5 to 1 foot, and 0 to 0.05 foot, respectively. Long-term decreases in shallow groundwater levels by reduced infiltration and percolation through areas reclaimed by cover systems would therefore be long-term, minor, and localized. Long-term reduction in groundwater levels in the Wells Regional Aquifer would be negligible.

Impacts to Groundwater Quality

The Proposed Action would result in moderate impacts to groundwater quality in the local-intermediate- and regional-scale aquifers. The impacts described in the following sections do not incorporate the existing baseline chemistry of groundwater, which is variable and currently exceeds applicable groundwater standards for some parameters at some locations. Therefore, the concentrations discussed for the Proposed Action in the following sections would need to be added to existing groundwater concentrations to calculate concentrations expected if the groundwater were sampled or withdrawn at any given point. Predicted total groundwater concentrations (i.e., modeled maximum concentrations plus the existing baseline concentrations) of COPCs at Rasmussen Valley Mine baseline monitoring well locations under the Proposed Action have been provided in **Table 4.3-6** as examples. The following simplified discussion of impacts to groundwater quality is intended to facilitate disclosure of impacts from mining activities at the Rasmussen Valley Mine and to allow for consideration of future monitoring data that may modify the calculated baseline concentrations.

Modeling results indicate that a number of COPCs would be transported northwest in the Wells Regional Aquifer and southwest in the local- and intermediate-scale aquifers, forming plumes with concentrations that would be higher than in unaffected groundwater. Increased COPC loading to groundwater from partially constructed overburden piles and backfill would begin shortly after the start of mining. Overburden piles and backfill would be capped and reclaimed concurrent with mining to reduce infiltration of meteoric water and to minimize the potential for seepage from the facilities. Runoff from unreclaimed overburden within the pit area would be captured in a runoff collection ditch within the pit footprint, where it would be routed to the pit sump. This water would report to the regional aquifer, where it would be transported in groundwater to the northwest with seepage from the pit backfill. Runoff from unreclaimed external overburden piles located on alluvium west of the pit would report to sediment ponds, where it would evaporate, infiltrate into underlying alluvial groundwater, or be transported to other approved storm water holding areas. Runoff that infiltrates into alluvial groundwater would follow a groundwater flow path toward Angus Creek similar to seepage from the adjacent external overburden piles.

Shallow Groundwater

Modeling results indicate that contaminant plumes of selenium and other COPCs would form beneath the external overburden piles overlying the alluvial aquifers soon after commencement of mining, and would migrate southwest in shallow alluvial groundwater toward Angus Creek and Blackfoot River. Simulated groundwater plumes for selenium and manganese in shallow groundwater under the Proposed Action are shown on **Figure 4.3-12**, **Figure 4.3-13,** and **Figure 4.3-14**. Concentrations for COPCs in shallow groundwater at model observation points OBS-1 through OBS-4, GLS-AC2-OBS, and GLS-AC3-OBS (**Figure 4.3-12**) are shown on **Figure 4.3-15**. Peak and long-term concentrations at model observation points are summarized in **Table 4.3-7** and **Table 4.3-8**.

Modeling results indicate that construction of the of the North, South Main Temporary, and South-South Overburden Piles and the Optional Ore Stockpile/Overburden Storage Area would result in the release of COPCs in shallow groundwater at concentrations that exceed Idaho groundwater quality standards. With the exceptions of aluminum, copper, and iron, simulated concentrations of COPCs exceed the applicable standards in shallow groundwater below the external overburden and ore storage facilities. The simulated concentrations of antimony, cadmium, manganese, selenium, sulfate, and TDS were higher than groundwater standards outside of the facility footprints. In the shallow groundwater, manganese exhibited the greatest mobility at levels above Idaho groundwater quality standards. The simulated plumes for all other COPCs are contained within the footprints of the manganese plumes shown on **Figure 4.3-13**. Contaminant loading to shallow groundwater below the external overburden storage facilities is modeled to correspond to the pore volume timing for the highest source term concentrations in **Table 4.3-5**. The timing of peak concentrations at model observation points OBS-1 through OBS-4, GLS-AC2-OBS, and GLS-AC3-OBS is shown on **Figure 4.3-15**. The South Main Temporary Overburden Pile and portions of the Optional Ore Stockpile/Overburden Storage Area would be removed at the end of mining, and these facilities would not be a source of long-term COPC loads to shallow groundwater.

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Table 4.3-6 Predicted Total Groundwater Concentrations of COPCs for the Proposed Action at Baseline Monitoring Well Locations

		Aluminum	Antimony	Cadmium	Copper	Iron	Manganese	Nickel	Selenium	Sulfate	TDS	Thallium	Uranium	Zinc
Idaho Groundwater Standard		0.2[4]	0.006[3]	0.005[3]	1.3[3]	0.3[3]	0.05[4]	0.0520[5]	0.05[3]	250[4]	500[4]	0.002[3]	0.030[6]	5[4]
MW-6A	Baseline[7] (Mean) Concentration (mg/L)	0.524	0.000	---[2]	0.001	0.363	0.190	---	0.001	6.864	242.000	---	0.001	0.008
	Modeled[8] Maximum Concentration (mg/L)	0.047	0.003	0.021	0.002	0.042	2.500	0.928	1.132	1401.467	2357.820	0.002	0.025	1.601
	Predicted[9] Maximum Concentration (mg/L)	0.571	0.003	0.021	0.003	0.405	2.690	0.928	1.133	1408.330	2599.820	0.002	0.026	1.609
MW-8A	Baseline (Mean) Concentration (mg/L)	---	---	---	---	0.097	0.197	---	---	4.380	119.500	---	---	---
	Modeled Maximum Concentration (mg/L)	0.004	0.001	0.002	0.000	0.004	0.101	0.092	0.235	76.486	127.762	0.000	0.002	0.179
	Predicted Maximum Concentration (mg/L)	0.004	0.001	0.002	0.000	0.101	0.298	0.092	0.235	80.866	247.262	0.000	0.002	0.179
MW-9A	Baseline (Mean) Concentration (mg/L)	0.116	---	0.000	0.001	0.145	0.021	---	0.001	6.045	179.278	---	0.000	0.004
	Modeled Maximum Concentration (mg/L)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Predicted Maximum Concentration (mg/L)	0.116	0.000	0.000	0.001	0.145	0.021	0.000	0.001	6.045	179.278	0.000	0.000	0.004
MW-10D	Baseline (Mean) Concentration (mg/L)	0.039	---	---	---	0.324	0.298	---	---	126.258	416.333	---	0.001	---
	Modeled Maximum Concentration (mg/L)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Predicted Maximum Concentration (mg/L)	0.039	0.000	0.000	0.000	0.324	0.298	0.000	0.000	126.259	416.334	0.000	0.001	0.000
MW-4R	Baseline (Mean) Concentration (mg/L)	0.051	---	---	0.001	2.275	0.319	0.028	---	30.595	220.857	---	0.001	0.027
	Modeled Maximum Concentration (mg/L)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.068	0.119	0.000	0.000	0.000
	Predicted Maximum Concentration (mg/L)	0.051	0.000	0.000	0.001	2.275	0.319	0.028	0.000	30.663	220.976	0.000	0.001	0.027
MW-5R	Baseline (Mean) Concentration (mg/L)	0.030	---	---	---	0.227	0.086	0.012	0.000	21.864	334.833	---	0.001	0.005
	Modeled Maximum Concentration (mg/L)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.030	0.057	0.000	0.000	0.000
	Predicted Maximum Concentration (mg/L)	0.030	0.000	0.000	0.000	0.227	0.086	0.012	0.000	21.894	334.890	0.000	0.001	0.005
MW-11R	Baseline (Mean) Concentration (mg/L)	0.026	---	---	---	0.451	0.559	---	---	44.120	342.000	---	0.000	0.040
	Modeled Maximum Concentration (mg/L)	0.004	0.000	0.002	0.000	0.003	0.126	0.047	0.058	72.013	122.329	0.000	0.001	0.080
	Predicted Maximum Concentration (mg/L)	0.030	0.000	0.002	0.000	0.454	0.685	0.047	0.058	116.133	464.329	0.000	0.002	0.120

Table 4.3-6 Predicted Total Groundwater Concentrations of COPCs for the Proposed Action at Baseline Monitoring Well Locations

		Aluminum	Antimony	Cadmium	Copper	Iron	Manganese	Nickel	Selenium	Sulfate	TDS	Thallium	Uranium	Zinc
Idaho Groundwater Standard		0.2[4]	0.006[3]	0.005[3]	1.3[3]	0.3[3]	0.05[4]	0.0520[5]	0.05[3]	250[4]	500[4]	0.002[3]	0.030[6]	5[4]
MW-14R	Baseline (Mean) Concentration (mg/L)	---	---	---	---	0.475	0.114	---	0.000	26.669	232.667	---	0.000	0.003
	Modeled Maximum Concentration (mg/L)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.028	0.049	0.000	0.000	0.000
	Predicted Maximum Concentration (mg/L)	0.000	0.000	0.000	0.000	0.475	0.114	0.000	0.000	26.697	232.716	0.000	0.000	0.003
MW-1W	Baseline (Mean) Concentration (mg/L)	0.081	---	---	0.000	0.301	0.110	---	---	21.400	285.000	---	0.002	0.048
	Modeled Maximum Concentration (mg/L)	0.026	0.002	0.012	0.000	0.018	0.351	0.349	0.914	468.316	814.104	0.002	0.007	0.893
	Predicted Maximum Concentration (mg/L)	0.106	0.002	0.012	0.001	0.319	0.462	0.349	0.914	489.716	1099.104	0.002	0.010	0.941
MW-2W	Baseline (Mean) Concentration (mg/L)	0.206	---	---	0.001	1.161	0.075	---	0.000	362.100	938.600	---	0.002	---
	Modeled Maximum Concentration (mg/L)	0.003	0.000	0.001	0.000	0.001	0.048	0.040	0.097	53.831	94.021	0.000	0.001	0.095
	Predicted Maximum Concentration (mg/L)	0.209	0.000	0.001	0.002	1.162	0.123	0.040	0.097	415.931	1032.621	0.000	0.003	0.095
MW-3W	Baseline (Mean) Concentration (mg/L)	0.056	0.001	---	0.001	0.894	0.040	---	0.003	40.416	295.053	---	0.001	0.006
	Modeled Maximum Concentration (mg/L)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Predicted Maximum Concentration (mg/L)	0.056	0.001	0.000	0.001	0.894	0.040	0.000	0.003	40.416	295.053	0.000	0.001	0.006
MW-12W	Baseline (Mean) Concentration (mg/L)	---	---	---	---	1.442	0.611	---	---	10.100	278.000	---	0.001	---
	Modeled Maximum Concentration (mg/L)	0.006	0.000	0.003	0.000	0.011	0.104	0.087	0.210	116.682	203.788	0.000	0.002	0.206
	Predicted Maximum Concentration (mg/L)	0.006	0.000	0.003	0.000	1.453	0.715	0.087	0.210	126.782	481.788	0.000	0.003	0.206
MW-13W	Baseline (Mean) Concentration (mg/L)	0.030	0.001	---	0.000	0.071	0.099	---	---	20.290	276.000	---	0.002	---
	Modeled Maximum Concentration (mg/L)	0.022	0.002	0.010	0.000	0.020	0.311	0.298	0.769	400.144	696.266	0.002	0.006	0.752
	Predicted Maximum Concentration (mg/L)	0.052	0.003	0.010	0.001	0.091	0.410	0.298	0.769	420.434	972.266	0.002	0.008	0.752
MW-16W	Baseline (Mean) Concentration (mg/L)	0.064	---	---	0.001	0.304	0.044	0.003	---	30.409	263.182	---	0.000	0.007
	Modeled Maximum Concentration (mg/L)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.002	0.000	0.000	0.000
	Predicted Maximum Concentration (mg/L)	0.064	0.000	0.000	0.001	0.304	0.044	0.003	0.000	30.410	263.184	0.000	0.000	0.007

Table 4.3-6 Predicted Total Groundwater Concentrations of COPCs for the Proposed Action at Baseline Monitoring Well Locations

		Aluminum	Antimony	Cadmium	Copper	Iron	Manganese	Nickel	Selenium	Sulfate	TDS	Thallium	Uranium	Zinc
Idaho Groundwater Standard		0.2[4]	0.006[3]	0.005[3]	1.3[3]	0.3[3]	0.05[4]	0.0520[5]	0.05[3]	250[4]	500[4]	0.002[3]	0.030[6]	5[4]
MW-17W	Baseline (Mean) Concentration (mg/L)	0.022	0.001	---	---	0.239	0.033	---	0.000	32.469	261.667	---	0.000	0.005
	Modeled Maximum Concentration (mg/L)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Predicted Maximum Concentration (mg/L)	0.022	0.001	0.000	0.000	0.239	0.033	0.000	0.000	32.469	261.667	0.000	0.000	0.005
OW-1W	Baseline (Mean) Concentration (mg/L)	0.202	---	0.001	0.001	0.791	0.145	0.014	0.000	13.157	240.000	0.000	---	0.111
	Modeled Maximum Concentration (mg/L)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Predicted Maximum Concentration (mg/L)	0.202	0.000	0.001	0.001	0.791	0.145	0.014	0.000	13.157	240.000	0.000	0.000	0.111

Notes:
1. Baseline concentration data are from Baseline Water Resources Technical Report (Whetstone 2015b)
2. '---' indicates insufficient number of results above the detection limit to calculate meaningful statistic
3. Idaho Primary Groundwater Standard
4. Idaho Secondary Groundwater Standard
5. Idaho Surface Water Standard for Aquatic Life (chronic concentration)
6. Federal Primary Drinking Water Maximum Contaminate Limit
7. Baseline concentrations represent the existing water quality at each monitoring well and are equal to the mean of the monitoring data described in **Section 3.3.2.3.1**
8. Modeled maximum concentrations represent the maximum concentrations that would be added to groundwater at the monitoring location as a result of the Proposed Action
9. Predicted concentrations represent the maximum concentration that would occur in groundwater at the monitoring location as a result of the Proposed Action and are the sum of the baseline concentration and the modeled maximum concentration

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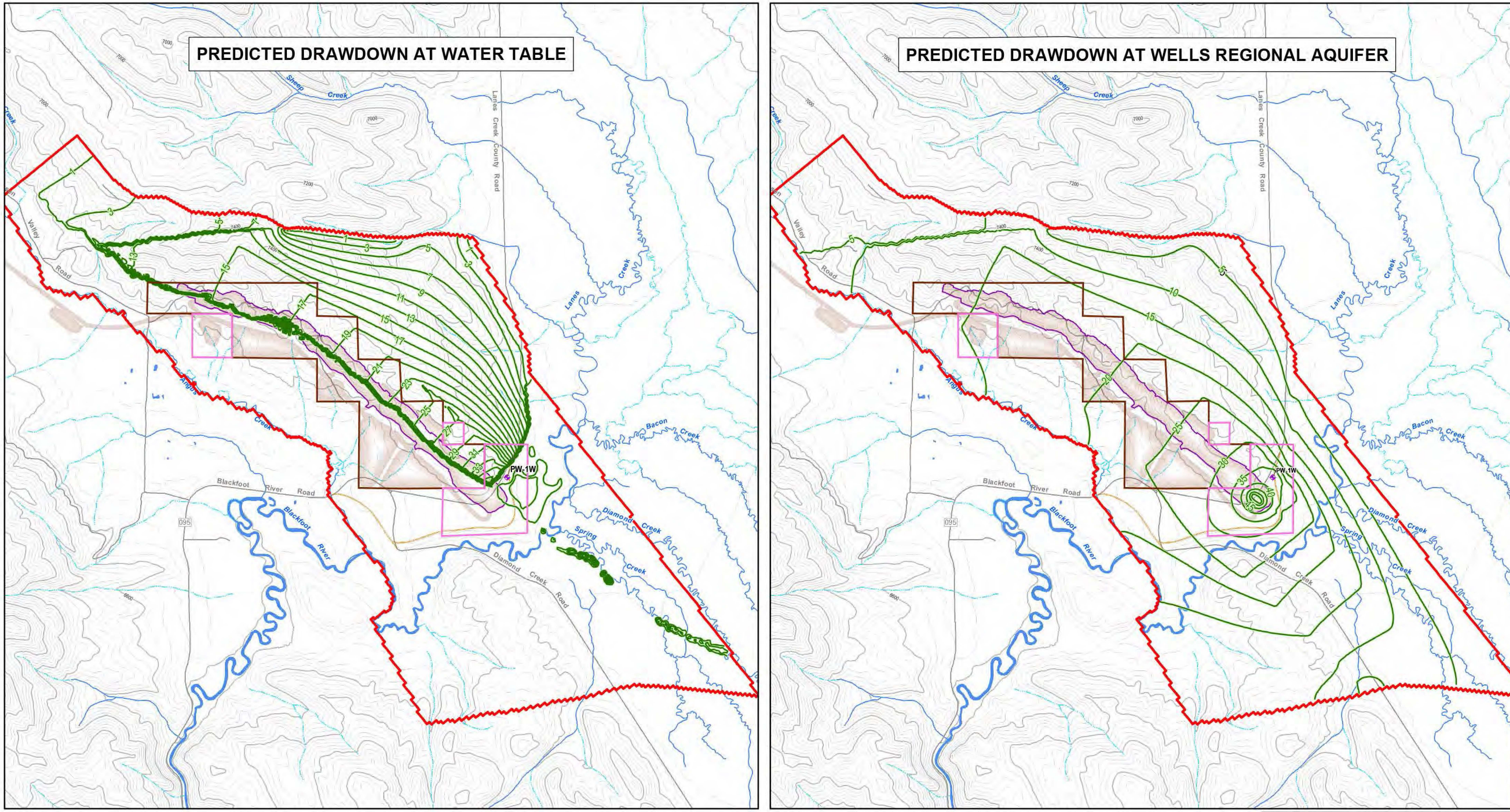

LEGEND

- NUMERICAL MODEL EXTENT
- LEASE I-05975
- PROPOSED LEASE MODIFICATION
- PROPOSED PIT BOUNDARY
- PROPOSED HAUL ROAD AND MINE FOOTPRINT
- COUNTY ROAD REALIGNMENT
- EXISTING ROAD
- INTERMITTENT STREAM
- PERENNIAL STREAM
- TOPOGRAPHIC CONTOUR
- SIMULATED DRAWDOWN CONTOUR (LEFT PANEL: 2-FOOT INTERVAL, RIGHT PANEL: 5-FOOT INTERVAL)

Projection:
North America Datum 1983, Universal Transverse Mercator, Zone 12 North

NORTH

0 3,200 6,400 Feet

RASMUSSEN VALLEY MINE

FIGURE 4.3-11
Predicted Maximum Drawdown during Mine Dewatering for the Proposed Action

ANALYSIS AREA: Caribou County, Idaho
Date: 6/23/2016 | Prepared By: JC
File: K:\CO1553\2015_DEIS\Chapter4\Max DrawDown_PA.mxd

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Table 4.3-7 Predicted Peak Concentrations in Shallow Groundwater for the Proposed Action at Model Observation Points OBS-1 through OBS-4, GLS-AC2-OBS, and GLS-AC3-OBS

Constituent	OBS-1	OBS-2	OBS-3	OBS-4	GLS-AC2-OBS	GLS-AC3-OBS	Groundwater Standard (mg/L)
Aluminum[2]	0.0007	0.0055	0.0596	0.0045	0.0009	0.0007	0.2
Antimony[1]	0.00003	0.0006	0.0093	0.0003	0.00005	0.00008	0.006
Cadmium[1]	0.0003	0.0024	0.0252	0.002	0.0004	0.0003	0.005
Copper[1]	0.00001	0.0002	0.0011	0.0002	0.00003	0.00002	1.3
Iron[2]	0.0006	0.0046	0.0588	0.0041	0.0007	0.0006	0.3
Manganese[2]	0.017	0.215	1.331	0.24	0.039	0.027	0.05
Nickel[4]	0.008	0.118	1.317	0.089	0.014	0.015	N/A
Selenium[1]	0.012	0.232	3.478	0.109	0.018	0.029	0.05
Sulfate[2]	13	134.7	1049.8	134.6	21.9	16.7	250
TDS[2]	22.5	226	1752.1	226.5	37.2	28.0	500
Thallium[1]	0.00002	0.0002	0.0014	0.0002	0.00003	0.00002	0.002
Uranium[3]	0.0002	0.0026	0.0224	0.0024	0.0004	0.0003	0.03014
Zinc[2]	0.014	0.219	2.595	0.154	0.024	0.027	5

Notes:
1 Primary Idaho Groundwater Standard for antimony, cadmium, copper, selenium, and thallium
2 Secondary Idaho Groundwater Standard for aluminum, iron, manganese, sulfate, TDS, and zinc
3 Federal Primary Drinking Water Standard for uranium
4 There is no Idaho Groundwater Standard for nickel
N/A – Not Applicable

Table 4.3-8 Predicted Long-Term Concentrations in Shallow Groundwater for the Proposed Action at Model Observation Points OBS-1 through OBS-4, GLS-AC2-OBS, and GLS-AC3-OBS

Constituent	OBS-1	OBS-2	OBS-3	OBS-4	GLS-AC2-OBS	GLS-AC3-OBS	Groundwater Standard (mg/L)
Aluminum[2]	0.0007	0.0029	0.0013	0.0033	0.0008	0.0005	0.2
Antimony[1]	0.00002	0.00007	0.00003	0.00008	0.00002	0.00001	0.006
Cadmium[1]	0.0003	0.0013	0.0006	0.0015	0.00038	0.00024	0.005
Copper[1]	0.00001	0.00006	0.00003	0.00007	0.00002	0.00001	1.3
Iron[2]	0.0006	0.0026	0.0012	0.0029	0.0007	0.0005	0.3
Manganese[2]	0.008	0.032	0.014	0.036	0.009	0.006	0.05
Nickel[4]	0.003	0.013	0.006	0.014	0.004	0.002	N/A
Selenium[1]	0.002	0.007	0.003	0.007	0.002	0.001	0.05
Sulfate[2]	13	54.3	24.6	61.2	15.6	9.8	250
TDS[2]	22.5	93	42	104.8	26.7	16.8	500
Thallium[1]	0.000005	0.00002	0.000008	0.00002	0.00001	0.000003	0.002
Uranium[3]	0.0002	0.0006	0.0003	0.0007	0.0002	0.0001	0.03014
Zinc[2]	0.006	0.026	0.012	0.029	0.007	0.005	5

Notes:
1 Primary Idaho Groundwater Standard for antimony, cadmium, copper, selenium, and thallium
2 Secondary Idaho Groundwater Standard for aluminum, iron, manganese, sulfate, TDS, and zinc
3 Federal Primary Drinking Water Standard for uranium
4 There is no Idaho Groundwater Standard for nickel
N/A – Not Applicable

Regional Groundwater

Fate-and-transport modeling results for the Proposed Action predict that contaminant plumes of selenium and other COCPs would form in the Wells Regional Aquifer beneath the backfilled pit soon after commencement of mining, and would migrate northwest toward the intersection of the Rasmussen and Enoch Valley Faults. Simulated groundwater plumes for selenium and manganese in the Wells Regional Aquifer under the Proposed Action are shown on **Figure 4.3-16**. Concentrations of COPCs in the Wells Regional Aquifer at model observation point OBS-5 (**Figure 4.3-16**) are shown on **Figure 4.3-17**. Peak and long-term (700 years) concentrations at model observation points are summarized in **Table 4.3-9**.

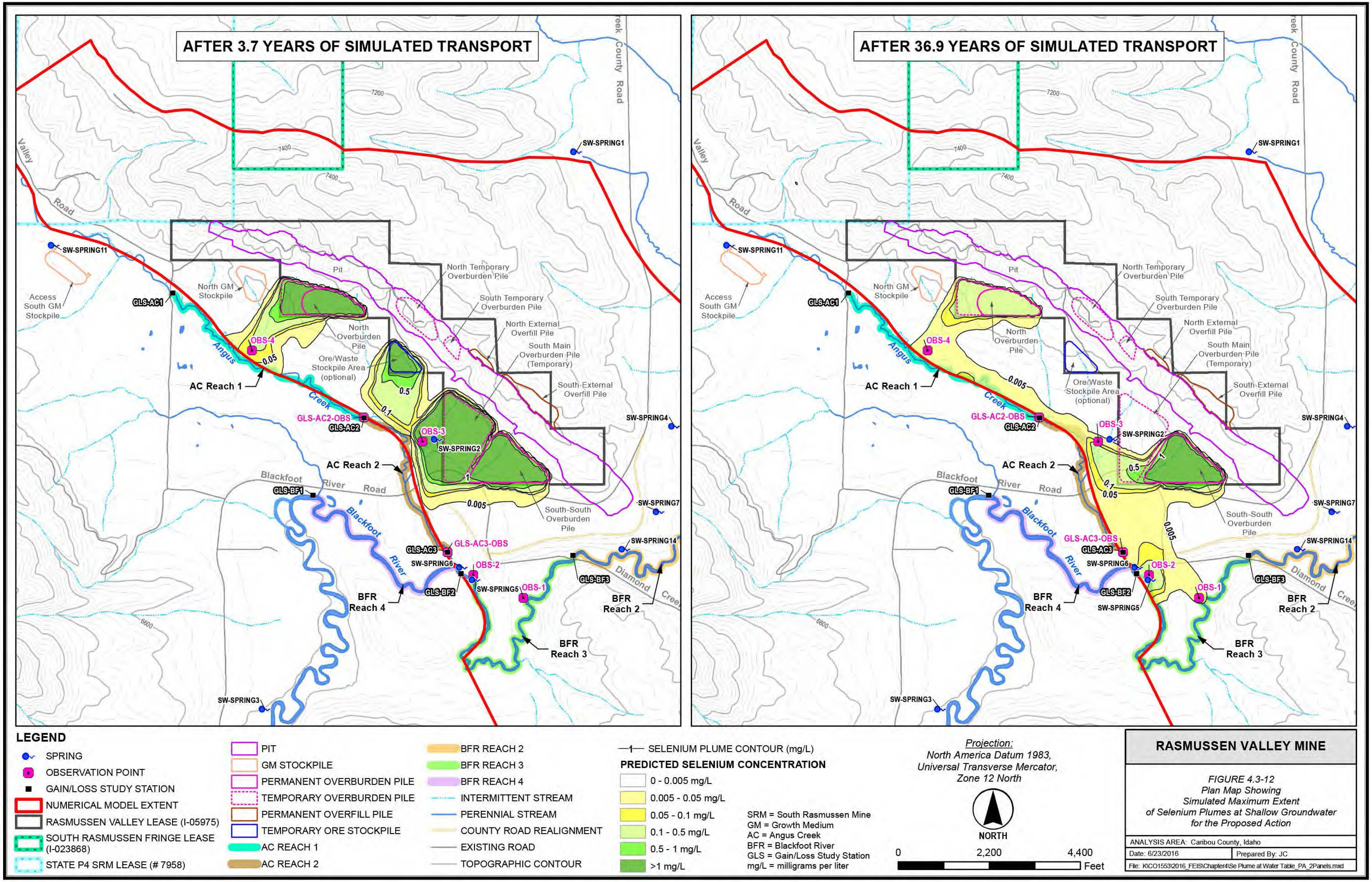
Modeling results indicate that seepage and groundwater movement through the backfilled pit and overfill areas under the Proposed Action would result in the release of COPCs into the Wells Regional Aquifer at concentrations that exceed Idaho groundwater quality standards. With the exceptions of aluminum, copper, iron, and zinc, modeled concentrations of remaining COPCs exceed the applicable standards in the regional aquifer at least at one location below the proposed pit backfill and overfill areas. Cadmium, manganese, selenium, sulfate, TDS, and thallium are modeled as being mobile at concentrations higher than groundwater standards outside of the pit backfill and overfill areas. Selenium is modeled to exhibit the greatest mobility in the Wells Regional Aquifer at levels above Idaho groundwater quality standards. The simulated plumes for all other COPC are contained within the footprint of the selenium plume shown on **Figure 4.3-16**. Contaminant loading to the Wells Regional Aquifer at the pit backfill and overfill area is modeled to correspond to the pore volume timing for the highest source term concentrations in **Table 4.3-9**. The timing of peak concentrations at model observation point OBS-5 is shown on **Figure 4.3-17**. The footprints of the maximum and long-term extents of the contaminant plumes are equal.

The Proposed Action would result in moderate impacts to groundwater quality in the local-, intermediate-, and regional-scale aquifers. Seepage from mine facilities would result in increased loading of selenium and other COPCs to groundwater. These COPCs would be transported northwest in the Wells Regional Aquifer and southwest in the local and intermediate aquifers, forming plumes with higher COPC concentrations than the unaffected groundwater. Seepage and groundwater movement through the backfilled pit would also result in the release of COPCs into the Wells Regional Aquifer at concentrations that exceed Idaho groundwater quality standards.

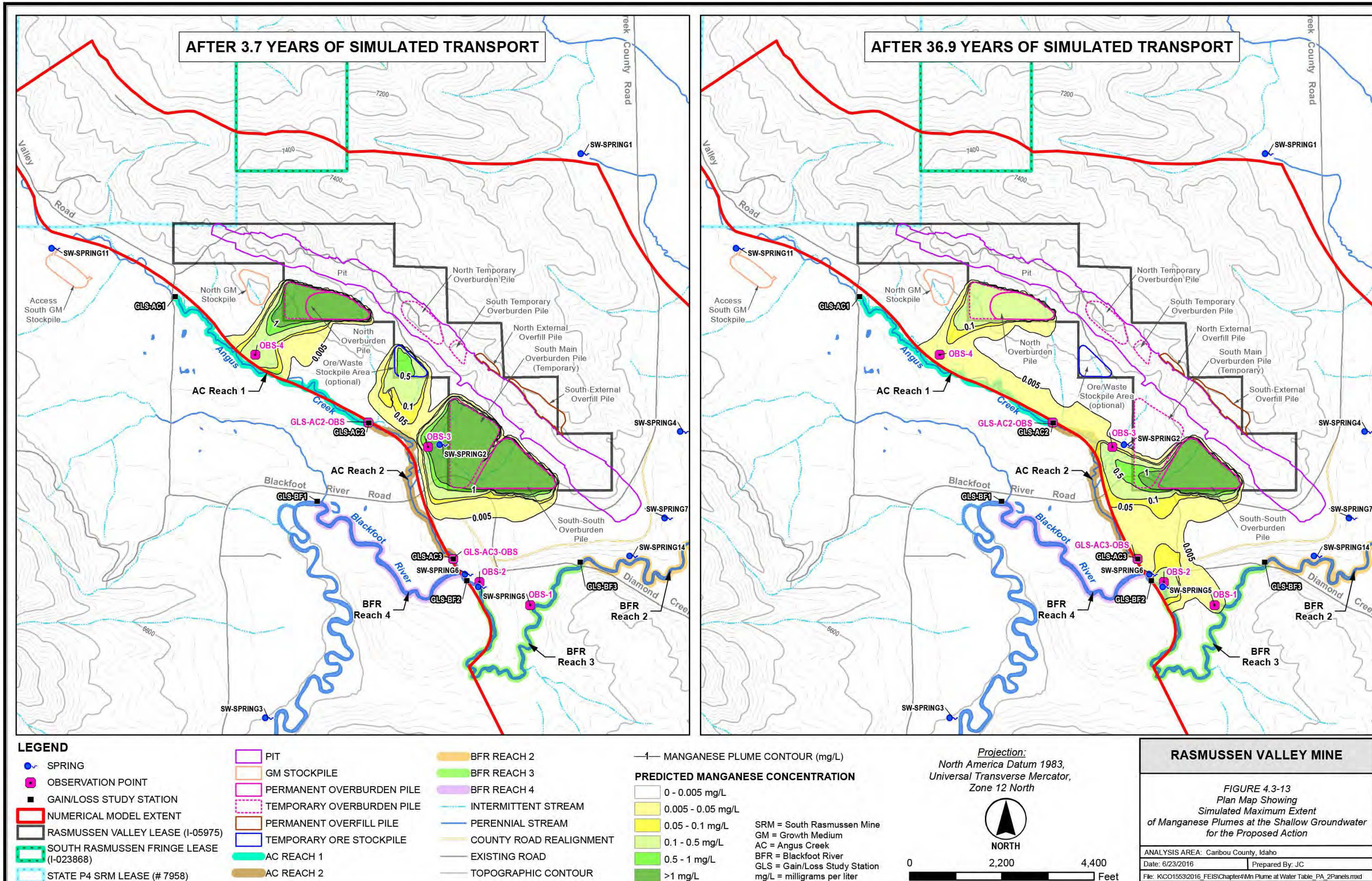
Table 4.3-9 Predicted Peak and Long-term Concentrations in the Wells Regional Aquifer for the Proposed Action at Model Observation Point OBS-5

Constituent	Peak Concentration (mg/L)	Long-Term Concentration (mg/L)	Groundwater Standard (mg/L)
Aluminum[2]	0.013	0.0048	0.2
Antimony[1]	0.001	0.0008	0.006
Cadmium[1]	0.0061	0.0061	0.005
Copper[1]	0.0002	0.0001	1.3
Iron[2]	0.011	0.0038	0.3
Manganese[2]	0.184	0.108	0.05
Nickel[4]	0.178	0.139	N/A
Selenium[1]	0.46	0.007	0.05
Sulfate[2]	238.37	169.73	250
TDS[2]	414.73	265.7	500
Thallium[1]	0.00106	0.00029	0.002
Uranium[3]	0.00385	0.00169	0.03
Zinc[2]	0.45	0.374	5

Notes:
1 Primary Idaho Groundwater Standard for antimony, cadmium, copper, selenium, and thallium
2 Secondary Idaho Groundwater Standard for aluminum, iron, manganese, sulfate, TDS, and zinc
3 Federal Primary Drinking Water Standard for uranium
4 There is no Idaho Groundwater Standard for nickel
N/A – Not Applicable



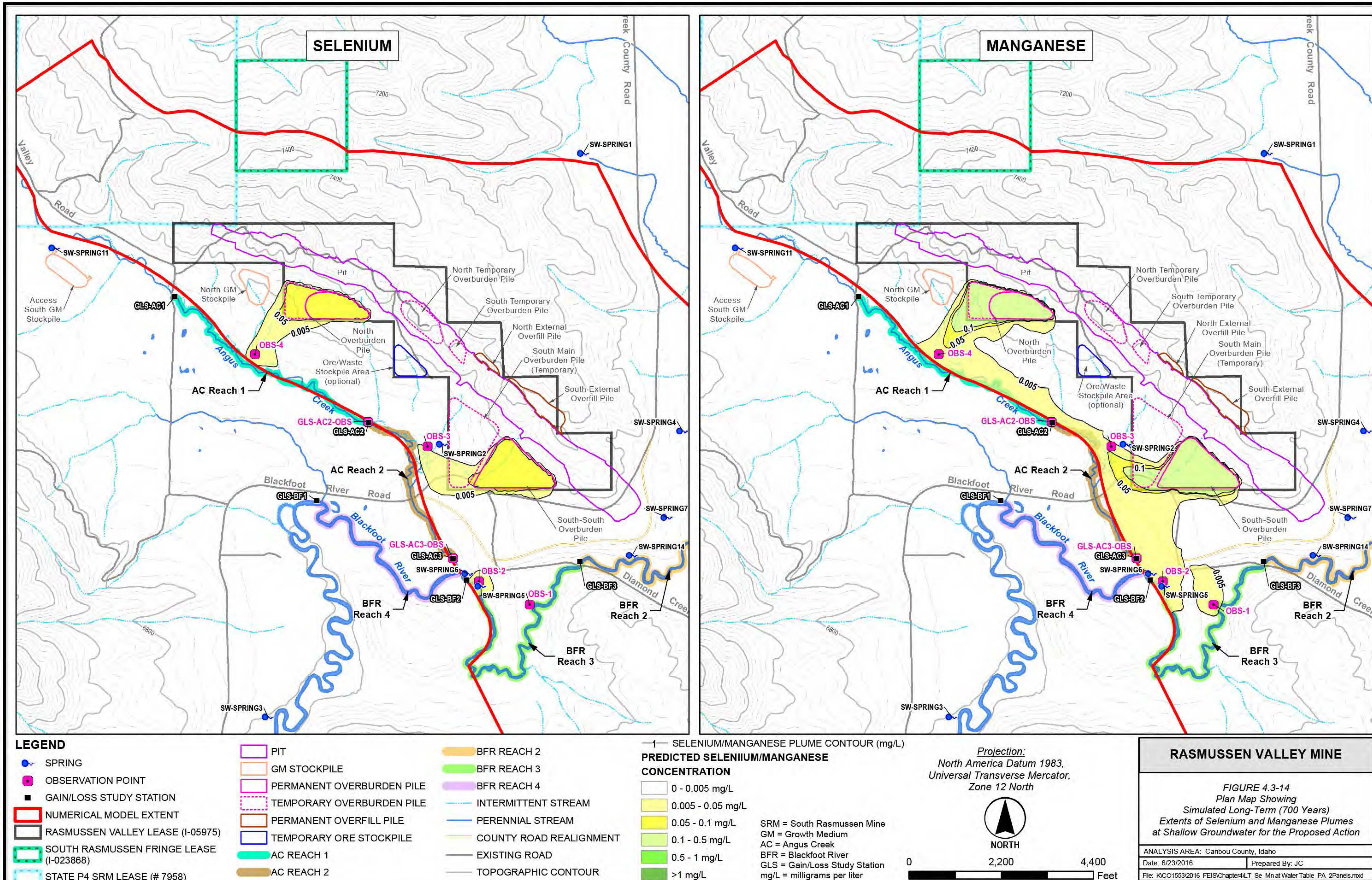
AFTER 3.7 YEARS OF SIMULATED TRANSPORT
AFTER 36.9 YEARS OF SIMULATED TRANSPORT
Valley Road
County Road
Blackfoot River Road
Angus Creek
Blackfoot River
Diamond Creek
SW-SPRING1
SW-SPRING11
SW-SPRING2
SW-SPRING3
SW-SPRING4
SW-SPRING5
SW-SPRING6
SW-SPRING7
SW-SPRING14
GLS-AC1
GLS-AC2
GLS-AC2-OBS
GLS-AC3
GLS-AC3-OBS
GLS-BF1
GLS-BF2
GLS-BF3
OBS-1
OBS-2
OBS-3
OBS-4
AC Reach 1
AC Reach 2
BFR Reach 2
BFR Reach 3
BFR Reach 4
Access South GM Stockpile
North GM Stockpile
Pit
North Temporary Overburden Pile
South Temporary Overburden Pile
North External Overfill Pile
South Main Overburden Pile (Temporary)
South External Overfill Pile
North Overburden Pile
Ore/Waste Stockpile Area (optional)
South-South Overburden Pile
7200
7400
6600
0.005
0.05
0.1
0.5
1
LEGEND
SPRING
OBSERVATION POINT
GAIN/LOSS STUDY STATION
NUMERICAL MODEL EXTENT
RASMUSSEN VALLEY LEASE (I-05975)
SOUTH RASMUSSEN FRINGE LEASE (I-023868)
STATE P4 SRM LEASE (# 7958)
PIT
GM STOCKPILE
PERMANENT OVERBURDEN PILE
TEMPORARY OVERBURDEN PILE
PERMANENT OVERFILL PILE
TEMPORARY ORE STOCKPILE
AC REACH 1
AC REACH 2
BFR REACH 2
BFR REACH 3
BFR REACH 4
INTERMITTENT STREAM
PERENNIAL STREAM
COUNTY ROAD REALIGNMENT
EXISTING ROAD
TOPOGRAPHIC CONTOUR
SELENIUM PLUME CONTOUR (mg/L)
PREDICTED SELENIUM CONCENTRATION
0 - 0.005 mg/L
0.005 - 0.05 mg/L
0.05 - 0.1 mg/L
0.1 - 0.5 mg/L
0.5 - 1 mg/L
>1 mg/L
SRM = South Rasmussen Mine
GM = Growth Medium
AC = Angus Creek
BFR = Blackfoot River
GLS = Gain/Loss Study Station
mg/L = milligrams per liter
Projection:
North America Datum 1983, Universal Transverse Mercator, Zone 12 North
NORTH
0
2,200
4,400
Feet
RASMUSSEN VALLEY MINE
FIGURE 4.3-12
Plan Map Showing Simulated Maximum Extent of Selenium Plumes at Shallow Groundwater for the Proposed Action
ANALYSIS AREA: Caribou County, Idaho
Date: 6/23/2016
Prepared By: JC
File: K:\CO1553\2016_FEIS\Chapter4\Se Plume at Water Table_PA_2Panels.mxd



RASMUSSEN VALLEY MINE

FIGURE 4.3-13
Plan Map Showing Simulated Maximum Extent of Manganese Plumes at the Shallow Groundwater for the Proposed Action

ANALYSIS AREA: Caribou County, Idaho
Date: 6/23/2016
Prepared By: JC
File: K:\CO1553\2016_FEIS\Chapter4\Mn Plume at Water Table_PA_2Panels.mxd


SELENIUM
MANGANESE
SW-SPRING1
SW-SPRING11
SW-SPRING2
SW-SPRING3
SW-SPRING4
SW-SPRING5
SW-SPRING6
SW-SPRING7
SW-SPRING14
GLS-AC1
GLS-AC2-OBS
GLS-AC2
GLS-AC3-OBS
GLS-AC3
GLS-BF1
GLS-BF2
GLS-BF3
OBS-1
OBS-2
OBS-3
OBS-4
AC Reach 1
AC Reach 2
BFR Reach 2
BFR Reach 3
BFR Reach 4
Access South GM Stockpile
North GM Stockpile
Pit
North Temporary Overburden Pile
South Temporary Overburden Pile
North External Overfill Pile
South Main Overburden Pile (Temporary)
South External Overfill Pile
North Overburden Pile
Ore/Waste Stockpile Area (optional)
South-South Overburden Pile
Angus Creek
Blackfoot River
Blackfoot River Road
Diamond Creek
Valley Road
County Road
7200
7400
6600
0.005
0.05
0.1
LEGEND
SPRING
OBSERVATION POINT
GAIN/LOSS STUDY STATION
NUMERICAL MODEL EXTENT
RASMUSSEN VALLEY LEASE (I-05975)
SOUTH RASMUSSEN FRINGE LEASE (I-023868)
STATE P4 SRM LEASE (# 7958)
PIT
GM STOCKPILE
PERMANENT OVERBURDEN PILE
TEMPORARY OVERBURDEN PILE
PERMANENT OVERFILL PILE
TEMPORARY ORE STOCKPILE
AC REACH 1
AC REACH 2
BFR REACH 2
BFR REACH 3
BFR REACH 4
INTERMITTENT STREAM
PERENNIAL STREAM
COUNTY ROAD REALIGNMENT
EXISTING ROAD
TOPOGRAPHIC CONTOUR
SELENIUM/MANGANESE PLUME CONTOUR (mg/L)
PREDICTED SELENIIUM/MANGANESE CONCENTRATION
0 - 0.005 mg/L
0.005 - 0.05 mg/L
0.05 - 0.1 mg/L
0.1 - 0.5 mg/L
0.5 - 1 mg/L
>1 mg/L
SRM = South Rasmussen Mine
GM = Growth Medium
AC = Angus Creek
BFR = Blackfoot River
GLS = Gain/Loss Study Station
mg/L = milligrams per liter
Projection:
North America Datum 1983,
Universal Transverse Mercator,
Zone 12 North
NORTH
0
2,200
4,400
Feet
RASMUSSEN VALLEY MINE
FIGURE 4.3-14
Plan Map Showing
Simulated Long-Term (700 Years)
Extents of Selenium and Manganese Plumes
at Shallow Groundwater for the Proposed Action
ANALYSIS AREA: Caribou County, Idaho
Date: 6/23/2016
Prepared By: JC
File: K:\CO1553\2016_FEIS\Chapter4\LT_Se_Mn at Water Table_PA_2Panels.mxd

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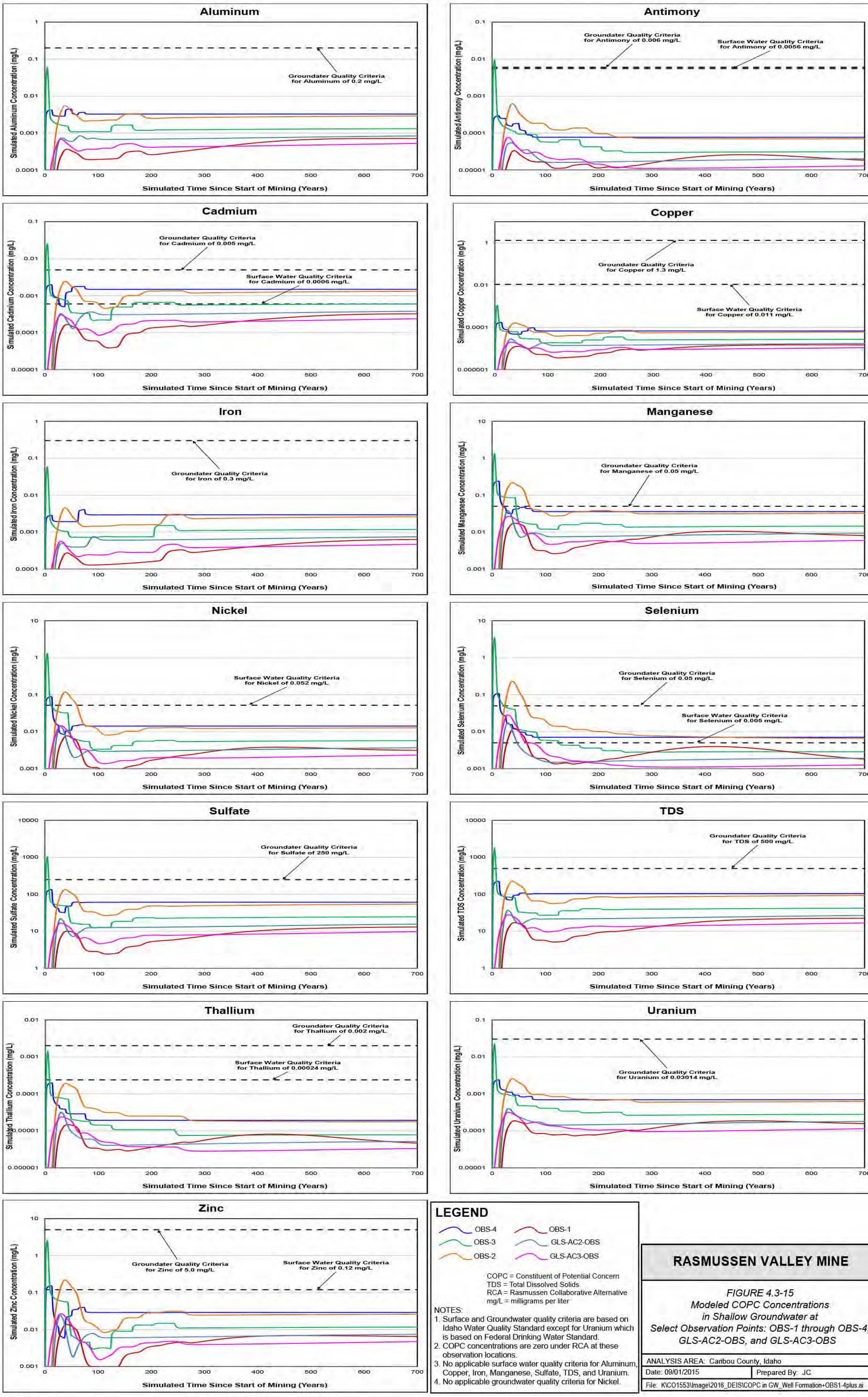

COPC = Constituent of Potential Concern
TDS = Total Dissolved Solids
RCA = Rasmussen Collaborative Alternative
mg/L = milligrams per liter

NOTES:
1. Surface and Groundwater quality criteria are based on Idaho Water Quality Standard except for Uranium which is based on Federal Drinking Water Standard.
2. COPC concentrations are zero under RCA at these observation locations.
3. No applicable surface water quality criteria for Aluminum, Copper, Iron, Manganese, Sulfate, TDS, and Uranium.
4. No applicable groundwater quality criteria for Nickel.

RASMUSSEN VALLEY MINE

FIGURE 4.3-15
Modeled COPC Concentrations in Shallow Groundwater at Select Observation Points: OBS-1 through OBS-4, GLS-AC2-OBS, and GLS-AC3-OBS

ANALYSIS AREA: Caribou County, Idaho
Date: 09/01/2015 | Prepared By: JC
File: K:\CO1553\Image\2016_DEIS\COPC in GW_Well Formation+OBS1-4plus.ai

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4.3.1.1.4 Impacts to Surface Water Resources

Mining activities associated with the Proposed Action carry the potential to impact surface waters through changes in volume and timing of surface water runoff and flow patterns; by the introduction of pollutants such as sediment, selenium, and other COPCs by storm water runoff and spills; by surface runoff contacting exposed overburden; and by discharge of shallow aquifers to surface waters.

Watershed Area Disturbance

RFP guidelines for the CNF (USFS 2003) recommend that less than 30 percent of HUC 5 and HUC 6 watershed areas should be hydrologically disturbed at any given time. Hydrologic disturbance is defined as changes in natural canopy cover (vegetation removal) or a change in surface soil characteristics (such as compaction) that may alter natural streamflow quantities and character. HUC 6 sub-watersheds that contain elements of the Proposed Action or the RCA were evaluated for conformance to RFP guidelines. Existing hydrologic disturbances in the three HUC 6 sub-watersheds (Angus Creek-Blackfoot River, Lower Lanes Creek, and Diamond Creek) that would be affected by the Proposed Action or the RCA include roads, recreational trails, utility lines, agricultural fields, homes, mining areas, and wildfires or timber harvesting that remove trees and have not recovered to a sapling/pole size class. Additional areas that would be disturbed include the open pit, stockpiles, external overburden disposal piles, roads, staging areas, and other facilities. These disturbances and prescribed percentage within HUC 6 watersheds pertain only to areas located on USFS land. Existing and proposed hydrologic disturbances in the HUC 6 sub-watersheds that would be affected by the Proposed Action are summarized in **Table 4.3-10** (USFS 2015a; BLM 2015a).

Table 4.3-10 Existing and Proposed Hydrologic Disturbances on Forest Service Lands under the Proposed Action

Sub-Watershed	Existing HUC 6 Watershed Disturbance (% area)	New Disturbances in HUC 6 watershed under the Proposed Action During Mining					
		Pit (% area)	External Stockpiles (% area)	Water Retention/ Sediment Basins (% area)	Roads (% area)	Fuel Storage Staging Area (% area)	Total New Disturbance (%)
Angus Creek-Blackfoot River	23.60	0.80	0.43	0.02	0.33	0.01	1.59
Lower Lanes Creek	16.98	0.00	0.00	0.00	0.00	0.00	0.00
Diamond Creek	3.30	0.00	0.00	0.00	0.00	0.00	0.00

Note:
Existing disturbances of HUC 6 watersheds from USFS 2015a and BLM 2015a

During mining, the Proposed Action would increase hydrologic disturbances in the Angus Creek-Blackfoot River sub-watershed by 1.59 percent. The total hydrological disturbance of 25.18 percent in the Angus Creek-Blackfoot River sub-watershed would meet the USFS guideline of less than 30 percent. There would be no disturbance on USFS lands in Lower Lanes Creek and Diamond Creek sub-watersheds under the Proposed Action.

The CNF RFP (USFS 2003) notes that the USEPA and USGS assessed the Blackfoot River watershed (4th level HUC) with a rating of 5 on their 1 to 6 IWI. This rating indicates “more serious water quality problem, low vulnerability”, which means that the existing condition may not meet the designated uses, but the vulnerability to additional stressors, such as pollutant loadings, is low.

Impacts to a hydrologically disturbed condition resulting from the Proposed Action would be considered minor, local, and long-term, lasting until vegetation fully recovered and trees reached the sapling/pole size class.

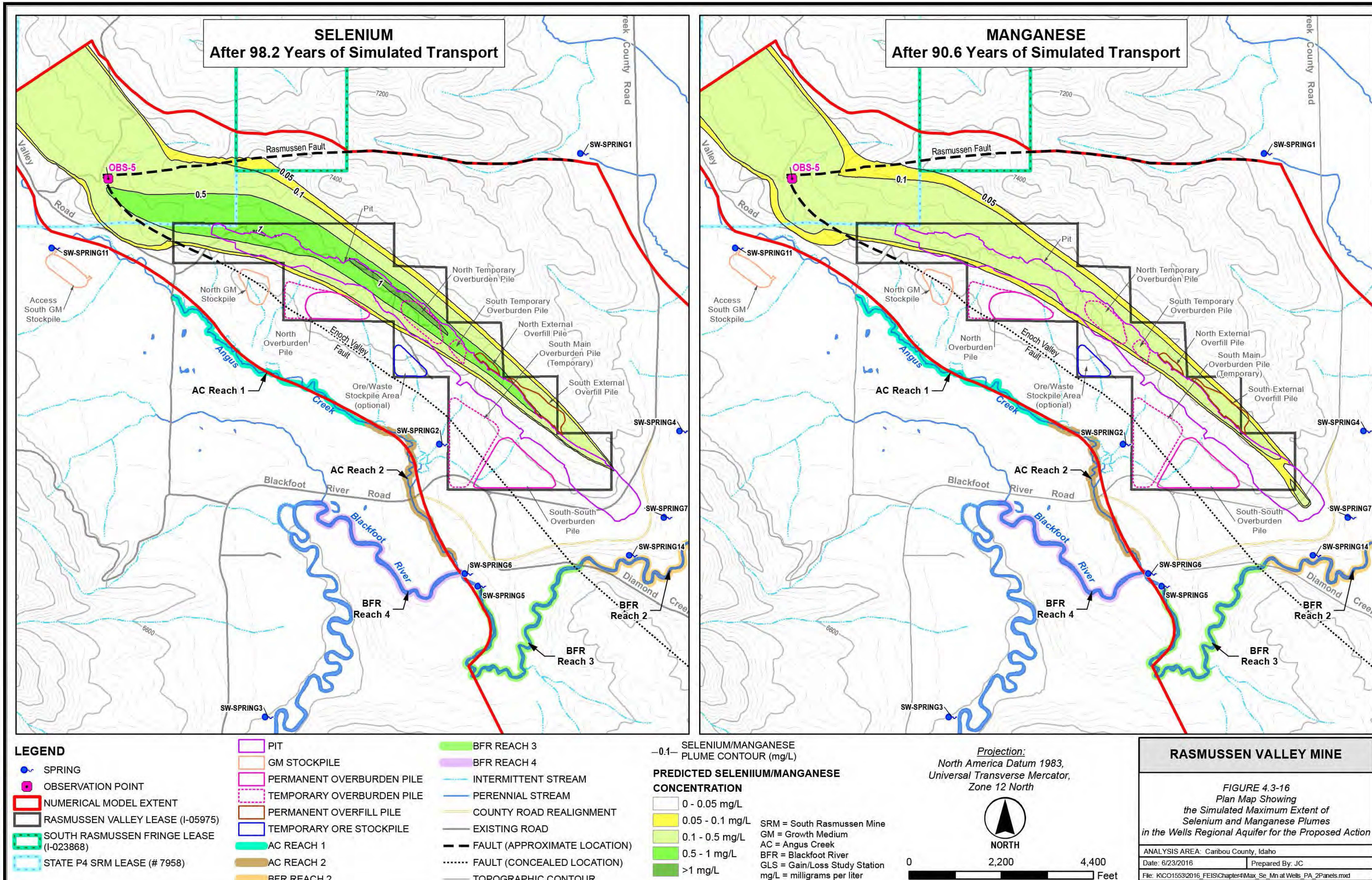
Impacts to Runoff Areas

Precipitation falling on disturbed areas associated with the pit, stockpiles, and haul roads and other facilities would infiltrate or be retained in sediment basins. Water in these basins would evaporate, infiltrate, or be transported to other available approved storm water storage areas. No discharge of runoff water would occur unless the design storm event is exceeded. This means that runoff from the disturbed areas, as well as undisturbed drainages captured by the pit, collection ditches, and sediment retention pond, would be retained during mining and would not contribute to runoff in the surrounding drainages as would normally occur under the baseline condition. Drainage areas upslope of the pit would not contribute to the affected downstream watersheds, thereby potentially reducing runoff volumes and peak flows during mining until reclamation is completed and the sediment basins are removed. The percent reduction in the contributing watershed is used in the following analysis to estimate the percent reduction in stream flow that could occur from the Proposed Action. This is a useful simplification that does not consider all factors that contribute to the volume of runoff generated by a drainage area. The analysis is used to compare the Proposed Action to the RCA, but should not be interpreted to represent quantitative changes in flows. Estimated reductions in runoff areas related to the Proposed Action for each sub-watershed are presented in **Table 4.3-11**.

Table 4.3-11 Reduction in Runoff Areas under the Proposed Action

Sub-Watershed	Pit and upstream drainages (acres)	External Stockpiles (acres)	Haul Roads (acres)	Water Retention/ Sediment basins (acres)	Fuel Storage Staging Area	Subtotal (acres)	Percent of Watershed
Angus Creek-Blackfoot River	589.00	116.77	79.83	7.02	1.40	794.02	4.14
Lower Lanes Creek	8.14	0.0	0.0	0.0	0.0	8.14	0.03
Diamond Creek	0.0	0.0	0.0	0.0	0.0	0.0	0.00

The area of the Angus Creek-Blackfoot River sub-watershed is 19,167 acres. The total runoff area that would be intercepted by the pit during mining would be 589 acres; however, the runoff area captured at any given time would be smaller because the pit would be backfilled and reclaimed as mining advances. This area would also include 12 drainage basins (1 through 12), located directly upstream of the pit, which would contribute surface runoff to the open pit during the life-of-mine (**Figure 2.3-5**). Disturbances for external overburden piles and GM stockpiles (North Overburden, South-South Overburden, Optional Ore, South Main Temporary Overburden, and North GM Stockpiles) and sediment basins would total 125 acres. Runoff from the North and South External Overfill Piles would be captured by the pit during mining. Runoff from the North and South GM Stockpiles would not be retained in sediment ponds and were excluded from the analysis. The total area that would be captured by the haul road during operation would be 80 acres. Overall, the total runoff area would represent 4.14 percent of the Angus Creek-Blackfoot River sub-watershed (**Table 4.3-11**). Based on this evaluation of the intercepted runoff areas, the reduction of runoff in the Angus Creek-Blackfoot River sub-watershed during mining would be minor, local, and limited to the life of proposed mining activities. After final reclamation, 11.2 acres of the pit wall would remain unreclaimed, but runoff from these areas and the overlying drainages would be rerouted and would still report to Angus Creek. For this reason, no reduction to runoff would occur from the backfilled and reclaimed pit. All external stockpiles, access roads, and haul roads would be fully reclaimed, and these areas would again function as part of the watershed and fully contribute runoff to Angus Creek.


SELENIUM
After 98.2 Years of Simulated Transport
MANGANESE
After 90.6 Years of Simulated Transport
Rasmussen Fault
OBS-5
0.05
0.1
0.5
1
Pit
North Temporary Overburden Pile
South Temporary Overburden Pile
North External Overfill Pile
South Main Overburden Pile (Temporary)
South External Overfill Pile
South-South Overburden Pile
Ore/Waste Stockpile Area (optional)
North Overburden Pile
North GM Stockpile
Access South GM Stockpile
Enoch Valley Fault
Valley Road
County Road
Angus Creek
Blackfoot River Road
Blackfoot River
Diamond Creek
AC Reach 1
AC Reach 2
BFR Reach 2
BFR Reach 3
BFR Reach 4
SW-SPRING1
SW-SPRING2
SW-SPRING3
SW-SPRING4
SW-SPRING5
SW-SPRING6
SW-SPRING7
SW-SPRING11
SW-SPRING14
7200
7400
6600
LEGEND
SPRING
OBSERVATION POINT
NUMERICAL MODEL EXTENT
RASMUSSEN VALLEY LEASE (I-05975)
SOUTH RASMUSSEN FRINGE LEASE (I-023868)
STATE P4 SRM LEASE (# 7958)
PIT
GM STOCKPILE
PERMANENT OVERBURDEN PILE
TEMPORARY OVERBURDEN PILE
PERMANENT OVERFILL PILE
TEMPORARY ORE STOCKPILE
AC REACH 1
AC REACH 2
BFR REACH 2
BFR REACH 3
BFR REACH 4
INTERMITTENT STREAM
PERENNIAL STREAM
COUNTY ROAD REALIGNMENT
EXISTING ROAD
FAULT (APPROXIMATE LOCATION)
FAULT (CONCEALED LOCATION)
TOPOGRAPHIC CONTOUR
0.1 SELENIUM/MANGANESE PLUME CONTOUR (mg/L)
PREDICTED SELENIIUM/MANGANESE CONCENTRATION
0 - 0.05 mg/L
0.05 - 0.1 mg/L
0.1 - 0.5 mg/L
0.5 - 1 mg/L
>1 mg/L
SRM = South Rasmussen Mine
GM = Growth Medium
AC = Angus Creek
BFR = Blackfoot River
GLS = Gain/Loss Study Station
mg/L = milligrams per liter
Projection:
North America Datum 1983,
Universal Transverse Mercator,
Zone 12 North
NORTH
0 2,200 4,400 Feet
RASMUSSEN VALLEY MINE
FIGURE 4.3-16
Plan Map Showing
the Simulated Maximum Extent of
Selenium and Manganese Plumes
in the Wells Regional Aquifer for the Proposed Action
ANALYSIS AREA: Caribou County, Idaho
Date: 6/23/2016
Prepared By: JC
File: KCO1553\2016_FEIS\Chapter4\Max_Se_Mn at Wells_PA_2Panels.mxd

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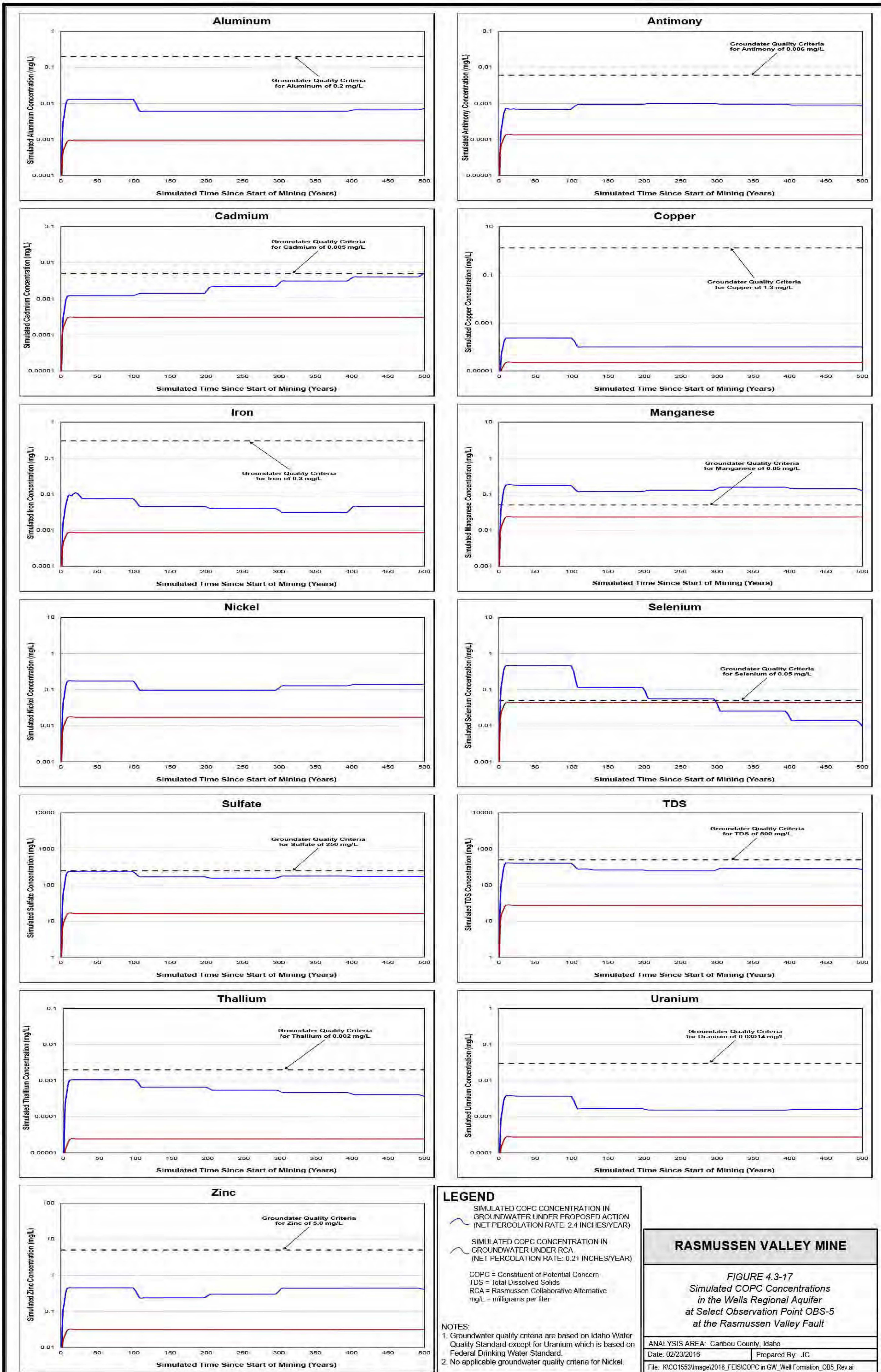
Aluminum
Groundater Quality Criteria for Aluminum of 0.2 mg/L
Simulated Aluminum Concentration (mg/L)
Antimony
Groundater Quality Criteria for Antimony of 0.006 mg/L
Simulated Antimony Concentration (mg/L)
Cadmium
Groundater Quality Criteria for Cadmium of 0.005 mg/L
Simulated Cadmium Concentration (mg/L)
Copper
Groundater Quality Criteria for Copper of 1.3 mg/L
Simulated Copper Concentration (mg/L)
Iron
Groundater Quality Criteria for Iron of 0.3 mg/L
Simulated Iron Concentration (mg/L)
Manganese
Groundater Quality Criteria for Manganese of 0.05 mg/L
Simulated Manganese Concentration (mg/L)
Nickel
Simulated Nickel Concentration (mg/L)
Selenium
Groundater Quality Criteria for Selenium of 0.05 mg/L
Simulated Selenium Concentration (mg/L)
Sulfate
Groundater Quality Criteria for Sulfate of 250 mg/L
Simulated Sulfate Concentration (mg/L)
TDS
Groundater Quality Criteria for TDS of 500 mg/L
Simulated TDS Concentration (mg/L)
Thallium
Groundater Quality Criteria for Thallium of 0.002 mg/L
Simulated Thallium Concentration (mg/L)
Uranium
Groundater Quality Criteria for Uranium of 0.03014 mg/L
Simulated Uranium Concentration (mg/L)
Zinc
Groundater Quality Criteria for Zinc of 5.0 mg/L
Simulated Zinc Concentration (mg/L)
Simulated Time Since Start of Mining (Years)
LEGEND
SIMULATED COPC CONCENTRATION IN GROUNDWATER UNDER PROPOSED ACTION (NET PERCOLATION RATE: 2.4 INCHES/YEAR)
SIMULATED COPC CONCENTRATION IN GROUNDWATER UNDER RCA (NET PERCOLATION RATE: 0.21 INCHES/YEAR)
COPC = Constituent of Potential Concern
TDS = Total Dissolved Solids
RCA = Rasmussen Collaborative Alternative
mg/L = milligrams per liter
NOTES:
1. Groundwater quality criteria are based on Idaho Water Quality Standard except for Uranium which is based on Federal Drinking Water Standard.
2. No applicable groundwater quality criteria for Nickel.
RASMUSSEN VALLEY MINE
FIGURE 4.3-17
Simulated COPC Concentrations in the Wells Regional Aquifer at Select Observation Point OBS-5 at the Rasmussen Valley Fault
ANALYSIS AREA: Caribou County, Idaho
Date: 02/23/2016
Prepared By: JC
File: K:\CO1553\Image\2016_FEIS\COPC in GW_Well Formation_OB5_Rev.ai

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The area of the Lower Lanes Creek sub-watershed is 26,864 acres. A total runoff area of 8.14 acres within Lower Lanes Creek sub-watershed would be captured by the pit during mining (**Table 4.3-11**). The captured area represents 0.03 percent of the Lower Lanes Creek sub-watershed; therefore, impacts related to reduction of runoff within Lower Lanes Creek sub-watershed during mining would be negligible. Agrium would also have the option to divert runoff from drainage areas 3 and 4 using a runon diversion ditch during mining of Phase 4. Water intercepted by the ditch would be routed to drainage area 20, which drains into Lower Lanes Creek sub-watershed. This operational decision, if implemented, would result in a slight increase (106 acres or 0.4 percent) in runoff area contributing to Lower Lanes Creek sub-watershed during Phase 4 of mining. After mining cessation, the portion of the southern end of the pit in Lower Lanes Creek sub-watershed would be fully reclaimed, and there would be no reduction in runoff to Lanes Creek.

There would be no surface disturbance in the Diamond Creek sub-watershed; therefore, no changes in the amount of runoff reporting to Diamond Creek are expected to occur from the Proposed Action.

To assess impacts from runoff reduction to Angus Creek, the same type of analysis was performed for only areas of Angus Creek-Blackfoot River sub-watershed that drain into Angus Creek. This area encompasses 9,289 acres. The total runoff area that would be temporarily removed from Angus Creek drainage would be 722.4 acres under the Proposed Action. As discussed above, the total acreage that would be removed at any given time would be lower because the pit would be backfilled and reclaimed as mining advances. Overall, the total runoff area reduction would represent 7.8 percent of the Angus Creek drainage.

All disturbed areas under the Proposed Action are tributary to Blackfoot River. A combined total of 802 acres (**Table 4.3-11**) would be temporarily removed from the Blackfoot River Watershed. However, the total acreage that would be removed at any given time would be less. The total drainage area of the Blackfoot River above the Study Area, including the Lanes Creek-Diamond Creek watershed and excluding the Spring Creek drainage (which is part of Angus Creek-Blackfoot River watershed), is 83,828 acres. The combined total capture area under the Proposed Action would be less than 1 percent of the total runoff area reporting to Blackfoot River.

<u>Impacts to Peak Flows</u>

Haul and access roads under the Proposed Action carry the potential to affect peak flows through two primary mechanisms. First, the road drainage network of in-slope ditches and cross-drains could alter peak flows and accelerate runoff by increasing drainage density, extending the stream network, and causing small-scale trans-basin diversions (Furniss et al. 2000). The Proposed Action would minimize this potential to the extent possible by reducing the extent of hydrologically connected roads. Hydrologically connected roads are defined as “any road segment that, during a design runoff event, has a continuous surface flow path between any part of the road prism and a natural stream channel” (Furniss et al. 2000).

Second, if a stream crossing or culvert cannot pass all stream flow, either because it is blocked or because the design event is exceeded, the flow could overtop the crossing or culvert, flow down the road, and be redirected to a tributary channel other than the intended one, which could result in locally higher peak flows, head cutting, and erosion (Furniss et al. 1997). The Mine and Reclamation Plan (Agrium 2011) addresses this concern by designing all ditches, culverts, and crossings for the 100-year, 24-hour storm event.

Final reclamation would include removal of some road material and re-contouring of the remaining road bed. Linear, on-contour road bed features would remain. The potential peak flow alterations resulting from these remaining features under the Proposed Action would be minor, local, and have short durations. The county road re-alignment would have localized minor impacts that would be long-term.

Impacts to Channels

Runoff from temporary and permanent overburden piles, pit backfills, haul roads, and other disturbed areas would increase the potential for erosion.

Sediment loading in downstream waterbodies would be controlled by directing on-site surface water flow into retention ponds. Runoff from the proposed external overburden piles, optional ore stockpile, and North GM Stockpile would be collected in collection ditches at the bases of each facility and routed to sediment basins. The North and South Temporary Overburden Piles and the North and South External Overfill Piles would drain into the mine pit and would not need sediment basins. The two GM stockpiles, containing soils salvaged from construction of the haul roads, would be stabilized with temporary seeding and vegetation. Sediment would be intercepted by straw wattles and silt fences, removing the need for sediment basins. Culverts and ditches would be used to collect runoff from the haul road and divert it to sediment basins located downslope of the West Side and Rasmussen Valley Haul Roads. Sediment basins would be in place during construction and mining, and would be designed to retain sediment and runoff generated by the 100-year, 24-hour precipitation event. The basins would be maintained and trapped sediments removed as needed to ensure pond capacity. An event producing runoff greater than the 100-year, 24-hour precipitation event could fill ponds with water and discharge from the sediment basins. Runoff from disturbances associated with the external overburden piles, optional ore stockpile, and North GM Stockpile are not predicted to result in increased sedimentation of stream channels in the Study Area.

Mining under the Proposed Action would intercept a number of upslope drainages crossing the pit area. Disruption of these drainages would change the flow dynamics of the channels as well as limit the amount of runoff that reaches Angus Creek. The drainages would be re-established as the backfilled pit is reclaimed. The Proposed Action would also affect four drainages below the pit through the construction of external overburden piles within and adjacent to intermittent stream channels (**Figure 2.3-2**). Construction of these facilities would alter the natural flow patterns by changing overland flow characteristics and diverting the flow away from the natural channels. The intermittent drainages affected by the South Main Temporary Overburden Pile would be re-established after reclamation, and the drainages and overland flow affected by the North and South-South Overburden Piles would be permanently diverted. The permanent diversions would route surface flow around the overburden piles and are not expected to affect sediment loads to downstream channels and waterbodies.

Impacts to stream channels from the Proposed Action would generally be minor, local, and short-term. Exceptions to this generalization include the channel diversions associated with the North and South-South Overburden Piles. Diversion of the channels around these facilities would have minor, local, and long-term impacts.

Impacts to Stream and Spring Flows

Changes in surface runoff and groundwater flow that would result from the Proposed Action carry the potential to impact stream flows, spring flows, and water availability for wetlands.

Angus Creek and Associated Wetlands and Springs

Direct impacts to stream flow in Angus Creek would be primarily related to reduced runoff reaching the creek during mining operations. Runoff areas in the Angus Creek-Blackfoot River sub-watershed would be temporarily reduced by a maximum of 4.14 percent during mining under the Proposed Action (**Table 4.3-11**). The Proposed Action would also result in reduced surface water flow to the wetland adjacent to Angus Creek. Reduced runoff to the wetland springs could temporarily decrease the size of some wetland areas. These impacts would be minor to moderate in extent and limited to the projected life of proposed mining activities of 4.8 years. It is likely that the wetland area west of the proposed mine may be supported in part by shallow groundwater discharge. However, mass balance analysis from numerical modeling of pre- and post-mining conditions suggest no significant changes in groundwater discharge to wetland areas as a result of mining activities under the Proposed Action.

Dewatering of the pit to facilitate mining below the regional water table would not impact flows in Angus Creek or the associated wetlands. Groundwater pumped from the pit would primarily originate from the Wells Regional Aquifer, the water level of which is 100 feet lower than the lowest elevation of Angus Creek, the point where it joins Blackfoot River. The numerical simulation of pit dewatering by Arcadis (2015g) indicates that pumping to facilitate mining below the regional water table would not decrease the streamflow in Angus Creek.

Baseline monitoring data indicate that Angus Creek is a losing stream over its length during most flow conditions. However, numerical modeling by Arcadis (2015g) suggests that Angus Creek gains 0.01 cubic foot per second (cfs; Table 6 in Arcadis 2015g) in the segment immediately above its confluence with Blackfoot River (AC Reach 2, **Figure 3.3-4**). Both the modeled gain and the range of measured losses (0.02 to 0.42 cfs) are small and are considered to be within the accuracy of field measurements performed for the baseline surface water monitoring program. It is also noted that the gain-loss measurement on Angus Creek and the groundwater model do not account for flow in the hyporheic zone. The hyporheic zone is the region below and beside the streambed, where there is mixing of shallow groundwater flow and surface water flow. As a result, AC Reach 2 is interpreted as a relatively neutral reach under the base flow conditions with complex interaction with groundwater in the hyporheic zone rather than having dominantly losing characteristics.

Impacts to stream flow in Angus Creek and water availability in the adjacent wetlands during mining would be temporary, localized, and minor. After reclamation, surface water flow to the wetland would be fully restored, and long-term impacts to stream flows and water availability in the wetlands after final reclamation would be negligible.

Blackfoot River, Lanes Creek, and Associated Springs

The Proposed Action would have negligible impacts to the total runoff area reporting to Blackfoot River below the Study Area (less than 1 percent reduction), and potential reductions in runoff would not measurably affect stream flows.

Numerical modeling indicates that the Proposed Action would result in negligible impacts to shallow groundwater flow to Blackfoot River during mining and after reclamation of the mine facilities (Arcadis 2015g). As indicated in Table 6 of the Groundwater Modeling Report (Arcadis 2015g), model-predicted shallow groundwater fluxes to Blackfoot River vary between 0.008 cfs and 0.145 cfs, and indicate that the majority of the shallow groundwater flow would be concentrated in the valley at the junction with Angus Creek within the BFR Reach 3 (**Figure 4.3-12**).

Dewatering for mining would not measurably affect stream flows in Blackfoot River, and no impacts are predicted to Lanes Creek above the Blackfoot River headwater. However, as indicated on **Figure 4.3-11,** some temporary stream flow depletions to Spring Creek may occur as a result of dewatering during the first 7 to 8 months of mining operations. Numerical modeling indicates that flows from springs along the banks of Blackfoot River (SW-Spring3, SW-Spring5, SW-Spring6, SW-Spring7, and SW-Spring14) and in Upper Valley (SW-Spring1, SW-Spring4, and SW-Spring10) (**Figure 4.3-12**) would not be measurably affected by mining, dewatering, or reclamation under the Proposed Action.

Impacts to Surface Water Quality

The Proposed Action carries the potential to impact water quality in Blackfoot River, Angus Creek, and springs and wetlands in the Study Area. Potential impacts to water quality include increases in suspended sediment, turbidity, and concentrations of the COPCs listed in **Table 4.3-1**.

Temporary impacts to water quality from increased sediment yield could occur from disturbances related to construction of haul roads and other mine facilities. BMPs, including silt fences, straw bales, or geotextiles, would be used to mitigate sediment and turbidity in runoff during construction. The South Main Temporary Overburden Pile and South-South Overburden Pile would be constructed within the footprint of the wetland complex in Assessment Area (AA) 2, and sedimentation impacts during the construction phase for these facilities would be minimized by implementing BMPs.

Impacts to water quality from sedimentation during mining would be controlled by diversion structures, runoff sediment basins, slope stabilization, and other BMPs described in **Section 2.3.5**. The Proposed Action is expected to result in negligible sedimentation impacts to Angus Creek and Blackfoot River because runoff from disturbed areas would be captured in sediment basins, and BMPs would be used to control sediment and turbidity as required.

After mining, the overburden piles and backfilled pit would be capped and reclaimed. All disturbance areas would be graded to a stable slope and vegetated to prevent erosion. Once reclamation is complete, sediment loads and turbidity in runoff from the previously disturbed areas would be similar to the pre-mining condition; thus, no long-term impacts from sedimentation would occur from the Proposed Action. The cover system over the reclaimed pit backfill and the North and South-South Overburden Piles would prevent contact of runoff with overburden, preventing COPC loading to streams and wetlands by this mechanism.

COPC loading to surface water could occur when seepage from the North, South Main Temporary, and South-South Overburden Piles enters surface water via migration in shallow groundwater southwest toward the confluence of Angus Creek and Blackfoot River.

Angus Creek

Baseline monitoring data indicate that Angus Creek is a losing stream over its length during low-flow conditions. However, numerical modeling by Arcadis (2015g) suggests that Angus Creek gains 0.01 cfs in Reach 2 above its confluence with Blackfoot River (**Figure 3.3-4**). Both the modeled gain and the measured losses are relatively small and are considered to be within the accuracy of baseline monitoring. As a result, AC Reach 2 is interpreted as a relatively neutral reach under base flow conditions with complex interaction with groundwater in the hyporheic zone. The following COPC loading analysis for Angus Creek assumes the modeled gain from shallow groundwater in Reach 2 of the stream under base flow conditions. Reach 1 is conceptualized as a losing stream segment consistent with baseline surface water monitoring data (Whetstone 2015b); thus, chemical loading of Reach 1 by the migration of COPCs in shallow groundwater from the Proposed Action is not predicted.

Predicted chemical loadings and concentrations of COPCs in Angus Creek Reach 2 are presented in **Table 4.3-12**. The peak and long-term average groundwater concentrations (i.e., long-term average concentrations over the modeling period of 700 years) represent modeled concentrations in groundwater immediately before mixing with surface water of Angus Creek. Simulated concentrations of COPCs in the discharging groundwater generally peak during the first 35 years and then decrease rapidly to a steadily declining long-term concentration. The presented peak mass loading rates to Angus Creek are based on the maximum of the average annual discharging COPC concentrations and would occur for only a short period of time. Increases in instream concentrations are based on peak chemical loadings and represent the estimated COPC concentration increase in Angus Creek after mixing of discharging groundwater with the surface water under both low-flow and high-flow conditions.

Stream flow measurements from surface water station SW-AC1, collected during baseline monitoring performed from 2010 through 2014, were used to calculate representative stream flows for Angus Creek. Data from year 2011 were excluded because of anomalously high stream flow conditions during that year. The average of measured stream flow values during the months of August through October were used to calculate representative low-flow conditions, while data from the months of April through July were used to calculate representative high-flow conditions. A measurement of 0.004 cfs, recorded in August 2014, was identified as an outlier (being 2 orders of magnitude lower than the next lowest measurement) and was therefore excluded from the calculations. The resulting average stream flow in Angus Creek is 0.7 cfs under low-flow and 8.0 cfs under high-flow conditions.

Predicted impact to surface water, applicable surface water quality standards, and baseline statistics calculated for surface water quality stations at Angus Creek between 2010 and 2014 (Whetstone 2015b), are also provided in **Table 4.3-12**.

Table 4.3-12 Predicted COPC Loadings and Concentrations in Angus Creek AC Reach 2 for the Proposed Action

Constituent		Predicted Peak GW Concentration (mg/L)	Predicted Long-term Average GW Concentration (mg/L)	Predicted Peak Mass Loading Rate (lbs/yr)	Predicted Peak In-stream Increase Concentration (mg/L)	Applicable Surface Water Standard (mg/L)	Surface Water Baseline Concentration [1] (mg/L)
Aluminum	Low Flow	0.001	0.0004	0.01	<0.0001	N/A	<0.03
	High Flow				<0.0001		0.08
Antimony	Low Flow	0.0001	0	0	0	0.0056	<0.0004
	High Flow				0		<0.0004
Cadmium	Low Flow	*0.0004*	*0.0002*	0.01	<0.0001	0.0006	<0.0001
	High Flow				<0.0001		<0.0001
Copper	Low Flow	0	0	0	0	0.011	0.0009
	High Flow				0		0.0011
Iron	Low Flow	0.001	0.0003	0.01	<0.0001	N/A	0.012
	High Flow				<0.0001		0.064
Manganese	Low Flow	0.033	0.0077	0.52	0.0004	N/A	0.08
	High Flow				<0.0001		0.09
Nickel	Low Flow	*0.018*	0.0031	0.28	0.0002	0.052	<0.01
	High Flow				<0.0001		<0.02
Selenium	Low Flow	***0.035***	*0.004*	0.55	0.0004	0.005	0.0008
	High Flow				<0.0001		0.0019
Sulfate	Low Flow	20.54	7.68	326.07	0.23	N/A	29.5
	High Flow				0.02		24.3

Table 4.3-12 Predicted COPC Loadings and Concentrations in Angus Creek AC Reach 2 for the Proposed Action

Constituent		Predicted Peak GW Concentration (mg/L)	Predicted Long-term Average GW Concentration (mg/L)	Predicted Peak Mass Loading Rate (lbs/yr)	Predicted Peak In-stream Increase Concentration (mg/L)	Applicable Surface Water Standard (mg/L)	Surface Water Baseline Concentration [1] (mg/L)
TDS	Low Flow	34.47	13.47	547.12	0.39	N/A	230
	High Flow				0.03		176
Thallium	Low Flow	0	0	0	0	0.00024	<0.0001
	High Flow				0		<0.0001
Uranium	Low Flow	0.0004	0.0001	0.01	<0.0001	N/A	0.0006
	High Flow				<0.0001		0.0004
Zinc	Low Flow	*0.033*	0.0058	0.53	0.0004	0.12	<0.02
	High Flow						<0.078

Notes:
1 Surface Water Baseline Concentration calculated for monitoring station SW-AC1 by Whetstone (2015b)
Standard for Human Health based on consumption of water and organisms for antimony and thallium
CCC standard for cadmium, nickel, selenium, and zinc
Value in bold-italic represents groundwater concentration before mixing in exceedance of applicable surface water quality standard
Value in italics represents groundwater concentration before mixing greater than surface water baseline statistics
GW = Groundwater
mg/L = milligrams per liter
lbs/yr = pounds per year
N/A = no standard exists

The groundwater model indicates that selenium concentrations in groundwater flow that would report to AC Reach 2 would likely exceed the cold-water aquatic life CCC chronic standard of 0.005 mg/L, starting in year 15, and attain a peak predicted concentration of 0.035 mg/L 35 years after the start of mining. Selenium concentrations in groundwater flow to the AC Reach 2 are projected to decrease rapidly after the peak but remain elevated above 0.005 mg/L for an additional 43 years. Long-term concentrations in groundwater reporting to AC Reach 2 are predicted to meet applicable surface water standards.

Table 4.3-12 shows the modeled maximum selenium plume extent at the shallow groundwater for the Proposed Action. The peak selenium groundwater concentration is reached at year 35, with highest concentrations predicted at the confluence of Angus Creek with Blackfoot River. While the modeled groundwater plume extends nearly to the stream at AC Reach 1, the modeling results indicate that the plume does not enter the stream, and no COPC loading is predicted for AC Reach 1.

Baseline selenium concentrations in the Upper Blackfoot River Watershed tend to correlate positively with the streamflow (e.g., high concentrations typically observed with high stream flows; Mebane et al. 2015). This trend was also observed during baseline monitoring performed on Angus Creek between 2010 and 2014. Baseline selenium concentrations, as measured during this period at SW-AC1, SW-AC2, and SW-AC-3, averaged 0.001mg/L during low-flow conditions and 0.003 mg/L during high-flow conditions (Whetstone 2015b). Predicted peak chemical loading of 0.55 lbs/yr would result in increase of selenium concentrations in AC Reach 2 by 0.0004 mg/L during low-flow conditions (**Table 4.3-12**). No measurable increase in selenium concentrations in streams is therefore predicted under high-flow conditions from the Proposed Action. Concentrations for all other COPCs in groundwater that would flow to AC Reach 2 are predicted to meet applicable surface water standards.

Predicted peak and long-term groundwater concentrations at AC Reach 2 are generally below the surface water baseline concentrations with the exception of peak groundwater concentrations for nickel and zinc, and both peak and long-term groundwater concentrations for cadmium and selenium. Increases in instream concentrations at AC Reach 2 predicted for manganese, nickel, selenium, sulfate, TDS, and zinc would represent up to a 50-percent increase (for selenium) under low-flow conditions and a 0.02-percent increase (for TDS) under high-flow conditions, respectively.

As a result of predicted moderate increases of in-stream COPC concentrations and projected 78-year exceedance of CCC for selenium in shallow groundwater before entering the creek, potential impacts to water quality of Angus Creek under the Proposed Action would be considered moderate and long-term.

Blackfoot River

Based on the site conceptual model, there would be no contribution from the regional or intermediate groundwater system to surface water in Blackfoot River (Whetstone 2015c). Modeling results indicate that there would be a shallow groundwater flow contribution from the alluvial and underlying basalt systems that would be concentrated primarily in the valley at the junction with Angus Creek within BFR Reach 3 (**Figure 4.3-12**). As depicted on **Figure 4.3-12**, no shallow groundwater path is predicted from the pit to the Blackfoot River. The source of COPC loading to Blackfoot River would be the seepage from the South Main Temporary Overburden Pile and South-South Overburden Pile. The model predicts no COPC loading to BFR Reach 1 and BFR Reach 2.

Predicted chemical loadings and concentrations of COPCs in BFR Reach 3 are presented in **Table 4.3-13**. The peak and long-term average groundwater concentrations represent modeled concentrations in groundwater immediately before mixing with surface water of Blackfoot River. Concentrations of COPCs in groundwater flow generally peak during the first 35 years and then decrease rapidly to a steadily declining long-term concentration. The presented peak mass loading rates to BFR Reach 3 are based on the maximum of the average annual discharging COPC concentrations and would occur for only a short period. The mass loading analysis assumes the modeled gain from shallow groundwater in BFR Reach 3 of the stream under base flow conditions. Calculated increases in instream concentrations are based on peak chemical loadings and represent the estimated COPC concentration increases in Blackfoot River after mixing with the surface water of Blackfoot River under both low-flow and high-flow conditions.

To estimate representative stream flows in the Blackfoot River, baseline monitoring data from surface water station SW-BF1, collected between 2010 and 2014, were used. Data from year 2011 were excluded because of anomalously high stream flow conditions during that year. The average of measured stream flow values during the months of August through October were used to calculate representative low-flow conditions. As a result of the absence of measurements (resulting from the inability to collect flow data because of dangerously high flow conditions) during the months of April and May, the average of three highest values was used to estimate representative high-flow conditions in the Blackfoot River. The resulting representative stream flow in the Blackfoot River is 37 cfs under low-flow conditions and 211 cfs under high-flow conditions.

Applicable surface water quality standards, as well as baseline statistics calculated for surface water quality stations between 2010 and 2014 (Whetstone 2015b), are provided in **Table 4.3-13** for comparison.

Table 4.3-13 Predicted COPC Loadings and Concentrations in Blackfoot River BFR Reach 3 for the Proposed Action

Constituent		Predicted Peak GW Concentration (mg/L)	Predicted Long-term Average GW Concentration (mg/L)	Predicted Peak Mass Loading Rate (lbs/yr)	Predicted Peak In-stream Increase Concentration (mg/L)	Applicable Surface Water Standard (mg/L)	Surface Water Baseline Concentration[1] (mg/L)
Aluminum	Low Flow	*0.006*	*0.0003*	0.19	<0.0001	N/A	<0.03
	High Flow				<0.0001		0.067
Antimony	Low Flow	*0.0006*	0	0.02	<0.0001	0.0056	<0.0004
	High Flow				<0.0001		<0.0004
Cadmium	Low Flow	***0.0025***	0.0001	0.09	<0.0001	0.0006	<0.0001
	High Flow				<0.0001		<0.0001
Copper	Low Flow	0.0002	0	0.01	<0.0001	0.011	0.0005
	High Flow				<0.0001		0.0008
Iron	Low Flow	0.005	0.0003	0.16	<0.0001	N/A	<0.02
	High Flow				<0.0001		0.037
Manganese	Low Flow	*0.221*	0.0068	7.68	0.0001	N/A	0.02
	High Flow				<0.0001		0.027
Nickel	Low Flow	***0.12***	0.0028	4.13	0.0001	0.052	<0.01
	High Flow				<0.0001		<0.01
Selenium	Low Flow	***0.235***	*0.0037*	7.96	0.0001	0.005	0.0012
	High Flow				<0.0001		0.0041
Sulfate	Low Flow	*137.88*	6.65	4781.48	0.06	N/A	10.7
	High Flow				0.01		7.3
TDS	Low Flow	*231.34*	11.70	8023.50	0.11	N/A	204
	High Flow				0.02		186
Thallium	Low Flow	*0.0002*	0	0.01	<0.0001	0.00024	<0.0001
	High Flow				<0.0001		<0.0001
Uranium	Low Flow	*0.0026*	0.0001	0.09	<0.0001	N/A	0.0004
	High Flow				<0.0001		0.0004
Zinc	Low Flow	***0.223***	0.0051	7.63	0.0001	0.12	<0.01
	High Flow				<0.0001		<0.013

Notes:
1 Surface Water Baseline Concentration for monitoring station SW-BF1 calculated by Whetstone (2015b)
Standard for Human Health based on consumption of water and organisms for antimony and thallium
CCC standard for cadmium, nickel, selenium, and zinc
Value in bold-italic represents groundwater concentration before mixing in exceedance of applicable surface water quality standard
Value in italics represents groundwater concentration before mixing greater than surface water baseline statistics
GW = for Groundwater
mg/L = milligrams per liter
lbs/yr = pounds per year
N/A = no standard exists

Results from the groundwater model indicate that selenium concentrations in shallow groundwater flow to the BFR Reach 3 would likely exceed the cold-water aquatic life CCC standard of 0.005 mg/L starting in year 23. Peak selenium concentrations and loading to the river would occur 38 years after the start of mining. Selenium concentrations in shallow groundwater flow to BFR Reach 3 would decrease rapidly after the peak but would remain elevated above 0.005 mg/L for the modeled period of 700 years (**Figure 4.3-15**).

As discussed in **Section 3.3.1.2.2**, selenium concentrations in Blackfoot River are cyclic and generally exceed the CCC of 0.005 mg/L for a short period of time in the spring during the peak flow period. Selenium concentrations in the river are typically below 0.005 mg/L during the remainder of the year. Mixing calculations for peak selenium concentrations in groundwater entering the Blackfoot River indicate that the Proposed Action would increase selenium concentrations in BFR Reach 3 by 0.0001 mg/L during low-flow conditions. No increase in selenium concentrations is predicted under high-flow conditions.

BFR Reach 3 is a segment of Blackfoot River listed as a 303(d) impaired stream for selenium from the confluence of Lanes and Diamond Creeks to Blackfoot Reservoir (**Figure 3.3-5**; Idaho Department of Environmental Quality [IDEQ] 2005a, 2014c). The model predicted that increases of selenium in-stream concentrations in BFR Reach 3 are 0.0001 mg/L, which is an order of magnitude below the measurable threshold of 0.001 mg/L for selenium. Because of uncertainty related to the magnitude of the predicted concentration, the impact of additional selenium loading to the 303(d) stream segment would likely not be measurable.

Peak groundwater concentrations of cadmium, nickel, and zinc before mixing would also exceed their applicable surface water quality standards; however, long-term groundwater concentrations would be lower than the applicable surface water quality standards. Concentrations for the other COPCs in groundwater that would flow to BFR Reach 3 would meet applicable surface water standards.

Peak groundwater concentrations would be higher than the surface water baseline concentrations for all COPCs with the exception of iron and copper. However, long-term groundwater concentrations would be higher than surface water baseline concentrations for aluminum and selenium only. Modeled instream increases are predicted for manganese, selenium, nickel, sulfate, TDS, and zinc.

As a result of the low predicted increases of in-stream COPC concentrations and projected long-term exceedances of CCC for selenium in shallow groundwater before entering the river, potential impacts to water quality of Blackfoot River under the Proposed Action would be considered minor and long-term.

4.3.1.2 Rasmussen Collaborative Alternative

Selection of the RCA would result in several changes to the mine facilities that would reduce impacts to water resources compared to those associated with the Proposed Action. Under the RCA, the pit would be reconfigured to eliminate mining below the regional water table, thus reducing the amount of pit water to be handled. The RCA would eliminate the proposed external North, South Main Temporary, and South-South Overburden Piles, which were predicted to be the primary sources of COPC loading to shallow groundwater and surface water under the Proposed Action. The RCA would also result in placement of the majority of overburden from mining Phases 1 and 2 and a portion of the overburden from Phases 3 and 4 in P4's South Rasmussen Mine pit as backfill. Reconfiguration of the Rasmussen Valley Mine pit; elimination of the external North, South Main Temporary, and South-South Overburden Piles; and placement of overburden in the South Rasmussen Mine pit would result in a different material balance in backfill and overfill in the RCA mine pit compared to the Proposed Action (**Table 4.1-4**).

Finally, the RCA would result in construction of a cover system, designated Cover C, over the backfill and overfill that has higher runoff and transpiration rates, resulting in a lower net deep percolation compared to the Proposed Action cover.

Cover C would consist of three layers as described in **Chapter 2**. Cover C would be an evapotranspiration (ET) cover and would limit percolation into the backfill by shedding water as runoff, evaporation from the surface, and storing water within the various layers that would be removed by plant uptake (transpiration). Conceptual hydrologic models for mine facilities included in the RCA are discussed in the following sections. Because of the elimination of mining below the water table, and the elimination of the overburden piles downslope of the mine pit, the effects of the RCA to water resources would be much less than those associated with the Proposed Action. The overall effects of the RCA to water resources would be long-term and negligible.

4.3.1.2.1 Conceptual Hydrologic Models for Mine Facilities

Open Pit and Backfill

Under the RCA, the open pit and backfill, including the three permanent external overburden overfill areas, would be 2.4 miles long with a footprint of 221.0 acres (**Figure 2.5-4**). The ore would be mined in nine phases over the course of 4.8 years, including initial infrastructure and reclamation requiring 7.1 years. The pit excavation would progress from north to south, starting adjacent to P4's partially backfilled South Rasmussen Mine West Limb Pit and terminating 1,000 feet north of the Blackfoot River (**Figure 2.5-4**). The bottom of the pit would slope generally to the south with a minimum elevation of 6,340 feet amsl near the southern end. The RCA is designed with a shallower pit depth on the southern end compared to the Proposed Action to avoid mining below the water table in the Wells Regional Aquifer, thus avoiding encountering more groundwater in the pit than can be effectively managed within the pit area.

Although mining would not intersect the regional aquifer, limited volumes of groundwater would be encountered at higher elevations in the pit. This inflow would originate from alluvium, the Rex Chert, and to a lesser extent the Meade Peak. Experience at other mines in the region indicate that these strata would drain rapidly after being opened, but could generate water intermittently during the spring snowmelt or in response to precipitation events. Agrium's proposal to handle water that accumulates in the pit from runoff, precipitation, or groundwater inflow would be to collect it in a sump at the bottom of the pit. If needed, the sump water would then be pumped or hauled to unreclaimed backfill areas, where it would be dispersed and allowed to infiltrate.

Backfilling of the Rasmussen Valley Mine pit under the RCA would start when Phase 1 is complete, concurrent with mining of Phase 2. Three external overfill areas (North, Central, and South Overfill) would be constructed on the northeast side (upslope) of the excavation contiguous with the backfill. A total of 36.9 MLCY of material would be placed as backfill and overfill including basalt (0.9 percent), alluvium (4.8 percent), Cherty Shale (5.7 percent), Rex Chert (18.9 percent), Meade Peak (44.3 percent), Grandeur Tongue (15.3 percent), and Wells Formation (10.0 percent). The backfilled pit and overfill areas would be configured to resemble the pre-mining topography and capped with Store-and-Release Cover C, which would consist of 1 foot of pit GM over 2 feet of external alluvium and GM above 3 feet of pit alluvium (**Figure 2.5-7**). The final reclaimed surface would be re-vegetated and contoured to have a maximum slope of 3H:1V. A small portion (13.2 acres) of the northeast pit wall would remain exposed after final reclamation. Reclamation of the completely backfilled pit and overfill would be completed 7.1 years after the start of construction.

Precipitation falling on the capped backfill and overfill would either run off, evaporate, or infiltrate. Infiltration would be transpired by vegetation, stored in the soil pore space, or continue percolating downward into the underlying backfill and overburden. There are 417 acres of undisturbed area uphill to the north and northeast of the pit. Runoff from 338 acres of this area would be intercepted by a ditch before it enters the pit (**Figure 2.5-6**). Runoff from the remaining area between the diversion ditch and the mine pit would run into the pit, where it would be collected in a pit sump and if needed, spread onto unreclaimed backfill. Runoff from precipitation onto unreclaimed backfill would be captured in collection ditches on the downslope side of the backfill and routed to the pit sump. The collection ditches would be located within the footprint of the pit to minimize infiltration into the alluvial aquifer.

The final reclamation surface of the backfill would be graded to re-establish drainage patterns that are similar to the pre-mining topography of the site. The proposed Store-and-Release Cover C is designed to limit the amount of meteoric water that would percolate through the overburden and prevent root uptake of selenium in cover vegetation. Based on the infiltration modeling results presented in **Section 4.3.1.1.2**, Cover C design would result in higher runoff characteristics compared to cover design under the Proposed Action. Runoff from the RCA reclaimed backfill and overfill areas would have chemical characteristics similar to those of runoff from reclaimed backfill and overfill areas of the Proposed Action and would be managed in the same way using BMPs to mitigate suspended sediment during construction and reclamation.

Meteoric water that percolates through the cover and overburden would leach metals and other constituents into the Wells Regional Aquifer, where they would be transported to the northwest in groundwater. The depth to the regional groundwater table from the bottom of the backfilled pit would range from 0 under the southern portion of the pit to 60 feet at other locations in the pit, depending on location. A conceptual diagram illustrating the release of solutes from the pit backfill is shown on **Figure 4.3-18**.

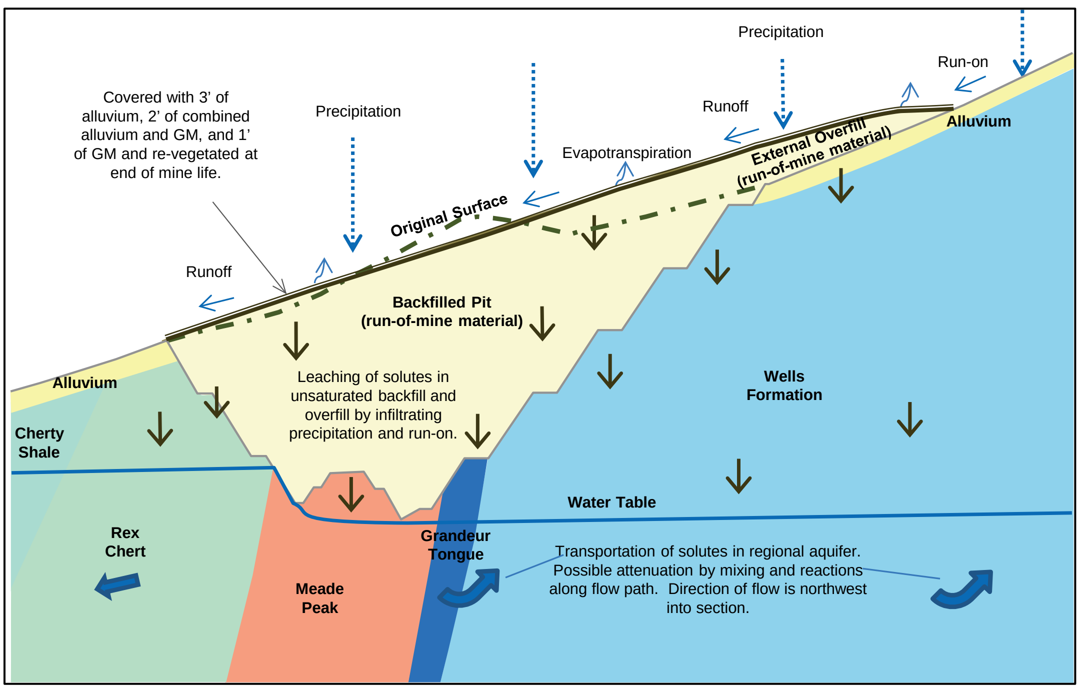


Figure 4.3-18 Conceptual Diagram Showing Runoff, Infiltration, and Solute Transport for Pit Backfill for the RCA after Reclamation

<u>South Rasmussen Mine Pit Backfill</u>

Selection of the RCA would result in the placement of 7.61 MLCY of overburden from the Rasmussen Valley Mine pit as backfill in the existing partially backfilled South Rasmussen Mine pit. The backfill would cover the currently exposed eastern pit wall and a portion of the Wells Formation footwall. The RCA backfill would consist of alluvium (8.0 percent), Cherty Shale (4.1 percent), Rex Chert (16.0 percent), Meade Peak (45.9 percent), Grandeur Tongue (8.8 percent), and Wells Formation (17.1 percent) from mining Phase 1 and portions of Phases 2, 3, and 4 at the Rasmussen Valley Mine. As a result of comments received on the Rasmussen Valley Mine Draft EIS, P4 has proposed to revise the cover on the RCA backfill. The revised cover would consist of 3 feet of limestone overlain by 2 feet of combined GM, alluvium, and colluvium, borrow material similar to the middle layer on the RCA Cover C and obtained from the same areas adjacent to the Rasmussen Valley Mine (and overlain by 1.5 feet of South Rasmussen Mine GM), and would be graded to slope west to route runoff to the footwall, where it would infiltrate to groundwater through the Wells Formation. The footprint of the final reclaimed backfill would be 58 acres. The depth to the regional water table below the bottom of the South Rasmussen Mine pit is approximately 330 feet (Arcadis 2015h).

Precipitation falling on the capped backfill would either run off, evaporate, or infiltrate. The infiltration would then either be transpired by vegetation, stored in the soil pore space, or continue percolating downward into the underlying backfill. Meteoric water that percolates through the cover and overburden would leach metals and other constituents into the Wells Regional Aquifer, where they would be transported west in the groundwater toward the Enoch Valley Fault. A conceptual diagram illustrating the movement of water and release of solutes from the pit backfill is shown on **Figure 4.3-19**.

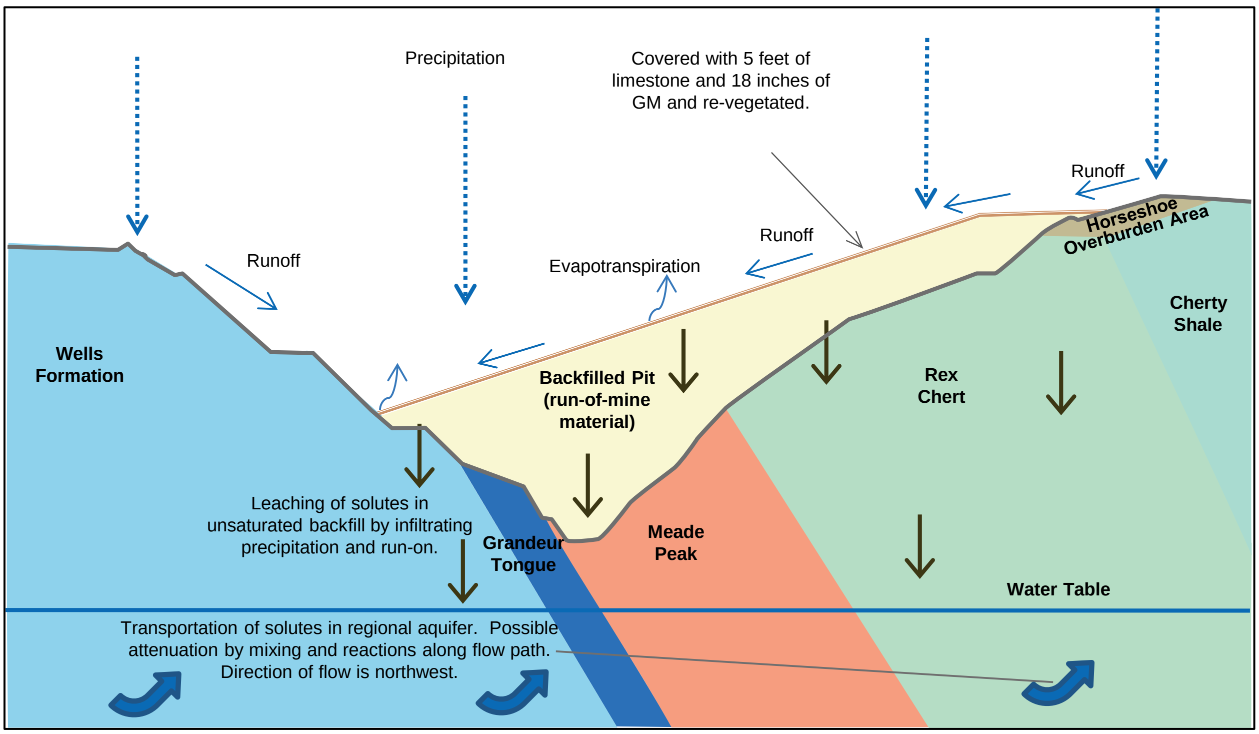


Figure 4.3-19 Conceptual Diagram Showing Runoff, Infiltration, and Solute Transport for South Rasmussen Mine Main Pit Backfill for the RCA after Reclamation

External Overburden Piles and GM Stockpiles

Central and South Temporary Overburden Piles

The Central and South Temporary Overburden Piles would be located on pit backfill, with a portion of the piles extending northeast upslope of the pit and outside of the pit footprint (**Figure 2.5-4**). The temporary piles would contain about 4.3 MLCY (7.3 million tons) of material at their largest extent compared to 0.56 MLCY (0.85 million tons) for the internal overburden piles for the

Proposed Action. The materials that would be placed in the temporary piles would include non-Meade Peak-containing and Meade Peak-containing material. The approximate combined material balance of the Central and South Temporary Overburden Piles under the RCA would include alluvium (6.1 percent), Cherty Shale (1.4 percent), Rex Chert (10.1 percent), hanging wall mud (4.7 percent), center waste (32.8 percent), upper and lower ore partings (8.5 percent), footwall mud (2.7 percent), Grandeur Tongue (19.5 percent), and Wells Formation (14.3 percent). The Central Temporary Overburden Piles would be constructed during Phase 5 and the South during Phase 7. The piles would be re-handled and placed as pit backfill during Phases 8 and 9. The maximum time during which the piles would be present is 38 months.

Meteoric water that percolates into and through the uncovered temporary overburden piles would leach metals and other constituents. Because of the limited time during which the piles would be in place and their locations, the temporary piles are expected to result in COPC loads to groundwater similar to those that would occur from the backfill. A conceptual diagram showing the impacts from the North and Central Temporary Overburden Piles is shown on **Figure 4.3-20**.

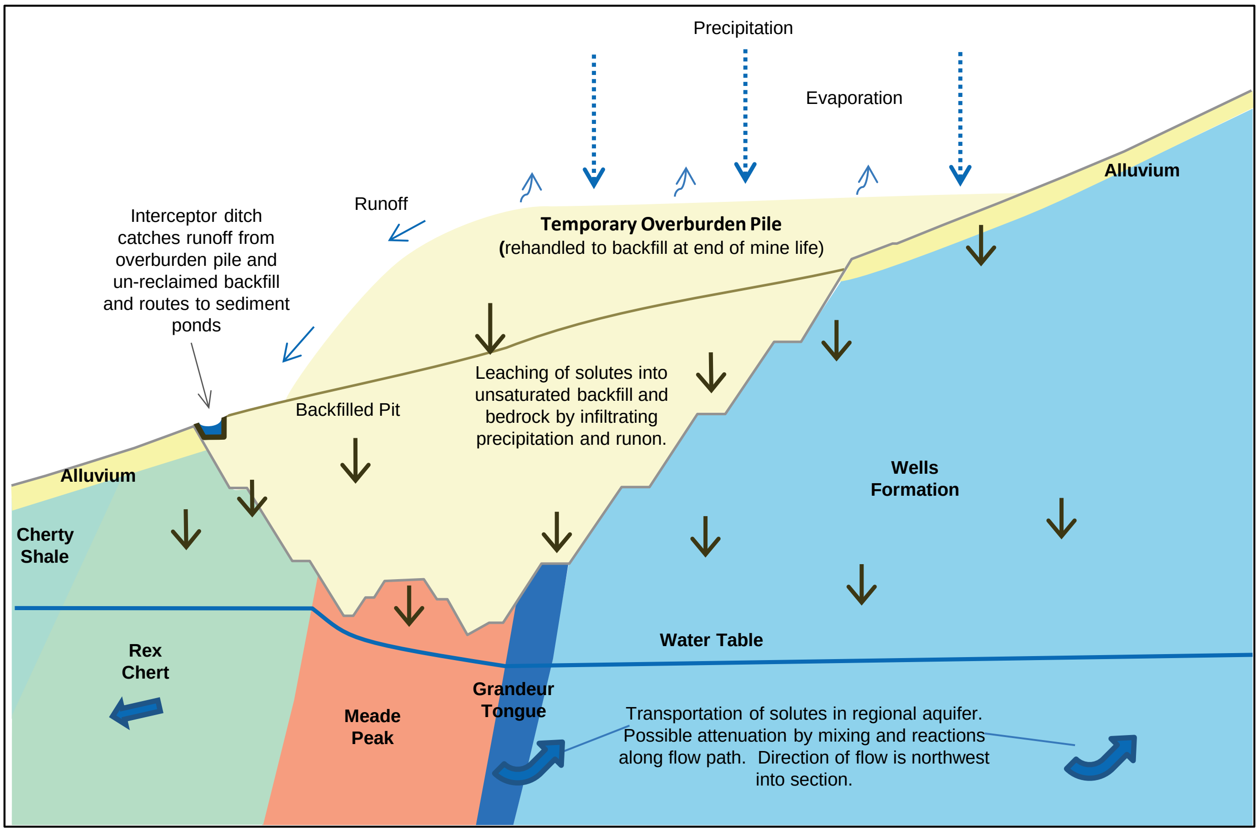


Figure 4.3-20 Conceptual Diagram Showing Runoff, Infiltration, and Solute Transport from the Central and South Temporary Overburden Piles of the RCA during Mining

Growth Medium and Alluvium Borrow and Stockpile Areas

The RCA would use three borrow and storage areas for GM, alluvium, and colluvium. These areas would replace the three stockpile areas that would be used only to store GM under the Proposed Action. The borrow and storage areas would be located along the haul road on the southwest side of the pit and would include the North-North, North Main, and South Main Borrow and Storage Areas (**Figure 2.5-4**). The borrow and storage areas would result in a combined maximum disturbance of 168.4 acres. Construction of the North-North and North Main Borrow and Storage

Areas would start during Phase 1. The South Main Borrow and Storage Area would be constructed during Phase 5. The borrow and storage areas would vary in size and volume over time as disturbance areas expand and material is added or removed for concurrent reclamation.

Material would be removed from the stockpiles and borrow areas for reclamation activities as necessary throughout the life of proposed mining activities. Any GM material remaining in stockpiles or storage areas after the reclamation is complete would be distributed along haul roads or other areas to enhance the GM thickness. A total of 2.11 MBCY of GM, alluvium, and colluvium would be required for reclamation of mine facilities. Precipitation that falls onto the borrow and storage areas would run off, evaporate, or infiltrate where it would be transpired, stored in the soil pore space, or continue percolating downward into natural ground. GM would exhibit leaching characteristics similar to those of undisturbed soils, and runoff and seepage from the piles is predicted to meet applicable water quality standards (with the exception of TSS in runoff, which would be mitigated by the use of BMPs such as silt fences, straw wattles, and retention basins). The conceptual hydrologic model for the borrow and storage areas under the RCA is similar to that for the Proposed Action (**Figure 4.3-8**).

Seepage Chemistry and Constituents of Potential Concern

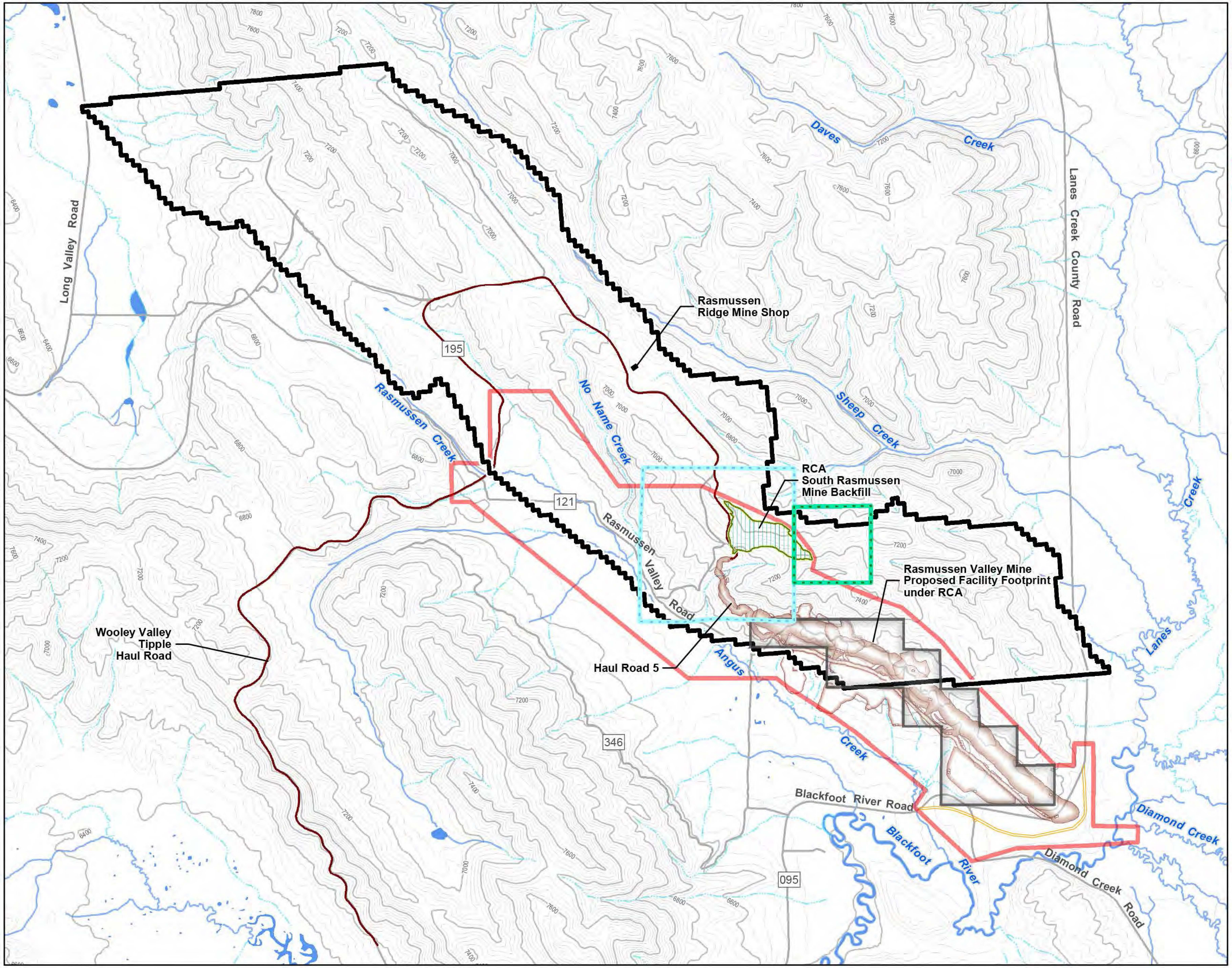
The chemistry of seepage from the backfilled Rasmussen Valley Mine pit was evaluated with column leaching tests using the same methods described for the Proposed Action (**Section 4.3.1.1.1**).

Under IDEQ review, seepage chemistry for the existing South Rasmussen Mine backfill was evaluated by NewFields (2015), a P4 contractor, using SPLP tests performed on overburden originating from the South Rasmussen Mine. NewFields (2015) evaluated the chemistry of seepage from the RCA overburden to be placed in the South Rasmussen Mine pit using the same procedures, but utilizing SPLP data from the Rasmussen Valley Mine pit phases that are to be placed in South Rasmussen Mine. The resulting seepage chemistry concentrations were determined to be 0.76 mg/L for selenium and 0.94 mg/L for manganese.

4.3.1.2.2 Groundwater Flow and Solute Transport Modeling

Potential impacts to water resources from the RCA were evaluated using two separate groundwater models. Potential impacts from the RCA open pit and backfill at the Rasmussen Valley Mine were evaluated using the numerical groundwater contaminant fate-and-transport model discussed in **Section 4.3.1.1.2**. The South Rasmussen Mine Groundwater Model (NewFields 2015) was used for evaluating groundwater impacts and reclamation work at P4's South Rasmussen Mine (separate from this EIS) as part of IDEQ's ongoing oversight. The South Rasmussen Mine Groundwater Model was run both with, and without the Rasmussen Valley Mine overburden that would be placed into the partially backfilled South Rasmussen Mine open pit as part of the RCA.

The South Rasmussen Mine Groundwater Model was prepared using MODFLOW-SURFACT (HydroGeologic 2011) and covers an area of 8.8 square miles (**Figure 4.3-21**). The model extends 29,000 feet southeast along the axis of the Snowdrift Anticline and overlaps a portion of the Rasmussen Valley Mine Study Area. It is bound by the Enoch Valley Fault to the southwest. The southwest-northeast extent of the model is 7,500 feet, with the boundaries set parallel to bedding. The model is restricted to the Wells Regional Aquifer and has 27 layers that extend vertically from the top of the regional aquifer to an elevation of 5,000 feet amsl. Hydrologically



RASMUSSEN VALLEY MINE

FIGURE 4.3-21
South Rasmussen Groundwater Model Domain
(Newfields 2015)

ANALYSIS AREA: Caribou County, Idaho
Date: 6/23/2016 | Prepared By: JC
File: K:\CO1553\2016_FEIS\Model Domain_WellsFm_RCA.mxd

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important faults and zones of increased fracturing are simulated according to the conceptual hydrogeologic model developed by AMEC (2010). Zones of higher hydraulic conductivity were assigned to the Enoch Valley Fault and hinge of the Snowdrift Anticline to simulate their function as conduits for groundwater flow. The Rasmussen Fault is represented as a leaky barrier to groundwater flow between the South Rasmussen Mine and Rasmussen Valley Mine. Flow enters the model in the Wells Regional Aquifer at the southeastern edge and exits northwest.

The average regional gradient across the model domain is 0.0008 ft/ft, consistent with water level data developed for the South Rasmussen Mine (AMEC 2010). An average recharge value of 2.64 inches per year is assigned across the model domain. This recharge is equal to 11 percent of the average annual precipitation estimated for the South Rasmussen Mine (AMEC Geomatrix 2008/2009).

Modeled values for hydraulic conductivity, storage, and porosity are variably distributed according to the conceptual model for the South Rasmussen Mine site (AMEC 2010). The ranges of assigned parameters are consistent with site-specific testing and regional hydrologic data with hydraulic conductivity values of 0.0011 to 15 feet/day and a porosity of 1.0 percent.

The groundwater model was prepared in two steps including an initial steady-state simulation calibrated to the existing groundwater elevation data for the South Rasmussen Mine and a predictive simulation that evaluates the transport of selenium and manganese in the Wells Regional Aquifer under the RCA. More detailed discussions of the groundwater model are presented in the RCA groundwater modeling memoranda prepared by NewFields (2015, 2016).

4.3.1.2.3 Chemical Loading, Transport, and Attenuation in Groundwater and Surface Water

Chemical loading to groundwater would occur when COPCs from backfill are leached by precipitation that has percolated below the cover root zone to become seepage through the overburden. Seepage concentrations and timing for the overburden in the Rasmussen Valley Mine pit and overfill piles were calculated using the same methods as described for the Proposed Action (**Section 4.3.1.1.1**). Source term concentrations for the RCA were calculated by mathematically mixing the leachate concentrations from the monolithologic columns to represent the seepage expected to be released from the modeled facilities (Whetstone 2015c). A monolithologic column was not prepared for the Wells Formation because it was planned to represent less than 5 percent by weight of total material waste under the Proposed Action. However, the Wells Formation would represent more than 5 percent of the pit backfill under the RCA (10.2 percent). Leaching characteristics of the Wells Formation were evaluated using SPLP data and leachates from the Grandeur Tongue column (GTD-U1).

The source term concentrations for the existing backfill at the South Rasmussen Mine pit were calculated using SPLP analyses for each lithology that constituted the South Rasmussen Mine backfill. The SPLP results were combined in proportions to represent the percentages and types of materials that were backfilled into the pit to arrive at the overall weighted average source term concentration. The weighted SPLP averages were then multiplied by a factor of 20 to account for the higher SPLP water-to-rock ratios compared to that expected in the overburden under natural climatic conditions. Source terms for the South Rasmussen Mine backfill originating from the Rasmussen Valley Mine were generated in the same manner using SPLP data from material obtained from the first four phases of the Rasmussen Valley Mine, representing the overburden that will be placed in the South Rasmussen Mine main pit. The weighted average SPLP data for these four phases were combined and also increased by a factor of 20, again to account for the higher water to rock ratios compared to that expected in the overburden under natural climatic conditions.

Because SPLP tests are a single-contact testing method, a single concentration loading term was used for both the original South Rasmussen Mine fate and transport modeling and the current South Rasmussen Mine modeling with the RCA backfill rather than incrementing the concentration based on pore volumes obtained from a column leach test as used for the Rasmussen Valley Mine RCA pit.

Because only selenium and manganese were predicted to leach from the source area at concentrations exceeding Idaho groundwater quality standards, these were the only constituents used for the POC of the existing mine and P4's POC determination for the South Rasmussen Mine (**Section 3.3.2.3**). Analysis of the source terms developed for the Rasmussen Valley Mine material that will be placed in the South Rasmussen Mine main pit supported the modeling of only selenium and manganese. Therefore, only selenium and manganese were included in the fate-and-transport model for the South Rasmussen Mine plus Rasmussen Valley Mine backfill. The simulated pore volume time for the Rasmussen Valley Mine RCA backfill is presented in **Table 4.3-14**. The South Rasmussen Mine pit was not modeled using a pore volume approach; therefore, pore volume times were not calculated. Modeled concentrations for COPCs in seepage from backfill are presented in **Table 4.3-15**.

Table 4.3-14 Pore Volume Times for Modeled Source Terms for the RCA

Mine Facility	Percolation Rate (in/yr)	Facility Footprint (Acres)	Seepage Rate (ft^3/day)	Material Volume (lcy)	Pore Volume Time (years)
Pit Backfill and External Overfill	0.21	220.9	461	41,128,000	989

Table 4.3-15 Modeled Seepage Source Concentrations (mg/L) for the RCA

	PV-1	PV-2	PV-3	PV-4	PV-5	PV-6	PV-7
Rasmussen Valley Mine RCA Pit Backfill							
Sulfate	1,495	1,048	888	851	866	845	864
Total Dissolved Solids	2,499	1,763	1,472	1,440	1,441	1,372	1,392
Total Aluminum	0.084	0.044	0.044	0.042	0.047	0.054	0.047
Total Antimony	0.0123	0.0086	0.0075	0.0087	0.0069	0.0067	0.0059
Total Cadmium	0.0279	0.0243	0.0235	0.0220	0.0237	0.0277	0.0239
Total Copper	0.002	0.001	0.001	0.001	0.001	0.002	0.002
Total Iron	0.078	0.027	0.026	0.022	0.027	0.027	0.026
Total Manganese	2.11	1.45	1.30	1.17	1.10	1.08	1.13
Total Nickel	1.56	0.89	0.70	0.66	0.66	0.71	0.73
Dissolved Selenium	3.972	1.298	0.430	0.174	0.123	0.101	0.086
Total Thallium	0.0022	0.0010	0.0008	0.0008	0.0008	0.0008	0.0006
Total Uranium	0.0248	0.0121	0.0120	0.0119	0.0124	0.0131	0.0109
Total Zinc	2.827	1.336	1.155	1.347	1.329	1.434	1.418
South Rasmussen Mine Pit Backfill							
Manganese	0.94						
Selenium	0.76						

4.3.1.2.4 Impacts to Groundwater Resources

Installation of the Store-and-Release Cover C over the Rasmussen Valley Mine pit backfill as part of the RCA would reduce seepage to the Wells Regional Aquifer compared to the Proposed Action. Because the RCA eliminates mining below the regional water table, no dewatering activities would be required to lower the water table during mining operations. Therefore, no drawdown impacts would occur to the Wells Regional Aquifer. However, similar to the Proposed Action, the RCA pit would intersect localized pockets of perched groundwater at elevations higher than the regional water table. These perched groundwater zones would drain quickly, and would not result in significant inflow to the pit. Draining of the perched water could result in minor reductions in the volume of groundwater that would be available to seasonal springs and wetlands downslope from the pit during operation and after reclamation. The pit excavation and backfill could provide a permanent pathway for the transfer of groundwater from the local- and intermediate-scale aquifers to the Wells Regional Aquifer.

The RCA would eliminate the proposed North, South Main Temporary, and South-South External Overburden Piles, which are the predicted sources of COPC loading to shallow and intermediate groundwater and connected surface waters under the Propose Action. As a result, no impacts to water levels and water quality in shallow and intermediate groundwater systems or connected surface waters under the RCA are predicted. Modeling results indicate that, under the RCA post-reclamation conditions, groundwater levels in the Wells Regional Aquifer near the reclaimed mining facilities would decrease by 0 to 0.05 foot, and the long-term impact on groundwater levels in the Wells Regional Aquifer is considered to be negligible.

The impacts on groundwater quality described in the following sections do not incorporate the existing baseline chemistry of groundwater, which is variable and currently exceeds applicable groundwater standards for some parameters at some locations. All water quality impacts are presented as the chemical load that would be added to the groundwater as a result of the mining activity, not the concentrations expected if the groundwater were sampled once impacts have occurred. To calculate concentrations expected if the groundwater were sampled or withdrawn at any given point, the concentrations discussed for the RCA in the following sections would need to be added to existing groundwater concentrations. As an example, the added load plus baseline concentrations were calculated for select baseline monitoring wells to illustrate total groundwater concentrations (i.e., modeled maximum concentrations plus the exiting baseline concentrations) of COPCs at these locations for the RCA and are provided in **Table 4.3-16**.

<u>Impacts to Groundwater Quality in the Wells Regional Aquifer</u>

The RCA would result in reduced loading of COPCs to groundwater compared to the Proposed Action as a result of the implementation of the Store-and-Release Cover C and changes in backfill material ratios (percentages). Modeling results (Arcadis 2016) predict that contaminant plumes of selenium and other COPCs would still form beneath the backfilled pit soon after commencement of mining. However, only selenium and manganese would migrate northwest in the Wells Regional Aquifer toward the intersection of the Rasmussen Fault and Enoch Valley Fault at concentrations higher than the applicable water quality standard (Arcadis 2016). Simulated groundwater plumes for selenium and manganese in the Wells Regional Aquifer under the RCA are shown on **Figure 4.3-22**. Peak and long-term concentrations of COPCs at model observation point OBS-5 are summarized in **Table 4.3-17**.

Overburden from the Rasmussen Valley Mine placed in the existing South Rasmussen Mine pit under the RCA would also release COPCs to the Wells Regional Aquifer. The transport of selenium and manganese from the South Rasmussen Mine pit backfill was evaluated in a numerical groundwater model prepared by NewFields (2015). Modeling simulations were performed for both the currently approved reclamation plan and the proposed RCA backfill modification. **Figure 4.3-23** and **Figure 4.3-24** provide comparisons of predicted selenium and manganese plumes in the Wells Regional Aquifer between the approved reclamation plan and proposed RCA backfill modification. In general, modeling results indicated that downgradient impacts to water quality in the Wells Regional Aquifer under the proposed RCA backfill modification would be similar to the predicted impacts for the currently approved reclamation plan for the facility (P4 2014).

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Table 4.3-16 Predicted Total Groundwater Concentrations of COPCs for the RCA at Baseline Monitoring Well Locations

		Aluminum	Antimony	Cadmium	Copper	Iron	Manganese	Nickel	Selenium	Sulfate	TDS	Thallium	Uranium	Zinc
Idaho Groundwater Standard		0.2[2]	0.006[1]	0.005[1]	1.3[1]	0.3[1]	0.05[2]	0.0520[3]	0.05[1]	250[2]	500[2]	0.002[1]	0.030[4]	5[2]
MW-6A	Baseline (Mean) Concentration (mg/L)	0.524	0.000	---	0.001	0.363	0.190	---	0.001	6.864	242.000	---	0.001	0.008
	Modeled Maximum Concentration (mg/L)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Predicted Maximum Concentration (mg/L)	0.524	0.000	0.000	0.001	0.363	0.190	0.000	0.001	6.864	242.000	0.000	0.001	0.008
MW-8A	Baseline (Mean) Concentration (mg/L)	---	---	---	---	0.097	0.197	---	---	4.380	119.500	---	---	---
	Modeled Maximum Concentration (mg/L)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Predicted Maximum Concentration (mg/L)	0.000	0.000	0.000	0.000	0.097	0.197	0.000	0.000	4.380	119.500	0.000	0.000	0.000
MW-9A	Baseline (Mean) Concentration (mg/L)	0.116	---	0.000	0.001	0.145	0.021	---	0.001	6.045	179.278	---	0.000	0.004
	Modeled Maximum Concentration (mg/L)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Predicted Maximum Concentration (mg/L)	0.116	0.000	0.000	0.001	0.145	0.021	0.000	0.001	6.045	179.278	0.000	0.000	0.004
MW-10D	Baseline (Mean) Concentration (mg/L)	0.039	---	---	---	0.324	0.298	---	---	126.258	416.333	---	0.001	---
	Modeled Maximum Concentration (mg/L)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Predicted Maximum Concentration (mg/L)	0.039	0.000	0.000	0.000	0.324	0.298	0.000	0.000	126.258	416.333	0.000	0.001	0.000
MW-4R	Baseline (Mean) Concentration (mg/L)	0.051	---	---	0.001	2.275	0.319	0.028	---	30.595	220.857	---	0.001	0.027
	Modeled Maximum Concentration (mg/L)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.003	0.000	0.000	0.000
	Predicted Maximum Concentration (mg/L)	0.051	0.000	0.000	0.001	2.275	0.319	0.028	0.000	30.596	220.860	0.000	0.001	0.027
MW-5R	Baseline (Mean) Concentration (mg/L)	0.030	---	---	---	0.227	0.086	0.012	0.000	21.864	334.833	---	0.001	0.005
	Modeled Maximum Concentration (mg/L)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Predicted Maximum Concentration (mg/L)	0.030	0.000	0.000	0.000	0.227	0.086	0.012	0.000	21.864	334.833	0.000	0.001	0.005
MW-11R	Baseline (Mean) Concentration (mg/L)	0.026	---	---	---	0.451	0.559	---	---	44.120	342.000	---	0.000	0.040
	Modeled Maximum Concentration (mg/L)	0.004	0.000	0.002	0.000	0.003	0.126	0.047	0.058	72.013	122.329	0.000	0.001	0.080
	Predicted Maximum Concentration (mg/L)	0.030	0.000	0.002	0.000	0.454	0.685	0.047	0.058	116.133	464.329	0.000	0.002	0.120

Table 4.3-16 Predicted Total Groundwater Concentrations of COPCs for the RCA at Baseline Monitoring Well Locations

		Aluminum	Antimony	Cadmium	Copper	Iron	Manganese	Nickel	Selenium	Sulfate	TDS	Thallium	Uranium	Zinc
Idaho Groundwater Standard		0.2[2]	0.006[1]	0.005[1]	1.3[1]	0.3[1]	0.05[2]	0.0520[3]	0.05[1]	250[2]	500[2]	0.002[1]	0.030[4]	5[2]
MW-14R	Baseline (Mean) Concentration (mg/L)	---	---	---	---	0.475	0.114	---	0.000	26.669	232.667	---	0.000	0.003
	Modeled Maximum Concentration (mg/L)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.001	0.000	0.000	0.000
	Predicted Maximum Concentration (mg/L)	0.000	0.000	0.000	0.000	0.475	0.114	0.000	0.000	26.670	232.668	0.000	0.000	0.003
MW-1W	Baseline (Mean) Concentration (mg/L)	0.081	---	---	0.000	0.301	0.110	---	---	21.400	285.000	---	0.002	0.048
	Modeled Maximum Concentration (mg/L)	0.002	0.000	0.001	0.000	0.002	0.045	0.034	0.086	32.250	53.907	0.000	0.001	0.061
	Predicted Maximum Concentration (mg/L)	0.083	0.000	0.001	0.001	0.303	0.156	0.034	0.086	53.650	338.907	0.000	0.003	0.109
MW-2W	Baseline (Mean) Concentration (mg/L)	0.206	---	---	0.001	1.161	0.075	---	0.000	362.100	938.600	---	0.002	---
	Modeled Maximum Concentration (mg/L)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.501	0.000	0.000	0.001
	Predicted Maximum Concentration (mg/L)	0.206	0.000	0.000	0.001	1.161	0.076	0.000	0.001	362.100	939.101	0.000	0.002	0.001
MW-3W	Baseline (Mean) Concentration (mg/L)	0.056	0.001	---	0.001	0.894	0.040	---	0.003	40.416	295.053	---	0.001	0.006
	Modeled Maximum Concentration (mg/L)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Predicted Maximum Concentration (mg/L)	0.056	0.001	0.000	0.001	0.894	0.040	0.000	0.003	40.416	295.053	0.000	0.001	0.006
MW-12W	Baseline (Mean) Concentration (mg/L)	---	---	---	---	1.442	0.611	---	---	10.100	278.000	---	0.001	---
	Modeled Maximum Concentration (mg/L)	0.000	0.000	0.000	0.000	0.000	0.006	0.004	0.011	4.183	6.993	0.000	0.000	0.008
	Predicted Maximum Concentration (mg/L)	0.000	0.000	0.000	0.000	1.442	0.617	0.004	0.011	14.283	284.993	0.000	0.001	0.008
MW-13W	Baseline (Mean) Concentration (mg/L)	0.030	0.001	---	0.000	0.071	0.099	---	---	20.290	276.000	---	0.002	---
	Modeled Maximum Concentration (mg/L)	0.001	0.000	0.000	0.000	0.001	0.026	0.019	0.049	18.317	30.618	0.000	0.000	0.035
	Predicted Maximum Concentration (mg/L)	0.031	0.002	0.000	0.000	0.072	0.125	0.019	0.049	38.607	306.618	0.000	0.002	0.035
MW-16W	Baseline (Mean) Concentration (mg/L)	0.064	---	---	0.001	0.304	0.044	0.003	---	30.409	263.182	---	0.000	0.007
	Modeled Maximum Concentration (mg/L)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Predicted Maximum Concentration (mg/L)	0.064	0.000	0.000	0.001	0.304	0.044	0.003	0.000	30.409	263.182	0.000	0.000	0.007

Table 4.3-16 Predicted Total Groundwater Concentrations of COPCs for the RCA at Baseline Monitoring Well Locations

		Aluminum	Antimony	Cadmium	Copper	Iron	Manganese	Nickel	Selenium	Sulfate	TDS	Thallium	Uranium	Zinc
Idaho Groundwater Standard		0.2[2]	0.006[1]	0.005[1]	1.3[1]	0.3[1]	0.05[2]	0.0520[3]	0.05[1]	250[2]	500[2]	0.002[1]	0.030[4]	5[2]
MW-17W	Baseline (Mean) Concentration (mg/L)	0.022	0.001	---	---	0.239	0.033	---	0.000	32.469	261.667	---	0.000	0.005
	Modeled Maximum Concentration (mg/L)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Predicted Maximum Concentration (mg/L)	0.022	0.001	0.000	0.000	0.239	0.033	0.000	0.000	32.469	261.667	0.000	0.000	0.005
OW-1W	Baseline (Mean) Concentration (mg/L)	0.202	---	0.001	0.001	0.791	0.145	0.014	0.000	13.157	240.000	0.000	---	0.111
	Modeled Maximum Concentration (mg/L)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Predicted Maximum Concentration (mg/L)	0.202	0.000	0.001	0.001	0.791	0.145	0.014	0.000	13.157	240.000	0.000	0.000	0.111

Notes:

Baseline concentration data are from Baseline Water Resources Technical Report (Whetstone 2015b)

'---' indicates insufficient number of results above the detection limit to calculate meaningful statistic

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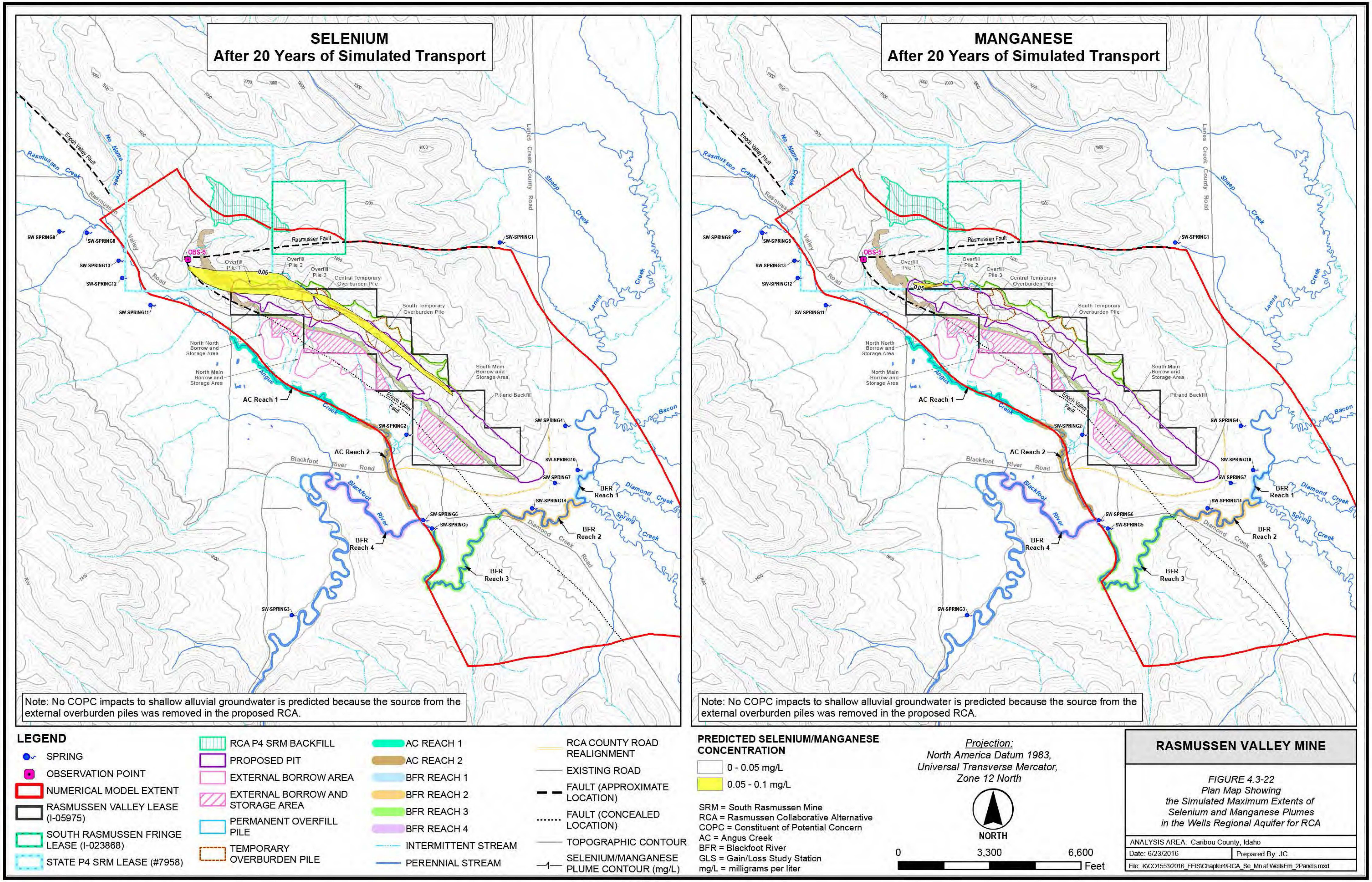

SELENIUM
After 20 Years of Simulated Transport
MANGANESE
After 20 Years of Simulated Transport
Note: No COPC impacts to shallow alluvial groundwater is predicted because the source from the external overburden piles was removed in the proposed RCA.
Rasmussen Creek
No Name Creek
Enoch Valley Fault
Rasmussen Valley Road
Lanes Creek County Road
Sheep Creek
Lanes Creek
Rasmussen Fault
OBS-5
Overfill Pile 1
Overfill Pile 2
Overfill Pile 3
Central Temporary Overburden Pile
South Temporary Overburden Pile
North North Borrow and Storage Area
North Main Borrow and Storage Area
South Main Borrow and Storage Area
Pit and Backfill
Angus Creek
AC Reach 1
AC Reach 2
Blackfoot River Road
Blackfoot River
Bacon Creek
Diamond Creek
Diamond Creek Road
Spring Creek
BFR Reach 1
BFR Reach 2
BFR Reach 3
BFR Reach 4
SW-SPRING1
SW-SPRING2
SW-SPRING3
SW-SPRING4
SW-SPRING5
SW-SPRING6
SW-SPRING7
SW-SPRING8
SW-SPRING9
SW-SPRING10
SW-SPRING11
SW-SPRING12
SW-SPRING13
SW-SPRING14
0.05
LEGEND
SPRING
OBSERVATION POINT
NUMERICAL MODEL EXTENT
RASMUSSEN VALLEY LEASE (I-05975)
SOUTH RASMUSSEN FRINGE LEASE (I-023868)
STATE P4 SRM LEASE (#7958)
RCA P4 SRM BACKFILL
PROPOSED PIT
EXTERNAL BORROW AREA
EXTERNAL BORROW AND STORAGE AREA
PERMANENT OVERFILL PILE
TEMPORARY OVERBURDEN PILE
AC REACH 1
AC REACH 2
BFR REACH 1
BFR REACH 2
BFR REACH 3
BFR REACH 4
INTERMITTENT STREAM
PERENNIAL STREAM
RCA COUNTY ROAD REALIGNMENT
EXISTING ROAD
FAULT (APPROXIMATE LOCATION)
FAULT (CONCEALED LOCATION)
TOPOGRAPHIC CONTOUR
SELENIUM/MANGANESE PLUME CONTOUR (mg/L)
PREDICTED SELENIUM/MANGANESE CONCENTRATION
0 - 0.05 mg/L
0.05 - 0.1 mg/L
SRM = South Rasmussen Mine
RCA = Rasmussen Collaborative Alternative
COPC = Constituent of Potential Concern
AC = Angus Creek
BFR = Blackfoot River
GLS = Gain/Loss Study Station
mg/L = milligrams per liter
Projection:
North America Datum 1983,
Universal Transverse Mercator,
Zone 12 North
NORTH
0
3,300
6,600
Feet
RASMUSSEN VALLEY MINE
FIGURE 4.3-22
Plan Map Showing
the Simulated Maximum Extents of
Selenium and Manganese Plumes
in the Wells Regional Aquifer for RCA
ANALYSIS AREA: Caribou County, Idaho
Date: 6/23/2016
Prepared By: JC

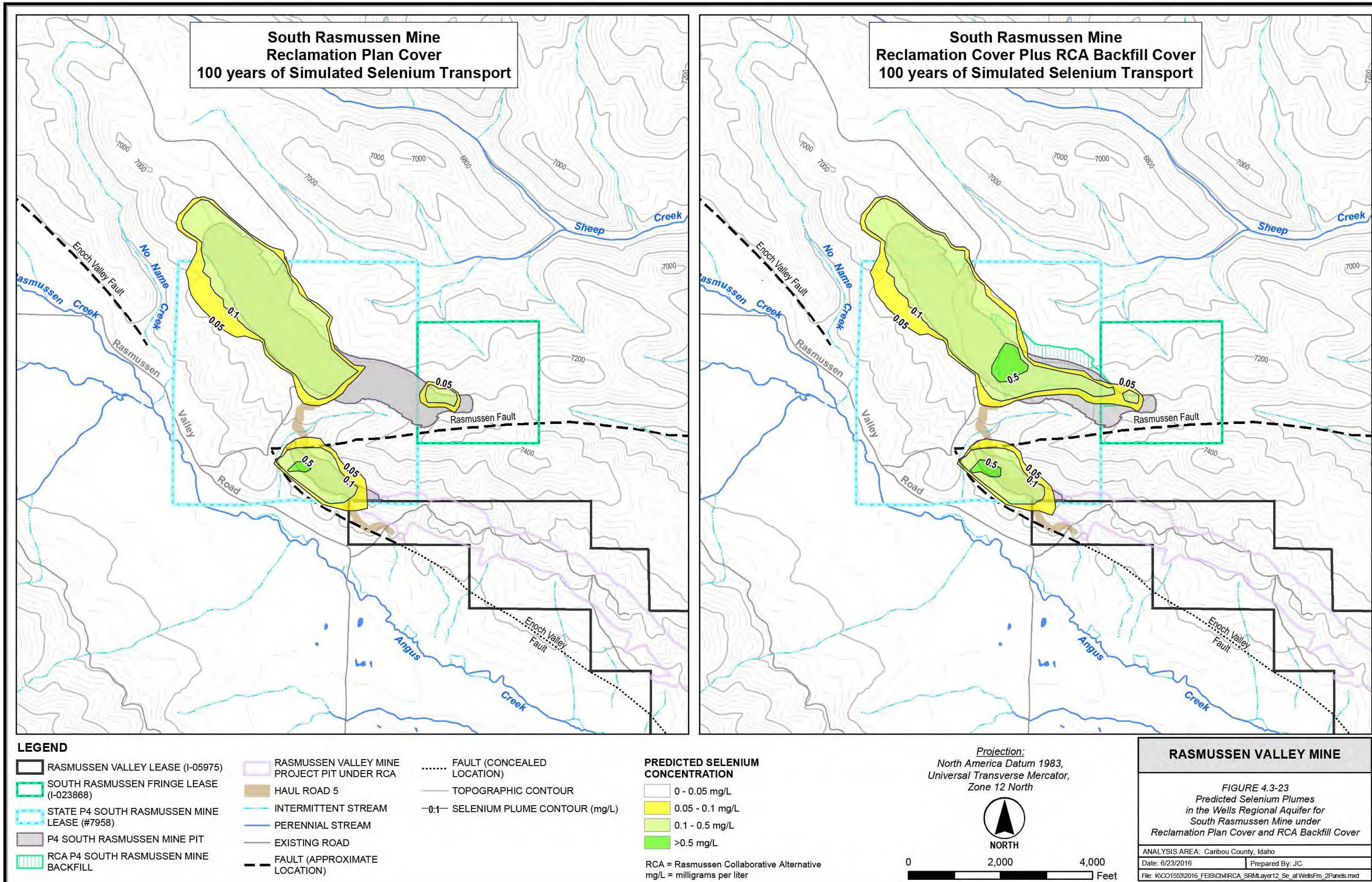
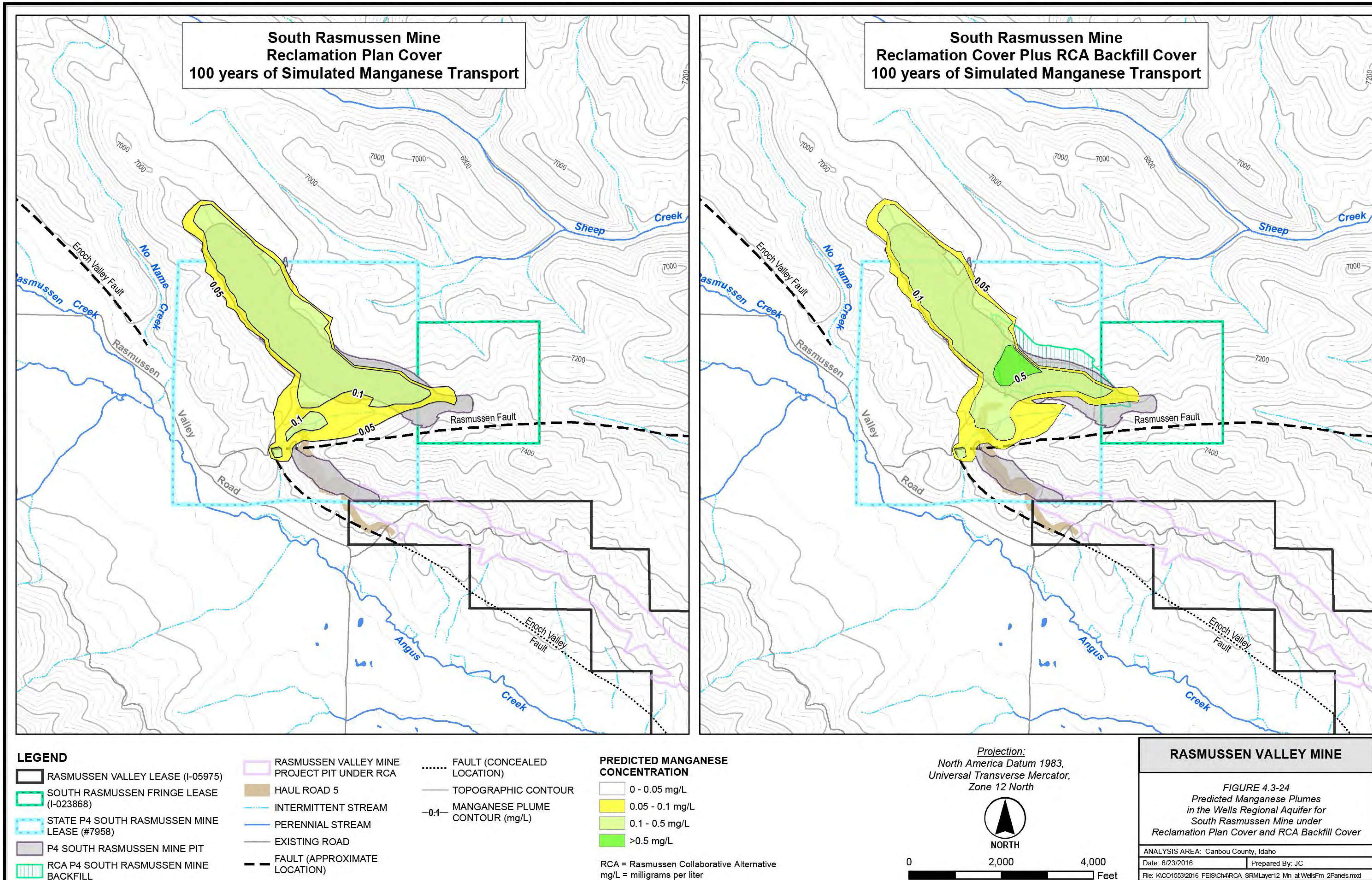


FIGURE 4.3-23
Predicted Selenium Plumes in the Wells Regional Aquifer for South Rasmussen Mine under Reclamation Plan Cover and RCA Backfill Cover



RASMUSSEN VALLEY MINE

FIGURE 4.3-24
Predicted Manganese Plumes in the Wells Regional Aquifer for South Rasmussen Mine under Reclamation Plan Cover and RCA Backfill Cover

ANALYSIS AREA: Caribou County, Idaho
Date: 6/23/2016 Prepared By: JC
File: K:\CO1553\2016_FEIS\Ch4\RCA_SRMLayer12_Mn_at WellsFm_2Panels.mxd

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Table 4.3-17 Predicted Peak/Long-term Concentrations in the Wells Regional Aquifer for the RCA at Model Observation Point OBS-5

Constituent	Peak Concentration (mg/L)	Long-Term Concentration (mg/L)	Groundwater Standard (mg/L)
Aluminum[2]	0.0009	0.0009	0.2
Antimony[1]	0.000014	0.000014	0.006
Cadmium[1]	0.0003	0.0003	0.005
Copper[1]	0.00002	0.00002	1.3
Iron[2]	0.0009	0.0009	0.3
Manganese[2]	0.023	0.023	0.05
Nickel[4]	0.017	0.017	N/A
Selenium[1]	0.044	0.044	0.05
Sulfate[2]	16.43	16.43	250
TDS[2]	27.47	27.47	500
Thallium[1]	0.00002	0.00002	0.002
Uranium[3]	0.0003	0.0003	0.03014
Zinc[2]	0.031	0.031	5

Notes:

1 Primary Idaho Groundwater Standard for antimony, cadmium, copper, selenium, and thallium

2 Secondary Idaho Groundwater Standard for aluminum, iron, manganese, sulfate, TDS, and zinc

3 Federal Primary Drinking Water Standard for uranium

4 There is no Idaho Groundwater Standard for nickel

N/A – Not Applicable

The proposed RCA backfill modification would cover 58 acres within the planned South Rasmussen Mine open pit where backfill was not planned to be placed, thus adding an impact to the groundwater under this area and downgradient and extending the duration for predicted impacts as a result of the additional backfill pore volume available for leaching. Modeled contaminant plumes with selenium and manganese concentrations higher than 0.05 mg/L are predicted to still be limited to a small downgradient area northwest of the South Rasmussen Mine pit.

Under the Idaho Groundwater Rule (IDAPA 58.01.11), degradation of groundwater resources from the additional loading of COPCs as described above would require authorization by IDEQ (**Section 3.3.2.3.1**). This is typically accomplished by a mining proponent submitting a POC application to IDEQ. IDEQ then reviews the application for completeness and if approved, sets spatial points of compliance (POC) beyond which groundwater impacted by the mine is not allowed to exceed the maximum concentrations specified in IDAPA 58.01.11 (**Table 3.3-17**). Agrium has obtained a POC determination from the IDEQ for the RCA.

P4's South Rasmussen Mine has existing POCs set by IDEQ for the current Mine and Reclamation Plan and IDEQ has determined that the existing POCs are adequate for the additional overburden from the RCA. Potential impacts to regional groundwater in and around the RCA would be considered minor to moderate and long-term. This is because the regional water table is fairly deep and there is no current active water well use and, besides mining, there are limited projected future uses for deep groundwater in and around the RCA. COPC exposure potential to environmental and human receptors is small. Impacted water is predicted to meet the human drinking water standard (0.050 mg/L) down gradient of the POCs.

4.3.1.2.5 Impacts to Surface Water Resources

The main differences between the Proposed Action and the RCA that would reduce the effect on surface water resources include elimination of all external overburden piles downslope from the pit, elimination of mining below the water table, and eliminating the need for a haul road across the Rasmussen Valley floor. In addition, Store-and-Release Cover C, designed to decrease infiltration, would result in higher runoff that could have direct impacts to peak flows in streams and drainages in the analysis area under the RCA.

Watershed Area Disturbance

The larger mine pit footprint and the borrow areas under the RCA would result in a larger area in a hydrologically disturbed condition. Surface disturbance from the haul road would decrease because of the shorter length of the HR-5 compared to the Rasmussen Valley Haul Road under the Proposed Action.

Existing (USFS 2015a; BLM 2015a) and proposed hydrologic disturbances in the HUC 6 sub-watersheds that would be affected by the RCA are summarized in **Table 4.3-18**.

Table 4.3-18 Existing and Proposed Hydrologic Disturbances on Forest Service Lands under the RCA

Sub-watershed	Existing Disturbance[1] (% area)	Pit (% area)	External Stockpiles (% area)	Water Retention/ Sediment Basins (% area)	Roads (% area)	Fuel Storage Staging Area (% area)	Total New Disturbance (%)
Angus Creek-Blackfoot River	23.60	1.03	1.18[2]	0.04	0.22	0.01	2.50
Lower Lanes Creek	16.98	0.00	0.00	0.00	0.00	0.00	0.00
Diamond Creek	3.30	0.00	0.00	0.00	0.00	0.00	0.00

Notes:
1 Existing disturbances from USFS 2015a and BLM 2015a
2 For the RCA, external stockpiles includes the enlarged borrow and storage areas

During mining operations, the RCA would increase hydrologic disturbance by 2.50 percent in the Angus Creek-Blackfoot River sub-watershed. The total new hydrologic disturbance would be 0.91 percent higher than that for the Proposed Action in the Angus Creek-Blackfoot River sub-watershed, and would be the same for Lower Lanes Creek and Diamond Creek sub-watersheds. Total hydrologically disturbed area in the sub-watersheds under the RCA would meet the USFS guidelines of less than 30 percent in all three sub-watersheds.

Impacts to Runoff Areas

Runoff volumes and peak flows reporting to Angus Creek and Blackfoot River would be affected under the RCA. Estimated reductions in runoff areas related to the RCA for each sub-watershed are presented in **Table 4.3-19**.

Table 4.3-19 Reduction in Runoff Areas under the RCA

Sub-watershed	Pit and upstream drainages (acres)	External GM Stockpiles (acres)	Haul Roads (acres)	Water Retention/ Sediment Basins (acres)	Subtotal (acres)	Percent of Watershed
Angus Creek-Blackfoot River	213.58	205.73	64	23.16	506.47	2.64
Runon diverted to Angus Creek Blackfoot River[1]	(337.97)				337.97	
Lower Lanes Creek	7.85	0.00	0.00	0.00	7.85	0.03
Diamond Creek	0.00	0.00	0.00	0.00	0.00	0.00

Notes:

1 This is the area of clean runon northeast of the pit that would be diverted to the Angus Creek Blackfoot River sub-watershed by the runon diversion ditch. This is not part of the runoff reduction.

During mining, 506.5 acres of runoff area would be removed from the Angus Creek-Blackfoot River sub-watershed, 287.5 acres less than under the Proposed Action. A small portion of this would be from 14 drainage areas upslope of the pit, which would contribute to surface runon to the open pit during the life of the proposed mining activities. However, under the RCA, a runon diversion ditch would capture clean runon water from 337.94 acres of this upslope area and return it to the Angus Creek-Blackfoot River sub-watershed. Although the RCA ore haul road would be shorter than the Proposed Action ore haul road, greater disturbance from the rest of the components would result in up to 73 acres more disturbance compared to the Proposed Action primarily as a result of the extensive GM, alluvium, and colluvium borrow and storage areas downslope of the pit. Because the runon diversion ditch would keep most of the upslope drainage area in the Angus Creek-Blackfoot River sub-watershed, the total runoff reduction area would represent about 2.6 percent of the Angus Creek-Blackfoot River sub-watershed. This runoff reduction is 506.5 acres (or 36 percent) lower than under the Proposed Action.

<u>Impacts to Peak Flows</u>

Based on the infiltration modeling results presented in **Section 4.3.1.1.2**, Store-and-Release Cover C design would result in higher runoff characteristics (3.5 inches per year) compared to the Proposed Action cover design (1.4 inches per year). A potential volume of runoff was estimated using the approximate area of covered material (pit backfill and overburden piles, if applicable) and the runoff rates from the infiltration modeling. The covered areas are estimated to be 271.5 acres for the Proposed Action (Agrium 2011) and 221 acres for the RCA (Whetstone 2015c). The resulting runoff volumes are estimated to be 31.7 acre-feet for the Proposed Action and 63.9 acre-feet for the RCA. As a result, RCA cover design may result in higher peak flows during precipitation and snowmelt events compared to the Proposed Action.

<u>Impacts to Natural Drainage Channels</u>

Direct impacts to natural drainage channels under the RCA would be similar to those for the Proposed Action. During the construction and mining operations, sediment loading in downstream waterbodies would be controlled by implementing a Surface Water Management Plan (**Appendix C**) and BMPs.

Construction of the pit under the RCA would disrupt natural channels and intercept runoff from two additional drainage basins located upslope from the pit. Flows in drainage basins 22 and 23 would be intercepted during mining Phases 1 and 2 (**Figure 2.5-6**). However, drainage runoff from above the pit would be re-established with their respective downstream drainages after mining.

While there would be disturbance to intermittent drainages from up to four external borrow areas and GM stockpiles constructed within the intermittent drainages downslope of the mine pit, these would all be reclaimed after the cessation of the mining activities, and there would be no permanent diversions from original stream or drainage channels under the RCA.

Impacts to Stream and Spring Flows

Angus Creek and Associated Wetlands and Springs

The RCA would result in reduced surface water flow reporting to Angus Creek and wetlands during the mining operations. Under the RCA, runoff areas in the Angus Creek-Blackfoot River watershed would be temporarily reduced by 2.64 percent compared to 4.14 percent under the Proposed Action. Reduced runoff area reporting to wetland in AA2 adjacent to Angus Creek would be the same as under the Proposed Action.

There would be no impacts to surface water from dewatering under the RCA because there would be no mining below the water table. However, the RCA cover design would result in increased runoff to Angus Creek compared to that under the Proposed Action.

Blackfoot River, Lanes Creek, and Associated Springs

While there would be predicted dewatering-induced stream flow depletions in Spring Creek during Phase 1 mining under the Proposed Action, there would be no impacts from dewatering under the RCA because there would be no dewatering below the water table.

The predicted run off on the RCA cover over the reclaimed pit backfill and overfill compared to the Proposed Action cover would result in increased surface runoff entering the Blackfoot River. However, changes in shallow groundwater flow contribution to the Blackfoot River and springs after reclamation under both the Proposed Action and the RCA would be negligible compared to baseline conditions.

Impacts to Shallow Groundwater and Surface Water Quality

The modeling predicts that there would be no impacts to surface water and shallow groundwater quality under the RCA (Arcadis 2016). The source of the loading of COPCs to shallow groundwater under the Proposed Action is the seepage from the external overburden piles downslope from the pit. Eliminating all external overburden stockpiles southwest of the mine pit would eliminate the source of increased COPCs in shallow groundwater; hence, there would be no potential for adverse impacts to surface water quality from COPC loading under the RCA. Based on the modeling results for the RCA (Arcadis 2016), all COPC concentrations in shallow groundwater are several orders of magnitude lower than the quantifiable limit, and as such are predicted to meet applicable surface water standards.

4.3.1.3 No Action Alternative

Implementation of the No Action Alternative would avoid water resource impacts described for the Proposed Action and RCA. Specifically, predicted impacts to hydrologically disturbed areas, runoff areas, groundwater flow to streams springs and wetlands, and surface and groundwater quality would not occur. Under the No Action Alternative, the federal phosphate leases would not be developed. However, this does not preclude future development of the federal phosphate leases under a different mine plan. The No Action Alternative would eliminate placement of overburden from the RCA pit into the partially backfilled South Rasmussen Mine pit, and the South Rasmussen Mine pit would be reclaimed according to P4's currently approve reclamation plan.

4.3.2 Irreversible and Irretrievable Commitment of Resources

Irreversible impacts to water resources from the Proposed Action would include changes in groundwater quality and recharge in the analysis area.

The loss of groundwater quantity during mine dewatering under the Proposed Action would last less than 1 year, would practically all be recovered through regional flow (as well as natural precipitation and infiltration during the life of proposed mining activities), and would not be irreversible or irretrievable. Because the RCA eliminates mining below the regional water table, no dewatering activities would be required to lower the water table during mining operation, and no irreversible or irretrievable water resource impacts would occur to the Wells Regional Aquifer. Final cover placement over the pit backfill and external stockpiles would decrease infiltration rates and thus slightly limit recharge after reclamation. Modeling results for the Proposed Action indicate that groundwater levels in the shallow and intermediate groundwater systems would decrease by 1 to 5 feet and 0.5 to 1.0 foot, respectively. However, because the RCA eliminates all external overburden piles southwest of the pit, little or no reduction in shallow and intermediate groundwater levels would occur. Projected reduction in groundwater levels in the Wells Regional Aquifer would be negligible under both the Proposed Action and the RCA.

Irretrievable changes in groundwater quality under and downgradient of the pit backfill and overburden disposal areas would occur. An area of the Wells Regional Aquifer extending northwest from the pit backfill has been modeled to have water quality impacts from seepage through the area of backfill for the Proposed Action. Peak concentrations of selenium and other COPCs within the affected areas of the aquifer are likely to exceed applicable groundwater quality standards under the Proposed Action. Impacts from seepage through backfill areas would be minimized under the RCA and would result in exceedance of only selenium and manganese concentrations within the Wells Regional Aquifer. These exceedances of selenium and manganese are not predicted to reach surface waters. These changes would likely be irreversible. COPC concentrations in groundwater would be expected to reduce after hundreds of years.

4.3.3 Unavoidable Residual Adverse Effects

Unavoidable adverse effects to water resources in the analysis area after mining ceases, and after any mitigation or final reclamation has occurred, would be mainly from water quality impacts. Under the Proposed Action, percolation of precipitation through pit backfill and external dumps would continue to affect water quality by releasing selenium and other COPCs into the environment. Under the Proposed Action, selenium concentrations in shallow groundwater entering Angus Creek and the Blackfoot River would exceed the surface water quality criteria of 0.005 mg/L for 60 and 683 or more years after the end of mining, respectively. This represents a 40-percent and 10-percent increase in in-stream concentrations compared to baseline after mixing with surface water of Angus Creek and the Blackfoot River, respectively. However, because the RCA eliminates all external overburden stockpiles southwest of the pit, it would eliminate the source of COPCs in shallow groundwater, and unavoidable adverse impacts to Angus Creek and the Blackfoot River from COPC loading under the RCA would not occur.

4.3.4 Mitigation Measures

Agrium would use BMPs previously described to control erosion, sedimentation, and the release of COPCs from the project-related activities to protect groundwater and surface waters in and around the analysis area. Agrium would also design and implement other BMPs as needed and would be required to adaptively manage impacts unidentified and unanticipated in this analysis but discovered by future environmental monitoring. In addition, Agrium would limit the surface area of Meade Peak-containing material that would be exposed at any given time through direct backfilling and placing protective covers over any backfill and overburden. Additionally, surface water drainage diversion structures may be constructed before each mining phase to intercept runoff before it reaches the pit, thereby avoiding runoff water contact with Meade Peak-containing material.

Surface water control structures would include several types of designs to reduce or eliminate risk of surface water contamination. Runoff sediment basins for runoff water and sediments would be constructed at strategic locations before mining activities occur in that area to collect and contain water exposed to mining disturbances or overburden. Collection ditches constructed along the outer perimeters of the stockpile sites would transfer surface water runoff from these sites and carry it to runoff sediment basins. Culverts would be constructed to convey water from natural drainages underneath linear obstructions, such as haul roads or county roads, to reduce the potential for impacts to sedimentation and stream channel stability. Stockpiles would be stabilized with vegetation, straw waddles, silt fences, and other BMPs as necessary to minimize erosion. These measures include water diversion structures upslope of mine facilities, runoff collection ditches, and reclamation and covering of backfill and overfill concurrent with mining.

Protection of groundwater would include surface water control measures designed to limit surface water exposure to COPC-containing material or keep COPC-containing surface water from infiltrating to shallow groundwater. Store-and-Release Cover C would be an ET cover that would limit percolation into the backfill by shedding water to runoff, evaporation from the surface, and storing water within the various layers for plants to transpire.

Additionally, the collection ditch downslope of the pit backfill would be constructed within the footprint of the pit to limit infiltration from the ditch reaching the alluvial aquifers downslope.

A Spill Prevention, Control, and Countermeasure (SPCC) Plan would be developed before construction and operations, providing direction for preventing and controlling potential spills; describing the aboveground tanks and secondary containment structures for bulk petroleum products, solvents, and antifreeze; identifying the routine monitoring requirements; and describing BMPs for controlling releases of the pollutants of concern.

Agrium has prepared an Environmental Monitoring Plan (EMP; **Appendix B**) identifying a groundwater and surface water monitoring network to monitor compliance with IDEQ water quality standards.

Project design features, BMPs, the SPCC Plan, and the EMP (including groundwater monitoring) are the project elements designed to reduce and monitor environmental impacts to water resources and are predicted to maintain compliance with IDEQ's regulations and approvals. Because the Proposed Action and the RCA are both predicted to exceed groundwater quality standards, POCs were obtained to comply with the Groundwater Quality Rule.

4.4 SOILS

Issue: What are the potential impacts to soil services resources?

Indicators:

- Acres of soil disturbance by soil type resulting from mining
- Estimated volumes of topsoil or other suitable material available for reclamation

- Estimated quality of GM salvaged for reclamation
- Acres of disturbance not reclaimed at the conclusion of mining
- Compliance with the PFO ARMP, CNF RFP, and other applicable federal and state management plan direction

Issue: What is the potential for soil erosion and sediment delivery resulting from mining activity to impact soil quality and surface water?

Indicators:

- Acres of soil disturbance with moderate to high erosion hazard

Issue: What are the impacts on soil chemical and physical properties, specifically those related to selenium and other COPCs, and vegetative productivity?

Indicators:

- Estimated change in plant-available selenium and other COPCs
- Estimated change in soil depth between baseline conditions and final reclamation with GM
- Estimated changes in soil loss because of erosion
- Changes in soil productivity properties affecting potential vegetative success

4.4.1 Direct and Indirect Impacts

Analysis of the Proposed Action and alternatives was limited to the Study Area, as defined for the Rasmussen Valley Mine.

4.4.1.1 Proposed Action

Direct impacts to soil resources include increased erosion; soil compaction; decreased soil productivity in disturbed areas; and potential contamination of soils from spills of chemicals during transport, storage, and use. Overall adverse impacts to soil resources from the Proposed Action construction activities (soil salvage and facility construction) are anticipated to be long-term and moderate. As described below, reclamation activities are expected to mitigate further impacts to soil resources, but some impacts are still expected to occur.

Construction and operation activities, including salvage and stockpiling of topsoil, would directly impact soil resources. These activities would decrease soil productivity by reducing soil structure during salvage operations. Increasing bare ground area through stripping or other disturbances also decreases the ability of water to flow through soil, which decreases infiltration and increases runoff and soil loss (Jadczyszyn and Nidzwiecki 2005).

Soil compaction during these activities can also contribute to soil erosion and reduced soil productivity. Compaction can affect soil productivity by decreasing soil permeability, reducing water storage capacity, impairing root growth, degrading soil structures, damaging microbiotic crusts (if present) and other soil microorganisms, increasing bulk density, and increasing precipitation runoff and erosion potential. However, because soils would be salvaged before heavy or vehicle equipment operation, compaction-related impacts are expected to be negligible.

Salvaged soils typically have a lower bulk density after placement during reclamation than before salvage. No adverse impacts to soils related to compaction during reclamation are anticipated.

The Proposed Action would create 468 acres of surface disturbance, of which 450.5 acres would be reclaimed. The remaining 17.3 acres would consist of pit walls and permanently realigned county roads. The remaining pit walls would have slopes so steep as to not be capable of holding a soil cover and thus would be impractical to reclaim. Soil productivity in areas of surface disturbance would be directly affected until reclamation and re-vegetation are achieved. The reduction in productivity of acres would represent a long-term major impact to soils; however, these impacts are anticipated to decrease to minor or negligible as a result of reclamation. The 17.3 acres of unreclaimed pit walls and realigned county roads would represent an additional, long-term impact to soils, but given that some rock outcrops void of soil exist before mining, the actual impact to soils would be less than 17.3 acres. Overall effects to soils under the Proposed Action would be long-term and moderate, but much of the impact would reduce over time with the success of reclamation and development of soil structure.

Soils affected by the Proposed Action mostly carry moderate to low erosion hazards. Disruption of vegetative cover and soil aggregates would potentially result in increased soil erosion and potential for sediment transport. Increased erosion and sediment transport off the disturbed areas would be a moderate, short-term impact. Overall erosion rates are expected to decrease as portions of the Proposed Action are reclaimed and vegetation is established. Long-term effects on soil erosion rates would be minor. The potential for eroded soils to be transported downstream to Lanes and Angus Creeks is minimal as a result of the use of sediment basins and other erosion and sediment control BMPs (e.g., erosion mats, straw wattles, diversion ditches; **Section 4.4.4**). Study Area soils are generally resistant to wind erosion; therefore, impacts to Study Area soils because of wind erosion are expected to be negligible.

4.4.1.1.1 Erosion Hazards

Table 4.4-1 summarizes disturbances by soil map unit and soil component. Because it is not known exactly which horizons would be exposed at a given time, **Table 4.4-1** provides the general erosion hazard for each of the major soil components. Under the Proposed Action, 62 acres of surface disturbance would occur on soils with high erosion hazard (**Table 3.4-5**) and 126 acres on soils with moderate erosion hazard. Two hundred and thirty acres of disturbance would be to soils with low erosion hazard or are areas that consist of rock outcrops.

Table 4.4-1 Surface Disturbances by Soil Map Unit

Map Unit Symbol	Component Name	General Erosion Hazard	Disturbed Acres	
			Proposed Action	RCA
CFT	Chubbflat	M	18.0	0.8
	Turson	M	2.1	0.1
	Inclusion-Enochville	M	0.4	<0.1
	Inclusion-Robana	H	0.4	<0.1
	Inclusion-Parkay	L	0.2	<0.1
DTL	Disturbed Land	NA	0.4	21.2
ENV	Enochville	M	1.4	0.5
	Inclusion-Chubbflat	M	<0.1	<0.1
	Inclusion-Robana	H	<0.1	<0.1
	Inclusion-Turson	M	<0.1	<0.1
HAX	Hades	L	62.0	85.5
	Agassiz	L	28.2	38.9
	Rock Outcrop	NA	11.3	15.5

Table 4.4-1 Surface Disturbances by Soil Map Unit

Map Unit Symbol	Component Name	General Erosion Hazard	Disturbed Acres	
			Proposed Action	RCA
	Inclusion-loamy-skeletal soils	M	5.6	7.8
	Inclusion-moderately deep soils	L	5.6	7.8
HBP	Hagenbarth	M	50.7	55.9
	Parkay	M	25.4	27.9
	Inclusion-Robana	H	2.5	2.8
	Inclusion-Woolsted	H	2.5	2.8
	Inclusion-clayey soils	NA	2.5	2.8
	Inclusion-rock outcrop	NA	0.8	0.9
HPM	Hagenbarth	M	3.6	9.5
	Parkay	M	2.5	6.7
	Inclusion-clayey soils	NA	0.5	1.3
	Inclusion-wet soils	M	0.5	1.3
	Inclusion-Ponds	NA	0.1	0.2
PCM	Parkcity	L	64.6	101.4
	Moonlight	L	13.8	21.7
	Inclusion-fine-loamy soils	M	4.6	7.2
	Inclusion-Parkay	L	3.7	5.8
	Inclusion-Hagenbarth	M	3.7	5.8
	Inclusion-rock outcrop	NA	1.8	2.9
RDX	Ireland	L	12.2	25.5
	Dipcreek	L	8.1	17.0
	Rock Outcrop	NA	4.1	8.5
	Inclusion-Xerorthents	L	1.4	2.8
	Inclusion-Deep soils	L	0.8	1.7
	Inclusion-Parkcity	L	0.5	1.1
RKO	Rock Outcrop	NA	0.4	0.4
WSR	Woolsted	H	30.6	14.2
	Robana	H	24.9	11.4
	Inclusion-Hagenbarth	M	3.1	1.4
	Inclusion-Chubbflat	M	3.1	1.4

Notes:

NA = Not assessed because of lack of data (e.g., clayey soil inclusions) or general low erosion hazards (e.g., rock outcrops, ponds).

H = high

M = moderate

L = low

Minor differences from acres presented in other sections may exist because of rounding and geographic information system (GIS) data. Acreages based on component proportions in **Table 3.4-1**.

Sources: AECOM 2012, Arcadis 2015e

4.4.1.1.2 Selenium and other Trace Elements

Given the natural oxidizing leaching processes that form the soils slated for salvage, additional COPCs are not expected to be released from the same soils when placed for reclamation. This is illustrated for selenium by the analysis of Study Area soils, alluvium, and colluvium (AECOM 2012; BC 2015a) that found a maximum reported plant-available selenium value of 0.03 parts per million (ppm). Mackowiak and Amacher (2003) and Mackowiak, et al. (2004) showed that vegetation grown in normally weathered soils with less than 1 mg/kg plant-available selenium resulted in vegetation that did not exceed the BLM ARMP selenium standard for vegetation of

5ppm. This indicates that the use of the native GM at the Rasmussen Valley Mine should meet the ARMP standard and is not expected to cause adverse impacts on plant selenium concentrations or downstream water quality.

4.4.1.1.3 Reclamation Suitability and Quantity

Under the Proposed Action, areas disturbed by project activities would first be stripped of salvageable soils for future use as GM during reclamation. Under the Proposed Action, a total of 0.95 million bank cubic yards (MBCY) of GM would be necessary to meet cover requirements for the pit and all other areas, including minimum GM depths of 24 inches for the pit and 12 inches for the external overburden piles, haul roads, and staging area as well as GM necessary to reclaim other features (Arcadis 2015e). No soils from areas outside disturbed areas are proposed to be made available for use as GM.

As described in **Section 2.3.7.3**, all salvaged GM would be temporarily stored in stockpiles or directly placed. Because stockpiling reduces GM's re-vegetation viability over time as a result of reduced microbiological activity and nutrient cycling while stored, placement of GM as soon as practical after salvage would reduce GM degradation. Because of the dynamic nature of reclamation and GM placement, the average time of GM storage in stockpiles cannot be determined. Erosion and transport of GM from stockpiles is expected to be negligible because storm water runon would be diverted from GM stockpiles, and runoff would be diverted through sediment control BMPs and a temporary sediment basin at the North GM Stockpile.

GM volume calculations were made assuming that dozers would push the soil into piles that are loaded onto trucks and hauled to concurrent reclamation areas for spreading or to storage (Arcadis 2015e). Under this salvage scenario, equipment operators would first strip the upper 18 inches of material from all areas to maximize preservation of seedbed, organic microbes, and other beneficial components of the upper soil. Then, a second 18-inch layer of soil would be stripped and stockpiled. Depth to bedrock was factored into calculations. For each area of disturbance (e.g., pit, overburden piles), total acres of disturbance were converted to acres per soil component. Based on those acreages and depths of material presented in **Table 3.4-4**, the amounts of good, fair, and poor materials within each of the two stripping phases, as well as any remaining soils below the second phase, were calculated. Salvageable soil volumes were calculated for the map unit because they are expected to correspond to what the salvage operation would experience.

Calculations of available GM excluded certain soils because of soil properties that would inhibit salvage equipment operation. Soils with a combined total rock fragment content of greater than 50 percent were excluded (Arcadis 2015e). For example, a soil with gravel content of 10 percent by weight, cobble content of 50 percent by weight, and stone content of 15 percent by weight would be classified as fair potential GM (ignoring all other criteria); however, in practice, this soil would be difficult to remove and would offer few beneficial reclamation properties. By excluding these types of soils, the first stripped layer would contain only soils classified as good (30 percent) or fair (70 percent) for use as GM. In addition, exclusion of rocky soils has the benefit of being a practical exclusion during equipment operation (i.e., equipment operators should be able to effectively identify rocky soils during salvage).

Based on the criteria evaluated in Arcadis (2015d, 2015e), 2.08 MBCY of GM would be available for salvage under the Proposed Action, and 1.57 MBCY would be salvaged in the first two lifts of stripping. Of the volume removed during the first two lifts of stripping, 0.26 MBCY would be soils characterized as good for use as GM, 1.23 MBCY would be fair, and 0.08 MBCY would be poor. Calculations by Arcadis (2015d) indicate that the Proposed Action cover would require the use of

0.55 MBCY of GM. A total of 0.69 MBCY are present within the pit, of which 0.57 MBCY could be salvaged from the first two stripping lifts. Reclamation of other (non-cover) areas would require 0.40 MBCY of GM. 1.40 MBCY of GM would be available for that purpose, 1.00 MBCY of which could be salvaged from the first two stripping lifts. Any surplus GM beyond that required for minimum thickness of reclamation would either be placed to a thicker depth (other than cover over backfill) or placed in GM stockpiles for later use. **Table 4.4-2** provides the estimated GM volumes required and available on site under the Proposed Action.

Table 4.4-2 Estimated On-Site Growth Medium Volumes Required and Available under the Proposed Action

Description	Required (MBCY)	Available (MBCY)	Available in 1st Two Lifts (MBCY)
Cover	0.55		
Reclaim of other areas	0.40		
Total	0.95		
Pit		0.69	0.57
Other Areas		1.40	1.00
Total		2.08	1.57

Notes:
Volumes estimated by Arcadis (2015e)
MBCY = million bank cubic yard

For the Proposed Action, within the first two stripping phases, 16 percent of soils available for salvage and use as GM are rated as good for use as GM, 78 percent are rated as fair, and 5 percent as poor. Soils rated as good have no properties that are expected to limit their use as GM, whereas soils rated as fair have at least one property that somewhat limits their use. Soils rated as poor have at least one property that is limiting. Most fair soils that would be salvaged within the Study Area are somewhat limited by low (acidic) pH and low organic material content. Most soils available for reclamation that are rated as poor are limited by low organic material content or high clay content. Local soil conditions were incorporated into the selection of seed mixes proposed for reclamation; therefore, the need for soil amendments is not anticipated. The estimated volumes of available GM for the Proposed Action indicate that sufficient soils of adequate quality are present within the area to be disturbed to meet re-vegetation requirements established in the BLM ARMP and the CNF RFP.

4.4.1.1.4 Management Plan Compliance

The CNF RFP (USFS 2003) and PFO ARMP (BLM 2012a) do not establish reclamation suitability criteria for plant-available selenium in soils to be used for reclamation. The Proposed Action is expected to comply with applicable desired future conditions, goals, standards, and guidelines for soil resources outlined in the CNF RFP, including forest-wide standards and guidelines for reclamation of mined/drastically disturbed lands and management prescriptions for Phosphate Mine Areas, Rangeland Vegetation, and Elk and Deer Winter Range. The Proposed Action is also expected to comply with applicable PFO ARMP goals, objectives, actions, and operational standards and guidelines for soils and for minerals and energy that apply to soil resources.

4.4.1.2 Rasmussen Collaborative Alternative

The types of impacts to soils expected under the RCA would be the same as those described for the Proposed Action. The intensity of effects would be slightly different because of differences in the extents and locations of surface disturbances and soil units affected. Under the RCA, a maximum of 540.9 acres of surface disturbance would occur, of which 517.8 acres would be reclaimed. Similar to the Proposed Action, 13.2 acres of pit walls and the 9.9 acres occupied by realigned county roads would be unreclaimed under the RCA. Maximum total disturbance would be 14 percent more than under the Proposed Action.

Under the RCA, 31 acres of surface disturbance would occur on soils with high erosion hazard (**Table 3.4-5**) and 120 acres on soils with moderate erosion hazard. This represents a decrease in disturbance of soils with high and moderate erosion hazard, compared to the Proposed Action, and the potential for erosion and transport of soils would also decrease. As for the Proposed Action, impacts from wind erosion are expected to be negligible for the RCA.

Although there would be more surface disturbance under the RCA, much of the additional disturbance would be in areas of soils deemed unsuitable for salvage because of high total rock fragment content or limited by shallow depth to bedrock (e.g., map units HAX, RDX) and less GM would be available on site. Arcadis (2015e) presents calculated estimates of available and required GM for the RCA. Minor revisions to the RCA have been made after publication of that document; the volumes presented in this section reflect the revised RCA layout and updated calculations. Compared to the Proposed Action, slightly less soil would be available for salvage and use as GM (2.00 MBCY), but reclamation would also require a smaller volume (0.77 MBCY). Overall percentages of available soils rated as good, fair, or poor for use as GM are similar to those with the Proposed Action but with slightly more soils rated as good or fair and less rated as poor. Fewer soils would be salvaged from low-lying areas (especially soil map units CFT, ENV, and WSR), resulting in a decrease in total poor rated soils within the first two salvage lifts of 0.05 MBCY.

A total of 0.70 MBCY of pit GM could be salvaged from the first two stripping lifts within the pit and overfill areas (Arcadis 2015e). The RCA cover would require the use of 0.33 MBCY of pit GM (**Section 2.5.1.8.5**). An estimated 0.37 MBCY of surplus pit GM would be available from the first two pit stripping lifts that would not be required for cover construction or reclamation of external borrow areas (Arcadis 2015e). Available quantities of pit GM required for cover construction were estimated to be sufficient (BC 2015a).

A total of 2.50 MBCY of external combined GM, alluvium, and colluvium could be salvaged from the external borrow sites (Guedes 2016). The cover over the pit backfill and at South Rasmussen Mine would require the use of 0.88 MBCY of external combined GM, alluvium, and colluvium. The material not required for the cover would be left in place. Available quantities of external combined GM/alluvium required for cover over pit backfill and South Rasmussen Mine backfill construction were estimated to be sufficient (BC 2015a).

A total of 3.17 MBCY of pit alluvium could be salvaged from the pit and overfill areas (BC 2015a). The Store-and-Release Cover C would require the use of 1.02 MBCY of pit alluvium. Available quantities of pit alluvium required for cover construction were estimated to be sufficient (BC 2015a).

Reclamation of other (non-cover) areas would require 0.43 MBCY of GM. 0.65 MBCY of GM would be available for that purpose, 0.30 MBCY of which could be salvaged from the first two stripping lifts in disturbed areas outside of the pit and borrow areas. The remaining 0.35 MBCY of required GM would be obtained from the borrow areas. Any surplus GM beyond that required for minimum thickness of reclamation would either be placed to a thicker depth (other than cover over backfill) or placed in GM stockpiles for later use.

The estimated volumes of available GM for the RCA indicate that sufficient soils of adequate quality are present within the area to be disturbed to meet re-vegetation requirements in the PFO ARMP and the CNF RFP as shown in **Table 4.4-3**.

Overall adverse effects to soils under the RCA would be greater than those under the Proposed Action and would be long-term and minor to moderate. As under the Proposed Action, much of the impact would reduce over time with the success of reclamation. Management compliance would be the same as under the Proposed Action.

4.4.1.3 No Action Alternative

Under the No Action Alternative, existing soil resource trends within the Study Area would continue, and soil resources would remain in their natural condition. No direct or indirect impacts to soil resources would occur as a result of implementation of the No Action Alternative.

Table 4.4-3 Estimated On-Site Material Volumes Required and Available under the RCA

Description	GM Required (MBCY)	GM Available (MBCY)	GM Available in 1st Two Lifts (MBCY)	Pit Alluvium Required (MBCY)	Pit Alluvium Available (MBCY)	External Area Combined GM/Alluvium Required (MBCY)	External Area Combined GM/Alluvium Available (MBCY)
Cover	0.33[1]			1.02[1]		0.69[3]	
Reclaim of Other Areas[a]	0.43[2]						
South Rasmussen Mine	0.14[3]					0.19[3]	
Total Required	0.90			1.02		0.88	
Pit[b]		0.85[2]	0.70[2]		3.17[1]		
External Borrow Areas		0.84[2]	0.57[2]		0.53		2.50[3]
Other Areas		0.30[2]	0.30[2]				
Total Available		2.00[2]	1.57[2]		3.70[2]		2.50[3]

Notes:

a Other areas includes all areas to be reclaimed outside of the cover system

b Pit includes pit footprint and overfill pile areas external to the pit footprint

Source: 1= BC 2015a, 2=Arcadis 2015e, 3=Guedes 2016

4.4.2 Irreversible and Irretrievable Commitment of Resources

Long-term loss of soils and irreversible commitments of soil resources would occur in portions of the analysis area where soil would not be replaced during reclamation (e.g., pit walls and realigned county roads). Unreclaimed areas would be 17.3 acres for the Proposed Action and 23.1 acres for the RCA. Pit walls may eventually weather in place to form steep slopes capable of supporting soil development and vegetation. Restoration of soil characteristics, such as soil structures, infiltration, water-holding capacity, and vegetative productivity, would gradually return through natural soil development processes over an extremely long period of time.

4.4.3 Unavoidable Residual Adverse Effects

Native soil conditions would be directly impacted during multiple phases of the Proposed Action or the RCA. Adverse impacts would include degradation of natural soil structures and microbiotic crusts (if present), microorganisms, and discontinuation of soil development. These residual effects would gradually lessen as natural soil development progresses follow reclamation. Residual effects would occur in areas of pit walls where reclamation does not occur, natural soil development may take centuries, and where county roads are realigned and maintained. These residual effects are expected to affect 17.3 acres for the Proposed Action and 23.1 acres for the

RCA, but these values do not take into account that rock outcrops void of soil existed naturally within the pit footprint, and that these areas would be reclaimed and vegetated, thus helping mitigate the loss of soil areas on unreclaimed pit walls.

4.4.4 Mitigation Measures

Under the Proposed Action and the RCA, straw wattles, silt fences, erosion matting, and other erosion control and sediment transport BMPs would be implemented to reduce, capture, and control soil movement (Agrium 2011). All slopes would be dragged, fertilized, and seeded on the contour as much as practical to reduce soil movement. Excess sediment transport by runoff would be contained by temporary sediment basins until vegetative controls are established. The EMP (**Appendix B**) outlines sampling and monitoring activities, including surface water and storm water monitoring, in further detail.

4.5 VEGETATION, RIPARIAN AREAS, AND WETLANDS

Issue: What is the potential for impacts to vegetative productivity?

Indicators:

- Changes in the local vegetation communities and relative success of reclamation related to changes in cover percent and richness

Issue: What is the potential for impacts to vegetation patterns?

Indicators:

- Acres of disturbed area that are planned for reclamation, the types of vegetation that would be restored, and the number of years it would take for restoration to be completed and mature
- Potential for bioaccumulation of COPCs (including selenium) in the reclamation vegetation at concentrations in excess of stated BLM Pocatello ARMP guidance or CNF RFP prescriptions for phosphate lease areas
- Acres of vegetation conversion from forest to non-forest cover and predicted re-establishment potential to return to a forested condition over time
- Changes in grassland fuel load related to conversion to non-forest cover and resulting changes in fire regimes
- Acres of snag habitat and old-growth forest removed

Issue: What is the potential for construction and surface disturbance to impact WOUS including wetlands?

Indicators:

- Acres of direct impact to WOUS or change in function and value of wetlands disturbed by the mine and related facilities
- Change in water balance entering and leaving wetlands
- Changes in the concentrations of contaminants or sediments to WOUS, including wetlands

Issue: What is the potential for the introduction or spread invasive, non-native, or noxious plant species?

Indicators:

- Acres of disturbed land potentially subjected to invasive plant species

Issue: What is the potential for impacts on pollinators?

Indicators:

- Acres of disturbance to vegetation types favorable to pollinators
- Vegetation types that would be re-established by reclamation and balance of plant species in the reclamation seed mixes that would benefit pollinator populations
- Delay time for complete reclamation of habitat favorable to pollinator populations

The CNF RFP (USFS 2003) and the BLM PFO ARMP (BLM 2012a) list DFCs and goals, respectively, for vegetation in the Study Area, including forested and non-forested vegetation, old-growth forests, riparian areas, wetlands, noxious weeds, and invasive plants.

4.5.1 Direct and Indirect Impacts

4.5.1.1 Proposed Action

4.5.1.1.1 Vegetation

Over the life of proposed mining activities, the Proposed Action would remove up to 447 acres of upland (non-wetland) vegetation and 20.5 acres of wetland vegetation (which includes shrub/scrub wetland/seasonal mountain drainage [3 acres] and mesic emergent/ponded wetland [17 acres]). The vegetation types and associated acreages affected by the Proposed Action are summarized in **Table 4.5-1**.

Table 4.5-1 Vegetation Types and Estimated Affected Acreages under the Proposed Action

Vegetation Type	Acres*
Aspen Mature Dry Woodland	52
Aspen Mature	26
Aspen Old Growth	4
Aspen/Conifer Mix	0
Total Aspen	***83***
Big Sagebrush Rangeland	165
Silver Sagebrush Rangeland	34
Total Sagebrush*	***199***
High-elevation Rangeland	117
Shrub/Scrub Wetland/Seasonal Mountain Drainage	3
Mesic Emergent/Ponded Wetland	17
Previously Reclaimed	19
Disturbance of undetermined upland vegetation areas for POC monitoring wells, access roads, and pit layback	28
Total Disturbed Acreage	**467**
Reclaimed Acreage that would Recover to Big Sagebrush	**326**
Reclaimed Acreage that would Recover to High Elevation Rangeland	**89**
Total Reclaimed Vegetation Acreage	**443**

Notes:
*Acreages are rounded to nearest whole number
**Subcategories do not sum to totals in some cases as a result of rounding
***4 acres of disturbed vegetation would remain unreclaimed as pit walls and portions of county road realignment

All vegetation would be removed within the vegetation types impacted by the Proposed Action. Reclamation would reseed these areas using the seed mixes shown in **Table 4.5-2**. The objectives addressed in the development of seed mixes are discussed in the following paragraphs. While vegetation would re-grow in these areas, the resulting species composition and community structure would be different than that before disturbance; therefore, direct impacts to vegetation would be long-term.

Table 4.5-2 Proposed Reclamation Seed Mixes for Southwest and Northeast Slope Aspects

Southwest Aspects (drier sites)*	Pounds per Acre	Percentage of Seed Type	Northeast Aspects (moister sites)*	Pounds per Acre	Percentage of Seed Type
Grasses					
Bluebunch Wheatgrass (*Pseudoroegneria spicata*)	6.75	15	Mountain Brome (*Bromus marginatus*)	9.00	20
Western Wheatgrass (*Pascopyrum smithii*)	2.25	5	Bluejoint Grass (*Calamagrostis canadensis*)	6.75	15
Great Basin Wildrye (Leymus cinereus)	4.50	10	Redtop Bentgrass (*Agrostis stolonifera*)	2.25	5
Idaho Fescue (*Festuca idahoensis*)	4.50	10	Timothy (*Phleum pretense*)	2.25	5
Mountain Brome (*Bromus marginatus*)	6.75	15	Pine Reedgrass (*Calamagrostis rubescens*)	4.50	10
Big Bluegrass (*Poa secunda*)	4.50	10	Bluebunch Wheatgrass (*Pseudoroegneria spicata*)	6.75	15
Green Needlegrass (*Nassella viridula*)	5.40	12	Slender Wheatgrass (*Elymus trachycaulus* ssp. *Trachycaulus*)	4.50	10
Slender Wheatgrass (*Elymus trachycaulus*)	4.50	10	June Grass (*Koeleria macrantha*)	4.50	10
Sterile Annual Rye (Quick Guard) (*Lolium multiflorum Lam.*)	2.25	5			
Forbs					
Western Yarrow (Achillea millefolium L. var. occidentalis)	0.90	2	Western Yarrow	0.90	2
Lewis Blue Flax (*Linum perenne var. lewisii*)	0.90	2	Lewis Blue Flax	0.90	2
Balsamroot (*Balsamorhiza sagittata*)	0.90	2	Mountain Snowberry (*Symphoricarpos oreophilus*)	0.90	2
Brush					
Bitterbrush (*Purshia tridentata*)	0.90	2	Cinquefoil (*Potentilla*)	0.90	2
			Bitterbrush	0.90	2
Total	**45.0**	**100**	**Total**	**45.0**	**100**

Notes:

* The northeast aspect seed mix would be applied to reclaimed areas with aspects between 315 compass degrees clockwise to 135 compass degrees, and the southwest aspect seed mix would be applied to flat reclaimed areas as well as those with aspects between 135 compass degrees clockwise to 315 compass degrees.

Source: Agrium 2011

Approximately 95 percent (443 acres) of the disturbed vegetation would be reclaimed and re-vegetated. The remaining 5 percent (24 acres) would comprise bare pit walls remaining where pits are not backfilled crest-to-crest and unreclaimed realigned county roads. For the purposes of the Habitat Equivalency Analysis (HEA) and quantifying residual wildlife habitat service losses (habitat service lost after accounting for habitat service gained from reclamation), these areas were assumed to remain unvegetated into perpetuity (Arcadis 2015a). Although the purpose of the HEA was to quantify wildlife habitat services lost and gained, because upland vegetation parameters were used to formulate the metric, the HEA is also useful for quantifying impacts and subsequent recovery of upland vegetation.

To determine the residual wildlife habitat service losses under the Proposed Action, the HEA required quantification of wildlife habitat services gained through reclamation. Published literature, data from other mines in the region, and the best professional judgment of Arcadis and USFS botanists were used to develop recovery trajectories for reclaimed areas. Richness/cover/wetness (RICHCOVWET) is the metric chosen to represent wildlife habitat services for the HEA using vegetation parameters including plant species richness, percent vegetation cover, and wetness. Change in the percent multi-layer cover (total percentage plant cover allowing for overlap of plants) and species richness (number of plant species) had to be predicted over time (recovery trajectories had to be developed for these parameters). The methodology and results for the development of recovery trajectories for reclaimed areas are presented in the Predictive Metrics Report (Arcadis 2015a), and the results are summarized here. The HEA suggests that the percent multi-layer cover of the reclaimed area would reach 54 percent 9 years after reclamation and remain at 54 percent until 25 years after reclamation. In the long term, percent multi-layer cover of the areas reclaimed with the southwest aspects seed mix would return to the baseline multi-layer cover value for big sagebrush (127 percent). Over the long term, percent multi-layer cover of areas reclaimed with the northeast aspects seed mix would return to the baseline multi-layer cover value for high-elevation rangeland (149 percent). For the southwest aspects seed mix, plant species richness would start at 17 in the first year, drop to 16, and remain at that level for 110 years. For the northeast aspects seed mix, plant species richness would start at 14 in the first year and reach 23 by year 110. Assumptions and literature used to develop the recovery trajectories are provided in Arcadis (2014b).

According to the HEA, the Proposed Action would result in a total debit of 7,258 discount service acre years (DSAYs) during mining and before reclamation. Reclamation would result in the long-term return of 3,979 DSAYs at the mine site, which equates to 55 percent of the wildlife habitat services total debit under the Proposed Action. Therefore, under the Proposed Action, there would be a net debit of 3,279 residual DSAYs of wildlife habitat services (Arcadis 2015b). Without additional mitigation, this residual debit in wildlife habitat services would represent a long-term adverse impact of the Proposed Action on wildlife, and also on vegetation as measured by plant species RICHCOVWET.

Some plant species would be unlikely to re-establish in reclaimed areas because these areas would exhibit different soil characteristics and would likely be drier than existing conditions. Aspen is a clonal species that primarily regenerates by sprouting from parent roots. These roots would be removed or destroyed in the mining process; therefore, without an existing root source, it would be unlikely to recover in areas where the soil had been removed (Schier et al. 1984). Therefore, the Proposed Action would result in the permanent loss of 83 acres of aspen, which includes 4 acres of old-growth aspen forest (3.6 acres on BLM land and 0.7 acre on private land). The 83 acres of aspen impacts include 16 acres on BLM land, 2 acres on private land, 9 acres on state land, and 55 acres on USFS land.

This would also represent a permanent loss of 83 acres of snag-producing forest habitat, which, through reclamation and succession, would be replaced with grassland and shrubland. The loss of these aspen stands would not adversely affect landscape-scale age class evenness of aspen forest because the stands that would be lost are all in old-mature age classes, which are over-represented on the landscape (Arcadis 2014a).

The management of GM would be critical to the success of revegetation. All topsoil deemed suitable for use as GM would be placed directly on areas that are ready for reclamation or would be salvaged and stockpiled for later use in reclamation (**Section 2.3.7.3**).

Appropriate BMPs to control invasive and noxious species would be implemented throughout the duration of the Proposed Action, including pre-mining preparations and post-mining reclamation.

Some reclamation revegetation on historical southeastern Idaho phosphate mines has been found to accumulate selenium to levels detrimental to livestock foraging on the vegetation. Certain species, such as trees, legumes, and plants with deep roots and tap roots, are more susceptible to selenium accumulation (Mackowiak and Amacher 2003; Mackowiak et al. 2004; Zlatnik 1999; Ohlendorf 2003).

The Proposed Action cover is designed to be thick enough to isolate the revegetation roots from plant-available selenium in the underlying Meade Peak-containing material, thus preventing the plant uptake of selenium at concentrations exceeding the 5 milligrams per kilogram (mg/kg) plant dry weight ARMP action level. All pit backfill would be covered with 3 feet of non-Meade Peak-containing material and then covered with no less than 2 feet of GM. This cover system is also designed to limit the amount of meteoric water percolating through the cover. Given the moisture storage properties of the upper 2 feet of the Proposed Action cover, it is expected that the large majority of the plant rooting mass would be within the top 2 feet of the cover, where transpiration would occur.

The Proposed Action seed mixes have also been developed to avoid selenium accumulator or deep-rooted species. These seed mixes do not contain any trees, legumes, or plants that would extend substantial root mass to depths below the cover. Seeds would be drilled or broadcast onto the area to be seeded. GM would be augmented with fertilizer based on species and soil analysis. Seeding would typically take place during the fall, following preparation of the surface.

There would be no uptake of selenium by vegetation at concentrations that would exceed the 5 mg/kg ARMP action level for the Proposed Action reclaimed areas underlain by Meade Peak-containing material; thus, negligible impact is predicted and it would be long-term.

Table 4.5-3 summarizes compliance with the PFO ARMP with regard to vegetation resources under the Proposed Action.

Table 4.5-3 Compliance with Applicable PFO ARMP Goals, Objectives, and Actions for Vegetation Resources under the Proposed Action

Goal/Objective/Action	Compliance under Proposed Action
Action ME-2.1.4. Applicable Idaho Standards for Rangeland Health (BLM 1997) will be employed to determine the success of reclamation, rehabilitation, or restoration activities following major surface disturbances on public lands.	The Proposed Action would be consistent with this action because proposed reclamation activities are designed to comply and the seed mixtures selected for reclamation contain a variety of native grass, forb, and shrub species that could provide forage for livestock and wildlife. Additional native species are predicted to colonize reclaimed areas over time through natural successional processes. Over the long term, the reclaimed areas are

Table 4.5-3 Compliance with Applicable PFO ARMP Goals, Objectives, and Actions for Vegetation Resources under the Proposed Action

Goal/Objective/Action	Compliance under Proposed Action
	anticipated to recover to the baseline habitat quality of big sagebrush and high-elevation rangeland on the mine site. Weed control would also be undertaken.
Action ME-2.2.1. Reclamation Plans for mineral development operations will be designed to attain and final reclamation will meet applicable standards (BLM 1997) consistent with the rehabilitation potential of the disturbed site.	The Proposed Action would be consistent with this action because proposed reclamation activities are designed to comply and the seed mixtures selected for reclamation contain a variety of native grass, forb, and shrub species that could provide forage for livestock and wildlife. Additional native species are predicted to colonize reclaimed areas over time through natural successional processes. Over the long term, the reclaimed areas are anticipated to recover to the baseline habitat quality of big sagebrush and high-elevation rangeland on the mine site. Weed control would also be undertaken.
Action ME-2.2.2. Operational Standard 9: Within development areas, soils and native vegetation will be retained undisturbed when disturbance of the site is not necessary for minerals development or safety.	This standard would be met under the Proposed Action. Disturbance would be limited to the minimum area necessary, and areas would be reclaimed and revegetated when no longer needed for mining.
Action ME-2.2.2. Operational Guideline 1: Selection of plant species for establishment will reflect the surrounding ecosystem and post-development land use. Plant materials selected for reclamation use will be adapted to the climate of the site. Consideration and preference will be given to promoting natural succession, native plant species, and structural diversity.	This guideline would be met under the Proposed Action. Areas no longer needed for mining would be reclaimed with a variety of predominantly native plant species (**Table 4.5-2**) that are adapted to the local climate. The seed mixes include bunchgrasses, forbs, and shrubs for structural diversity. Reclaimed areas would be subject to natural succession and eventually recover to big sagebrush and high-elevation rangeland plant communities.
Action ME-2.3.5. In reclamation activities, plant species known to reduce the risk of bioaccumulation of hazardous substances, such as selenium, will be used if such risk is present.	The Proposed Action would be consistent with this Action. Seed mixes were designed to include predominantly shallow-rooted species, and no selenium accumulator species were included in seed mixes. The 5-foot-deep cover is designed to eliminate adverse bioaccumulation of selenium.
Action ME-2.3.6. Prior to release of any performance bond or relinquishment of a mineral lease/permit, reclamation vegetation will be monitored for bioaccumulation of hazardous substances for a period of time to be determined appropriate by the Authorized Officer.	The Proposed Action would be consistent with this Action. Agrium would conduct monitoring consistent with the EMP (**Appendix B**).

Source: BLM 2012a

Table 4.5-4 summarizes compliance with applicable standards and guidelines from the CNF RFP (USFS 2003) with regard to vegetation resources under the Proposed Action.

Overall effects of the Proposed Action to upland vegetation would be long-term and minor. Reclamation would eventually re-establish vegetation cover, but the species composition and community structure would be different.

Table 4.5-4 Compliance with Applicable Caribou Forest Plan Standards and Guidelines for Vegetation Resources under the Proposed Action

Standard or Guideline	Compliance under Proposed Action
Vegetation Standard 2: In each 5th code HUC which has the ecological capability to produce forested vegetation, the combination of mature and old age classes (including old growth) shall be at least 20 percent of the forested acres. At least 15 percent of all the forested acres in the HUC are to meet or be actively managed to attain old-growth characteristics (RFP 3-19).	Currently, 93 percent of the aspen stands in the 5th code HUC are in old/mature age classes based on USFS mapping. All of the aspen stands that would be impacted under the Proposed Action are in mature/old age classes. On-site inventory showed that no acres that currently meet Region Four “Old-growth” definitions will be impacted on USFS lands. Therefore, the Proposed Action would not negatively impact the distribution of aspen forest age classes, and would be consistent with maintaining at least 20 percent mature/old age classes in the 5th code HUC that encompasses the analysis area. Because of the prevalence of mature/old aspen stands on the landscape, it is likely that at least 15 percent of the aspen forest in the watershed would still remain to attain old-growth characteristics, even with the loss of 4 acres of old-growth aspen (on BLM and private land) under the Proposed Action.
Vegetation Guideline 1: Manage to reduce the decline of aspen and promote aspen regeneration and establishment. Provide protection from grazing where needed and consistent with management objectives.	The Proposed Action would result in the permanent loss of 83 acres of aspen forest. This permanent loss is not expected to impact aspen on a forest-wide scale, particularly given that stands in the Study Area are naturally patchy, with none of the individual stands surpassing 200 acres in size (BC 2012c).
Vegetation Guideline 3: For aspen and conifer types, acres classified as mature and old growth should be in blocks over 200 acres in size unless the natural patch size is smaller (a block can consist of a combination of mature and old-growth forest types). Within these blocks: • Maintain the dead and down woody material guidelines for wildlife. • Silvicultural techniques may be used to maintain or improve old-growth and mature forest characteristics. • If a catastrophic event (such as fire) reduces the acres of old-growth and mature forest below 20 percent of the forested acres in a principal watershed, identify replacement forested acres. When necessary, use silvicultural techniques to promote desired characteristics in the replacement acres.	The aspen forest in the Study Area is naturally patchy, with none of the individual aspen stands surpassing 200 acres in size (BC 2012c). The Proposed Action would result in a permanent loss of 83 acres of aspen forest. This would further reduce the size of mature and old-growth areas (blocks) in the Study Area and thus further reduce mature and old-growth forest availability for wildlife habitat management.
Plant Species Diversity Standard 1: Projects and activities shall be managed to avoid adverse impacts to sensitive plant species that would result in a trend toward federal listing or loss of viability.	There are no identified plant species listed as threatened, endangered, or proposed under the Endangered Species Act (ESA) in Caribou County (USFWS 2014). No CNF sensitive plant species or CNF Forest Watch rare plant species have been documented in the baseline studies. The Proposed Action is in compliance with this guideline.
Plant Species Diversity Guideline 1: Native plant species from genetically local sources should be used to the extent practical for erosion control, fire rehabilitation,	Native plant species from genetically local sources will be used to the extent practical. The Proposed Action is in compliance with this guideline.

Table 4.5-4 Compliance with Applicable Caribou Forest Plan Standards and Guidelines for Vegetation Resources under the Proposed Action

Standard or Guideline	Compliance under Proposed Action
riparian restoration, road rights-of-way seeding, and other revegetation projects.	
Plant Species Diversity Guideline 2: Where practical, disturbed sites should be allowed to revegetate naturally where the seed source and soil conditions are favorable (e.g., low erosion potential, deeper soils) and noxious weeds are not expected to be a problem.	A Forest Botanist has reviewed the proposed seed mix for revegetation. The Proposed Action is in compliance with this guideline.
Plant Species Diversity Guideline 3: Known occurrences or habitat for rare plants on the "Forest Watch" list and rare or unique plant communities on the Forest should be maintained.	No CNF sensitive plant species or CNF Forest Watch rare plant species have been documented in the baseline studies. The Proposed Action is in compliance with this guideline.
Plant Species Diversity Guideline 4: Maintain, and where possible, increase unique or difficult-to-replace elements such as areas of high species diversity aspen, riparian areas, tall forbs, rare plant communities, etc.	The Proposed Action would be consistent with this guideline, as it would not result in the loss of high diversity aspen stands (they are naturally patchy in the Study Area), riparian areas, or rare plant communities.
Plant Species Diversity Guideline 5: The Forest Botanist or Ecologist should review seed mixes used for revegetation to insure no adverse impacts to threatened, endangered, sensitive species; other species at risk; and the overall native flora within the analysis area.	A Forest Botanist has reviewed the proposed seed mix for revegetation. The Proposed Action is in compliance with this guideline.
Drastically Disturbed Lands Standard 7: Reclamation vegetation shall be monitored for bioaccumulation of hazardous substances prior to release for multiple-use management.	The EMP (**Appendix B**) identifies the environmental monitoring activities that would be undertaken at the mine to ensure the effectiveness of BMPs and mitigation measures. The plan identifies which resources need to be monitored and describes monitoring and sampling locations, approved monitoring and sampling methods, duration and frequency of sampling, and data reporting requirements. The Proposed Action is in compliance with this standard.
Drastically Disturbed Lands Standard 10: Within mine areas, native vegetation shall be retained undisturbed when disturbance of the site is not necessary for minerals development or safety.	Existing vegetation would be protected to the extent practicable by limiting surface disturbance to those areas needed for operations. The Proposed Action is in compliance with this standard.
Drastically Disturbed Lands Guideline 2: Selection of plant species for establishment should reflect the surrounding ecosystem and post-remedial land use. Plant materials used should be adapted to the climate of the site. Consideration and preference should be given to promoting natural succession, native plant species, and structural diversity.	Agency-approved seed mixes containing native seeds would be applied. Two seed mixes would be used: one for drier sites and one for moister sites. The Proposed Action is in compliance with this guideline.
Drastically Disturbed Lands Guideline 3: Prescribe reclamation plant species known to reduce the risk of bioaccumulation of hazardous substances, if such risk is present.	Under the Proposed Action, seed mixes have been developed to encourage uptake of water from the upper soil horizon and avoid the use of selenium accumulator species. These seed mixes do not contain any trees, legumes, or deep-rooted species, which typically accumulate selenium to a greater extent than grasses and shrubs (Mackowiak and Amacher 2003; Mackowiak et al. 2004). The Proposed Action is in compliance with this guideline.

Table 4.5-4 Compliance with Applicable Caribou Forest Plan Standards and Guidelines for Vegetation Resources under the Proposed Action

Standard or Guideline	Compliance under Proposed Action
Prescription 8.2.2 Goal 4: Emphasize the use of native plant species in reclamation but allow the use of non-natives when natives will not achieve reclamation goals.	Agency-approved seed mixes containing native seeds would be applied. Two seed mixes would be used: one for drier sites and one for moister sites. The Proposed Action is in compliance with this guideline.

Source: USFS 2003

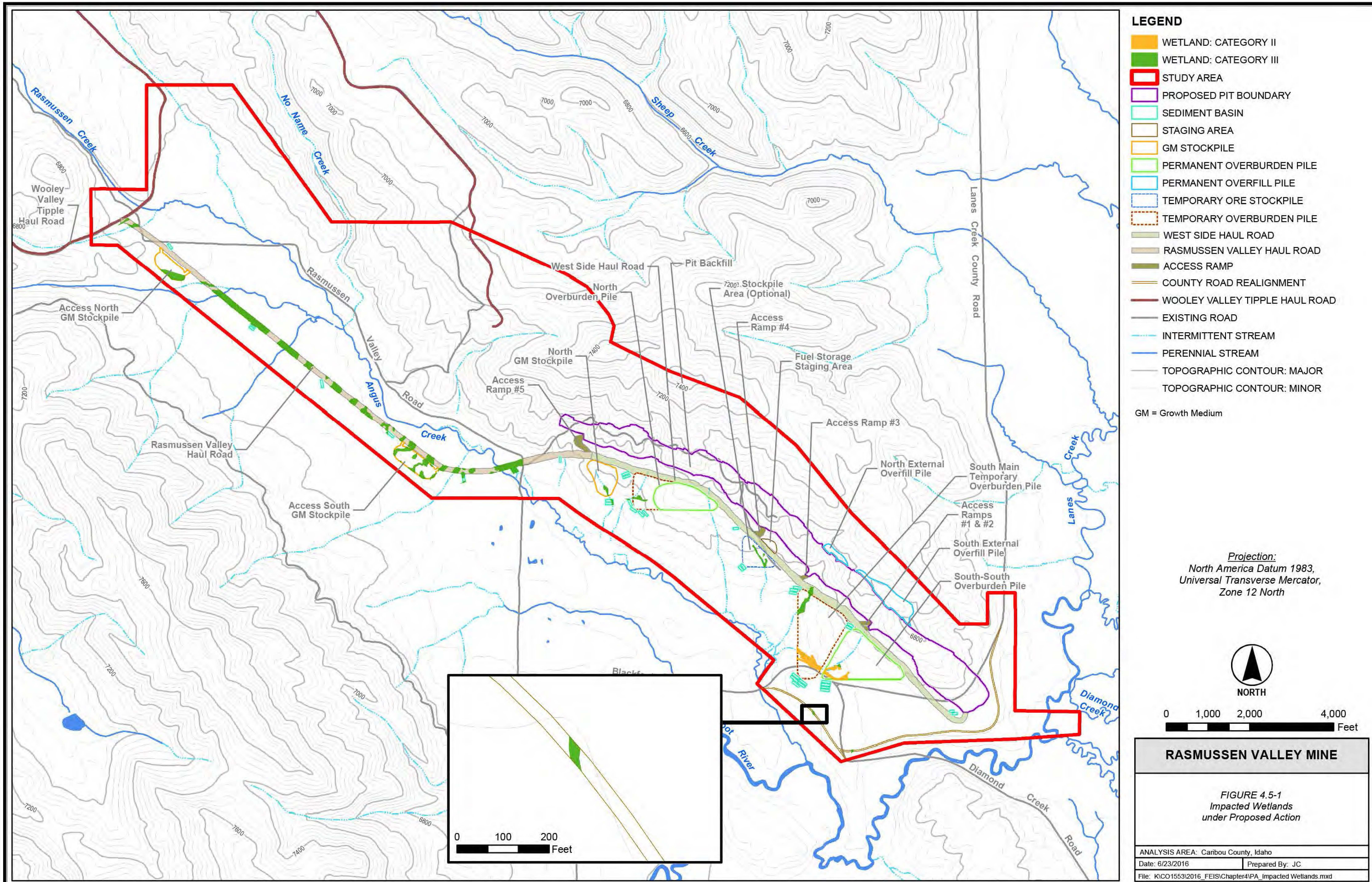
4.5.1.1.2 Wetlands and Riparian Areas

Executive Order (EO) 11990, Protection of Wetlands, requires that federal agencies "…avoid to the extent possible the long- and short-term adverse impacts associated with the destruction or modification of wetlands and to avoid direct or indirect support of new construction in wetlands wherever there is a practicable alternative." Under the Proposed Action, there would be 20.5 acres of direct removal of wetlands and non-wetland WOUS. **Table 4.5-5** summarizes project components that would result in impacts to wetlands; these impacted areas are shown on **Figure 4.5-1**. Wetland assessment area and categories are described in **Section 3.5.2**. Wetland assessment areas are specific areas chosen to delineate and sample the functions of wetlands and thereby gage their quality. Impacts to fisheries and aquatic resources are discussed in **Section 4.7**.

Table 4.5-5 Direct Impacts to Wetlands under the Proposed Action

Project Component	Affected Wetland Assessment Area (WAA)	Wetland Category	Wetlands (acres)
Access Road	WAA 6	III	1.79
	WAA 8	III	1.5
	WAA 13	III	4.42
	WAA 14G	III	0.25
	WAA 12	III	0.25
	WAA 9	III	4.36
	WAA7	III	0.07
GM Stockpile	WAA14C	III	0.19
	WAA 13	III	1.55
	WAA9	III	1.35
Overburden Pile	WAA2	II	0.95
	Outside of wetland assessment area	III	0.15
	WAA 14C	III	0.21
Realigned County Road	Outside of wetland assessment area	III	0.04
Sediment Basin	WAA 13	III	0.09
	WAA 6	III	0.27
	WAA 9	III	0.03
	WAA 14C	III	0.03
Stockpile Area	WAA 14F	III	0.23
Temporary Overburden Pile	WAA 2	II	2.04
	WAA 14G	III	0.74
	Total		**20.51**

Source: BC 2012b


LEGEND
WETLAND: CATEGORY II
WETLAND: CATEGORY III
STUDY AREA
PROPOSED PIT BOUNDARY
SEDIMENT BASIN
STAGING AREA
GM STOCKPILE
PERMANENT OVERBURDEN PILE
PERMANENT OVERFILL PILE
TEMPORARY ORE STOCKPILE
TEMPORARY OVERBURDEN PILE
WEST SIDE HAUL ROAD
RASMUSSEN VALLEY HAUL ROAD
ACCESS RAMP
COUNTY ROAD REALIGNMENT
WOOLEY VALLEY TIPPLE HAUL ROAD
EXISTING ROAD
INTERMITTENT STREAM
PERENNIAL STREAM
TOPOGRAPHIC CONTOUR: MAJOR
TOPOGRAPHIC CONTOUR: MINOR
GM = Growth Medium
Rasmussen Creek
No Name Creek
Sheep Creek
Wooley Valley Tipple Haul Road
Access North GM Stockpile
Rasmussen Valley Road
Angus Creek
Rasmussen Valley Haul Road
Access South GM Stockpile
West Side Haul Road
Pit Backfill
North Overburden Pile
Stockpile Area (Optional)
Access Ramp #4
North GM Stockpile
Fuel Storage Staging Area
Access Ramp #5
Access Ramp #3
North External Overfill Pile
South Main Temporary Overburden Pile
Access Ramps #1 & #2
South External Overfill Pile
South-South Overburden Pile
Lanes Creek County Road
Lanes Creek
Diamond Creek
Diamond Creek Road
River
0 100 200 Feet
Projection:
North America Datum 1983,
Universal Transverse Mercator,
Zone 12 North
NORTH
0 1,000 2,000 4,000 Feet
RASMUSSEN VALLEY MINE
FIGURE 4.5-1
Impacted Wetlands
under Proposed Action
ANALYSIS AREA: Caribou County, Idaho
Date: 6/23/2016
Prepared By: JC
File: K:\CO1553\2016_FEIS\Chapter4\PA_Impacted Wetlands.mxd

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As shown in **Table 4.5-4**, the most wetland impacts (17.5 acres) would occur to Category III wetlands. These wetlands are more common than Category II wetlands, but are generally less diverse, and often smaller and more isolated than Category I or Category II wetlands. Category III wetlands provide many functions and values, although they may not be assigned high ratings for as many parameters as Category I or II wetlands.

In summary, the impacted wetland assessment areas are: 2, 6, 7, 8, 9, 12, 13, 14C, 14F, and 14G. The primary, moderate functions of these wetlands include general wildlife habitat, flood attenuation, short- and long-term surface water storage, sediment/nutrient/toxicant removal, and sediment/shoreline stabilization. Functional ratings for these wetlands were restricted by size, disturbance ratings, grazing, channel structure, and structural diversity. These functions would be reduced as a result of the Proposed Action.

As discussed in **Section 3.5.2**, the 2008 Montana Department of Transportation Montana Wetland Assessment Method (MWAM) was used to determine wetlands functions and values.

The level at which affected wetlands provide ecological functions was estimated by deriving a functional index that reflects wetland functional parameters compared to an ideal condition. The functional index is a percentage of the level at which ecological functions are being delivered by the affected wetland. This index is multiplied by the acres of wetlands to derive “functional units,” which become the “currency” of impact determination and compensatory mitigation.

The Proposed Action would result in the loss of 11.99 functional units, as summarized in **Table 4.5-6**.

Table 4.5-6 Reduction in Wetland Functional Units as a Result of Dredging or Filling under the Proposed Action

Wetland Assessment Area	Functional Index (Percent)	Affected Acreage	Functional Unit Lost
2	72.7	2.99	2.17
6	59.5	2.06	1.22
7	47.3	0.07	0.03
8	54.5	1.50	0.80
9	60.5	5.74	3.47
12	53.2	0.25	0.13
13	56.4	6.06	3.41
14C	46.6	0.43	0.20
14F	46.6	0.23	0.10
14G	46.6	0.99	0.46
Not in WAA	not evaluated	0.19	cannot be calculated
	Total	**20.51**	**11.99**

Source: BC 2012b; Agrium 2011
WAA = Wetland Assessment Area

The Proposed Action carries the potential to indirectly impact wetlands through the introduction of wind-borne and water-borne sediments into surface waters. Exposed areas of bare soil and the haul road could generate dust that could be carried into nearby waters by wind and settle on wetland vegetation. Dust would be mitigated or minimized by the application of water to the haul road and, as necessary, supplementation with dust suppressants such as magnesium chloride or calcium chloride. Areas of exposed soil would be minimized by revegetating disturbed areas as soon as they are no longer needed.

Sediments could also be carried into surface water by storm water runoff. BMPs would be designed and implemented to control storm water runoff and the resulting sediment load. During mining, precipitation falling on disturbed areas associated with the pit, stockpiles, and haul roads would infiltrate or be retained in sediment catchment and runoff sediment basins. Runoff sediment basins for runoff water and silt would be constructed at strategic locations before mining activities occur in that area to collect and contain water exposed to mining disturbances or overburden. Collection ditches constructed along the outer perimeters of the overburden pile and stockpile sites would transfer surface water runoff from these sites and carry it to runoff sediment basins. Sediment basins are designed at a minimum to capture runoff water from a 100-year, 24-hour storm event. The capture of runoff during active mining would minimize erosion and sedimentation at the Proposed Action to protect surface waters (and thus wetlands connecting to surface waters) in and around the Proposed Action. Additional erosion control measures would be used where needed to further reduce the potential for introduction of sediments into the watershed, including straw wattles and silt fencing, to control water and soil movement from mining disturbances and the use of erosion matting on haul road fill slopes where appropriate to control soil movement into drainages. Brush barriers would be used to control runoff from overburden piles and GM stockpiles.

The capture of surface runoff during active mining would decrease the quantity of water in streams and wetlands downstream of the Study Area over the short-term. As explained in **Section 4.3.1**, the area of captured runoff equates to 4 percent of the Angus Creek-Blackfoot River sub-watershed and 0.03 percent of the Lower Lanes Creek sub-watershed. The reduced quantity of water may result in the localized drying of some wetlands downstream of the Study Area over the short term. Following reclamation, runoff to nearby streams and wetlands is predicted to be the same or greater compared to baseline conditions.

The Proposed Action carries the potential to impact water quality in Blackfoot River, Angus Creek, and springs and wetlands in the Study Area. Potential impacts to water quality include an increase in concentrations of COPCs listed in **Table 4.3-1**. These potential impacts to wetlands from COPCs are discussed in detail in **Section 4.3.1.1.1.4** Impacts to Surface Water Resources.

The Proposed Action would permanently affect 20.5 acres of wetlands of the 424.8 acres of wetlands delineated in the assessment areas. The Proposed Action could also indirectly impact wetlands near proposed activities. As a result of project design, use of BMPs, acreage, and similar functionality of wetlands not impacted in the assessment areas, the wetland impacts would be local, long-term, and moderate. Wetlands would be mitigated as required by the Clean Water Act (CWA) to compensate for this loss (**Section 4.5.4.2**).

Table 4.5-7 summarizes compliance with the PFO ARMP with regard to wetland and riparian resources under the Proposed Action. Applicable CNF RFP standards and guidelines for riparian resources are provided in **Table 4.7-2**.

Table 4.5-7 Compliance with Applicable PFO ARMP Goals, Objectives, and Actions for Wetland and Riparian Resources under the Proposed Action

Goal/Objective/Action	Compliance under Proposed Action
Action ME-2.3.7. Phosphate mine site plans will be designed to meet the following goals as identified in the Interagency Area-Wide Investigation of Phosphate Mine Contamination and Final Risk Management Plan (IDEQ 2004). Protect southeast Idaho's surface water resources. Protect wildlife habitat and ecological resources in southeast Idaho. Maintain and protect	In regards to protecting wildlife habitat and ecological resources, the Proposed Action would be consistent with this action over the long term because the majority of disturbed areas would be reclaimed to grassland and shrubland, which would eventually recover to the baseline habitat quality of big sagebrush and high-elevation rangeland on the mine site. Over the short

Table 4.5-7 Compliance with Applicable PFO ARMP Goals, Objectives, and Actions for Wetland and Riparian Resources under the Proposed Action

Goal/Objective/Action	Compliance under Proposed Action
multiple beneficial uses of the southeast Idaho phosphate mining resource area. Protect southeast Idaho's ground water resources.	term, the Proposed Action would result in reduced habitat and forage for big game and other species.
Action ME-2.3.8. In order to achieve the goals identified in Action ME-2.3.7, the following action level for vegetation, surface waters and groundwater as identified in the current IPMP (Appendix F) and/or future updates or revisions will be used to design mine and reclamation plans. In addition, these levels will be used in determining the success of phosphate mine reclamation, rehabilitation, or restoration activities.	The EMP (**Appendix B**) identifies the environmental monitoring activities that would be undertaken at the mine to ensure the effectiveness of BMPs and mitigation measures. The plan identifies which resources need to be monitored and describes monitoring and sampling locations, approved monitoring and sampling methods, duration and frequency of sampling, and data reporting requirements. The Proposed Action is in compliance with this action.
Goal VE-1. Provide for the proper functioning condition (PFC) of riparian areas.	The Proposed Action would meet Goal VE-1. Although the Proposed Action would result in long-term removal of riparian habitat and potentially contribute to further degradation of riparian areas through indirect impacts (such as sedimentation and contribution of selenium and other COPCs into wetland and riparian areas), BMPs and the Section 404 permit would include mitigation for these impacts.
Objective VE-1.1. Maintain properly functioning riparian areas and restore or improve those areas that are not at PFC.	The Proposed Action would meet Objective VE-1.1. The Proposed Action would result in long-term but minimal removal of riparian habitat. Indirect impacts (such as sedimentation and contribution of selenium and other COPCs into wetland and riparian areas) would be mitigated through BMPs and other measures under the Section 404 permit.
Action VE-1.1.1. Appropriate management guidelines, techniques, or practices will be implemented to control erosion, stabilize streambanks, shade/reduce water temperature, and encourage a diversity of desirable riparian vegetation.	Action VE-1.1.1 would be partially met under the Proposed Action. BMPs would be used to control erosion and combat streambank degradation, as described in **Section 4.3.4**. However, no steps would be taken to shade/reduce water temperature or encourage a diversity of desirable riparian vegetation.
Action VE-1.1.2. Idaho Standards for Rangeland Health (BLM 1997) will be implemented to maintain or improve riparian areas.	The Proposed Action would meet Objective VE-1.1.2. The Proposed Action would result in long-term but minimal removal of riparian habitat. Indirect impacts (such as sedimentation and contribution of selenium and other COPCs into wetland and riparian areas) would be mitigated through BMPs and other measures under the Section 404 permit.
Action VE-1.1.4. Stream crossings, if necessary, will be designed to minimize adverse impacts on soils, water quality, and riparian vegetation.	Action VE-1.1.4 would be met under the Proposed Action. As described in **Section 4.3.4**, culverts would be appropriately sized and placed such that they would minimize impacts at stream crossings. These impacts would be mitigated for under the Section 404 permit.

Source: BLM 2012a

4.5.1.1.3 Noxious Weeds

EO 13112, Invasive Species, requires that a federal agency "…not authorize, fund, or carry out actions that it believes are likely to cause or promote the introduction or spread of invasive species in the U.S. or elsewhere unless, pursuant to guidelines it has prescribed, the agency has determined and made public its determination that the benefits of such actions clearly outweigh the potential harm caused by invasive species; and that all feasible and prudent measures to minimize risk of harm would be taken in conjunction with actions." The primary purpose of this EO is to reduce ecological and economic effects of invasive plant and animal species to agriculture, industry, recreation, and the environment.

The removal of native vegetation would increase the potential for expansion of non-native plants including noxious weeds. Non-native plants carry a potential to colonize disturbed areas and, once established, may reduce the diversity in native plant communities. However, because of the existing low occurrence of noxious weeds in the analysis area and incorporation of BMPs into the project design, the potential for the uncontrollable infestations of noxious weeds would be minimized, and effects from noxious weeds would be short-term and minor. Project BMPs that would minimize noxious weed impacts include keeping active mining disturbances to a minimum for as short a timeframe as possible, with overburden areas and pit backfill advancing in concert with the active pit; monitoring and controlling noxious weed infestations; using certified weed-free seed, mulch, and straw; and implementing an annual noxious weed treatment plan.

Table 4.5-8 summarizes the goals, objectives, and actions of the PFO ARMP with regard to noxious weeds and invasive species. **Table 4.5-8** summarizes applicable CNF RFP Standards and Guidelines for Noxious Weeds. The Proposed Action would be in compliance with these goals/objectives/actions, standards, and guidelines by use of native seed mixtures that would be applied to complement the existing plant communities and reclaimed areas and by actively controlling identified noxious weeds. Appropriate BMPs, in compliance with the goals/objectives/action, standards, and guidelines listed in **Table 4.5-9**, would be implemented to control invasive and noxious species throughout the life of proposed mining activities. Examples of these BMPs include treatment of identified invasive species, using state-certified noxious weed free hay/straw when needed, use of a seed mix that is certified as weed-free, and monitoring for noxious weeds. There is a low occurrence of noxious weeds in the analysis area, and BMPs will be implemented to minimize their potential spread. Therefore, the effects of noxious weeds from the Proposed Action would be short-term and minor.

Table 4.5-8 PFO ARMP Goals, Objectives, and Actions for Noxious Weeds and Invasive Species

Goal/Objective/Action
Goal VE-2. Prevent the establishment of invasive species/noxious weed species.
Objective VE-2.1. Treat invasive species/noxious weeds to decrease or control the total number of acres occupied.
Action VE-2.1.1. Invasive species/noxious weeds will be treated based upon the following priority: 1. Idaho Noxious Weeds List 2. Invasive species/noxious weeds
Action VE-2.1.2. Priority treatment areas will be: • Research Natural Areas (RNAs) • Riparian areas • Springs/Seeps • Developed Recreation Sites/Campgrounds/Campsites • Heavily used roads/trails • Big game winter range • Special Status Species (flora habitat area)

Table 4.5-8 PFO ARMP Goals, Objectives, and Actions for Noxious Weeds and Invasive Species

Goal/Objective/Action
• Wildland Urban Interfaces (WUIs) • Mine reclamation sites • New areas identified: treat smallest populations first
Action VE-2.1.3. When authorizing new permitted/authorized activities, stipulations will be incorporated for the prevention and treatment of invasive species/noxious weeds as applicable. Examples of such stipulations to consider will promote: • The replacement of invasive species/noxious weeds by perennial plant cover which includes purchasing and planting of desirable seeds or plants. • The use of perennial green fire breaks when emergency stabilization and rehabilitation (ES&R) or restoration efforts are planned/implemented. • Invasive species/noxious weed management being integrated into any new or renewal of permitted/authorized activities resulting in major surface disturbance.
Action VE-2.1.4. As appropriate, chemical, biological, mechanical, and manual methods will be used in treating invasive species/noxious weeds. The use of biological control agents will be promoted when reasonable as identified through current BLM policy.
Action VE-2.1.5. Herbicide use will be consistent with current BLM policy (e.g., Record of Decision. Vegetation Treatments Using Herbicides on Bureau of Land Management Lands in 17 Western States. Programmatic Environmental Impact Statement. US Department of the Interior, Bureau of Land Management. September 2007.)
Action VE-2.1.6. Projects involving the application of herbicides, pesticides and insecticides that may affect Special Status Species will be analyzed at the project level and designed such that applications will support species conservation and recovery and minimize risks of exposure.
Action VE-2.1.7. Control of invasive species/noxious weeds will be coordinated with adjacent land owners and local governments through cooperative management programs.
Action VE-2.1.8. Fuels and restoration projects will be coordinated with other programs to reduce the risk of invasive species/noxious weeds.
Action VE-2.1.9. Suppression equipment will be washed for invasive species/noxious weeds at designated sites.
Action VE-2.1.11. Where hay or straw will be used on public lands for permitted/authorized and internal BLM activities, state-certified noxious weed free hay/straw will be required.
Action VE-2.1.12. Integrated weed management strategies will be coordinated and developed with Tribal, Federal and State agencies and local governments at appropriate scales to restore affected BLM-administered public lands. Such strategies or actions may include but are not limited to: • coordination of treatment efforts; • identification of priority areas; • promote public awareness; and • develop educational material regarding control, prevention, etc.

Source: BLM 2012a

Table 4.5-9 Compliance with Applicable Caribou Forest Plan Standards and Guidelines for Noxious Weeds

Standard or Guideline (Forest-wide Direction)	Compliance under Proposed Action
Noxious Weeds and Invasive Species Standard 1: Only weed-free hay, straw, pellets, and mulch shall be used on the Forest.	This standard would be met under the Proposed Action by the implementation of appropriate BMPs.
Noxious Weeds and Invasive Species Standard 2: All seed used shall be certified to be free of noxious weed seeds from weeds listed on the current *All States Noxious Weeds List*.	This standard would be met under the Proposed Action by the implementation of appropriate BMPs.
Noxious Weeds and Invasive Species Standard 3: Gravel or borrow material sources shall be monitored	This standard would be met under the Proposed Action by the implementation of appropriate BMPs.

Table 4.5-9 Compliance with Applicable Caribou Forest Plan Standards and Guidelines for Noxious Weeds

Standard or Guideline (Forest-wide Direction)	Compliance under Proposed Action
for noxious weeds and other invasive species. Sources infested with noxious weeds shall be closed until the weeds are successfully controlled.	
Noxious Weeds and Invasive Species Standard 4: Noxious weeds shall be aggressively treated throughout the Forest, unless specifically prohibited, following the Caribou Noxious Weed Strategy. Using Integrated Weed Management, methods of control, and access shall be consistent with the goals of each prescription area.	This standard would be met under the Proposed Action by the implementation of appropriate BMPs.
Noxious Weeds and Invasive Species Guideline 1: Weed treatment projects, especially those using herbicides, should be timed to achieve desired effects on target vegetation, while having minimal effects on non-target vegetation.	This guideline would be met under the Proposed Action by the implementation of appropriate BMPs.
Noxious Weeds and Invasive Species Guideline 3: Monitor, as needed, disturbed areas, such as landings, skid trails, roads, mines, burned areas, etc., for noxious weeds or invasive species and treat where necessary.	This guideline would be met under the Proposed Action by the implementation of appropriate BMPs.
Noxious Weeds and Invasive Species Guideline 4: Evaluate the potential for invasion by noxious weeds into proposed vegetation units and wildland fire use plan areas and modify units or mitigate where necessary.	This guideline would be met under the Proposed Action by the implementation of appropriate BMPs.

Source: USFS 2003

4.5.1.1.4 Fire Management

Under the Proposed Action, 83 acres of aspen forest would be removed and replaced with a grass-dominated vegetation community following reclamation. This would shift some of the Proposed Action from an aspen fire regime (Fire Regime III) to a perennial grass fire regime (Fire Regime IV; Hardy et al. 2001). The fire frequency would be similar under the two fire regimes, but Fire Regime IV is characterized by more severe, stand-replacing fires (in which more than 75 percent of the dominant overstory vegetation is replaced). The shift is expected to alter the fire regime by permanently removing a natural fire break (aspen forest stands) and increasing the size and connectivity of grass and shrubland patches.

Fuel loads in perennial grasslands range from 250 pounds per acre to more than 2,000 pounds per acre (BLM 2008a). Perennial grasses reportedly exhibit good recovery after severe fire. Growth points in these grasses are compressed near the ground at the base of shoots (e.g., root crowns in bunchgrasses and lateral shoots in sod-formers). Most perennial grasses respond by re-sprouting from these basal growing points following fire. The primary determinant of fire response in perennial grasslands is fire residence time. Fast-moving fires have a short residence time and seldom cause substantial mortality. Slow-moving fires, however, have longer residence times and impose greater severity. Mortality to perennial grasses is high under these conditions, as the fire spends more time in the vegetative base of the plant. With most natural ignitions, the predominant fire spread is a fast-moving fire. Because native grasslands are seral to sagebrush steppe, natural and historical fire rotations of 60 to 110 years (the same as for low-elevation shrub) would prevail (BLM 2008a).

4.5.1.1.5 Pollinators

The Proposed Action would impact 419 acres of aspen, sagebrush, rangeland, shrub/scrub wetland, and ponded wetland habitats. These habitats include flowering species from which pollinators can feed. Because no threatened, endangered, or USFS sensitive pollinators are known to occur in the analysis area, impacts from the Proposed Action on pollinators are expected to be limited to common and well-populated species. As previously mentioned, 99 percent of disturbed areas would be reclaimed (mostly to high-elevation rangeland habitat). The proposed seed mix includes shrub, forb, and legume species that are pollinator-friendly. Impacts on pollinators would include the direct loss of habitat and potential indirect impacts of avoidance and change in species composition. Reclamation efforts would be initiated in the relative short term, but some habitat (i.e., aspen) would be permanently lost, and some plant species (such as shrubs) will take some time to re-establish; therefore, impacts on pollinators are expected to be long-term but minor given that no special status species impacts are expected and reclaimed vegetation will ultimately provide pollinator habitat similar to baseline conditions.

4.5.1.2 Rasmussen Collaborative Alternative

4.5.1.2.1 Vegetation

The types of vegetation impacts from the RCA would be similar to those described for the Proposed Action; however, the magnitude of impacts would be different for some vegetation types. The RCA would remove 540.9 acres of vegetation. This is 73 acres more than the total vegetation that would be removed under the Proposed Action, but the RCA would result in no impacts to wetlands or riparian areas.

The vegetation types and associated acreages affected by the RCA are summarized in **Table 4.5-10**.

Table 4.5-10 Vegetation Types and Estimated Affected Acreages under the RCA

Vegetation Type	Acres
Aspen Mature Dry Woodland	95
Aspen Mature	33
Aspen Old Growth	3
Aspen/Conifer Mix	0
Total Aspen*,**	***132***
Big Sagebrush Rangeland	212
Silver Sagebrush Rangeland	0
Total Sagebrush***	***212***
High Elevation Rangeland	163
Shrub/Scrub Wetland/Seasonal Mountain Drainage	0
Mesic Emergent/Ponded Wetland	0
Previously Reclaimed	5
Disturbance of undetermined upland vegetation areas for POC monitoring wells, access roads and pit layback	**28**
Total Disturbed Acreage	**541**
Total Reclaimed Acreage (would recover to High-Elevation Rangeland)****	**499**

Notes:
* Acreages are rounded to the nearest whole number, except for shrub/scrub wetland/seasonal mountain drainage
** Subcategories do not sum to totals in all cases because of rounding conventions
*** Twenty-three acres of disturbed vegetation would remain unreclaimed as pit walls and portions of the county road realignments
**** The RCA would also reclaim 58 acres on the South Rasmussen Mine that would have otherwise gone unreclaimed. This area would also recover to high-elevation rangeland
Source: BC 2012a, BC 2015c

The RCA would result in the residual net debit of 3,367 RICHCOVWET DSAYs (the units that represent wildlife habitat services in the HEA; Arcadis 2015c). This means that the RCA would have a long-term net negative impact on wildlife habitat, as measured by the RICHCOVWET vegetation metric. Compared to the Proposed Action, the RCA would result in up to three percent more net debit residual DSAYs. This would largely be the result of the use of a diverse reclamation seed mix designed to be adapted to the predicted post-mining site conditions that includes a variety of native shrubs and forbs, and greater plant-available moisture provided by the store-and-release cover, which would enhance vegetation recovery on reclaimed areas. Recovery trajectories developed for the HEA predict that it would take 110 years for reclaimed areas to exhibit plant species richness and vegetation cover similar to those of the baseline high-elevation rangeland habitat type (Arcadis 2015b).

For the same reasons described in the Proposed Action (**Section 4.5.1.1**), the RCA would result in the permanent loss of 132 acres of aspen, of which 3 acres (located on BLM land), is old-growth aspen forest. This is 48 more acres of aspen impact and 1 less acre of old-growth aspen forest impact compared to the Proposed Action.

Under the RCA, the elimination of external overburden piles would address issues associated with mobilization of COPCs (including selenium) into surface waters. In contrast to the Proposed Action, under the RCA, there would be no measurable loading of COPCs into the Blackfoot River or its tributaries (or to adjacent wetlands). The RCA would also eliminate the potential for adverse selenium uptake by reclamation vegetation because the RCA store-and-release Cover C, like the Proposed Action cover, is thick enough to separate the majority of the plant roots from the selenium that would be potentially present in the underlying overburden or backfill.

The ultimate vegetation disturbance resulting from the implementation of the RCA would total up to 540.9 acres, of which 517.8 acres (or 96 percent) would be reclaimed. The remaining 4 percent would consist of pit walls exposed in the partially backfilled areas and the unreclaimed disturbance associated with the county road realignments. The RCA would also reclaim 58 acres of backfill in the South Rasmussen Mine that would have otherwise gone unreclaimed.

Similar to the Proposed Action, during reclamation activities, areas of vegetation impact would be reseeded as part of reclamation. The alternative seed mix proposed for the RCA is shown in **Table 4.5-11.** The seed mix also includes a list of alternate species. This seed mix would be used on the Rasmussen Valley Mine portion of the RCA. Areas on the South Rasmussen Mine would be reclaimed in accordance with the South Rasmussen Mine Reclamation Plan Modification (P4 2014), including use of the approved seed mix specified therein.

Similar to the Proposed Action (**Section 4.5.1.1.1**), the seed mix for the RCA was also developed to encourage uptake of water from the upper soil horizon and avoid the use of selenium accumulator species, and all reclaimed areas will be managed to control invasive and noxious plant species.

Table 4.5-11 Alternative Seed Mix (Rasmussen Valley Mine)

Scientific Name	Common Name	Recommended lbs/acre	% of Seed Mix
Grasses			
Bromus marginatus	Mountain Brome	2.00	5.3
Elymus elymoides	Bottlebrush Squirrel Tail	2.00	5.3
Elymus lanceolatus ssp *lanceolatus*	Thickspike Wheatgrass	1.00	2.6
Elymus lanceolatus ssp *psammophilus*	Streambank Wheatgrass	1.00	2.6

Table 4.5-11 Alternative Seed Mix (Rasmussen Valley Mine)

Scientific Name	Common Name	Recommended lbs/acre	% of Seed Mix
Elymus trachycaulus	Slender Wheatgrass	2.00	5.3
Festuca *I*dahoensis	Idaho Fescue	1.00	2.6
Festuca ovina	Sheep Fescue	1.00	2.6
Koeleria macrantha	Prairie Junegrass	0.25	0.7
Leymus cinereus	Great Basin Wildrye	2.00	5.3
Pascopyrum smithii	Western Wheatgrass	1.50	4.0
Poa secunda ssp ampla	Big Bluegrass	0.75	2.0
Pseudoroegneria spicata	Bluebunch Wheatgrass	2.00	5.3
Triticum aestivum x Secale cereale	Quickguard	3.00	7.9
	Grass Totals	**19.50**	**51.7**
Forbs			
Achillea millefolium var *occidentalis*	Western Yarrow	0.50	1.3
Heliomeris multiflora	Showy Goldeneye	0.50	1.3
Linum lewisii	Lewis Blue Flax	1.00	2.6
Lupinus argenteus	Silver Lupine	4.00	10.6
Penstemon palmeri	Palmer Penstemon	1.00	2.6
Penstemon strictus	Rocky Mountain Penstemon	1.00	2.6
	Forb Totals	**8.00**	**21.2**
Shrubs			
Artemisia cana	Silver Sagebrush	0.15	0.4
Artemisia tridentata ssp *vaseyana*	Mountain Big Sagebrush	0.10	0.3
Ceanothus velutinus	Snowbrush Ceanothus	1.00	2.6
Krascheninnikovia lanata	Winterfat	0.50	1.3
Purshia tridentata	Bitterbrush	4.50	11.9
Rosa woodsii	Wood's Rose	1.00	2.6
Symphoricarpos oreophilus	Mountain Snowberry	3.00	7.9
	Shrub Totals	**10.25**	**27.2**
	Overall Totals	**37.75**	**100.0**
Alternate Species for Rasmussen Valley Mine Project Seed Mix*			
Grasses			
Bouteloua curtipendula	Sideoats Grama		
Nassella viridula	Green Needlegrass		
Forbs			
Artemisia frigida	Fringed Sagewort		
Balsamorhiza sagittata	Arrowleaf Balsamroot		
Gaillardia aristata	Blanket Flower		
Hedysarum boreale	Northern Sweetvetch		
Sphaeralcea coccinea	Scarlet Globemallow		
Penstemon cyaneus	Blue Penstemon		
Penstemon eatonii	Firecracker Penstemon		
Shrubs			
Amelanchier alnifolia	Saskatoon Serviceberry		
Potentilla fruticosa	Cinquefoil		
Rubus idaeus	American Red Raspberry		
Ribes cereum	Wax Current		

Table 4.5-11 Alternative Seed Mix (Rasmussen Valley Mine)

Scientific Name	Common Name	Recommended lbs/acre	% of Seed Mix
Ribes aureum	Golden Current		

Notes:

* If alternate species are selected to replace species on the approved list, the species would be replaced at a percentage of the overall mix equal to that of the removed species. Recommended seeding rate would be calculated accordingly.

Sources: Guedes 2014 and Great Ecology 2015

Under the RCA, a store-and-release cover would be applied to the backfill and overfill areas, which represents a majority (59 percent) of the reclaimed acreage (BC 2015a) on the Rasmussen Valley Mine. Based on infiltration modeling, this store-and-release cover would retain slightly more moisture in the root zone for use by the reclamation vegetation compared with the Proposed Action (BC 2015a). This may result in faster growth of vegetation and overall reclamation recovery than the Proposed Action.

Table 4.5-12 summarizes compliance with the PFO ARMP with regard to vegetation resources under the RCA. Overall, under the RCA, compliance is essentially the same as with the Proposed Action.

Table 4.5-12 Compliance with Applicable PFO ARMP Goals, Objectives, and Actions for Vegetation Resources under the RCA

Goal/Objective/Action	Compliance under RCA
Action ME-2.1.4. Applicable Idaho Standards for Rangeland Health (BLM 1997) will be employed to determine the success of reclamation, rehabilitation, or restoration activities following major surface disturbances on public lands.	The RCA would be consistent with this action because proposed reclamation activities are designed to comply and the seed mix selected for reclamation contains a variety of native grass, forb, and shrub species that could provide forage for livestock and wildlife. Additional native species are predicted to colonize reclaimed areas over time through natural successional processes. Over the long term, the reclaimed areas are anticipated to recover to the baseline habitat quality of high-elevation rangeland on the mine site. Weed control would also be undertaken.
Action ME-2.2.1. Reclamation Plans for mineral development operations will be designed to attain and final reclamation will meet applicable standards (BLM 1997) consistent with the rehabilitation potential of the disturbed site.	In regards to protecting wildlife habitat and ecological resources, the RCA would be consistent with this action over the long term because the majority of disturbed areas would be reclaimed to grassland and shrubland, which would eventually recover to the baseline habitat quality of big sagebrush and high-elevation rangeland on the mine site. Over the short term, the RCA would result in reduced habitat and forage for big game and other species.
Action ME-2.2.2. Operational Standard 9: Within development areas, soils, and native vegetation will be retained undisturbed when disturbance of the site is not necessary for minerals development or safety.	This standard would be met under the RCA. Disturbance would be limited to the minimum area necessary, and areas would be reclaimed and revegetated when no longer needed for mining.
Action ME-2.2.2. Operational Guideline 1: Selection of plant species for establishment will reflect the surrounding ecosystem and post development land use. Plant materials selected for reclamation use will be adapted to the climate of the site. Consideration and preference will be given to	This guideline would be met under the RCA. Areas no longer needed for mining would be reclaimed with a variety of predominantly native plant species (**Table 4.5-11** and **Table 4.5-12**) that are adapted to the local climate. The seed mix includes bunchgrasses, forbs, and

Table 4.5-12 Compliance with Applicable PFO ARMP Goals, Objectives, and Actions for Vegetation Resources under the RCA

Goal/Objective/Action	Compliance under RCA
promoting natural succession, native plant species, and structural diversity.	shrubs for structural diversity. Reclaimed areas would be subject to natural succession and would eventually recover to high-elevation rangeland plant communities.
Action ME-2.3.5. In reclamation activities, plant species known to reduce the risk of bioaccumulation of hazardous substances, such as selenium, will be used if such risk is present.	The RCA would be consistent with this Action. Seed mixes were designed to include predominantly shallow-rooted species, and no selenium accumulator species were included in the seed mix. The 6-foot-deep cover would also limit bioaccumulation of selenium.
Action ME-2.3.6. Prior to release of any performance bond or relinquishment of a mineral lease/permit, reclamation vegetation will be monitored for bioaccumulation of hazardous substances for a period of time to be determined appropriate by the Authorized Officer.	The RCA would be consistent with this Action. Agrium would conduct monitoring consistent with the EMP (**Appendix B**).

Source: BLM 2012a

Table 4.5-13 summarizes compliance with the CNF RFP with regard to vegetation resources under the RCA. Overall, under the RCA, compliance is essentially the same as with the Proposed Action.

Table 4.5-13 Compliance with Applicable Caribou Forest Plan Standards and Guidelines for Vegetation Resources under the RCA

Standard/Guideline	Compliance under the RCA
Vegetation Standard 2: In each 5th code HUC which has the ecological capability to produce forested vegetation, the combination of mature and old age classes (including old growth) shall be at least 20 percent of the forested acres. At least 15 percent of all the forested acres in the HUC are to meet or be actively managed to attain old growth characteristics.	Currently, 93 percent of the aspen stands in the 5th code HUC are in old/mature age classes based on USFS mapping. All of the aspen stands that would be impacted under the RCA are in mature/old age classes. On-site inventory showed that no acres that currently meet Region Four "Old-growth" definitions would be impacted on USFS lands. Therefore, the RCA would not negatively impact the distribution of aspen forest age classes and would be consistent with maintaining at least 20 percent mature/old age classes in the 5th code HUC that encompasses the analysis area. Because of the prevalence of mature/old aspen stands on the landscape, it is likely that at least 15 percent of the aspen forest in the watershed would still remain to attain old-growth characteristics, even with the loss of 3 acres (on BLM land) of old-growth aspen under the RCA. The RCA is in compliance with this standard.
Vegetation Guideline 1: Manage to reduce the decline of aspen and promote aspen regeneration and establishment. Provide protection from grazing where needed and consistent with management objectives.	The RCA would result in the permanent loss of 132 acres of aspen forest. This loss is not expected to impact the overall aspen health of the CNF given that stands in the Study Area are not diverse, are patchy, and are relatively small.
Vegetation Guideline 3: For aspen and conifer types, acres classified as mature and old growth should be in blocks over 200 acres in size unless the natural patch size is smaller (a block can consist of a combination of mature and old growth forest types). Within these blocks: • Maintain the dead and down woody material guidelines for wildlife. • Silvicultural techniques may be used to maintain or improve old growth and mature	The aspen forest in the analysis area is naturally patchy, with none of the individual aspen stands surpassing 200 acres in size (BC 2012c). The RCA would result in a permanent loss of 132 acres of these small and patchy aspen forests. Dead and woody material would be maintained to the extent feasible, and impacts for the project are not expected to reduce the acres of old-growth and mature forest below 20 percent of the forested acres in the watershed.

Table 4.5-13 Compliance with Applicable Caribou Forest Plan Standards and Guidelines for Vegetation Resources under the RCA

Standard/Guideline	Compliance under the RCA
forest characteristics. • If a catastrophic event (such as fire) reduces the acres of old growth and mature forest below 20 percent of the forested acres in a principal watershed, identify replacement forested acres. When necessary, use silvicultural techniques to promote desired characteristics in the replacement acres.	
Plant Species Diversity Standard 1: Projects and activities shall be managed to avoid adverse impacts to sensitive plant species that would result in a trend toward federal listing or loss of viability.	There are no identified plant species listed as threatened, endangered, or proposed under the ESA in Caribou County (USFWS 2014). No CNF sensitive plant species or CNF Forest Watch rare plant species have been documented in the baseline studies. The RCA is in compliance with this standard.
Plant Species Diversity Guideline 1: Native plant species from genetically local sources should be used to the extent practical for erosion control, fire rehabilitation, riparian restoration, road rights-of-way seeding, and other re-vegetation projects.	Native plant species from genetically local sources will be used to the extent practical. The RCA is in compliance with this guideline.
Plant Species Diversity Guideline 2: Where practical, disturbed sites should be allowed to revegetate naturally where the seed source and soil conditions are favorable (e.g. low erosion potential, deeper soils) and noxious weeds are not expected to be a problem.	A Forest Botanist has reviewed the proposed seed mix for revegetation. The RCA is in compliance with this guideline.
Plant Species Diversity Guideline 3: Known occurrences or habitat for rare plants on the "Forest Watch" list and rare or unique plant communities on the Forest should be maintained.	No CNF sensitive plant species or CNF Forest Watch rare plant species have been documented in the baseline studies. The RCA is in compliance with this guideline.
Plant Species Diversity Guideline 4: Maintain, and where possible, increase unique or difficult-to-replace elements such as areas of high species diversity aspen, riparian areas, tall forbs, rare plant communities, etc.	The RCA would be in compliance with this guideline. It would not impact any high species diversity aspen stands (stands are not diverse in the Study Area), riparian areas, or diverse or rare vegetation communities.
Plant Species Diversity Guideline 5: The Forest Botanist or Ecologist should review seed mixes used for revegetation to insure no adverse impacts to threatened, endangered, sensitive species; other species at risk; and the overall native flora within the analysis area.	A Forest Botanist has reviewed the proposed seed mix for r-vegetation. The RCA is in compliance with this guideline.
Drastically Disturbed Lands Standard 7: Reclamation vegetation shall be monitored for bio-accumulation of hazardous substances prior to release for multiple use management.	The EMP (**Appendix B**) identifies the environmental monitoring activities that would be undertaken at the mine to ensure the effectiveness of BMPs and mitigation measures. The plan identifies which resources need to be monitored and describes monitoring and sampling locations, approved monitoring and sampling methods, duration and frequency of sampling, and data reporting requirements. The RCA is in compliance with this standard.
Drastically Disturbed Lands Standard 10: Within mine areas, native vegetation shall be retained undisturbed when disturbance of the site is not necessary for minerals development or safety.	Existing vegetation would be protected to the extent practical by limiting surface disturbance to those areas needed for operations. The RCA is in compliance with this standard.
Drastically Disturbed Lands Guideline 2: Selection of plant species for establishment should reflect the surrounding ecosystem and post remedial land use. Plant materials used should be adapted to the climate of the site. Consideration and	Agency-approved seed mixes containing native seeds would be applied. Two seed mixes would be used: one for drier sites and one for moister sites. The RCA is in compliance with this guideline.

Table 4.5-13 Compliance with Applicable Caribou Forest Plan Standards and Guidelines for Vegetation Resources under the RCA

Standard/Guideline	Compliance under the RCA
preference should be given to promoting natural succession, native plant species, and structural diversity.	
Drastically Disturbed Lands Guideline 3: Prescribe reclamation plant species known to reduce the risk of bioaccumulation of hazardous substances, if such risk is present.	Under the RCA, the seed mix has been developed to encourage uptake of water from the upper soil horizon and avoid the use of selenium accumulator species. The seed mix that would be used in the reclaimed areas does not contain any trees, legumes, or deep-rooted species, which typically accumulate selenium to a greater extent than grasses and shrubs (Mackowiak and Amacher 2003; Mackowiak et al. 2004). The RCA is in compliance with this guideline.
Prescription 8.2.2 Goal 5: Emphasize the use of native plant species in reclamation but allow the use of nonnatives when natives will not achieve reclamation goals.	Agency-approved seed mixes containing native seeds would be applied. Two seed mixes would be used: one for drier sites and one for moister sites. The RCA is in compliance with this goal.

Source: USFS 2003

Overall effects of the RCA to upland vegetation would be long-term and minor. Reclamation would eventually re-establish vegetation cover, but the species composition and community structure would be different.

4.5.1.2.2 Wetlands and Riparian Areas

The avoidance of riparian and wetland areas was a primary objective during the design of the RCA. Under the RCA, there would be no direct removal of wetlands and non-wetland WOUS, whereas there would be 20.5 acres of impacts to wetlands and non-wetland WOUS under the Proposed Action. Wetlands and non-wetland WOUS in relation to the RCA are shown on **Figure 4.5-2**.

The proposed haul road for the RCA (HR-5) would result in no unavoidable permanent impacts to wetlands. In addition, the realignment of portions of the County Roads would result in no unavoidable permanent impacts to wetlands (**Figure 4.5-2**).

The RCA would result in indirect impacts to wetlands similar to those of the Proposed Action, such as sedimentation by wind-borne and water-borne sediments and storm water runoff. BMPs described in **Section 4.5.1.1** to mitigate these indirect impacts would also be used in the RCA.

The use of water diversion structures under the RCA is unchanged from the Proposed Action. Sediment basins, runon diversion ditches, collection ditches, and culverts would be used in the RCA, similar to those proposed in the Proposed Action. However, the specific locations of diversion structures would be affected by the change in mine pit dimensions and the haul road realignment. Overall, there would be fewer culverts and fewer sediment basins needed for the RCA. Because there is less capture and management of surface runoff under the RCA, there may be more surface water runoff available (compared to the Proposed Action) to percolate into wetlands and riparian areas. As a result, wetlands carry less potential for becoming drier under the RCA.

The RCA would eliminate the storage of overburden in locations downslope of and external to the mine pit, removing a potential source of selenium impacts to surface waters, and thus riparian areas and wetlands. In addition, the RCA would limit the quantity of selenium material that would be exposed throughout the life-of-mine through direct backfilling to the maximum extent practical and ensuring that the store-and-release cover system is properly constructed. Under the RCA, there would be no measureable loading of selenium or other COPCs to wetlands and riparian areas.

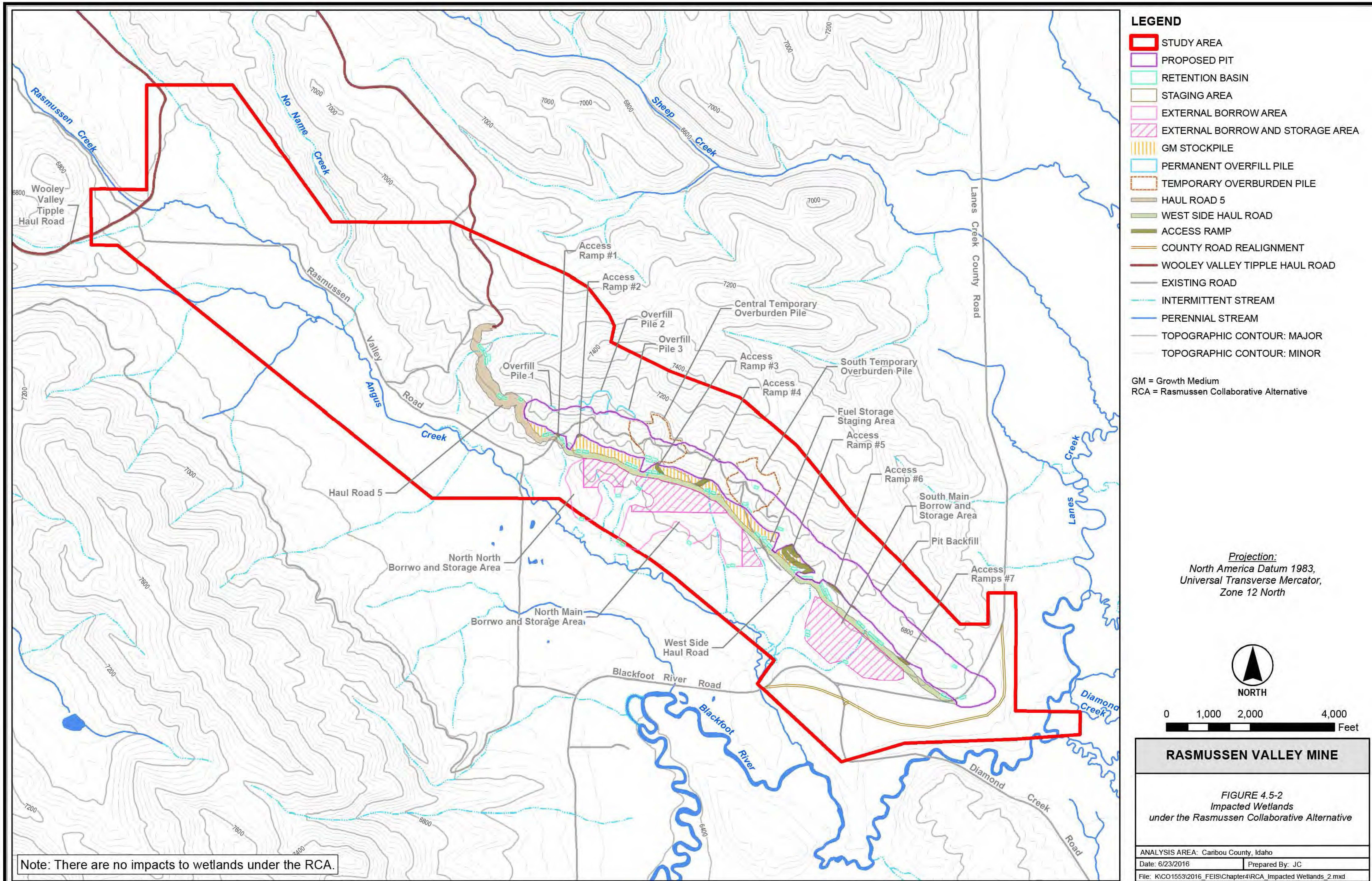
In summary, the RCA would not affect any of the 424.8 acres of wetlands delineated in the assessment area. However, the RCA could indirectly impact wetlands near proposed activities. As a result of project design, project lifetime use of BMPs, acreage, and similar functionality of wetlands not impacted in the assessment area, the wetland impacts from the RCA were determined to be local, long-term, and minor.

Table 4.5-14 summarizes compliance with the PFO ARMP with regard to wetland and riparian resources under the RCA. Applicable CNF RFP standards and guidelines for riparian resources are identified in **Table 4.7-4**. Greater compliance is achieved through the RCA compared to the Proposed Action because there are fewer riparian impacts.

Table 4.5-14 Compliance with Applicable BLM Pocatello ARMP Goals, Objectives, and Actions for Wetland and Riparian Resources under the RCA

Goal/Objective/Action	Compliance under RCA
Goal VE-1. Provide for the proper functioning condition (PFC) of riparian areas.	The RCA would meet Goal VE-1 because it would not result in long-term removal of riparian habitat and would not directly contribute to degradation of riparian areas.
Objective VE-1.1. Maintain properly functioning riparian areas and restore/improve those areas that are not at PFC.	The RCA would meet Objective VE-1.1 because it would not result in long-term removal of riparian habitat and would not directly contribute to degradation of riparian areas.
Action VE-1.1.1. Appropriate management guidelines, techniques or practices will be implemented to control erosion, stabilize streambanks, shade/reduce water temperature, and encourage a diversity of desirable riparian vegetation.	Because the RCA was designed to avoid and minimize impacts to riparian habitats, it would not hinder riparian improvement goals including control of erosion, stabilization of stream banks, and maintaining desirable riparian vegetation. The RCA is in compliance with Action VE-1.1.1
Action VE-1.1.2. Idaho Standards for Rangeland Health (BLM 1997) will be implemented to maintain or improve riparian areas.	The RCA would meet Action VE-1.1.2 because it would not result in long-term removal of riparian habitat and it would minimize degradation of riparian areas through indirect impacts such as sedimentation. It would also avoid the measureable loading of selenium and other COPCs into wetland and riparian areas.
Action VE-1.1.4. Stream crossings, if necessary, will be designed to minimize adverse impacts on soils, water quality, and riparian vegetation.	Action VE-1.1.4 would be met under the RCA. Stream crossings would not be necessary under the RCA.

Source: BLM 2012a



RASMUSSEN VALLEY MINE

FIGURE 4.5-2
Impacted Wetlands
under the Rasmussen Collaborative Alternative

ANALYSIS AREA: Caribou County, Idaho
Date: 6/23/2016 Prepared By: JC
File: K:\CO1553\2016_FEIS\Chapter4\RCA_Impacted Wetlands_2.mxd

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4.5.1.2.3 Noxious Weeds

Noxious weed control methods for the RCA are the same as those presented in the Proposed Action. The RCA would disturb 73 acres more vegetation than the Proposed Action. Because there would be more removal of native vegetation, the potential is increased under the RCA for non-native plants to colonize disturbed areas.

Similar to the Proposed Action, the RCA would be in compliance with the PFO ARMP noxious weeds and invasive species goals, objectives, and actions (**Table 4.5-9**) as well as the CNF RFP Standards and Guidelines for Noxious Weeds (**Table 4.5-9**). The effects of noxious weeds from the RCA would be short-term and minor.

4.5.1.2.4 Fire Management

Similar to the Proposed Action, following reclamation, the RCA would result in a shift of aspen forest (132 acres) to that of a grass-dominated vegetation community. Therefore, the fire regime would be altered similar to the Proposed Action by permanently removing a natural fire break (aspen forest stands) and increasing the size and connectivity of grass and shrubland patches. More forest habitat (48 more acres) would be removed under the RCA.

4.5.1.2.5 Pollinators

The types of vegetation and pollinator habitat impacts from the RCA would be similar to those described for the Proposed Action; however, the magnitude of impacts would be different for some vegetation types. The RCA would remove 540.9 acres of vegetation. This is 73 acres more than the total vegetation that would be removed under the Proposed Action, but the RCA would result in no impacts to wetlands or riparian areas (which contain a variety of pollinator-friendly plants). Overall, effects to pollinators are expected to be long-term (until vegetation, particularly forb and shrub species, re-establishes) and minor.

4.5.1.3 No Action Alternative

Under the No Action Alternative, the federal phosphate leases would not be developed. The No Action Alternative would result in no new impacts to vegetation resources in the Study Area. The No Action Alternative would maintain the current status of vegetation resources in and around the Study Area. However, this does not preclude future development of the federal phosphate leases under a different mine plan.

4.5.2 Irreversible and Irretrievable Commitment of Resources

Under the Proposed Action and RCA, the loss of aspen vegetation is considered an irreversible commitment of resources. Although the Mine and Reclamation Plan would re-establish upland grassland and shrub vegetation in disturbed areas after mining operations end, it is not anticipated that aspen would re-establish in the foreseeable future because the existing rootstock would be removed.

Long-term loss of vegetation would occur in areas where pit walls are not reclaimed. Over a very long time, exposed pit walls would ultimately weather to a reduced slope configuration conducive to supporting vegetative communities. Therefore, the pit walls would be considered an irreversible or irretrievable commitment of resources.

Under the Proposed Action, irretrievable changes in groundwater quality under and downgradient of the overburden piles would occur, affecting the water quality of wetlands along Angus Creek and the Blackfoot River. This would be an irreversible and irretrievable commitment of resources under the Proposed Action. In contrast, the RCA would not result in measurable loading of selenium or other COPCs to wetlands; therefore, this irreversible and irretrievable commitment of resources would not exist under the RCA.

4.5.3 Unavoidable Residual Adverse Effects

For the Proposed Action and RCA, an unavoidable residual adverse impact would occur if existing vegetation were not eventually replaced through reclamation and subsequent natural succession. Agrium would be required to stabilize and revegetate disturbed areas in accordance with their approved Mine and Reclamation Plan. Performance bonds would be held by regulatory agencies to ensure that the site is reclaimed to land use plan standards and other established requirements. Despite reclamation efforts, the Proposed Action and RCA would have a long-term residual adverse effect on vegetation communities, as some vegetation types (such as aspen and wetlands) may never recover to baseline conditions. These residual impacts on vegetation are reflected in the HEA results, which are based on vegetation metrics.

Based on the HEA, the Proposed Action would result in a net debit of 3,279 residual DSAYs of wildlife habitat services. The RCA would result in the net debit of up to 3,367 residual DSAYs of wildlife habitat services (Arcadis 2015c). This means that either alternative would have a long-term net negative impact on wildlife habitat, as measured by the RICHCOVWET vegetation metric. This debit in wildlife habitat services would constitute an unavoidable residual adverse effect of either alternative. However, the RCA would result in a net debit of up to three percent more residual DSAYs compared with the Proposed Action if all of the potential borrow areas were used. However, under the RCA, the use of a more diverse reclamation seed mix that includes a variety of native shrubs and forbs, as well as greater plant-available moisture provided by the store-and-release cover, would enhance vegetation recovery on reclaimed areas (Arcadis 2015b).

4.5.4 Mitigation Measures

Agrium's Mine and Reclamation Plan intends to keep mining disturbances to a minimum and for as short a timeframe as possible with overburden areas and pit backfill advancing in sequence with the active pit. Additionally, the cover would be constructed incrementally as mining advances, which would also help minimize impacts. The reclamation activities for the Proposed Action are described in **Section 2.3.7,** and the reclamation activities for the RCA are described in **Section 2.5.1.8**. The mine schedule is provided on **Figure 2.5-3**.

4.5.4.1 Vegetation Mitigation

No mitigation measures for vegetation, above and beyond what Agrium has proposed in the Mine and Reclamation Plan, have been determined to be necessary. Agrium has voluntarily proposed mitigation for upland wildlife habitat that would also potentially benefit vegetation communities. This proposed mitigation is further described in **Section 4.6.4**.

Impacts to vegetation resources would be partially offset through implementation of the Mine and Reclamation Plan. Under the Proposed Action, 463.5 acres (or 99 percent of the area of disturbed vegetation) would be reclaimed. Under the RCA, 517.8 acres (or 96 percent of the area of disturbed vegetation) would be reclaimed.

As mining progresses, reclamation would begin on the mined out areas. Through progressive open pit backfilling and concurrent reclamation, the area of unreclaimed pit disturbance at any one time would be minimized. The Proposed Action pit would be backfilled, capped with a minimum of 3 feet of non-Meade Peak-containing material, and followed by covering with a minimum of 2 feet of GM. The cover would be sloped to direct drainage of surface water off the reclaimed pit and onto native ground.

The three layers of the RCA store-and-release cover (Cover C) to be placed on the backfill and overburden would retard and store infiltrated precipitation that is percolating through the cover. This retained precipitation could be used as needed by the reclamation vegetation. As under the Proposed Action, the cover would be sloped to direct drainage of surface water off the reclaimed pit and onto native ground.

Existing vegetation would be protected to the extent feasible by limiting surface disturbance to those areas needed for operations. To the extent possible, GM removed from its original location would be placed directly on reclamation areas. The immediate use of GM in reclamation promotes continued growth of vegetative matter and preserves existing seeds in the GM. Some GM would need to be stockpiled because reclamation areas would not always be available at the time that GM must be removed. Agency-approved seed mixes would be used on reclaimed areas (**Table 4.5-2**), and the reclaimed areas would be managed to control invasive and noxious species and prevent their introduction.

4.5.4.2 Wetlands Mitigation

Agrium would submit a Section 404 permit application to the U.S. Army Corps of Engineers (USACE) for the direct disturbance of wetlands and other WOUS, as necessary. This EIS constitutes the primary impact analysis that the USACE would use to assess the application. As part of the application, and in compliance with the Final Rule, Compensatory Mitigation for Losses of Aquatic Resources (33 CFR Parts 325 and 332, and 40 CFR Part 230), Agrium would submit a Compensatory Mitigation Plan that identifies potential compensatory mitigation for the USACE to consider in replacement of wetlands and lost functions and values. This may include, but not be limited to, off-site replacement of wetland functions and values through restoration or enhancement of degraded wetlands or waters. The primary goal of compensatory wetland mitigation for the Proposed Action would be to replace or enhance wetland functions to maintain no net loss. The amount of wetland mitigation required would be determined based on the functional assessment conducted for projected levels of ecological functions.

Agrium would implement BMPs to control erosion, sedimentation, and the release of COPCs at the Rasmussen Valley Mine to protect surface waters, including wetlands, in and around the Proposed Action or RCA. In addition, Agrium would limit the surface area of Meade Peak overburden that would be exposed at any given time through direct backfilling and, under the Proposed Action, ensuring that a minimum cap thickness of non-Meade Peak-containing material (3 feet) and a minimum cover of GM (2 feet) are used over any backfill. Under the RCA, the 6-foot-thick store-and-release Cover C would be placed over backfill and overburden. In addition, surface water drainage diversion structures could be constructed before each mining phase to intercept runoff before it reaches the pit, thereby reducing runoff water contact with Meade Peak-containing material.

Dust would be mitigated or minimized by surface application of water and, as necessary, supplemented with dust suppressants such as magnesium chloride or calcium chloride. Storm water control structures would include several types of designs to reduce or eliminate risk of surface water contamination. Runoff sediment basins for runoff water and silt would be constructed at strategic locations before mining activities occur in that area to collect and contain water exposed to mining disturbances or overburden. Collection ditches constructed along the outer perimeters of the stockpile sites would transfer surface water runoff from these sites and carry it to runoff sediment basins. Culverts would be constructed to convey natural drainages under potential linear obstructions, such as haul roads or county roads, to prevent impacts from stream crossings. Stockpiles would be stabilized with vegetation, straw wattles, and silt fences to minimize erosion.

Surface water control structures would include several types of designs to reduce or eliminate risk of surface water contamination. Runoff sediment basins for runoff water and silt would be constructed at strategic locations before mining activities occur in that area to collect and contain water exposed to mining disturbances or overburden. Collection ditches constructed along the outer perimeters of the stockpile sites would transfer surface water runoff from these sites and carry it to runoff sediment basins. Culverts would be constructed to convey natural drainages under potential linear obstructions, such as haul roads or county roads, to prevent impacts at stream crossings. Stockpiles would be stabilized with vegetation, straw wattles, and silt fences to minimize erosion.

In accordance with (laws/regulations), an SPCC Plan would be developed before construction and operations, providing direction for preventing and controlling potential spills; describing the aboveground tanks and secondary containment structures for bulk petroleum products, solvents, and antifreeze; identifying the routine monitoring requirements; and describing BMPs established to prevent releases of the pollutants of concern.

Agrium has prepared an EMP (**Appendix B**) identifying a groundwater and surface water monitoring network to monitor compliance with IDEQ water quality standards.

4.5.4.3 Noxious Weed Mitigation

To limit the potential expansion of noxious weeds within the Study Area, Agrium would monitor for and treat noxious weeds in reclaimed areas for the duration of the Proposed Action including pre-mining preparation and post-mining reclamation. Agrium would also follow the applicable actions, standards, and guidelines from the PFO ARMP and the CNF RFP for the monitoring and control of noxious weeds, as listed in **Table 4.5-8** and **Table 4.5-9**. No further mitigation measures have been determined to be necessary for noxious weeds.

4.6 TERRESTRIAL WILDLIFE

Issue: What is the potential to impact wildlife through mortality and displacement?

Indicators:

- Increase in mining and transportation-related noise levels in wildlife habitat
- Increased wildlife mortality through vehicle and power line collisions
- Disruption and displacement of wildlife from high value habitats (e.g., movement corridors, wintering areas, calving areas, nest sites, wetland and riparian habitats)

Issue: What is the potential to impact wildlife through habitat removal and alteration?

Indicators:

- Acres of different wildlife habitats physically disturbed and reclaimed
- Changes in predator/prey interactions and species composition of wildlife community

Issue: What is the potential for toxicity to wildlife from selenium or other COPCs?

Indicators:

- Wildlife exposure through uptake of selenium or other COPCs in vegetation
- Wildlife exposure through release of selenium or other COPCs into surface waters

Issue: What is the potential to impact migratory birds?

Indicators:

- Reduction in the quality or quantity of habitats used by migratory birds
- Direct mortality of migratory birds
- Disturbance to migratory birds from noise and mining activity

CNF, in coordination with IDFG, manages forest wildlife resources and their uses according to the CNF RFP (USFS 2003). The DFCs and objectives for wildlife resources are achieved through the implementation of the forest-wide standards and guidelines as well as the standards and guidelines for biological elements specified in the management prescriptions of the CNF RFP. Forest plans provide for the persistence of healthy wildlife communities while balancing multiple uses on Forest lands. CNF uses the planning process and ongoing monitoring, evaluation, and adjustment of fish, wildlife, and rare plant standards to prevent listing of species under the ESA and to avoid the extirpation of species (USFS 2003).

Management Prescription 8.2.2(g) of the CNF RFP lists specific standards and guidelines for wildlife in phosphate mine areas (USFS 2003). These include standards and guidelines pertaining to big game migration and general wildlife guidelines for reclamation. Snag habitat for woodpeckers is not a management consideration for phosphate mines (USFS 2003).

4.6.1 Direct and Indirect Impacts

4.6.1.1 Proposed Action

Impacts of the Proposed Action on terrestrial wildlife would include: 1) immediate, direct effects in terms of wildlife mortality, disturbance, and displacement; and 2) changes in wildlife behavior and composition associated with long-term changes in land cover and reclamation.

Under the Proposed Action, one potential direct impact on terrestrial wildlife would be mortality, particularly when species are not mobile enough to avoid mining equipment or vehicles. Although small mammals and ground-nesting birds are more likely to experience these types of mortalities, mortalities of large and intermediate-sized wildlife (e.g., coyote, big game, raptors) may occur because of vehicle and power line collisions or electrocutions in the Study Area. Mortalities are likely to occur on an individual, short-term, and localized scale. The impact of these mortalities at the population or community level is, therefore, expected to be negligible. Direct impacts on large and mobile terrestrial wildlife may include disturbance and displacement. These impacts are expected to have a greater effect on intermediate- and large-sized mammals (e.g., coyote and big game) and birds. These wildlife groups may be disturbed by human presence and noise, which could lead to stress and behavior modifications that could ultimately impact reproductive success and survivorship. As mining proceeds, terrestrial wildlife may also displace into adjacent areas to establish temporary or long-term (potentially permanent) territories and home ranges. Displacement to already occupied habitats would likely result in increased competition for available resources. Depending on the season and species, overall disturbance and displacement impacts would be short-term to long-term and negligible to moderate.

Wildlife may also be indirectly affected by exposure to COPCs including selenium in vegetation and surface water. An effective cover design over backfill and overburden, and the use of seed mixes with species that are relatively shallow-rooted and not selenium accumulators, would address issues associated with adverse COPC concentrations in reclamation vegetation. The seed mixes developed for the Proposed Action and the RCA both include species that are relatively shallow-rooted and are not selenium accumulators. Therefore, vegetation growing on the reclaimed areas would not create a selenium exposure pathway for wildlife.

The potential also exists for wildlife to have access to contaminated water. As described in **Section 4.3.1**, shallow groundwater percolating through overburden piles is predicted to introduce COPCs into downgradient surface waters (including Angus Creek and the Blackfoot River). However, increased COPC concentrations in downstream surface waters would still be lower than surface water standards (**Table 4.3-11** and **Table 4.3-12**), and exposure to COPCs through drinking water is considered less of a risk to wildlife than exposure via bioaccumulation through the food chain (ITRC 2011). Wildlife that consume aquatic insects, plants, and fish, and those that prey upon wildlife consuming these foods, may therefore be most at risk of toxicity associated with exposure to COPCs within and around the Study Area. These effects would be long-term and negligible depending on a wide range of factors including the mobility of the affected species, the percentage of time spent in the vicinity of the Study Area, the susceptibility of the species to toxicity effects, the concentration of COPCs in surface waters/vegetation, and the abundance or rarity of the species.

Indirect effects to terrestrial wildlife populations from habitat alteration and reclamation would generally be localized and long-term. As described in **Section 4.5**, the Proposed Action would result in the loss of 468 acres of primarily forested and shrubland wildlife habitat. This includes 447.3 acres of disturbance to upland habitats and 20.5 acres of disturbance to wetland and riparian habitats, which are particularly high-value wildlife habitats. Although wetlands only comprise 1 percent of Idaho's land area, more than 75 percent of Idaho's wildlife species depend on them during some part of their life cycle (IDFG 2004). Therefore, disturbance to wetlands resulting from the Proposed Action may have a disproportionately greater impact on wildlife than disturbance to upland habitats.

Ninety-nine percent of disturbed habitat would be reclaimed with grasses and shrubs. Over the long term, reclaimed areas would likely regain the level of wildlife habitat services provided by the baseline on-site big sagebrush and high-elevation rangeland habitat types. However, even after reclamation, the Proposed Action would result in the net debit of 3,279 RICHCOVWET DSAYs (units that represent wildlife habitat services in the HEA; Arcadis 2015c). This means that the Proposed Action would have a long-term net negative impact on wildlife habitat. Aspen forest habitats are unlikely to re-establish in reclaimed areas because of different soil characteristics and drier conditions, as well as removal of aspen root systems from the soil. As such, reclamation would result in a shift in some areas from forest to perennial grasses and shrubs and, therefore, would contribute to long-term fragmentation of formerly forested areas. Also, the shift in vegetation community from forest to grasses and shrubs in some reclaimed areas could change the species composition of the wildlife community as forest-dependent species (e.g., woodpeckers, martens) locally decline in abundance while grassland, shrub, and generalist species (e.g., meadowlarks, coyotes) locally increase in abundance in the Study Area.

4.6.1.1.1 Mammals

Direct impacts on mammals would be similar to those described for terrestrial wildlife in general. Small mammals may be crushed or trampled by mine equipment or vehicles. Large- and intermediate-sized mammals may be killed by moving vehicles along haul roads. Mortalities are expected to occur on a short-term, individual, and localized scale; therefore, population- or community-level impacts on wildlife from mortalities would likely be negligible.

Direct impacts to mammals may also occur from selenium contained in water sources. However, big game and intermediate-sized mammals (e.g., coyote) tend to range over large areas, and their behavior would tend to reduce their risk of chronic effects of selenium uptake and bioaccumulation from water. Small mammals could also be susceptible to selenium bioaccumulation from water if local populations spend a significant amount of time in the analysis area; however, these affects would be localized and negligible.

In terms of indirect impacts, habitat alteration, disturbance, and displacement from mine activities would affect mammals. Habitat structure and composition determine the current diversity of species in the analysis area. The landscape alteration would cause some large mammals to displace to surrounding habitats, potentially increasing competition for resources with other wildlife already occupying those habitats. However, some species (such as coyote) may acclimate to human presence and disturbances and may continue using resources in the analysis area.

Over the long term, reclaimed areas are anticipated to recover to big sagebrush and high-elevation rangeland habitat types. Aspen forest habitats are unlikely to re-establish in reclaimed areas because of different soil characteristics and drier conditions, as well as removal of aspen root systems from the soil. As such, reclamation would result in a shift in some areas from forest to perennial grasses and shrubs. This shift in the plant community could change the species composition of the mammalian community as forest-dependent species locally decline in abundance while grassland, shrub, and generalist species locally increase in abundance in the Study Area. Because of the localized scale of landscape alteration, overall indirect impacts on mammals are expected to be long-term and negligible to minor.

Direct and indirect impacts on individual groups of mammals are analyzed below. Note that the impacts generally described for mammals apply to all groups discussed in the following paragraphs. Therefore, only those impacts unique to each individual mammal group are discussed.

<u>Big Game</u>

Preliminary IDFG data indicate that elk and moose winter range minimally overlap but are present all around the Study Area (Wackenhut 2014), and observations made by TRC during baseline studies for the Proposed Action verify this information (TRC 2012b). Based on where winter range is expected to occur in comparison to the facilities layout for the Proposed Action, some IDFG-mapped elk and moose winter range would be directly impacted. Furthermore, the Proposed Action facilities overlap with 47 acres of elk and mule deer winter range as mapped in the CNF RFP (USFS 2003). This area would be stripped of vegetation and would therefore be unusable as winter range by big game during active mining. Winter range is especially important for big game, as it provides valuable food and thermal cover that allows these species to conserve energy during severe weather conditions (USFS 2003). Therefore, the temporary loss of winter range would have a long-term and minor effect on big game survivorship, at least until it was reclaimed and again supported vegetation of sufficient density and cover to provide food and shelter.

Although winter range habitat impacted by the Proposed Action would be reclaimed, the successional stages of grassland habitat to shrubland would take a number of years. Until it had fully recovered, the habitat would not provide the same structure and complexity as it did before disturbance. Increased human presence associated with the mine and reduction in cover may also intensify the potential for wildlife-human interactions.

Preliminary IDFG data suggest that mule deer summer range overlaps the entire Study Area and broadly surrounds it (Wackenhut 2014). Mule deer are dependent on shrublands for browse and cover (Cox et al. 2009), so the initial loss of shrubs from the impacted areas is likely to adversely affect mule deer in the Study Area over the short term. Over the long term, as reclaimed areas return to shrubland through succession, these areas would once again become suitable mule deer foraging habitat. The Idaho Mule Deer Initiative assigns a high value to fawning habitat and forage production associated with aspen forests (aspen forests are also important to elk annual recruitment). Given that there will be some permanent loss of aspen forest (as a result of changes to soil characteristics and removal of root systems), there would also be some permanent loss of deer fawning habitat and annual elk recruitment production.

Noise and human presence associated with the mine would interrupt big game movement corridors and displace some big game into adjacent habitat. Mule deer have been found to avoid heavily disturbed areas at mines during migration (Merrill et al. 1994; Blum et al. 2015). In addition to affecting movement corridors, there would likely be at least some displacement of big game from parturition and winter ranges over the short term. Noise and disturbance during the calving/fawning season may cause pregnant elk and mule deer and those with young calves/fawns to vacate the area, which could negatively impact calf and fawn survivorship. Human-related disturbances on winter ranges can cause big game to burn necessary fat reserves that help them survive the winter. Any extra activity or unnecessary movements, such as running from the sound of a vehicle, could affect survivorship, as could the need to travel farther to alternate areas of crucial range (Canfield et al. 1999; Lutz et al. 2011).

A study of elk calf response to human activity and simulated mine noises in southeastern Idaho found that calves exposed to disturbance moved farther, used larger areas, and used less favorable habitat than calves not exposed to disturbance (Kuck et al. 1985). However, if a resource in the disturbance area is of high quality, or there is no suitable alternative habitat, then big game may not flee (Frid and Dill 2002). In addition, there are existing active mines in the vicinity (e.g., Rasmussen Ridge), and it is possible that some individual big game may have become habituated to noise, disturbance, and human presence associated with mining activities in the area.

Overall, impacts to big game would be long-term and moderate under the Proposed Action. The effects of noise and disturbance would be short-term but would occur over a relatively wide area, whereas the effects of habitat removal would be localized to the mine footprint but would be long-term.

<u>Bats</u>

Mining activities could disturb bat roosts and result in the long-term loss of bat foraging habitat. Undocumented bat roosts and habitat could be directly impacted under the Proposed Action through removal of trees (primarily aspen trees). Bats may also collide with vehicles and mine equipment, particularly when they are most active at night during the summer. Because no mine shafts or caves have been identified within the Study Area, the Proposed Action is most likely to affect small numbers of individual bats that may be roosting in trees or rock crevices and is unlikely to have population-level impacts because of the lack of significant roosts or hibernacula identified in the Study Area. Overall, impacts to bats are expected to be minor, as they would occur on an individual and localized scale.

4.6.1.1.2 Birds

Upland Game Birds

The Proposed Action would result in the permanent loss of 83 acres of forested habitat for dusky and ruffed grouse. Indirect impacts from loss of habitat would be long-term because final reclamation would emphasize establishment of communities dominated by perennial grasses and shrubs. Although grouse would probably migrate to other suitable habitats outside the disturbed area, they may in the short term be subject to increased predation by raptors and other predators as a result of a reduction in vegetative cover. The power line that would be constructed under the Proposed Action may provide a perching platform for raptors and make it easier for them to prey on grouse over the short term. Because of the localized scale of land disturbance, overall impacts on upland game birds are expected to be minor. Impacts to greater sage-grouse and Columbian sharp-tailed grouse are discussed in **Section 4.8**.

Migratory Birds

The Proposed Action would result in the short-term loss of 447 acres of migratory bird habitats. Most of these areas would be reclaimed, but the post-reclamation habitat structure and composition would change toward a grassland-dominated community (initially), which would develop into upland shrubland over the long term. Birds that use shrubland, riparian, and forest communities would likely decrease in abundance in the Study Area after mining, whereas those that are generalist species or that use grasslands may remain at levels similar to baseline or increase in abundance. Bird species associated with aspen, sagebrush, high-elevation rangeland, and riparian/wetland habitats would be the most affected.

Potential direct effects would include direct mortality (trampling, vehicle collision, and powerline collision), forced movement, and stress related to increased noise and human activity. Removal of trees and other ground-clearing activities will not be allowed to take place during migratory bird nesting season. Agrium would plan ground-clearing activities during the non-nesting season to minimize potential impacts to nesting birds. Indirect effects could include increased competition among displaced individuals and resident birds.

Many species of migratory birds are susceptible to collision with power lines, especially during inclement weather, when the lines may be harder to see (Loss et al. 2014; Manville 2005). A recent study estimated that there is an average of 29.6 collision-caused avian mortalities per km of power line per year in the U.S. (though this collision rate varies widely depending on a number of factors such as habitat and the species involved; Loss et al. 2014). In lieu of mitigation, and assuming Agrium's 0.7-mile-long power line is in place for 5 years, this would equate to roughly 167 avian mortalities caused by the power line over the life-of-mine. This could result in a short-term, negligible to moderate impact on local migratory bird populations, depending on the species involved (species with large, increasing or stable populations are less likely to be adversely impacted by localized individual mortalities, whereas species with small or declining populations are more likely to be adversely impacted). To help minimize collisions, Agrium would make an effort to mark the top grounding wire of the power line with bird diverters, as suggested by current Avian Power Line Interaction Committee (APLIC) guidelines.

The Proposed Action would also result in habitat fragmentation: the division of blocks of contiguous habitat into smaller, isolated patches. The effects of habitat fragmentation on bird communities may depend on the scale of analysis (Fahrig 2003). On a landscape scale, fragmentation of shrub steppe habitats in the Intermountain West has been linked to range-wide declines in several bird species, including Brewer's sparrows, western meadowlarks, and horned larks (Knick and Rotenberry 2002). However, on a more localized scale (such as the Study Area), vegetation characteristics within habitats seem to have a larger influence on productivity and survival of individual birds than the juxtaposition of those habitats on the landscape (Knick and Rotenberry 2002). Also, evidence suggests that birds breeding in naturally patchy landscapes may be relatively tolerant of habitat fragmentation (Berry and Bock 1998). The habitats in the Study Area are naturally patchy; therefore, the effects from additional fragmentation caused by the Proposed Action are anticipated to be minor.

Studies have shown that bird populations, particularly breeding birds, may be negatively impacted by elevated noise levels (Reijnen and Foppen 2006; Bayne et al. 2008; Ortega 2012). Increased visual stimuli may also affect bird populations at relatively short distances, but the effects of noise appear to be the most critical factor for birds. Traffic and noise from mining activities could affect bird populations in a number of ways.

Acoustic interference from noise could hamper the detection of mating songs, making it more difficult for birds to establish and maintain territories, attract mates, or maintain pair bonds (Reijnen and Foppen 1994, Habib et al. 2007, Swaddle and Page 2007 as cited in Reijnen and Foppen 2006; Ortega 2012). Thus, noisy habitats may reduce breeding success. When begging for food, nestlings may also need to call louder to elicit the desired response from their parents (Reijnen and Foppen 2006; Ortega 2012). As a result, the energetic cost of obtaining food may increase, and fitness may decrease (Schroeder et al. 2012). High levels of traffic noise may also interfere with the detection of alarm calls, such as those signaling the presence of predators, which could lead to higher rates of predation (Parris and Schneider 2008; Ortega 2012).

Because birds may avoid areas close to noise sources, noise may effectively extend habitat disturbance beyond the actual facility footprint. The effects of traffic noise on nesting birds may extend more than 300 meters on both sides of roadways (Ortega 2012). McClure et al. (2013) found a negative relationship between recorded traffic noise and the abundance of 13 species of migratory birds at a site in Idaho. In a study of songbirds near energy facilities in Alberta, Canada, songbird density was 1.5 times higher near noiseless facilities than near noise-producing facilities (Bayne et al. 2008), indicating that birds avoided the noisy areas. Francis et al. (2009) found fewer species of birds nesting near natural gas wells with noise-producing compressors than at noiseless control sites.

The effects of noise are species-specific, with some species (e.g., black-chinned hummingbirds and house finches) seeming to prefer noisy sites in the Francis et al. (2009) study and others (e.g., mourning dove and black-headed grosbeak) avoiding these sites. Several species (e.g., gray flycatchers, gray vireos, black-throated gray warblers, and spotted towhees) avoided placing their nests near noise sources in the Francis et al. (2009) study, and the authors concluded that the effects of noise on the breeding bird community were predominantly negative. Similar conclusions were reached in a study of the impacts of traffic noise on bird communities in Puerto Rico, where bird species richness and occurrence were lower at sites near highways with noise exceeding 60 dBA than at sites with noise levels below 60 dBA (Herrera-Montes and Aide 2011). A New Mexico study found that impacts of gas well compressor noise on breeding songbird populations in pinyon-juniper habitat were strongest in areas where noise levels were greater than 50 dBA (LaGory et al. 2001). However, moderate noise levels (40 to 50 dBA) also had some effect on bird densities in this study (LaGory et al. 2001).

Migratory birds using the Study Area could be subject to indirect impacts of selenium, which include impaired reproduction and survivorship. However, significant population-level effects of COPCs on migratory birds have not been observed for birds in the Idaho phosphate patch, even at historical mines that were constructed without a cover. In 1999 and 2000, Ratti et al. (2006) tested selenium levels in 544 bird eggs from mine and reference sites in southeastern Idaho, and in 2001, the authors monitored the nest success of 623 American robin and red-winged blackbird nests at these sites. The authors concluded, “On a population level, American robin and red-winged blackbird reproductive success in southeastern Idaho was not impaired by existing levels of selenium in avian eggs. Based on our multi-species data ... and more-specific data on American robins and red-winged blackbirds, we conclude that there are no negative effects on reproductive success of the general avian community at this time.” The authors go on to acknowledge that negative effects may be occurring in some bird species immediately adjacent to some historical mine sites, where high selenium concentrations (>10 micrograms per gram [µg/g]) were observed in eggs (Ratti et al. 2006).

Under the Proposed Action, the potential exposure pathway would be through downstream surface waters and the aquatic food chain; however, risk of exposure through this pathway would be low because the predicted increased selenium concentrations in downstream surface waters are still below surface water standards.

Overall, impacts of the Proposed Action on migratory birds would be long-term and minor.

<u>Raptors</u>

Raptors that occur in the Study Area could be directly and indirectly affected by the Proposed Action. Raptors could be subject to mortality and could be directly disturbed by noise and activity associated with the mine and proposed 0.7-mile-long power line. Raptors are sensitive to noise and human presence near their nests and may become agitated and ultimately abandon nests located near disturbance. The distance at which raptors are sensitive to disturbance varies by species, habitat, topography, and even the habituation of individual birds to humans (Richardson and Miller 1997). Agrium would plan ground-clearing activities during the non-nesting season to minimize potential impacts to nesting birds. Removal of trees and other ground-clearing activities will not be allowed to take place during nesting season. To minimize impacts to nesting raptors, Agrium would implement appropriate mitigation measures, such as buffer zones around occupied nests, during the nesting season.

Raptors often perch and nest on power line poles and could be at risk of electrocution. To address this issue, Agrium would implement APLIC design measures that reduce the risk of electrocution, which may include, but would not be limited to, a 60-inch separation between conductors or grounded hardware as well as the use of insulating or cover-up materials for perch management. Raptors may also collide with the power line. As described above under migratory birds, the Proposed Action power line may result in roughly 167 avian mortalities over the duration of the Proposed Action, based on the nationwide average collision rate (Loss et al. 2014). At least some of these mortalities may be raptors, because raptors are known to be vulnerable to power line collision (Manville 2005).

Indirect disturbances would include loss of foraging habitat, reduction or alteration of prey base, and loss of nesting habitat. Over the short term, the Proposed Action would reduce habitat for a number of prey species, including mice, voles, ground squirrels, and rabbits. However, abundant foraging habitat exists adjacent to the Study Area, which would limit the potential effects of the Proposed Action. In addition, reduced plant cover on disturbed areas following reclamation may make prey species that colonize those areas more visible to raptors.

With implementation of buffer zones around active raptor nests and use of APLIC measures on the power line, overall impacts on raptors under the Proposed Action are expected to be short-term and minor.

Passerines and Small Birds

Passerines and small birds (PSBs) would be directly and indirectly affected by the Proposed Action as described above under migratory birds. PSBs and their nests could be directly trampled by mining equipment and vehicles, they could collide with mine facilities, and they could be disturbed by noise and activities associated with construction and mine operation. Indirect disturbances would include loss of foraging habitat, cover, and nesting habitat as well as exposure to COPCs including selenium. Impacts to PSBs are expected to be long-term and negligible. Measures discussed above generally for migratory birds would be implemented to minimize impacts to nesting PSBs.

Water Birds

Water birds would be subject to impacts similar to those described more generally for migratory birds. Water birds are particularly sensitive to the removal and degradation of riparian and wetland habitats, as they depend on these habitats to a greater degree than upland birds. In addition, water birds are particularly sensitive to power line collision, especially where power lines cross wetland and water habitats. Water birds tend to be large bodied and less maneuverable than other groups of birds. Relatively large numbers of cranes, herons, swans, and pelicans are known to be killed in areas where power lines cross wetlands (Manville 2005). The Proposed Action power line would cross the Blackfoot River, where it has the potential to cause disproportionately high mortality of water birds over the short term.

Impacts to surface water quality from chemical loading of COPCs could degrade habitat for water birds. As discussed in **Section 4.3**, additional loading of COPCs to water resources downgradient of the Study Area, including Angus Creek and the Blackfoot River, is predicted. Therefore, water birds using these habitats may be exposed to selenium when they forage on fish, aquatic plants, and aquatic invertebrates. However, these impacts would be negligible, as the predicted increased selenium concentrations in downstream surface waters would be lower than surface water standards. These impacts would be long-term.

Studies suggest that a relationship may exist between selenium sensitivity and salt tolerance among water bird species. For example, sea birds (e.g., gulls) seem to tolerate much higher selenium exposures without apparent ill effect than do freshwater birds. In contrast, freshwater ducks are among the bird species most sensitive to selenium (Hamilton 2004). Therefore, if the Proposed Action were to release selenium into the environment, freshwater ducks may potentially be vulnerable to indirect mortality and reproductive impacts associated with selenium toxicity. Symptoms of selenium toxicity in aquatic birds include embryo deformities, decreased growth and survival of hatchlings, impairment of immune function, lesions, and mortality of adults (Spallholz and Hoffman 2002). The potential for these effects to occur is long-term and negligible given the predicted small increases in selenium in downstream surface waters under the Proposed Action.

Overall, impacts to water birds as a result of the Proposed Action are expected to be long-term and minor. Implementation of BMPs to minimize COPC concentrations in the watershed, and the measures that would be implemented to reduce impacts to migratory birds more generally, would help to alleviate adverse effects.

Table 4.6-1 summarizes compliance with the PFO ARMP with regard to wildlife resources under the Proposed Action. The following actions pertaining to wildlife were also reviewed and found to be not applicable to a mining project:

- Actions FW-1.1.2 through 1.1.8
- Actions FW-1.1.9 through 1.1.10
- Actions FW-2.1.1 through 2.1.3

Table 4.6-1 Compliance with PFO ARMP Goals, Objectives, and Actions for Wildlife Resources under the Proposed Action

Goal/Objective/Action	Compliance under Proposed Action
Goal FW-1. Manage wildlife habitats so vegetation composition and structure assures the continued presence of fish and wildlife as part of an ecologically healthy system.	The Proposed Action would be consistent with this objective over the long term because the majority of disturbed areas would be reclaimed to grassland and shrubland, which would eventually recover to the baseline habitat quality of big sagebrush and high-elevation rangeland on the mine site. Over the short term, the Proposed Action would result in reduced habitat and forage for big game and other species.
Objective FW-1.1. Maintain and improve wildlife habitats to support IDFG management objectives.	The Proposed Action would be consistent with this objective over the long term because the majority of disturbed areas would be reclaimed to grassland and shrubland, which would eventually recover to the baseline habitat quality of big sagebrush and high-elevation rangeland on the mine site. Over the short term, the Proposed Action would result in reduced habitat and forage for big game and other species.
Action FW-1.1.1. As appropriate and practical, elk and deer habitat on public lands will be managed as identified below in order to generally support IDFG management objectives for southeast (SE) Idaho management units. Riparian areas will be managed for habitat and population linkage areas by applying appropriate management techniques that may include but are not limited to: • Fencing, • Providing adjacent cover strips, and • Controlling noxious weeds. Aspen will be treated by applying appropriate management techniques that may include but are not limited to: • Removing encroaching conifer in Aspen clones. • Slashing old age aspen clones while leaving snags and some live trees. • Fencing degraded aspen clones. • Pursuing the use of prescribed fire. • Plowing Aspen roots to release clones. Degraded riparian areas will be restored.	The Proposed Action would be consistent with Action FW-1.1.1 because this Action item applies mostly to BLM habitat enhancement projects, which a mine is not. The proposed reclamation plan has been designed to incorporate wildlife habitat needs as well as installation of a cover on backfill and overburden that eliminates wildlife exposure to COPCs. Reclamation proposed by Agrium would provide a long-term wildlife habitat, although there would be habitat conversion from baseline. This tends to meet the land use plan requirement as practicable at a reclaimed mine site that has potential water quality issues as well as wildlife habitat issues. Mitigation for wetland impacts would be implemented in accordance with CWA requirements. Agrium has also proposed voluntary mitigation for upland wildlife habitat impacts, as described in **Section 4.6.4**.
Goal FW-2. Provide for the diversity of native and desired non-native species as part of an ecologically healthy system.	The Proposed Action would be consistent with this goal because the majority of disturbed areas would be reclaimed with a mixture of native and desirable non-native grass, forb, and shrub species. Plant species richness on reclaimed areas is anticipated to be similar to baseline species richness. Over the long term, reclaimed areas are predicted to recover to the baseline habitat quality of big sagebrush and high-elevation rangeland on the mine site. However, the Proposed Action may result in localized declines in abundance of wildlife species that are dependent on aspen, riparian, and wetland communities, as it would result in permanent losses of these habitats within the mine footprint.
Objective FW-2.1. Maintain or improve native and desired non-native species habitat and the connectivity among habitats.	The Proposed Action would be consistent with this objective because the majority of disturbed areas would be reclaimed with a mixture of native and desirable non-native grass, forb, and shrub species. Reclaimed areas would eventually return to baseline level of wildlife habitat service provided by the on-site big sagebrush

Table 4.6-1 Compliance with PFO ARMP Goals, Objectives, and Actions for Wildlife Resources under the Proposed Action

Goal/Objective/Action	Compliance under Proposed Action
	and high-elevation rangeland habitats. While wildlife may avoid the mine site during active mining, the habitats in the Study Area are naturally patchy, and the Proposed Action is not anticipated to significantly disrupt habitat connectivity over the long term.

Source: BLM 2012a

Table 4.6-2 summarizes compliance with the CNF RFP with regard to wildlife resources under the Proposed Action. The following standards and guidelines were also reviewed but do not apply to the effects of mining on wildlife resources:

- Dead and Down Material Guideline 1
- Snag/Cavity Nesting Habitat Standards 1 through 3 and Guidelines 1 through 5
- Big Game Guideline 3

Table 4.6-2 Compliance with Applicable Caribou Forest Plan Standards and Guidelines for Wildlife Resources under the Proposed Action

Standard/Guideline	Compliance under Proposed Action
Big Game Guideline 1: Provide for vegetation buffers of at least one sight distance (Thomas 1979) around big game concentration/use areas, such as wallows and mineral licks. Sight distance is the distance at which 90 percent of a deer or elk is hidden from an observer. This will vary depending on site specific stand conditions.	No big game concentration areas, such as wallows or mineral licks, have been identified in the Study Area.
Big Game Guideline 2: Provide for security or travel corridors near created openings.	Over the short term, this guideline would not be met under the Proposed Action. As a result of noise and human presence, it is likely that wildlife such as big game would avoid a larger area than the actual disturbance footprint, reducing the amount of security habitat and potentially disrupting local travel corridors in the vicinity of the Proposed Action. However, the relatively small area of disturbance under the Proposed Action is not anticipated to impact security or travel corridors on a Forest-wide scale.
Landbirds Guideline 1: Stands of mature trees (including snags and dead-topped trees) should be maintained next to wet meadows.	The Proposed Action would not remove any stands of mature trees adjacent to wet meadows (the wet meadows in the Study Area are adjacent to sagebrush rangelands; **Figure 3.5-1**).
Landbirds Guideline 2: Where feasible, maintain 30 to 50 percent of the sagebrush habitat in a 5th code HUC in contiguous blocks greater than 320 acres to support sagebrush obligate species.	The Proposed Action would be consistent with this guideline because it would not reduce any contiguous blocks of big sagebrush habitat to less than 320 acres.
Landbirds Guideline 3: Practices which stabilize or increase native grass and forbs cover in sagebrush habitats with 5% to 25% sagebrush canopy cover should be implemented.	The Proposed Action would be consistent with this guideline over the long term (though 199 acres of sagebrush habitat would be removed during the Proposed Action). A variety of native and desirable non-native grass and forb species would be used in the seed mixes. Areas reclaimed with the southwest slope aspects seed mix are predicted to achieve 3 percent cover of big sagebrush by year 25 and 14.5 percent cover of big sagebrush by year

Table 4.6-2 Compliance with Applicable Caribou Forest Plan Standards and Guidelines for Wildlife Resources under the Proposed Action

Standard/Guideline	Compliance under Proposed Action
	50 after mining. At year 25, forb cover is anticipated to total 10 percent, and grass cover is anticipated to total 40 percent in these areas. At year 50, forb cover is anticipated to total 13 percent, and grass cover is anticipated to total 42 percent in these areas (Arcadis 2015a).
Landbirds Guideline 4: In sagebrush habitats, manage herbaceous cover to conceal nests through the first incubation period for ground and low shrub-nesting birds.	The RCA would be consistent with this guideline over the long term (though 199 acres of sagebrush habitat would be removed in the short term). Reclaimed areas are predicted to achieve 6 percent cover of big sagebrush by year 90 after mining, at which point, associated herbaceous and grass cover would allow for concealment of ground and low-shrub nests.
Prescription 8.2.2 Wildlife Guideline 1: Mining operations should be designed to accommodate big game migration	No major big game migration corridors have been identified within the analysis area; however, because of the presence of fawning/calving habitat and winter range in and around the Study Area, it is likely that the Proposed Action would disrupt big game movements, at least during the short-term period of active mining. Following final reclamation and cessation of human disturbance, it is anticipated that big game would no longer avoid the area.
Prescription 2.7.1 (d) Elk and Deer Winter Range Critical and 2.7.2 (d) Elk and Deer Winter Range, Wildlife Standard 1: Biological potential for woodpeckers shall be allowed to fluctuate with natural disturbance processes and management actions designed to maintain productive winter range.	The Proposed Action would result in the long-term loss of 47 acres of elk and mule deer winter range, including some aspen habitat therein that would be permanently lost. Quality of undisturbed winter range in or near the Project could be affected in the short term during construction and active mining, when human presence and noise could influence big game to avoid otherwise suitable habitats in/near the mine footprint. However, with final reclamation (including successful reemergence of native grass and shrub species) and cessation of human disturbance, it is anticipated that big game would return to use winter range in the impacted areas.
Prescription 8.2.2 Wildlife Guideline 3: Consider vegetation species that contribute to wildlife habitat needs when developing reclamation plans and create wildlife structures (slash piles, logs, rock piles) using native vegetation and materials to provide habitat diversity in created openings, where possible.	This guideline would be met under the Proposed Action. A variety of native and desirable non-native grasses, forbs, and shrubs would be used in the seed mixes for reclamation to promote post-reclamation use by wildlife. Reclamation plans do not specifically incorporate the use of wildlife structures, such as slash piles, logs, and rock piles; however, these structures may be used as appropriate in accordance with this guideline.
Prescription 8.2.2 Wildlife Guideline 4: Encourage construction of ledges on suitable pit walls to accommodate cliff-dwelling species.	This guideline would be met under the Proposed Action. The remaining pit walls and benches would be available for cliff-dwelling species. The nature of the rock making up the exposed pit walls results in the unravelling rock that has loosened each year, which tends to discourage nesting on the walls.

Source: USFS 2003

4.6.1.2 Rasmussen Collaborative Alternative

The types of potential impacts on terrestrial wildlife resulting from the RCA would be similar to those described in **Section 4.6.1.1** for the Proposed Action. The total acreage of wildlife habitat loss would be greater by 73 acres; however, the RCA would result in no impacts to wetlands and non-wetland WOUS. Use of an existing haul road and previously disturbed areas under the RCA would consolidate disturbance on the landscape and result in less habitat fragmentation compared with the Proposed Action.

The RCA would result in the permanent loss of 48 more acres of aspen habitat compared with the Proposed Action. Therefore, impacts of habitat loss would be reduced for some species (e.g., those that use wetlands and riparian habitats) compared with the Proposed Action, but would potentially be greater for species that use aspen forests. It is not anticipated that aspen would re-establish because the existing root stock would be removed as a result of mine disturbance. Reclaimed areas would likely recover to high-elevation rangeland habitat over the long term, which would favor shrubland wildlife species. Therefore, the RCA may result in a localized shift in wildlife community composition from forest-dependent to shrubland species over the long term, and this shift may be slightly more pronounced compared with the Proposed Action.

Compared with the Proposed Action, the RCA would remove 8 more acres of sagebrush habitat and 45 more acres of high-elevation rangeland habitat. Therefore, the RCA would result in relatively more habitat loss and displacement of sagebrush-dependent species and species that use high-elevation rangeland habitat. The RCA would reclaim 58 acres of backfill in the South Rasmussen Mine pit, which would have gone unreclaimed under P4's current reclamation plan. These reclaimed acres would initially support grasses that could be used as forage by wildlife and eventually return to high-elevation rangeland habitat through succession.

Under the RCA, 96 percent of disturbed habitat would be reclaimed with grasses and shrubs. Over the long term, reclaimed areas would likely regain the level of wildlife habitat services provided by the baseline on-site high-elevation rangeland habitat type. However, even after reclamation, the RCA would result in the net debit of 3,367 RICHCOVWET DSAYs (units that represent wildlife habitat services in the HEA; Arcadis 2015c). This means that the RCA would have a long-term net negative impact on wildlife habitat. The RCA would result in a net debit of up to three percent more residual DSAYs compared with the Proposed Action if all potential borrow areas were used. However, under the RCA, the use of a more diverse reclamation seed mix that includes a variety of native shrubs and forbs, and greater plant-available moisture provided by store-and-release Cover C, would enhance vegetation recovery on reclaimed areas (Arcadis 2015c).

The RCA would eliminate the need to construct an overhead power line, therefore eliminating potential avian mortality that could occur along this line under the Proposed Action. This would also eliminate potential perching by predators such as raptors and ravens.

The potential for wildlife to be affected by COPCs in surface waters that could result from the mining at Rasmussen Valley was addressed by eliminating the downslope external overburden piles overlying the shallow alluvial aquifers that could carry COPC seepage from the piles into the downgradient surface waters. Therefore, the potential for wildlife exposure to COPCs from the mine would be eliminated under the RCA compared with the Proposed Action.

Overall, impacts to wildlife under the RCA would be reduced compared with the Proposed Action. Depending on the season and species, overall disturbance and displacement impacts would be long-term and would range from negligible to minor.

4.6.1.2.1 Mammals

Big Game

Impacts to big game under the RCA would be similar in type to those that would occur under the Proposed Action, and include direct, long-term habitat loss in elk and moose winter range and elk and mule deer parturition habitat, as well as short-term disturbance to individual animals from noise and human presence. The RCA facilities overlap with 83 acres of elk and mule deer winter range as mapped in the CNF RFP (USFS 2003; 23 more acres than under the Proposed Action). This area would be stripped of vegetation and would therefore be unusable as winter range by big game during active mining. Relative to the Proposed Action, the RCA would result in fewer acres of direct loss of wetland/riparian habitat and more acres of direct loss of aspen habitat. Both habitat types are important for big game. Because the RCA would use an existing haul road and consolidate some previously disturbed areas on the South Rasmussen Mine, net impacts to big game would likely be reduced compared with the Proposed Action because there would be less fragmentation of the wet meadow habitats in Rasmussen Valley. Similar to the Proposed Action, most directly disturbed acres would be reclaimed and would eventually recover to high-elevation rangeland that could provide cover and forage. Overall, impacts to big game are anticipated to be long-term and moderate under the RCA.

Bats

Impacts to bats under the RCA would be similar to those under the Proposed Action. Relative to the Proposed Action, the RCA would likely carry greater potential to remove trees that could be used by roosting bats because there would be a larger area of direct disturbance to aspen habitat. However, the RCA would have a smaller area of direct disturbance to wetland and riparian habitats, which are potentially important foraging areas for bats. Overall, impacts to bats would be long-term and minor, as they would occur on an individual and localized scale.

4.6.1.2.2 Birds

Upland Game Birds

Compared with the Proposed Action, the RCA would result in the permanent loss of 48 more acres of forested habitat for dusky and ruffed grouse. The RCA would lack an overhead power line; therefore, the potential for avian predator perching on the power line would be eliminated. Because of the localized scale of land disturbance, overall impacts on upland game birds would be long-term and minor. Impacts to greater sage-grouse and Columbian sharp-tailed grouse are discussed in **Section 4.8**.

Migratory Birds

Compared with the Proposed Action, the RCA would directly remove 73 more acres of migratory bird habitats overall. However, there would no direct loss of wetland habitats and 48 more acres of direct loss of aspen habitats under the RCA. Therefore, impacts on species using wetland and riparian habitats would be reduced compared with the Proposed Action, whereas impacts on species such as woodpeckers using aspen forest would be greater. Compared with the Proposed Action, the RCA would remove 8 more acres of sagebrush habitat and 45 more acres of high-elevation rangeland habitat. Therefore, the RCA would carry slightly more potential to impact sagebrush-obligate species (such as Brewer's sparrows) and more potential to impact species that are commonly found in high-elevation rangeland (such as green-tailed towhees).

Potential direct effects to migratory birds would be similar to those under the Proposed Action. These include direct mortality (e.g., trampling of nests, vehicle collision), displacement, and stress related to increased noise and human activity. There would be no potential for power line-related mortality of migratory birds under the RCA. Removal of trees and other ground-disturbing activities will not be allowed to take place during migratory bird nesting season. Indirect effects could include increased competition among displaced individuals and resident birds.

The RCA would result in less habitat fragmentation compared with the Proposed Action because the haul road would be consolidated with existing disturbance on the South Rasmussen Mine rather than constructed through Rasmussen Valley. The RCA would also eliminate the potential traffic noise effects to breeding birds on the valley floor; however, noise and human activity would be greater in high-elevation areas around the South Rasmussen Mine. These areas are already disturbed and subject to regular human activity, and it is possible that nesting birds in this area are already acclimated to noise.

The potential for migratory birds to be exposed to selenium and other COPCs would be reduced compared with the Proposed Action because of the elimination of external overburden piles downslope of the mine. Overall, impacts on migratory birds would be long-term and minor under the RCA.

Raptors

The type of impacts that could occur to raptors under the RCA would be similar to those under the Proposed Action. There would not be an overhead power line under the RCA; therefore, there would be no potential for raptor mortality, perching, or nesting on a power line. There would potentially be more long-term loss of nesting habitat and greater short-term direct disturbance to nesting raptors from noise and activity because the RCA would directly disturb more forested habitat compared with the Proposed Action. Agrium would implement appropriate mitigation measures, such as buffer zones around occupied nests during the nesting season, to minimize these potential impacts. With implementation of buffer zones around active raptor nests, overall impacts on raptors under the RCA would be long-term and minor.

Passerines and Small Birds

PSBs would be directly and indirectly affected by the RCA as described above for migratory birds. Effects would generally be similar to those under the Proposed Action, except that long-term habitat loss would affect more aspen and high-elevation rangeland habitat and less wetland, riparian, and sagebrush habitat. Therefore, forest-dwelling PSB species (such as woodpeckers and chickadees) would likely be at greater risk of nest destruction, displacement, habitat loss, and noise disturbance, whereas riparian-dwelling species (such as willow flycatchers and Lincoln's sparrows) would be at little risk of these impacts. In addition, compared with the Proposed Action, PSBs would be at less risk of exposure to COPCs (including selenium) because of the elimination of external overburden piles downslope of the mine. Overall, impacts to PSBs are expected to be long-term and minor under the RCA. Measures discussed above generally for migratory birds would be implemented to minimize impacts to nesting PSBs.

Water Birds

Water birds are particularly sensitive to the removal and degradation of riparian and wetland habitats, as they depend on these habitats to a greater degree than upland birds. Therefore, impacts to water birds under the RCA would be reduced compared with the Proposed Action, as the RCA would not disturb any wetland habitat. This would help to maintain the integrity of aquatic habitats used by water birds in Rasmussen Valley. In addition, the RCA would also eliminate the use of an overhead power line, which would eliminate the potential collision risk associated with the power line under the Proposed Action.

Under the RCA, there would be no potential for water birds to be exposed to selenium and other COPCs in surface waters because of the elimination of external overburden piles downslope of the mine. Overall, impacts to water birds as a result of the RCA would be long-term and minor.

Table 4.6-3 summarizes compliance with the PFO ARMP with regard to wildlife resources under the RCA. The following actions pertaining to wildlife were also reviewed and found to be not applicable to a mining project:

- Actions FW-1.1.2 through 1.1.8
- Actions FW-1.1.9 through 1.1.10
- Actions FW-2.1.1 through 2.1.3

Table 4.6-3 Compliance with BLM Pocatello ARMP Goals, Objectives, and Actions for Wildlife Resources under the RCA

Goal/Objective/Action	Compliance under RCA
Goal FW-1. Manage wildlife habitats so vegetation composition and structure assures the continued presence of fish and wildlife as part of an ecologically healthy system.	The RCA would be consistent with this goal because the majority of disturbed areas would be reclaimed to grassland and shrubland, which would eventually recover to the baseline habitat quality of high-elevation rangeland on the mine site. However, loss of aspen habitat within the mine footprint would likely be permanent.
Objective FW-1.1. Maintain and improve wildlife habitats to support IDFG management objectives.	The RCA would be consistent with this objective over the long term because the majority of disturbed areas would be reclaimed to grassland and shrubland, which would eventually recover to the baseline habitat quality of high-elevation rangeland on the mine site. Over the short term, the RCA would result in reduced habitat and forage for big game and other species.
Action FW-1.1.1. As appropriate and practicable (see **Action ME-2.2.1)**, elk and deer habitat on public lands will be managed as identified below in order to generally support IDFG management objectives for southeast (SE) Idaho management units. Riparian areas will be managed for habitat and population linkage areas by applying appropriate management techniques that may include but are not limited to: • Fencing, • Providing adjacent cover strips, and • Controlling noxious weeds. Aspen will be treated by applying appropriate management techniques that may include but are not limited to: • Removing encroaching conifer in Aspen clones. • Slashing old age aspen clones while leaving snags and some live trees. • Fencing degraded aspen clones. • Pursuing the use of prescribed fire. • Plowing Aspen roots to release clones. • Degraded riparian areas will be restored. During travel management planning, give special consideration (e.g., timing of use, number of roads/trails, road locations) for reducing impacts on big game winter range.	The Proposed Action would be consistent with Action FW-1.1.1 because this Action item applies mostly to BLM habitat enhancement projects, which a mine is not. The proposed reclamation plan has been designed to incorporate wildlife habitat needs as well as installation of a cover on backfill and overburden that eliminates wildlife exposure to COPCs. Reclamation proposed by Agrium would provide a long-term wildlife habitat, although there would be habitat conversion from baseline. This tends to meet the land use plan requirement as practicable at the reclaimed mine site, which has potential water quality issues as well as wildlife habitat issues. Additional mitigation that may come from the HEA would further help meet this land use plan directive. Agrium has proposed voluntary mitigation for upland wildlife habitat impacts, as described in **Section 4.6.4**. The RCA was designed to minimize both physical and COPC impacts to wetlands and riparian habitats. There would be no direct impact to riparian habitats compared with 20.5 acres under the Proposed Action.
Goal FW-2. Provide for the diversity of native and desired non-native species as part of an ecologically healthy system.	The RCA would be consistent with this goal because the majority of disturbed areas would be reclaimed with a mixture of native grass, forb, and shrub species. Plant species richness on reclaimed areas is anticipated to be similar to baseline species richness. Over the long term,

Table 4.6-3 Compliance with BLM Pocatello ARMP Goals, Objectives, and Actions for Wildlife Resources under the RCA

Goal/Objective/Action	Compliance under RCA
	reclaimed areas are predicted to recover to the baseline habitat quality of high-elevation rangeland on the mine site. However, the RCA may result in localized declines in abundance of wildlife species that are dependent on aspen forest, as it would result in permanent loss of this habitat type within the mine footprint.
Objective FW-2.1. Maintain or improve native and desired non-native species habitat and the connectivity among habitats.	The RCA would be consistent with this objective because the majority of disturbed areas would be reclaimed with a mixture of native grass, forb, and shrub species. Reclaimed areas would eventually return to baseline level of wildlife habitat service provided by the on-site high-elevation rangeland habitat. While wildlife may avoid the mine site during active mining, the habitats in the Study Area are naturally patchy, and the RCA is not anticipated to significantly disrupt habitat connectivity over the long term.

Source: BLM 2012a

Table 4.6-4 summarizes compliance with the CNF RFP with regard to wildlife resources under the RCA. The following standards and guidelines pertaining to wildlife were also reviewed and found to be not applicable to the RCA because they relate to other types of forest management practices (e.g., timber harvest, grazing) and not to a mining project:

- Dead and Down Material Guideline 1
- Snag/Cavity Nesting Habitat Standards 1 through 3 and Guidelines 1 through 5
- Big Game Guideline 3

Table 4.6-4 Compliance with Applicable Caribou Forest Plan Standards and Guidelines for Wildlife Resources under the RCA

Standard/Guideline	Compliance under RCA
Big Game Guideline 1: Provide for vegetation buffers of at least one sight distance (Thomas 1979) around big game concentration/use areas, such as wallows and mineral licks. Sight distance is the distance at which 90 percent of a deer or elk is hidden from an observer. This will vary depending on site specific stand conditions.	No big game concentration areas, such as wallows or mineral licks, have been identified in the Study Area.
Big Game Guideline 2: Provide for security or travel corridors near created openings.	Over the short term, this guideline would substantively be met under the RCA. As a result of noise and human presence, it is likely that wildlife such as big game would avoid a larger area than the actual disturbance footprint, reducing the amount of security habitat and potentially disrupting local travel corridors in the vicinity of the RCA. However, the relatively small area of disturbance under the RCA is not anticipated to impact security or travel corridors on a Forest-wide scale.
Landbirds Guideline 1: Stands of mature trees (including snags and dead-topped trees) should be maintained next to wet meadows.	The RCA would not remove any stands of mature trees adjacent to wet meadows (the wet meadows in the Study Area are adjacent to sagebrush rangelands; **Figure 3.5-1**).
Landbirds Guideline 2: Where feasible, maintain 30 to 50 percent of the sagebrush habitat in a 5th code HUC in contiguous blocks greater than 320 acres to support sagebrush obligate species.	The RCA would be consistent with this guideline because it would not reduce any contiguous blocks of big sagebrush habitat to less than 320 acres.
Landbirds Guideline 3: Practices which stabilize or increase native grass and forbs cover in sagebrush	The RCA would be consistent with this guideline over the long term (though 199 acres of sagebrush habitat would

Table 4.6-4 Compliance with Applicable Caribou Forest Plan Standards and Guidelines for Wildlife Resources under the RCA

Standard/Guideline	Compliance under RCA
habitats with 5% to 25% sagebrush canopy cover should be implemented.	be removed in the short term). A variety of native and desirable non-native grass and forb species would be used in the seed mix. Reclaimed areas are predicted to achieve 6 percent cover of big sagebrush by year 90 after mining, at which point, forb cover is predicted to range from 36 to 42 percent, and grass cover is predicted to range from 23 to 31 percent (Arcadis 2015b).
Landbirds Guideline 4: In sagebrush habitats, manage herbaceous cover to conceal nests through the first incubation period for ground and low shrub-nesting birds.	The RCA would be consistent with this guideline over the long term (though 199 acres of sagebrush habitat would be removed in the short term). Reclaimed areas are predicted to achieve 6 percent cover of big sagebrush by year 90 after mining, at which point, associated herbaceous and grass cover would allow for concealment of ground and low-shrub nests.
Prescription 8.2.2 Wildlife Guideline 1: Mining operations should be designed to accommodate big game migration	No major big game migration corridors have been identified within the Study Area; however, because of the presence of fawning/calving habitat and winter range in and around the Study Area, it is likely that the RCA would disrupt local movements of individual deer, elk, and moose, at least during the short-term period of active mining. Following final reclamation and cessation of human disturbance, it is anticipated that big game would no longer avoid the area.
Prescription 2.7.1 (d) Elk and Deer Winter Range Critical and 2.7.2 (d) Elk and Deer Winter Range, Wildlife Standard 1: Biological potential for woodpeckers shall be allowed to fluctuate with natural disturbance processes and management actions designed to maintain productive winter range.	The RCA would result in the long-term loss of 70 acres of big game winter range, including some aspen habitat therein that would be permanently lost. Quality of undisturbed winter range in or near the project could be affected in the short term during construction and active mining, when human presence and noise could influence big game to avoid otherwise suitable habitats in/near the mine footprint. However, with final reclamation (including successful reemergence of native grass and shrub species) and cessation of human disturbance, it is anticipated that big game would return to use winter range in the impacted areas.
Prescription 8.2.2 Wildlife Guideline 3: Consider vegetation species that contribute to wildlife habitat needs when developing reclamation plans and create wildlife structures (slash piles, logs, rock piles) using native vegetation and materials to provide habitat diversity in created openings, where possible.	This guideline would be met under the RCA. A variety of native and desirable non-native grasses, forbs, and shrubs would be used in the seed mixes for reclamation to promote post-reclamation use by wildlife. Reclamation plans do not specifically incorporate the use of wildlife structures, such as slash piles, logs, and rock piles; however, these structures may be used as appropriate in accordance with this guideline.
Prescription 8.2.2 Wildlife Guideline 4: Encourage construction of ledges on suitable pit walls to accommodate cliff-dwelling species.	This guideline would be met under the RCA. The remaining pit walls and benches would be available for cliff-dwelling species.

Source: USFS 2003

4.6.1.3 No Action Alternative

Under the No Action Alternative, the federal phosphate leases would not be developed. The No Action Alternative would result in no new impacts to wildlife in the Study Area. The No Action Alternative would maintain the current status of terrestrial wildlife and terrestrial wildlife populations in and around the Study Area. However, this does not preclude future development of the federal phosphate leases under a different mine plan.

4.6.2 Irreversible and Irretrievable Commitment of Resources

Under the Proposed Action, the loss of aspen and wetland/riparian habitat is considered an irreversible commitment of resources and would have long-term impacts on wildlife species using those habitats. Under the RCA, this loss would primarily be limited to aspen habitat, as there would be no direct impacts to wetlands. Although the Mine and Reclamation Plan would re-establish upland grassland and shrub vegetation in disturbed areas after mining operations end, it is not anticipated that aspen would re-establish because the existing root stock would be removed. As a result of the loss of habitat, wildlife species that use aspen habitat may locally decline in abundance, while other species that use grassland and shrubland habitats may locally increase following reclamation. This small-scale shift in wildlife community composition in the Study Area would also be considered an irreversible commitment of resources.

It is possible that some terrestrial wildlife may be adversely affected by elevated selenium concentrations in plants growing on the reclaimed area over the duration of the Proposed Action. These impacts are anticipated to be limited in magnitude and areal extent and, therefore, represent a minor irretrievable commitment of resources. The potential for this is much lower under the RCA, which would include a deeper cover.

4.6.3 Unavoidable Residual Adverse Effects

Based on the HEA, reclamation would offset 55 percent of the wildlife habitat services lost under the Proposed Action, with a net debit of 3,279 residual DSAYs of lost wildlife habitat services (Arcadis 2015c). This loss of wildlife habitat services would be an unavoidable residual adverse effect of the Proposed Action. The net residual DSAY debit under the RCA would be greater than that of the Proposed Action, at 3,367 DSAYs, with reclamation offsetting 65 percent of the wildlife habitat services lost.

4.6.4 Mitigation Measures

To minimize noise and disturbance impacts to nesting raptors, Agrium would apply species-specific raptor nest buffers as detailed in Table B-2 of Appendix B of the ARMP.

In addition, Agrium would plan ground-clearing activities during the non-nesting season to minimize potential impacts to nesting birds. Under the Proposed Action, Agrium would implement APLIC raptor-friendly design measures on the 0.7-mile overhead power line that would be constructed. These may include, but would not be limited to, a 60-inch separation between conductors or grounded hardware as well as the use of insulating or cover-up materials for perch management.

On-site reclamation would partially offset the loss of wildlife habitat in the mine footprint. Under the Proposed Action, 443 acres (or 95 percent) of the total disturbed area would be reclaimed. Based on HEA results, this reclamation would result in the long-term credit of 3,979 DSAYs at the mine site. This means that reclamation would offset 55 percent of the wildlife habitat services lost under the Proposed Action, with a net debit of 3,279 residual DSAYs.

Under the RCA, 517.8 acres (or 96 percent of the disturbed acreage) on the Lease would be reclaimed. In addition, P4 would reclaim 84 acres on the South Rasmussen Mine, for a total reclaimed acreage of 594 acres. Based on HEA results, this reclamation would result in the long-term credit of 6,318 DSAYs at the mine site. This means that reclamation would offset 65 percent of the wildlife habitat services lost under the RCA, with a net debit of 3,367 residual DSAYs. As described in **Section 2.3.7.9**, Agrium has agreed to use a hypothetical mitigation project to calculate a fee amount for mitigating all of the DSAY debit from the RCA in lieu of performing a mitigation project themselves. The project and cost estimate would be described in a Wildlife Habitat Mitigation Plan prepared by Agrium after the Final EIS is published, but before the BLM ROD is signed. This document would include five components: 1) details of the hypothetical mitigation project(s); 2) the gain in DSAY values from the project and assumptions; 3) a calculation of the total cost to offset the selected alternative DSAY debit using the hypothetical mitigation project as a basis; 4) description of the provisions of the corresponding in-lieu fee to a third party; and 5) fulfillment of the voluntary mitigation.

The cost of the final hypothetical mitigation actions would be calculated in coordination with the Agencies. The BLM, Agrium, and other stakeholders would identify a third-party recipient of the in-lieu fee and confirm that the fee would be spent in accordance with the wildlife trustee agencies' wildlife habitat mitigation objectives including the BLM, USFS, USFWS, and IDFG. After the ROD is signed, Agrium would provide the in-lieu fee to the third party.

4.7 FISHERIES AND AQUATIC RESOURCES

Issue: What is the potential to impact aquatic habitats and aquatic species?

Indicators:

- The length of intermittent and perennial stream channels directly affected by road fill and associated culverts, and comparison with the undisturbed lengths of these stream channels in the analysis area
- Quantities of suspended sediment and COPCs in fishery resources in the area, with emphasis on compliance with applicable aquatic life water quality standards
- High selenium or other COPC levels in macroinvertebrates, amphibians, and fish
- Compliance with the applicable PFO ARMP and CNF RFP Standards and Guidelines

Issue: What is the potential for impacts to the aquatic influence zone (AIZ)?

Indicators:

- Reduction in the size of the AIZ (acres)
- Reduction in the quality of the AIZ such that there is a detrimental effect on aquatic resources

4.7.1 Direct and Indirect Impacts

4.7.1.1 Proposed Action

4.7.1.1.1 Aquatic Habitat

The Proposed Action is anticipated to result in the direct loss of 20.5 acres of wetland habitat (**Section 4.5**) and would directly impact 0.4 mile of intermittent and perennial stream channel in the Study Area through installation of culverts at road crossings. Aquatic habitats within and adjacent to the Study Area may also be indirectly affected by the Proposed Action. If not controlled, clearing vegetation within the Study Area could contribute to increased soil erosion, leading to increased amounts of siltation in local drainages. An increase in the amounts of suspended sediment in runoff could alter stream morphology, choke out aquatic plants, and alter communities of fish and aquatic invertebrates (Gray and Ward 1982; Wood and Armitage 1997; Shaw and Richardson 2001; Gleason et al. 2003). Implementation of the proposed BMPs, including construction of water control ponds and use of erosion control measures, would help to prevent sediment and runoff water from flowing into streams. Because of the incorporation of BMPs into the design of the Proposed Action, indirect impacts to aquatic habitats from sedimentation are expected to be minor and short-term.

The capture of surface runoff during active mining would decrease the quantity of water in streams and wetlands downstream of the Study Area over the short term. As explained in **Section 4.3.1.1.4**, the area of captured runoff equates to 4 percent of the Angus Creek-Blackfoot River sub-watershed and 0.03 percent of the Lower Lanes Creek sub-watershed. The reduced quantity of water may result in the localized drying of some aquatic habitats downstream of the Study Area over the short term. Following reclamation, runoff to nearby streams and wetlands is predicted to be the same as under baseline conditions.

The Proposed Action would also result in direct impacts to 80 acres of AIZ. Because AIZs typically encompass riparian areas, the removal of vegetation in AIZs may indirectly lead to: 1) increases in water temperature from the loss of shade, 2) decreases in natural sediment filtration capabilities and increases in substrate sedimentation, 3) potential changes in channel morphology resulting from the stream bank destabilization, 4) loss of potential instream wood recruitment, and 5) decreases in inputs of organic matter (leaf litter) as energy. The loss of stream habitat and AIZ function would result in direct and indirect impacts to cutthroat trout and other native fishes that would be potentially long-term, local, and moderate (**Section 4.7.1.1.3**).

4.7.1.1.2 Macroinvertebrates

Macroinvertebrates have the potential to be impacted by sedimentation and changes to the AIZ, which change the physical characteristics of the aquatic environment. Sedimentation may alter the substrate composition of aquatic habitats, thereby reducing or increasing the suitability of the substrate for particular macroinvertebrate taxa. It may cause some species to “drift” out of the benthos and into the water column. Sediment may also clog the respiratory or feeding structures of some species, resulting in mortality and declines in abundance. The ultimate result of these effects is that releases of sediment may alter macroinvertebrate community composition, with some species temporarily increasing in abundance while others that are less tolerant of turbidity decrease (Gray and Ward 1982; Wood and Armitage 1997; Shaw and Richardson 2001).

Removal of vegetation in the AIZ may further impact macroinvertebrate community composition. Presence of riparian vegetation providing shade has been correlated with abundance of *Ephemera, Plecoptera*, and *Trichoptera* (EPT) taxa (which are typically more sensitive to disturbance than other macroinvertebrate taxa; Barbour et al. 1999; Rios and Bailey 2006). In addition, some macroinvertebrate species depend on leaf litter that falls into streams as a food source, and reduction or removal of streamside vegetation has the potential to result in a decline of these species (Cummins et al. 1989). As species that are sensitive to sedimentation, disturbance, and warmer water temperatures decline, disturbance-tolerant taxa may increase in abundance. In general, mayflies, caddisflies, and stoneflies are considered relatively intolerant of human disturbance and would decline in areas impacted by sedimentation and removal of riparian vegetation. On the other hand, *Diptera* (fly larvae) and *Chironomidae* (midge larvae), which are generally more tolerant of disturbance, may increase in impacted areas (Barbour et al. 1999).

The Proposed Action is predicted to result in measurable loading of selenium into the watershed as a result of leaching of COPCs out of the downslope external overburden piles and into shallow groundwater and downstream surface waters via the shallow alluvial groundwater. Existing baseline selenium levels, coupled with any potential selenium increases, can reside in streambed sediments and the water column to be taken up directly by rooted aquatic plants, plankton, aquatic insects, and fish. Selenium released into the watershed under the Proposed Action may have long-term effects on local populations of macroinvertebrates in Angus Creek and associated tributaries and downstream waters.

The Proposed Action would result in inputs of water with selenium concentrations in excess of 0.005 mg/L, for a predicted peak in-stream increase in concentration of 0.0004 mg/L in Angus Creek and 0.0001 mg/L in the Blackfoot River (**Section 4.3.1.1.2**). Added to baseline selenium concentrations for these streams, these increases would equate to a selenium concentration of 0.0014 mg/L for Angus Creek and 0.0011 mg/L for the Blackfoot River (**Table 4.3-11** and **Table 4.3-12**). A bioaccumulation factor of 1,000 (Conley et al. 2009) was applied to predict how these increases in water-borne selenium might increase algal selenium concentrations downstream of the Proposed Action. At a water selenium concentration of 0.0014 mg/L (**Section 4.3.1.1.2**), a bioaccumulation factor of 1,000 could result in algal selenium concentration of 1.4 µg/g in Angus Creek. This is not much higher than baseline periphyton selenium concentrations determined from sampling in Angus Creek in September 2014. These sampled concentrations of selenium ranged from 0.2 µg/g dw at BAC-1 to 1.3 µg/g dw (estimated) at BAC-3 (GEI 2015). Under the Proposed Action, macroinvertebrates with a bioaccumulation factor of 2 (as observed in the Conley et al. 2009 study) feeding on algae with a selenium concentration of 1.4 µg/g could reach tissue concentrations of 2.8 µg/g, which is within the range of 2009 selenium concentrations (2.48 to 7.57 µg/g) documented in macroinvertebrates in Angus Creek at baseline (GEI 2012). This is higher than the 2014 selenium concentrations observed in Angus Creek (0.6 to 1.7 µg/g dw; GEI 2015). Therefore, the Proposed Action carries the potential to slightly elevate the selenium concentration in macroinvertebrates higher than the most recently sampled (2014) baseline condition, but is not anticipated to increase concentrations higher than the range of baseline conditions observed in past years (2009). Effects of increased selenium in the Blackfoot River would be lower in magnitude than those for Angus Creek because the incremental increase in selenium would be one fourth that predicted for Angus Creek.

Effects of selenium on macroinvertebrates have not been widely studied and are uncertain; rather, most research has focused on macroinvertebrates as an exposure pathway for transfer of selenium to higher organisms, such as fish and birds. There is some evidence suggesting that elevated concentrations of selenium impair larval growth and fecundity of aquatic invertebrates (Conley et al. 2009). Macroinvertebrate taxa vary in their tolerance to pollutants. Fish and bird species, even those that are closely related, differ in their selenium sensitivity, and it is likely that macroinvertebrate species do as well (Hamilton 2004). Slightly elevated levels of selenium in macroinvertebrates downgradient of the analysis area may result in reduced growth and reproduction for some species but not others. This may cause a shift in the composition of the local macroinvertebrate communities.

Overall, the Proposed Action would have a long-term, minor impact on aquatic macroinvertebrates in wetlands and waters downstream of the Study Area. Impacts would be minor because the use of BMPs as described in **Section 4.5.1.1.2** and the low concentrations of COPCs expected to enter the surface waters from the downslope external overburden piles would help to minimize impacts on streams and wetlands.

4.7.1.1.3 Fish

Surface water would be conveyed underneath the Rasmussen Valley Haul Road, the West Side Haul Road, and the county road realignment through culverts at 18 locations, summarized in

Table 2.3-6. Culverts would be installed to conform to the natural streambed and slope so that a minimum depth of water is always available in the culvert for fish passage. Thus, the Proposed Action would comply with BLM and USFS standards and guidelines requiring the maintenance of instream flows and would not fragment fish habitats or prevent fish migration.

Displacement and erosion of sediment in the stream bank during culvert installation would create short-term pulses of turbidity that could cause temporary gill irritation to individual fish immediately downstream of the culvert. Sedimentation could also diminish the suitability of stream habitat for many aquatic organisms and native fishes, including spawning areas for cutthroat trout in Angus Creek. Major additional sedimentation into analysis area streams is not expected because of the implementation of BMPs and Proposed Action design features, including dust suppression and control of storm water runoff (**Section 4.5.1.1.2**). Indirect impacts to native fishes via sedimentation would be short-term (for the duration of the Proposed Action), local, and minor.

As discussed in **Section 4.3.1.1.2**, the Proposed Action has the potential to increase selenium concentrations in the watershed to higher than the baseline condition by leaching from overburden piles to shallow alluvial groundwater. The predicted peak in-stream increase in selenium concentration would be 0.0004 mg/L in Angus Creek and 0.0001 mg/L in the Blackfoot River (**Table 4.3-11** and **Table 4.3-12**). A bioaccumulation factor of 1,900, based on Muscatello (2009), USEPA (2004), and Lemly (1999), was used to predict how this increase in water-borne selenium could affect fish tissue concentrations under the Proposed Action. Using this bioaccumulation factor, a water selenium concentration of 0.0014 mg/L (as predicted for Angus Creek; see **Section 4.3.1.1.2**) would equate to a fish tissue concentration of 2.7 µg/g, which (coupled with 2013 and 2014 fish tissue concentrations for a potential cumulative body burden of around 5.4 µg/g) is still lower than the USEPA draft fish whole-body criterion of 8.0 µg/g (USEPA 2015a) in drainages near the Study Area.

Under the Proposed Action, at a whole-body selenium concentration of 5.4 µg/g (using the bioaccumulation factor explained above), deformities in up to 4 percent of adult and juvenile fish and 8 percent of larvae and fry may occur, based on the relationships described by Lemly (1997). This would result in mortality rates of 10 percent and 70 percent, respectively, for the deformed fish, which would equate to overall population-level mortality of 0.4 percent and 6 percent, respectively (Lemly 1997). Lemly (1997) classified selenium impacts as negligible if they are anticipated to result in less than 5 percent population mortality and slight to moderate if they are anticipated to result in 5 to 20 percent population mortality.

A study of effects of accumulated selenium on the reproductive success and larval development of westslope cutthroat trout collected from a site of active coal mining in British Columbia demonstrated that eggs with selenium concentrations higher than 86.3 µg/g dw were not successfully fertilized or were non-viable at fertilization, while eggs with concentrations higher than 46.8 and less than 76.4 µg/g dw were fertilized but did not produce viable fry. In this study, a positive relationship between egg selenium concentrations and fry mortality was observed (Rudolph et al. 2008). The authors also described the relationship between egg selenium concentration and fish muscle tissue concentration. Assuming that the egg concentration/tissue concentration relationship that Rudolph et al. (2008) described holds true for the Upper Blackfoot watershed, tissue concentrations of 5.4 µg/g (the potential Proposed Action cumulative body burden described above) could equate to egg selenium concentrations of 10.8 µg/g. According to Rudolph et al. (2008), this egg concentration is below the level that would be expected to result in significant mortality of eggs or larval fish. This further supports the conclusion that the Proposed Action would be unlikely to have population-level effects of selenium on fish in the streams downgradient of the Study Area.

Hardy et al. (2010) completed a 2.5-year feeding trial where cutthroat trout were fed dietary selenium supplied as up to 10 µg/g of selenomethionine, a dominant form found in algae and in the aquatic food chain. The results of the study suggest that cutthroat trout are not as sensitive to intake of dietary selenium as fish in other studies, such as the Rudolph et al. (2008) study. Hardy et al. (2010) found that egg selenium concentrations were not consistently higher or lower than fish whole-body tissue concentrations, but were higher in some treatment groups and lower in others. Results also found no differences in growth, feed intake, survival, or egg hatchability between dietary groups when concentrations of selenium in whole fish and eggs were increased in proportion to dietary selenium intake. The results suggest differences in response to selenium exposure among fish species. DeForest et al. (2012) reviewed a number of studies on the effects of selenium on Canadian fish species and determined that sensitivity to selenium varies by species and even by subspecies (in general, suckers and minnows seem to be more sensitive than trout; westslope cutthroat trout seem to be more sensitive than Yellowstone cutthroat trout).

The data presented here are based on averages and representative of the overall “fish population” of the streams downgradient of the Study Area. It is likely that selenium affects some species or individuals more than others. It is also possible that short-term high inputs of selenium could be more of a limiting factor to aquatic resources than long-term, averaged inputs. Because evidence suggests that aquatic populations have already accumulated selenium from inputs into the watershed, additional input of selenium under the Proposed Action would be an additional impact and would be negligible over both the short and the long term.

In addition to selenium, the Proposed Action would contribute zinc, manganese, and nickel to Angus Creek and the Blackfoot River. Concentrations for all COPCs would be lower than surface water standards (**Table 4.3-11** and **Table 4.3-12**). Relative to selenium, fewer studies have examined the potential population-level effects of these other metals on fish. Adverse effects have been observed in rainbow trout when exposed to a zinc concentration of 0.01 mg/L (USDI 1998). The concentration predicted under the Proposed Action would be much lower at 0.0004 mg/L for Angus Creek and 0.0001 mg/L for the Blackfoot River. Nickel is known to be toxic to fish at high (>12 mg/L) concentrations (Ololade and Oginni 2010; Svecevicius 2010) and to inhibit growth at slightly lower (>10 mg/L) concentrations (Javed 2006), but effects at low (<2 mg/L) concentrations (such as those anticipated to occur under the Proposed Action) are unclear. Zinc and nickel are known to bioaccumulate in aquatic food chains in a manner similar to selenium (McGeer et al. 2003; USDI 1998). Manganese has been shown to have adverse sub-lethal effects on the blood cells of fish at concentrations as low as 0.64 mg/L (Sharma and Langer 2014) and to inhibit growth at high (>25 mg/L) concentrations (Javed 2006). Overall, impacts of non-selenium COPCs on fish would be long-term and would likely be negligible because of the low concentrations that would enter downstream waters (**Table 4.3-11** and **Table 4.3-12**).

Overall, impacts to fish under the Proposed Action would be long-term and moderate.

4.7.1.1.4 Amphibians and Reptiles

The Proposed Action would result in permanent loss of 20.5 acres of wetland and riparian habitat within the Study Area. Direct mortalities to amphibians and reptiles may occur in wetland, stream, and riparian areas that would be disturbed, as well as on the haul road as individuals travel between wetland habitats. The placement of culverts and mine runoff could introduce sediments into habitats used by amphibians and reptiles. Agrium would implement surface water control structures with several types of designs to reduce or eliminate risk of surface water contamination or fill. For this reason, indirect impacts from runoff on sensitive amphibians and reptiles are expected to be negligible. Indirect effects could also adversely affect amphibian populations including localized drying of wetlands as a result of the capture of surface runoff during active mining and increased concentrations of selenium and other COPCs in drainages downstream of the analysis area.

Amphibians are similar to fish in their susceptibility to selenium toxicity (Ohlendorf 2003). There is evidence that amphibians accumulate selenium that females transfer selenium to their eggs, and that egg selenium concentration is negatively correlated with reproductive success (Metts et al. 2013; Bergeron et al. 2010; Hopkins et al. 2006). Selenium bioaccumulation has also been demonstrated for reptiles; however, reptiles appear to be less sensitive to selenium than amphibians. Fewer studies have found adverse biological effects in reptiles (Hopkins et al. 2005; Ohlendorf 2003). Because inputs of selenium into downstream waters would be well below the surface water standard under the Proposed Action, the Proposed Action is unlikely to contribute to adverse population-level effects on amphibians in receiving waters (Angus Creek) but could contribute to adverse effects downstream of the Study Area (Blackfoot River).

Similar to fish, amphibians could be exposed to zinc, nickel, and manganese under the Proposed Action. Amphibians show serious adverse effects at water-borne zinc concentrations in excess of 1.5 mg/L (USDI 1998), which is much higher than the concentrations of 0.0001 to 0.0004 mg/L predicted under the Proposed Action (**Table 4.3-11** and **Table 4.3-12**). Nickel has been shown to be lethal to frog embryos at low concentrations (<1 mg/L; Sztrum et al. 2011). There is a lack of research on the effects of these COPCs on reptiles. Given that the concentrations of these COPCs in Angus Creek and the Blackfoot River would be well below surface water standards (**Table 4.3-12 and Table 4.3-13**), population-level effects of COPCs on amphibians and reptiles are unlikely. Overall, impacts of the Proposed Action on amphibians and reptiles would be long-term and moderate.

Table 4.7-1 summarizes compliance with the PFO ARMP with regard to fisheries and aquatic resources under the Proposed Action.

Table 4.7-1 Compliance with Applicable PFO ARMP Goals, Objectives, and Actions for Fisheries and Aquatic Resources under Proposed Action

Goal/Objective/Action	Compliance under Proposed Action
Action SW-2.1.4. Stream crossings, if necessary, will be designed to minimize adverse impacts on soils, water quality, and riparian vegetation and provide for fish passage as appropriate.	Culverts would be installed to conform to the natural streambed and slope so that a minimum depth of water is always available in the culvert for fish passage. Thus, the Proposed Action would comply with BLM and USFS standards and guidelines requiring the maintenance of instream flows and would not fragment fish habitats or prevent fish migration.
Action SW-2.1.5. As appropriate, new or existing roads and trails adjacent to streams or riparian areas that impact water quality may be redesigned, repaired, maintained, or re-located to a location not impacting the water quality.	Roads constructed under the Proposed Action are not anticipated to significantly impact water quality because of the implementation of BMPs to control sedimentation and runoff. However, there would still likely be some localized impacts to water quality from the haul road through Rasmussen Valley.
Action ME-2.2.2. The following operation standards and guidelines would be applied as appropriate to reduce environmental impacts from mineral exploration and development operations: **Operational Standards:** 1. Locate surface disturbing activities, including support facilities, outside riparian zones (e.g.,	This action would not be met under the Proposed Action. There would be 80 acres of direct impacts to the AIZ and a loss of 20.5 acres of riparian/wetland habitat.

Table 4.7-1 Compliance with Applicable PFO ARMP Goals, Objectives, and Actions for Fisheries and Aquatic Resources under Proposed Action

Goal/Objective/Action	Compliance under Proposed Action
riparian habitat conservation areas (RHCAs) or areas where surface disturbance will impact the PFC of the riparian areas) and fish bearing waters. Cutthroat trout guidance will be considered as identified in Appendix C of the ARMP. Where no feasible alternative site exists, operate and construct facilities in ways that will avoid or reduce impacts on riparian zone attributes.	

Source: BLM 2012a

Table 4.7-2 summarizes compliance with the CNF RFP with regard to fisheries and aquatic resources under the Proposed Action. The following standards and guidelines pertaining to aquatic resources were also reviewed and found to be not applicable to the Proposed Action as they are specific to unrelated land management or development practices:

- Prescription 2.8.3 (AIZ) Fire/Fuels Guidelines 1 through 5
- Prescription 2.8.3 (AIZ) Lands Standard 2
- Prescription 2.8.3 (AIZ) Lands Guidelines 2 through 5
- Prescription 2.8.3 (AIZ) Minerals/Geology Guidelines 2 through 3 and 5
- Prescription 2.8.3 (AIZ) General Riparian Area Management Standard 1
- Prescription 2.8.3 (AIZ) Fisheries Guidelines 2 through 3
- Prescription 2.8.3 (AIZ) Wildlife Standard 1
- Prescription 2.8.3 (AIZ) Access Standard 1
- Prescription 2.8.3 (AIZ) Fisheries Guidelines 2 through 3
- Prescription 2.8.3 (AIZ) Recreation Standards 1 and 2 and Guideline 1
- Prescription 2.8.3 (AIZ) Grazing Management Standards 1 and 2 and Guidelines 1 and 2
- Prescription 2.8.3 (AIZ) Timber Standard 1 and Guidelines 1 and 2

Table 4.7-2 Compliance with Applicable Caribou Forest Plan Standards and Guidelines for Fisheries and Aquatic Resources under Proposed Action

Standard/Guideline	Compliance under Proposed Action
Forest-wide Direction **Amphibian Guideline 3:** Maintain amphibian habitats when developing and modifying springs and wetlands.	This guideline would not be met under the Proposed Action, because the Proposed Action would result in the long-term removal of 20.5 acres of wetland and riparian amphibian habitat.
Prescription 2.8.3 Lands Standard 1: Special use authorizations for new projects involving instream facilities shall maintain minimum instream flows to maintain or improve desired AIZ attributes.	Culverts would be installed to conform to the natural streambed and slope so that a minimum depth of water is always available in the culvert for fish passage. Thus, the Proposed Action would comply with BLM and USFS standards and guidelines requiring the maintenance of instream flows and would not fragment fish habitats or prevent fish migration.
Prescription 2.8.3 Minerals/Geology Guideline 1:	There would be 80 acres of direct impacts to the AIZ and

Table 4.7-2 Compliance with Applicable Caribou Forest Plan Standards and Guidelines for Fisheries and Aquatic Resources under Proposed Action

Standard/Guideline	Compliance under Proposed Action
Locate new structures, support facilities, and roads outside AIZs. Where no alternative to siting facilities in AIZs exists, locate and construct the facilities in ways that avoid or reduce impacts to desired AIZs attributes. Where no alternative to road construction exists, keep roads to the minimum necessary for the approved mineral activity.	a loss of 20.5 acres of riparian/wetland habitat. Impacts will be mitigated to the extent feasible to reduce impacts to desired AIZ attributes. Measures will be implemented to reduce erosion, sedimentation, COPCs transport, and acres of impacts.
Prescription 2.8.3 Minerals/Geology Guideline 4: Do not locate debris, mine overburden, excess material, leaching pads, and other facilities within Aquatic Influence Zones, unless no other alternatives are available. If no other alternative exists, ensure that safeguards are in place to prevent release or drainage of toxic or other hazardous materials onto these lands.	There would be 80 acres of direct impacts to the AIZ and a loss of 20.5 acres of riparian/wetland habitat. Impacts will be mitigated to the extent feasible to reduce impacts to desired AIZ attributes. Measures will be implemented to reduce erosion, sedimentation, COPCs transport, and acres of impacts.
Prescription 2.8.3 General Riparian Area Management Guideline 1: Felled trees should remain on site when needed to meet woody debris objectives and desired AIZ attributes.	Felled trees will remain on site if needed. Further, this guideline would be met if felled trees removed are not within the AIZ or if there are no trees in the impacted AIZ.
Prescription 2.8.3 General Riparian Area Management Guideline 2: Use herbicides, pesticides, and other toxicants and chemicals only as needed to maintain desired AIZ attributes.	This guideline would be met under the Proposed Action. Agrium would adhere to federal and state requirements for herbicide and pesticide use and use these chemicals only where necessary.
Prescription 2.8.3 General Riparian Area Management Guideline 3: Avoid storage of fuels and other toxicants or refueling within AIZs unless there are no other alternatives. Any refueling sites within an AIZ should have an approved spill containment plan.	This guideline would be met under the Proposed Action. The fuel storage area would be located outside of the AIZ, and Agrium would implement spill control and containment measures specified in the SPCC Plan that would be prepared for the Proposed Action.
Prescription 2.8.3 Fisheries Guideline 1: Where feasible, restore connectedness of disjunct populations and enhance fish passage for native fish.	Culverts would be installed to conform to the natural streambed and slope so that a minimum depth of water is always available in the culvert for fish passage. Thus, the Proposed Action would comply with BLM and USFS standards and guidelines requiring the maintenance of instream flows and would not fragment fish habitats or prevent fish migration.
Prescription 2.8.3 Roads and Trails Standard 1: All new and replaced culverts, both permanent and temporary, shall be designed and installed to meet desired conditions for riparian and aquatic species.	Culverts would be installed to conform to the natural streambed and slope so that a minimum depth of water is always available in the culvert for fish passage. Thus, the Proposed Action would comply with BLM and USFS standards and guidelines requiring the maintenance of instream flows and would not fragment fish habitats or prevent fish migration.
Prescription 2.8.3 Roads and Trails Guideline 1: Avoid constructing roads within the AIZ unless there is no practical alternative.	The proposed haul road would impact 28 acres of AIZ. Impacts would be mitigated to the extent feasible to reduce impacts to desired AIZ attributes. Measures would be implemented to reduce erosion and sedimentation.
Prescription 2.8.3 Roads and Trails Guideline 2: Culverts (permanent and temporary) should be sized so that the probability of flow exceedance is 50 percent or less during the time the culvert is expected to be in place. Consider bedload and debris when sizing culverts.	Culverts would be installed to conform to the natural streambed and slope so that a minimum depth of water is always available in the culvert for fish passage. Culverts would be designed to accommodate 100-year, 24-hour or 50-year, 24-hour flow conditions, as detailed in **Table 2.3-**

Table 4.7-2 Compliance with Applicable Caribou Forest Plan Standards and Guidelines for Fisheries and Aquatic Resources under Proposed Action

Standard/Guideline	Compliance under Proposed Action
	6, and would follow the guidance of the Federal Lands Highway Project Development and Design Manual for high-standard roads on federal lands.
Prescription 2.8.3 Roads and Trails Guideline 3: When feasible, use bridges, arches, and open-bottom culverts in fish-bearing streams.	Culvert design would follow the guidance of the Federal Lands Highway Project Development and Design Manual for high-standard roads on federal lands (FHWA 2014). Culverts would be designed to maintain stream flows but would not necessarily be constructed with open bottoms.
Prescription 2.8.3 Roads and Trails Guideline 4: Avoid placing ditch relief culverts where they may discharge onto erodible slopes or directly into streams.	This guideline would be met under the Proposed Action. Agrium will avoid placing ditch relief culverts where they may discharge onto erodible slopes or directly into streams. All culverts will be designed to minimize erosion as per the guidance of the Federal Lands Highway Project Development and Design Manual for high-standard roads on federal lands (FHWA 2014).
Prescription 2.8.3 Roads and Trails Guideline 5: Where feasible, install cross-drainage above stream crossings to prevent ditch sediments from entering streams.	This guideline would be met under the Proposed Action. Where feasible, Agrium will consider installing cross-drainage above stream crossings. Further, ditches and sediments and erosion associated with any other area of impact will be mitigated.
Prescription 2.8.3 Roads and Trails Guideline 6: New or reconstructed roads and trails should cross the AIZ riparian areas as perpendicular as possible.	The proposed haul road would impact 28 acres of AIZ, and part of the haul road would run parallel to Angus Creek. However, impacts would be mitigated to the greatest extent feasible to reduce impacts to desired AIZ attributes.
Prescription 2.8.3 Roads and Trails Guideline 7: Avoid making channel changes on streams or drainages.	This guideline would be met under the Proposed Action. Culverts on drainages would be installed to conform to the natural streambed and slope as to avoid channel changes.
Prescription 2.8.3 Roads and Trails Guideline 8: Design and install drainage crossings to reduce the chances of turning stream flows down the road prism in case of a blocked or overflowing culvert.	This guideline would be met under the Proposed Action. Culverts would be installed to conform to the natural streambed and slope so as to not impact flow in the channel.
Prescription 2.8.3 Roads and Trails Guideline 9: Road drainage patterns should avoid disruption of natural hydrologic flow paths.	This guideline would be met under the Proposed Action. Roads have been designed such that drainage patterns would not disrupt natural hydrologic low paths.

Source: USFS 2003

4.7.1.2 Rasmussen Collaborative Alternative

4.7.1.2.1 Aquatic Habitat

The RCA would not directly impact any acres of wetland habitat or intermittent and perennial stream channels compared with 20.5 acres under the Proposed Action. Because project disturbance, including construction of the haul road, would occur in upland habitats under the RCA, direct and indirect impacts to aquatic habitat would be avoided. Implementation of erosion control measures would help to prevent sediment and runoff water from flowing into streams. Because of the incorporation of BMPs (**Section 4.5.1.1.2**) into the design of the RCA, and avoidance of direct impacts, overall impacts to aquatic habitats would be negligible under the RCA.

The capture of surface runoff during active mining would decrease the quantity of water in streams and wetlands downstream of the Study Area over the short term. As explained in **Section 4.3.1**, the area of captured runoff equates to 4 percent of the Angus Creek-Blackfoot River sub-watershed and 0.03 percent of the Lower Lanes Creek sub-watershed. The reduced quantity of water may result in the localized drying of some aquatic habitats downstream of the Study Area over the short term. Following reclamation, runoff to nearby streams and wetlands is predicted to increase relative to pre-mining conditions as a result of the cover design, which increases runoff.

The RCA would also result in direct impacts to 10 acres of AIZ, which is 70 fewer acres than under the Proposed Action. The minimal loss of stream habitat and AIZ function would result in direct and indirect impacts to cutthroat trout and other native fishes that would be potentially long-term, local, and negligible (**Section 4.7.1.2.3**).

4.7.1.2.2 Macroinvertebrates

Impacts to macroinvertebrates under the RCA would be reduced compared with those under the Proposed Action. Macroinvertebrates have the potential to be impacted by sedimentation and changes to the AIZ, which change the physical characteristics of the aquatic environment. There would only be 10 acres of direct impacts to the AIZ under the RCA, compared with 80 acres under the Proposed Action.

In contrast to the Proposed Action, the RCA would result in no measureable loading of selenium and other COPCs into surface waters because of the elimination of external overburden piles downslope of the mine. Exposure of macroinvertebrates to selenium or other COPCs is not anticipated under the RCA. Overall, the RCA would have a long-term, negligible impact on aquatic macroinvertebrates in wetlands and waters downstream of the Study Area.

4.7.1.2.3 Fish

The two differences between the Proposed Action and the RCA that would affect fisheries and aquatic resources are as follow:

- The elimination of all external overburden piles downslope from the pit would eliminate the potential for COPC loading to surface water.
- The elimination of the Proposed Action haul road across the Rasmussen Valley would eliminate eight surface water crossings, and there would only be 2 acres of direct impacts to AIZ associated with the haul road proposed under the RCA, compared with 28 acres under the Proposed Action.

The RCA would eliminate the use of external overburden piles downslope of the mine pit. Source of loading of COPCs via shallow groundwater migration under the Proposed Action is the seepage from the external overburden piles. Eliminating all external overburden stockpiles downslope of the Rasmussen Valley Mine pit would eliminate the source of COPCs in shallow groundwater; hence, there would be no impacts to surface water quality from COPC loading under the RCA. Based on the modeling results, all COPC concentrations in groundwater before mixing with surface water features are predicted to meet applicable surface water standards. Therefore, exposure of fish to selenium or other COPCs is not anticipated under the RCA.

No crossings of fish-bearing streams would be required under the RCA. Several seasonal mountain drainages would be crossed by the haul road, and culverts would be constructed at these crossings to maintain surface flows and minimize sedimentation to the watershed. Thus, the RCA would comply with BLM and USFS standards and guidelines requiring the maintenance of instream flows and would not fragment fish habitats or prevent fish migration.

Overall, the RCA would have a short-term, negligible impact on fish populations in wetlands and waters downstream of the Study Area.

4.7.1.2.4 Amphibians and Reptiles

As a result of the avoidance of most wetland and aquatic habitat under the RCA, impacts on amphibians and reptiles would be negligible. Over the short term, direct mortalities to individual amphibians and reptiles may occur on the haul road as individuals travel between wetland habitats. The placement of culverts and mine runoff into seasonal mountain drainages could introduce sediments into habitats used by amphibians and reptiles. Compared with the Proposed Action, long-term impacts of sedimentation would be more localized and less severe because the RCA would avoid crossings of perennial water bodies that support amphibian populations and would not directly impact any wetland or non-wetland WOUS acres.

Indirect effects could also adversely affect amphibian populations including short-term localized drying of wetlands as a result of capture of surface runoff during active mining. Compared with the Proposed Action, the RCA would carry no potential to affect amphibian and reptile populations through the introduction of COPCs into the watershed. Impacts on amphibians and reptiles from the RCA would be long-term and negligible.

Table 4.7-3 summarizes compliance with the PFO ARMP with regard to fisheries and aquatic resources under the RCA.

Table 4.7-3 Compliance with Applicable PFO ARMP Goals, Objectives, and Actions for Fisheries and Aquatic Resources under the RCA

Goal/Objective/Action	Compliance under RCA
Action SW-2.1.4. Stream crossings, if necessary, will be designed to minimize adverse impacts on soils, water quality, and riparian vegetation and provide for fish passage as appropriate.	No crossings of fish-bearing streams would be necessary under the RCA. Culverts on seasonal mountain drainages would be installed to conform to the natural streambed and slope so that natural flows are not impeded. Thus, the RCA would comply with BLM and USFS standards and guidelines requiring the maintenance of instream flows and would not fragment fish habitats or prevent fish migration.
Action SW-2.1.5. As appropriate, roads and trails adjacent to streams or riparian areas that impact water quality may be redesigned, repaired, maintained, or re-located to a location not impacting the water quality.	The RCA would conform to this action. The RCA would avoid perennial stream crossings and would avoid impacts to wetlands and riparian areas. Roads constructed under the RCA are not anticipated to significantly impact water quality because of the implementation of BMPs to control sedimentation and runoff.
Action ME-2.2.2. The following operation standards and guidelines would be applied as appropriate to reduce environmental impacts from mineral exploration and development operations: **OPERATIONAL STANDARDS:** 1. Locate surface disturbing activities, including support facilities, outside riparian zones (e.g., riparian habitat conservation areas (RHCAs) or areas where surface disturbance will impact the PFC of the riparian areas) and fish bearing waters. Cutthroat trout guidance will be considered as identified in Appendix C of the	This action would be met under the RCA, as this alternative was designed, in part, to minimize impacts to streams and wetlands. RCA disturbance would occur in upland habitats. There would be 10 acres of direct impacts to the AIZ.

Table 4.7-3 Compliance with Applicable PFO ARMP Goals, Objectives, and Actions for Fisheries and Aquatic Resources under the RCA

Goal/Objective/Action	Compliance under RCA
ARMP. Where no feasible alternative site exists, operate and construct facilities in ways that will avoid or reduce impacts on riparian zone attributes.	

Source: BLM 2012a

Table 4.7-4 summarizes compliance with the CNF RFP with regard to fisheries and aquatic resources under the RCA. The following standards and guidelines pertaining to aquatic resources were also reviewed and found to be not applicable to the RCA because they are specific to unrelated management or development practices:

- Prescription 2.8.3 (AIZ) Fire/Fuels Guidelines 1 through 5
- Prescription 2.8.3 (AIZ) Lands Standard 2
- Prescription 2.8.3 (AIZ) Lands Guidelines 2 through 5
- Prescription 2.8.3 (AIZ) Minerals/Geology Guidelines 2 through 3 and 5
- Prescription 2.8.3 (AIZ) General Riparian Area Management Standard 1
- Prescription 2.8.3 (AIZ) Fisheries Guidelines 2 through 3
- Prescription 2.8.3 (AIZ) Wildlife Standard 1
- Prescription 2.8.3 (AIZ) Access Standard 1
- Prescription 2.8.3 (AIZ) Fisheries Guidelines 2 through 3
- Prescription 2.8.3 (AIZ) Recreation Standards 1 and 2 and Guideline 1
- Prescription 2.8.3 (AIZ) Grazing Management Standards 1 and 2 and Guidelines 1 and 2
- Prescription 2.8.3 (AIZ) Timber Standard 1 and Guidelines 1 and 2

Table 4.7-4 Compliance with Applicable Caribou Forest Plan Standards and Guidelines for Fisheries and Aquatic Resources under the RCA

Standard/Guideline	Compliance under the RCA
Forest-wide Direction **Amphibians Guideline 3:** Maintain amphibian habitats when developing and modifying springs and wetlands.	This guideline would be met under the RCA, as the RCA was designed to avoid most impacts to wetland and riparian habitat.
Prescription 2.8.3 Lands Standard 1: Special use authorizations for new projects involving instream facilities shall maintain minimum instream flows to maintain or improve desired AIZ attributes.	No crossings of fish-bearing streams would be necessary under the RCA. Culverts on seasonal mountain drainages would be installed to conform to the natural streambed and slope so that natural flows are not impeded. Thus, the RCA would comply with BLM and USFS standards and guidelines requiring the maintenance of instream flows and would not fragment fish habitats or prevent fish migration.
Prescription 2.8.3 Minerals/Geology Guideline 1: Locate new structures, support facilities, and roads outside AIZs. Where no alternative to siting facilities in AIZs exists, locate and construct the facilities in ways that avoid or reduce impacts to desired AIZs attributes. Where no alternative to road construction exists, keep roads to the minimum necessary for the approved mineral activity.	This guideline would be met under the RCA, as this alternative was designed, in part, to minimize impacts to streams and wetlands. RCA disturbance would occur in upland habitats. There would be 10 acres of direct impacts to the AIZ.

Table 4.7-4 Compliance with Applicable Caribou Forest Plan Standards and Guidelines for Fisheries and Aquatic Resources under the RCA

Standard/Guideline	Compliance under the RCA
Prescription 2.8.3 Minerals/Geology Guideline 4: Do not locate debris, mine overburden, excess material, leaching pads, and other facilities within Aquatic Influence Zones, unless no other alternatives are available. If no other alternative exists, ensure that safeguards are in place to prevent release or drainage of toxic or other hazardous materials onto these lands.	This guideline would be met under the RCA. There would be 10 acres of direct impacts to the AIZ.
Prescription 2.8.3 General Riparian Area Management Guideline 1: Felled trees should remain on site when needed to meet woody debris objectives and desired AIZ attributes.	If felled trees being removed are not within the AIZ or there are no trees within the AIZ, this guideline would be met. If felled trees are within the AIZ, they will be removed only if necessary for construction of the project.
Prescription 2.8.3 General Riparian Area Management Guideline 2: Use herbicides, pesticides, and other toxicants and chemicals only as needed to maintain desired AIZ attributes.	This guideline would be met under the RCA. Agrium would adhere to federal and state requirements for herbicide and pesticide use and use these chemicals only where necessary.
Prescription 2.8.3 General Riparian Area Management Guideline 3: Avoid storage of fuels and other toxicants or refueling within AIZs unless there are no other alternatives. Any refueling sites within an AIZ should have an approved spill containment plan.	This guideline would be met under the RCA. The fuel storage area would be located outside of the AIZ, and Agrium would implement spill control and containment measures specified in the SPCC Plan that would be prepared for the RCA.
Prescription 2.8.3 Fisheries Guideline 1: Where feasible, restore connectedness of disjunct populations and enhance fish passage for native fish.	No crossings of fish-bearing streams would be necessary under the RCA. Culverts on seasonal mountain drainages would be installed to conform to the natural streambed and slope so that natural flows are not impeded. Thus, the RCA would comply with BLM and USFS standards and guidelines requiring the maintenance of instream flows and would not fragment fish habitats or prevent fish migration.
Prescription 2.8.3 Roads and Trails Standard 1: All new and replaced culverts, both permanent and temporary, shall be designed and installed to meet desired conditions for riparian and aquatic species.	No crossings of fish-bearing streams would be necessary under the RCA. Culverts on seasonal mountain drainages would be installed to conform to the natural streambed and slope so that natural flows are not impeded. Thus, the RCA would comply with BLM and USFS standards and guidelines requiring the maintenance of instream flows and would not fragment fish habitats or prevent fish migration.
Prescription 2.8.3 Roads and Trails Guideline 1: Avoid constructing roads within the AIZ unless there is no practical alternative.	This guideline would be met under the RCA. The proposed haul road would impact 2 acres of AIZ.
Prescription 2.8.3 Roads and Trails Guideline 2: Culverts (permanent and temporary) should be sized so that the probability of flow exceedance is 50 percent or less during the time the culvert is expected to be in place. Consider bedload and debris when sizing culverts.	This guideline would be met under the RCA. Culverts would be designed to accommodate 100-year, 24-hour or 50-year, 24-hour flow conditions, as detailed in **Table 2.3-6,** and would follow the guidance of the Federal Highway Administration Design Manual for high-standard roads on federal lands.
Prescription 2.8.3 Roads and Trails Guideline 3: When feasible, use bridges, arches, and open-bottom culverts in fish-bearing streams.	This guideline would be met under the RCA. No crossings of fish-bearing streams would be necessary under this alternative.
Prescription 2.8.3 Roads and Trails Guideline 4: Avoid placing ditch relief culverts where they may discharge onto erodible slopes or directly into streams.	This guideline would be met under the RCA. Agrium will avoid placing ditch relief culverts where they may discharge onto erodible slopes or directly into streams. All culverts will be designed to minimize erosion as per the requirements of the Federal Lands Highway Project

Table 4.7-4 Compliance with Applicable Caribou Forest Plan Standards and Guidelines for Fisheries and Aquatic Resources under the RCA

Standard/Guideline	Compliance under the RCA
	Development and Design Manual for high-standard roads on federal lands.
Prescription 2.8.3 Roads and Trails Guideline 5: Where feasible, install cross-drainage above stream crossings to prevent ditch sediments from entering streams.	This guideline would be met under the RCA. Where feasible, Agrium will consider installing cross-drainage above stream crossings. Further, ditches and sediments and erosion associated with any other area of impact will be mitigated.
Prescription 2.8.3 Roads and Trails Guideline 6: New or reconstructed roads and trails should cross the AIZ riparian areas as perpendicular as possible.	This guideline would be met under the RCA. The proposed haul road would impact only 2 acres of AIZ and crosses as perpendicular as possible.
Prescription 2.8.3 Roads and Trails Guideline 7: Avoid making channel changes on streams or drainages.	Culverts on seasonal mountain drainages would be installed to conform to the natural streambed and slope so as to not impact flow in the channel.
Prescription 2.8.3 Roads and Trails Guideline 8: Design and install drainage crossings to reduce the chances of turning stream flows down the road prism in case of a blocked or overflowing culvert.	This guideline would be met under the RCA. Culverts on seasonal mountain drainages would be installed to conform to the natural streambed and slope so that natural flows are not impeded.
Prescription 2.8.3 Roads and Trails Guideline 9: Road drainage patterns should avoid disruption of natural hydrologic flow paths.	This guideline would be met under the RCA. Roads have been designed as to no disrupt the natural hydrologic flow paths in the area.

Source: USFS 2003

4.7.1.3 No Action Alternative

Under the No Action Alternative, the federal phosphate leases would not be developed. The No Action Alternative would result in no new impacts to aquatic resources in the Study Area. The No Action Alternative would maintain the current status of aquatic resources and populations in and around the Study Area. However, this does not preclude future development of the federal phosphate leases under a different mine plan.

4.7.2 Irreversible and Irretrievable Commitment of Resources

Under the Proposed Action, the loss of wetland/riparian vegetation and alteration of AIZ is considered a long-term, irreversible commitment of aquatic habitat resources. Impacted wetlands, riparian areas, and AIZ would be re-seeded with upland vegetation, and while off-site mitigation may be required to offset wetland impacts under the CWA, the loss of wetland and riparian habitat and conversion of AIZ to upland habitat within the analysis area would be considered irreversible. This long-term, irreversible commitment of resources would be much less under the RCA, as there would only no direct disturbance to wetlands or non-wetland WOUS and 10 acres of direct disturbance to AIZ, compared with 20.5 acres and 80 acres, respectively, under the Proposed Action. The irreversible and irretrievable alteration of aquatic habitat would affect fish-bearing streams (Angus Creek and tributaries) under the Proposed Action but not under the RCA. Therefore, the RCA would not have any irreversible or irretrievable effects on fish populations.

4.7.3 Unavoidable Residual Adverse Effects

Unavoidable residual adverse effects of the Proposed Action and RCA would include the long-term loss of wetland and riparian habitat and alteration of AIZ vegetation within the Study Area. The residual loss of aquatic habitat would be greater under the Proposed Action, which would directly impact more wetland and riparian habitat and AIZ than the RCA.

4.7.4 Mitigation Measures

Agrium would design and implement BMPs to control erosion, sedimentation, and the release of COPCs to protect surface waters in and around the Proposed Action, as described in **Section 4.3.4**. Agrium would limit the surface area of Meade Peak overburden that would be exposed at any given time through direct backfilling. Under the Proposed Action, Agrium would cap backfilled areas with a 5-foot-thick cover. Under the RCA, a 6-foot-thick store-and-release cover would be installed on backfilled areas. Additionally, surface water drainage diversion structures would be constructed before each mining phase to intercept runoff before it reaches the pit, thereby reducing runoff water contact with Meade Peak-containing material. COPCs in dust would be mitigated or minimized by the application of water and, as necessary, supplemented with dust suppressants such as magnesium chloride or calcium chloride. Collectively, these measures would limit inputs of sediment and COPCs into Angus Creek and the Blackfoot River, which would minimize the potential for degradation of aquatic habitat.

Culverts would be constructed to convey natural drainages under potential linear obstructions, such as haul roads or county roads, to limit impacts from stream crossings. Under the Proposed Action, this would maintain passage for aquatic species, including fish and amphibians. No crossings would be constructed across fish-bearing streams under the RCA.

A SPCC Plan would be developed before construction and operations, providing direction for preventing and controlling potential spills; describing the aboveground tanks and secondary containment structures for bulk petroleum products, solvents, and antifreeze; identifying the routine monitoring requirements; and describing BMPs for managing the COPCs. The SPCC Plan would help to minimize the potential for releases of petroleum products into downstream waters and thus help to protect aquatic habitat.

The surface water monitoring network to monitor compliance with IDEQ water quality standards is discussed in the EMP (**Appendix B**). As part of the EMP, Agrium would monitor water quality to determine whether mine-related increases in COPCs were occurring in downstream waters. The EMP would provide flexibility for Agrium to conduct additional macroinvertebrate or fish sampling, if determined to be necessary based on water sampling results, and to employ mitigation measures if determined to be necessary in the future.

4.8 THREATENED, ENDANGERED, OR SENSITIVE SPECIES

Issue: What is the potential for impact to threatened, endangered, or sensitive species through mortality and displacement?

Indicators:

- Disruption of movement corridors between habitat areas
- Disruption and displacement of threatened, endangered, or sensitive species at lek, nest, or roost sites
- Disturbance to threatened, endangered, or sensitive species from noise and mining activity
- Mortality of threatened, endangered, and sensitive species through vehicle and power line collisions

Issue: What is the potential to impact threatened, endangered, or sensitive species through habitat removal and alteration?

Indicators:

- Acres of habitats for threatened, endangered, or threatened species physically disturbed and reclaimed
- Changes in predator/prey interactions for threatened, endangered, or sensitive species

Issue: What is the potential exposure to toxic substances such as selenium or other COPCs to threatened, endangered, or sensitive species?

Indicators:

- Expected concentrations of selenium or other COPCs in vegetation and surface waters

4.8.1 Direct and Indirect Impacts

4.8.1.1 Proposed Action

4.8.1.1.1 Threatened, Endangered, Proposed, and Candidate Species

As discussed in **Section 3.8.1**, the Canada lynx and North American wolverine are the only federally listed species (threatened) with potential to occur in or near the Proposed Action. In accordance with Section 7 consultation requirements under the ESA, a Biological Assessment (BA) was prepared using the process prescribed by the U.S. Fish and Wildlife Service (USFWS) and concurrence will be obtained from the USFWS before any ROD is signed and will document the potential impacts to Canada lynx and North American wolverine, discussed below, from the selected alternative.

Canada Lynx

The primary impact of the Proposed Action on Canada lynx would be the disruption of their movement through linkage habitat. This impact may result from noise, human activity, and small-scale habitat removal (as discussed below), but is expected to be negligible, as any lynx occurrence is likely to be limited to transient use of linkage habitat (as explained in **Section 3.8.1.1**). For this reason, the potential for lynx exposure to COPCs is also expected to be negligible.

The year-round noise and human activity associated with the construction and active mining phase of the Proposed Action would likely influence lynx, if present, to travel around the periphery of the Study Area rather than directly through it. Therefore, the potential for direct impacts to lynx from Proposed Action mining activities (e.g., vehicle collision) would be negligible.

The Proposed Action area of disturbance would be 5 miles wide (measured northwest to southeast). Assuming that the entire Proposed Action footprint is potential linkage habitat (USFS 2007), there could be a 5-mile-wide impact of disturbance. However, after active mining, the majority of disturbance would be reclaimed with grasses and shrubs, and human presence in the area would be minimal. Over the long term (110 years), reclaimed areas would be expected to recover to habitat composition similar to baseline conditions. Therefore, there would be little impact on lynx movement through the region over the long term. Thus, a determination was made that the Proposed Action may affect, but is not likely to adversely affect, the Canada lynx.

Compliance with applicable USFS and BLM directions for Canada lynx is summarized in **Table 4.8-1**. In addition, the following management direction was reviewed and found to not be applicable to a phosphate mine project:

- CNF RFP (USFS 2003) Lands Objective 1 and Lands Standard 1

Note that Agrium, where appropriate, will reference the 2013 Canada Lynx Conservation Assessment Strategy as best available science when implementing measures per the USFS and BLM plans.

Table 4.8-1 Compliance with USFS Management Direction for Canada Lynx under the Proposed Action

Source	Management Direction	Compliance under Proposed Action
2003 Caribou Forest Plan	**Forest Vegetation DFC 1**: Forested habitats display a diversity of structure and composition. Productive and diverse populations of plants are maintained or restored.	The Proposed Action would not hinder attainment of or progress towards this DFC. There would be an estimated permanent removal of 83 acres of forested habitat. On a forest-wide scale, this is minor and insignificant, amounting to only 1.5 percent of the total 550,000 acres of forested habitat available in the CNF (USFS 2003).
	Forest Vegetation DFC 2: In conifers, a range of structural stages exists where 30 to 40 percent of the acres are in mature and old age classes. Early successional stages are maintained through endemic insect and disease disturbance, vegetation management and fire. Patterns are within historical ranges of variability with functional corridors present.	The Proposed Action would not hinder this DFC. No conifer habitat would be affected.
	Forest Vegetation DFC 3: Conifer types are maintained and disturbance processes are restored through vegetation management, endemic insect / disease disturbances, & fire.	The Proposed Action would not hinder attainment of or progress towards this DFC. No conifer habitat would be affected.
	Forest Vegetation DFC 4: Quaking aspen communities are moving towards historical ranges with fire and other practices influencing structural class distribution and patterns across the landscape. Aspen forests are managed to achieve desired vegetative conditions with 20 to 30 percent in mature and old age classes, and to reduce the decline of aspen acres as a result of succession of aspen to conifer.	The Proposed Action would not hinder attainment of or progress towards this DFC. Impacts to aspen communities would be minor (83 acres). Currently, 93 percent of the aspen stands in the 5th code HUC are in old/mature age classes based on USFS mapping. All of the aspen stands that would be impacted under the Proposed Action are in mature/old age classes. On-site inventory showed that no acres that currently meet Region Four "Old-growth" definitions would be impacted on USFS lands. Therefore, the Proposed Action would not negatively impact the distribution of aspen forest age classes and would be consistent with maintaining at least 20 percent mature/old age classes in the 5th code HUC that encompasses the Study Area.
	Non-forest DFC-1: Non-forested ecosystems: are resilient, diverse, and functioning within their site potential; display a diversity of structure and composition; and are within their historical range of variability (HRV).	The Proposed Action would not hinder attainment of or progress towards this DFC. Impacts to non-forested ecosystems would largely be temporary, and they would be reclaimed with a variety of native plant species.
	Non-forest DFC-2: Non-forested ecosystems reflect a mosaic of multiple-aged shrubs, forbs, and native grasses with management emphasis on maintaining a diverse sustainable plant community.	The Proposed Action would not hinder attainment of or progress towards this DFC. Impacts to non-forested ecosystems would largely be temporary, and they would be

Table 4.8-1 Compliance with USFS Management Direction for Canada Lynx under the Proposed Action

Source	Management Direction	Compliance under Proposed Action
	Fire regimes exist on an approximate 20 to 40 year return cycle. Patterns are within historical ranges with 30 to 50 percent of the shrubs in greater than fifteen percent canopy cover class.	reclaimed with a variety of native plant species. Over the long term, reclaimed areas would recover to big sagebrush and high-elevation rangeland habitat types similar to baseline conditions.
	Non-forest DFC-3: Rehabilitation or restoration of native shrub communities is accomplished, where site potential permits.	The Proposed Action would not hinder attainment of or progress towards this DFC. Over the long term, reclaimed areas are expected to recover to big sagebrush and high-elevation rangeland habitat types similar to baseline conditions.
	Non-forest DFC-4: On areas capable of tall forb dominance, tall forb types reflect historical ranges of ground cover leading into the winter season. Composition reflects a mosaic dominance of tall forb indicator species. Disturbance regimes demonstrate stable or upward trend in tall forb indicator species. Patterns are within the historical range. Historical tall forb sites, which currently are not capable of tall forb dominance, are managed to maintain watershed stability.	The Proposed Action would not hinder attainment of or progress towards this DFC. Tall forbs would re-establish in reclaimed areas from surrounding habitats.
	Non-forest DFC-5: Woodland types including mountain mahogany, juniper and maple have multiple-aged shrub layers and a balanced shrub/herbaceous understory. Patterns are within historical ranges.	The Proposed Action would not hinder attainment of or progress towards this DFC. The Study Area does not contain these woodland types.
	Vegetation Goal 1: Diverse forested and non-forested ecosystems are maintained within their historic range of variability or restored through time with emphasis on aspen, aspen-conifer, mixed conifer, big sagebrush, mountain brush and tall forbs.	Short-term impacts of the Proposed Action would not be consistent with this goal; however, after reclamation activities were completed and the site had recovered to high-elevation rangeland habitat (110 years), the goal would be met.
	Vegetation Goal 2: Aspen forests are managed to reduce or halt the decline of aspen acres as a result of succession of aspen to conifer.	The Proposed Action would be inconsistent with this goal, as it would permanently remove 83 acres of aspen. However, lost aspen habitat would be expected to return to high-elevation rangeland (not conifer habitat), which over time and through succession could eventually return to aspen habitat.
	Vegetation Goal 3: Forested ecosystems are moving towards a balance of age and size classes in each forested vegetation type on a watershed or landscape scale. Early seral species are recruited and sustained while still providing a diversity of successional stages.	The Proposed Action would be consistent with the attainment of or progress towards this goal. The removal of 83 acres of forest habitat would not impact the distribution of forest stand age classes on the Forest or at the landscape scale. Currently, 93 percent of the aspen stands in the 5th code HUC are in old/mature age classes based on USFS mapping. All of the aspen stands that would be impacted under the Proposed Action are in mature/old age classes. On-site inventory showed that no acres that currently meet Region Four “Old-growth” definitions would be impacted on USFS lands. Therefore, the Proposed Action would not negatively impact the distribution of aspen forest age classes and would be consistent with maintaining at least 20 percent mature/old age classes in the 5th code HUC that encompasses the Study Area.

Table 4.8-1 Compliance with USFS Management Direction for Canada Lynx under the Proposed Action

Source	Management Direction	Compliance under Proposed Action
	Vegetation Goal 4: Sagebrush steppe and mountain shrub habitats are moving toward a balance of age, canopy cover, and size class on a watershed or landscape scale that is within their HRV.	The Proposed Action would be consistent with attainment of or progress towards this goal after reclamation activities were completed and the site had recovered to big sagebrush and high-elevation rangeland habitat types.
	Vegetation Goal 7: Biodiversity is maintained or enhanced by managing for a diverse array of habitats tied to natural process occurrence and distribution of plant communities.	The Proposed Action would be consistent with attainment of or progress towards this goal. Habitat changes resulting from the Proposed Action would be localized to the mine footprint. Maintenance of existing biodiversity on the Forest is expected.
	Vegetation Standard 2: In each 5th code HUC which has the ecological capability to produce forested vegetation, the combination of mature and old age classes (including old growth) shall be at least 20 percent of the forested acres. At least 15 percent of all the forested acres in the HUC are to meet or be actively managed to attain old growth characteristics.	The Proposed Action would be consistent with this standard. Currently, 93 percent of the aspen stands in the 5th code HUC are in old/mature age classes based on USFS mapping. All of the aspen stands that would be impacted under the Proposed Action are in mature/old age classes. On-site inventory showed that no acres that currently meet Region Four "Old-growth" definitions would be impacted on USFS lands. Therefore, the Proposed Action would not negatively impact the distribution of aspen forest age classes and would be consistent with maintaining at least 20 percent mature/old age classes in the 5th code HUC
	Wildlife Goal 2: Wildlife biodiversity is maintained or enhanced by managing for vegetation and plant communities within their historical range of variability.	The Proposed Action would be consistent with attainment of or progress towards this goal. Habitat changes resulting from the Proposed Action would be localized to the mine footprint. Maintenance of existing wildlife biodiversity on the Forest is expected.
	Wildlife Goal 3: Maintain multiple vegetation layers in woody riparian habitats that are stable or increasing with all age classes (seedlings, young plants, mature and decadent) represented to support native bird communities and other wildlife.	Three acres of woody riparian habitat (shrub/scrub wetland) would be permanently removed under the Proposed Action. This minimal impact is not expected to hinder attainment of the goal.
	Wildlife Goal 5: Maintain, and where necessary and feasible, provide for habitat connectivity across forested and non-forested landscapes.	The Proposed Action would be consistent with attainment of or progress towards this goal. Over the short term, the haul road and other mine facilities would fragment some of the shrub habitats in the Study Area, but these areas would be reclaimed following active mining; therefore, habitat connectivity would not be impacted over the long term.
2012 BLM CFO ARMP	**Goal FW-2**: Provide for the diversity of native and non-native species as part of an ecologically healthy system.	The Proposed Action would be consistent with this goal because plant species richness on reclaimed areas is anticipated to be similar to baseline species richness. Over the long term (110 years), reclaimed areas are predicted to recover to high-elevation rangeland habitat.
	Objective FW-2.1: Maintain or improve native and desired non-native species habitat and the connectivity among habitats.	The Proposed Action would be consistent with this goal because plant species richness on reclaimed areas is anticipated to be similar to baseline species richness. Over the long term (110 years), reclaimed areas are predicted to recover to high-elevation rangeland habitat. The Proposed Action is not anticipated to

Table 4.8-1 Compliance with USFS Management Direction for Canada Lynx under the Proposed Action

Source	Management Direction	Compliance under Proposed Action
		significantly disrupt habitat connectivity over the long term.
	Goal SS-1: Manage special status species and their habitats to provide for their continued presence and conservation as part of an ecologically healthy system.	The Proposed Action would be consistent with this goal. Most disturbed habitat (linkage habitat) would be reclaimed and is expected to recover to high-elevation rangeland over the long term.
	Objective SS-1.1: Conserve, inventory, and monitor species status species.	Agrium contracted TRC to conduct baseline lynx surveys from 2010 to 2012 (TRC 2012a, 2012b, 2012c).
	Action SS-1.1.1: USFWS will be consulted consistent with ESA requirements.	The BLM and the USFS have consulted and would continue to consult with the USFWS per all applicable ESA requirements.
	Action SS-1.1.3: Appropriate actions, conservation measures, and guidelines that contribute to the continued presence and conservation of special status species will be considered.	Impacts to lynx are expected to be minor and insignificant. As such, mitigation measures specific to lynx have not been determined to be necessary.
	Objective SS-1.2: Maintain or improve the quality of listed species habitat by managing public land activities to support species recovery and the benefit of those species.	Eighty-three acres of aspen habitat would be permanently lost under the Proposed Action. However, over the long term, 96 percent of disturbed areas would be reclaimed to high-elevation rangeland, and the Proposed Action would not hinder habitat connectivity in the linkage area. Therefore, it would not negatively impact lynx recovery.
	Action SS-1.2.1: Consistent with ESA requirements, the USFWS will be consulted regarding activities concerning listed species.	The BLM and the USFS have consulted and would continue to consult with the USFWS and other Agencies as needed.
	Action SS-1.2.2**:** Identified actions to maintain or improve listed species habitat will be modified through the ESA consultation process.	No actions to maintain or improve listed species habitat have yet been identified through the ESA consultation process. Such actions are not anticipated to be necessary because the Proposed Action is expected to have minor but insignificant impacts on lynx and linkage habitat.
	Action SS-1.2.3: Seasonal restrictions will be implemented for listed species.	Seasonal restrictions are not planned for lynx, as the Study Area is in a linkage area that is not regularly used by lynx.

Source: USFS 2007, 2003; BLM 2012a; Interagency Lynx Biology Team 2013

North American Wolverine

As discussed in **Table 3.8-1**, wolverine use of the Study Area is likely limited to occasional transitory movements of individual wolverines. Therefore, the primary impact of the Proposed Action on the wolverine would be the disruption of wolverine movement through the general area. Disruption of movement (anything that could influence wolverines, if present, to travel around the periphery of the Study Area) could result from habitat removal, noise, human activity, or impacts to distribution of prey (e.g., the potential for prey such as big game to avoid the mine site could influence wolverines to hunt outside the mine site). Generally, disruption to wolverine movement from these impacts is expected to be negligible given the species' wide-ranging nature and irregular use of the site. If wolverines do pass through the area during construction, mining, or reclamation, they could be at risk of vehicle collision along the haul road. Again, because of irregular use of the site, collision with vehicles is expected to be rare. Further, it is more likely that wolverines would travel around the edges of the mine rather than along the haul roads during periods of increased human activity.

As described in **Section 3.3.1**, baseline surface water quality data indicate that streams and tributaries in and near the Study Area exhibit chemical levels, particularly for selenium, that exceed Idaho Cold-Water Aquatic Life Standards CCCs. Therefore, wolverines could continue to be exposed to significant levels of COPCs (via drinking contaminated water or eating prey exposed to COPCs) whether the Proposed Action is built or not. As summarized in **Section 4.3.1.1.4**, the Proposed Action carries the potential to impact water quality in Blackfoot River, Angus Creek, and springs and wetlands in the Study Area. Potential impacts include the increase of concentrations of COPCs as listed in **Table 4.3-1**. Therefore, wolverines could be at risk of added COPCs exposure under the Proposed Action. However, this risk is expected to be negligible given species' wide-ranging nature and irregular use of the site, which would lead to negligible and short-term exposure to the COPCs.

Overall, there is no potential for wolverine denning in the Study Area. Impacts are therefore expected to be limited to transient individuals, if present, during construction, mining, and reclamation. Because of the likely infrequent and wide-ranging nature of the wolverine in the Study Area, disruption to movement associated with aforementioned impacts and exposure to COPCs are expected to be negligible. For these reasons, a determination was made that the Proposed Action is not likely to jeopardize the continued existence of the species or result in destruction or adverse modification of proposed critical habitat.

The CNF RFP (USFS 2003) includes the following guideline for the wolverine: Restrict intrusive human disturbance within 1 mile around known active den sites, March 1 to May 15. The Proposed Action would be consistent with this guideline, as there are no known active den sites (or suitable denning habitat) within 1 mile of the Study Area.

Compliance with applicable USFS management directions for North American wolverine is summarized in **Table 4.8-2** BLM does not provide management directions specific to wolverines.

USFS Sensitive and Management Indicator Species and BLM Sensitive Species

The following sections describe impacts to USFS sensitive, Management Indicator Species, and BLM sensitive species that carry potential to occur in the Study Area. As discussed in **Section 3.8.2**, the following sensitive and Management Indicator Species are not likely to occur in the Study Area because of a lack of suitable habitat, and would therefore not be affected by the Proposed Action: pygmy rabbit, Uinta chipmunk, spotted bat, American three-toed woodpecker, Lewis's woodpecker, Williamson's sapsucker, Hammond's flycatcher, olive-sided flycatcher, and Virginia's warbler. These species are not discussed further. A Biological Evaluation (BE) has been prepared and will be finalized before the signing of the ROD documenting the potential impacts to USFS and BLM sensitive species from the selected alternative.

Table 4.8-2 Compliance with USFS Management Direction for North American Wolverine under the Proposed Action

Source	Management Direction	Compliance under Proposed Action
2003 Caribou Forest Plan	Wildlife, Desired Future Conditions, Objective 1 (Wolverine Habitat): Within two years of signing the ROD, complete a GIS analysis to identify potential wolverine natal den sites. Within four years of the ROD, survey potential wolverine natal den sites to document wolverine presence and assess suitability as natal denning habitat.	There is no potential for denning as the Study Area is located at too low an altitude and lacks talus slopes that could provide denning habitat.
	Wolverine Guideline 1: Restrict intrusive disturbance within one mile around known active den sites, March 1 to March 15.	No wolverine den sites are known to occur within or near the Study Area. The Study Area does not provide suitable denning habitat.
	Wildlife, Sensitive Species, Guideline 1: Survey for the presence of sensitive species if suitable habitats are found within a project area a minimum of once prior to or during project development.	Winter track surveys were conducted for the Project in 2012 (TRC 2012a; 2012c).

Greater Sage-grouse

Under the Proposed Action, there would be 165 acres of direct removal of big sagebrush habitat. As described in **Section 3.8.2.1**, field observations (TRC 2012a,b,c) indicate that sagebrush habitat in the Study Area is patchy, and that grasses and forbs (which would contribute to nesting/brood-rearing habitat) generally grow in moderate to sparse quantities among the sagebrush. No sage-grouse habitat management areas (Priority Habitat Management Areas [PHMAs], Important Habitat Management Areas [IHMAs], and General Habitat Management Areas [GHMAs]) occur in the Study Area or vicinity (**Figure 3.8-1**; BLM and USFS 2015b). As noted in **Section 3.8.2.1**, no indication of breeding or nesting activity has been confirmed in the Study Area (TRC 2012a,b,c), and only one lek has been confirmed as occupied within 10 miles (7.8 miles southwest). For these reasons, the Study Area is not expected to be used by nesting or brood-rearing grouse but rather by individual or small, transient groups of foraging grouse (which coincides with baseline survey observations). This is further supported by the ROD for the ARMP Amendment (BLM and USFS 2015b), which indicates that 90 percent of sage-grouse nesting occurs within 6.2 miles of active leks in Idaho; no leks are known to occur within 6.2 miles of the Study Area. Therefore, the impacts discussed below are specific to individuals or small groups of transient, foraging grouse.

The Proposed Action may impact greater sage-grouse through short-term displacement of individuals, long-term habitat loss and alteration, direct mortality from vehicle collisions, avoidance responses to the proposed power line, and increased predation. Mining activities could potentially cause individual sage-grouse to temporarily or permanently avoid marginally suitable habitat in the vicinity of these activities. As a result, displaced sage-grouse may relocate to unaffected but already occupied habitats where population and competition would increase. Consequences of such displacement and competition could result in lower survival and potentially lower reproductive success of individual sage-grouse (NTT 2011).

Habitat modifications associated with development of the Proposed Action may fragment marginally suitable sagebrush habitat and could directly and indirectly impact individual sage-grouse. Over the long term, the areas reclaimed with the southwest aspects seed mix would be expected to recover to a plant community similar to that present in the on-site baseline high-elevation rangeland habitat, which includes a big sagebrush component. Noxious weed and invasive plant introductions could indirectly impact sage-grouse over the long term through a reduction in habitat quality or changes in trophic structure. The potential for invasive species to spread would be highest in newly disturbed areas. However, impacts from noxious weeds are anticipated to be minimal because of the use of BMPs to control them.

Individual sage-grouse could collide with moving vehicles along the proposed haul road. In a study conducted in Montana, vehicle collisions were found to be a more frequent cause of mortality than collisions with wires or fences (Wallestad 1975). A study in Idaho found that vehicle collisions were the cause of mortality for 4 percent of radio-marked females (Hagen 2011). However, vehicle collisions were not found to be a notable cause of mortality in a Nevada study (Blomberg et al. 2013). Under the Proposed Action, vehicles would travel the gravel haul road at low speeds, which would limit the potential for collisions. Fences also pose a collision risk to sage-grouse. For example, one study in Idaho found 56 sage-grouse that had been killed by colliding with fences. Most of these were male sage-grouse that collided with fences within 500 meters (1,640 feet) of a lek during the strutting season (Stevens et al. 2012). Under the Proposed Action, no fences would be installed near sage-grouse leks or in prime breeding habitat (as neither of these has been documented in the Study Area).

The proposed power line could have direct and indirect effects on individual sage-grouse using the Study Area, but as noted previously, the area is outside of mapped habitat management areas. Several studies suggest that sage-grouse and related species instinctively avoid areas where power lines or other vertical structures are visible to avoid predation (Schroeder 2010). One study found that sage-grouse tend to avoid habitat located within 600 meters (1,968 feet) of power lines (Gillan et al. 2013; Braun 1998). By avoiding use of the habitat, the birds lose the benefits of that habitat. Thus, the effective habitat loss and fragmentation created by power lines may extend to an area much larger than the actual power line corridor. These impacts are expected to be minor, as the power line would not fragment any PHMA, IHMA, GHMA, or other important habitats for sage-grouse.

Powerlines also provide hunting perches for raptors and ravens, which may result in increased predation on sage-grouse in the Study Area (Schroeder 2010; NGSGCT 2010). The power line would be constructed in compliance with APLIC standards to minimize raptor perching and thereby reduce predation on sage-grouse.

Overall, field observations indicate that sagebrush habitat is marginal, there are no greater sage-grouse habitat management areas (PHMAs, IHMAs, or GHMAs), and that there is only one occupied lek within a 10-mile radius of the Study Area (7.8 miles southwest). For these reasons, sage-grouse use of the Study Area is expected to be limited to small foraging or migrating groups. Therefore, potential direct and indirect impacts from the Proposed Action on these foraging grouse are not expected to affect greater sage-grouse at the population level. As such, a determination was made that the Proposed Action may have long-term but minor impacts on individuals or habitat. Compliance with applicable BLM and USFS management direction (as amended by the 2015 Greater Sage-Grouse ROD for Idaho and Southwest Montana [USFS 2015b]) for greater sage-grouse is summarized in **Table 4.8-3**.

Table 4.8-3 Compliance with BLM and USFS Management Direction for Greater Sage-Grouse under the Proposed Action

Source	Management Direction	Compliance under Proposed Action
2012 PFO ARMP	**Objective VE-4.1:** In Low-and Mid-Elevation Shrub and Mountain Shrub types, commensurate with site potential, maintain or increase Land Health Condition (LHC)-A acres as described below so the landscape is composed of a diversity of desirable/native herbaceous and shrub/woody species consisting of at least 15-25% sagebrush canopy cover in greater sage-grouse habitat in the Low-and Mid-Elevation Shrub types and at least 25% shrub cover in the Mountain Shrub type.	The Proposed Action would be inconsistent with this objective because the seed mix selected for reclamation contains native grass and forb species, but lacks sagebrush species. Sagebrush may naturally colonize in reclaimed areas over time through successional processes. However, reclaimed areas are likely to resemble high-elevation rangeland habitat type.
	Objective SS-1.1: Conserve, inventory, and monitor special status species.	The Proposed Action would be consistent with this objective. The minor loss of marginal sage-grouse habitat in the Study Area would not hinder BLM efforts to conserve, inventory, and monitor greater sage-grouse.
	Action SS-1.1.3: On a case by case basis, appropriate actions (e.g., timing and spatial closures, habitat avoidance/restrictions, and agency specific guidance), conservation measures and guidelines that contribute to the continued presence and conservation of special status species will be considered to minimize the potential for the listing of species. Appropriate actions, conservation measures and guidelines that may be considered include: Conservation Plan for Greater Sage-Grouse (Idaho Sage-grouse Advisory Committee 2006).	The BLM and USFS are using current guidelines for sage-grouse management against which to assess impacts including the BLM Instructional Memoranda 2012-043 and 2012-044 and the Conservation Plan for Greater Sage-Grouse (Idaho Sage-grouse Advisory Committee 2006). Based on information from baseline surveys (TRC 2012a,b,c), the Proposed Action is not expected to impact breeding or nesting sage-grouse. The mine site is not in designated grouse habitat. Seasonal restrictions contained in the ARMP do not apply to mining activities. (Action PP-ME-2.5.5 -Seasonal restrictions would not apply to the operation and maintenance of solid leasable mineral production facilities unless the findings of analysis demonstrate the continued need for such mitigation and that less stringent, project-specific mitigation measures would be insufficient.)
	Objective SS-1.2: Maintain or improve the quality of listed species habitat by managing public land activities to support species recovery and the benefit of those species.	The Proposed Action would be consistent with this objective. The minor loss of marginal sage-grouse habitat in the Study Area would not hinder recovery of the greater sage-grouse.
	Action SS-1.3.6: To the extent possible and to promote conservation, Greater sage-grouse habitat will be managed consistent with the *Conservation Plan for Greater Sage-grouse in Idaho* (IDFG 2006) or any future revisions/amendments and or current BLM guidance. Appropriate actions, conservation measures and guidelines that may be considered include, but are not limited to:	The Proposed Action would be consistent with BLM management direction for greater sage-grouse. No key or important sage-grouse habitats, as mapped by the BLM or IDFG, would be impacted by the Proposed Action. There would be no temporary disturbance within 0.6 mile of occupied leks or permanent disturbance within 2 miles of occupied leks. The Proposed Action would

Table 4.8-3 Compliance with BLM and USFS Management Direction for Greater Sage-Grouse under the Proposed Action

Source	Management Direction	Compliance under Proposed Action
	• Continue efforts to map populations and habitat for greater sage-grouse. Map seasonal (lek, nesting, brood-rearing and winter) habitats along with source and isolated populations. • Establish goals for greater sage-grouse habitat conservation at the local level in conjunction with IDFG and local working groups for protection and maintenance of existing populations and restoration goals. • Protect and maintain suitable habitats and reconnect separated populations based upon the following priorities: 1. Key habitats 2. Source habitats (S1) 3. Restoration areas (R1, R2) 4. Areas that link isolated populations • Commensurate with site potential, manage key habitat for a range of sagebrush canopy cover averaging 15 to 25 percent (11 to 31 inches in height); at least 15 percent grass cover; and 10 percent cover of a diversity of forbs. • Monitor progress and adjust activities to make progress towards greater sage-grouse goals and objectives. • In areas where grouse habitats are fragmented by land ownership pattern, cooperate with IDFG and local working groups to identify and maintain long-term habitat by acquiring conservation easements or bringing crucial habitats into public ownership. • In cooperation with IDFG identify areas where application of pesticides for grasshopper or Mormon cricket control may negatively affect grouse broods. Identify a cooperative strategy to review requests for pesticide application in these identified locations. • Active sage-grouse leks will be protected during the lekking season from temporary human disturbance (e.g., routine maintenance, inspections, and construction activities) by requiring a minimum buffer of 0.6 miles. • New infrastructure facilities/structures (e.g., major power transmission lines, power distribution lines, communications towers, and temporary meteorological towers) requiring permanent surface occupancy will be sited in a manner that avoids sage-grouse	not hinder BLM efforts to map important sage-grouse habitats; establish goals for sage-grouse habitat conservation; or protect, manage, or monitor key habitats and sage-grouse populations.

Table 4.8-3 Compliance with BLM and USFS Management Direction for Greater Sage-Grouse under the Proposed Action

Source	Management Direction	Compliance under Proposed Action
	habitat to the extent possible and will be placed at least 2.0 miles from occupied leks or other important sage-grouse seasonal habitats as identified locally. • Future permitted/authorized activities will be evaluated on a site specific basis for potential threats consistent with the Conservation Plan for Greater Sage-grouse in Idaho (IDFG 2006) and mitigated through the NEPA process. • Restore shrub-steppe habitats in the following priority: 1. source areas 2. restoration areas 3. areas that link isolated populations	
	Action SS-1.3.12: At minimum, maintain 30 to 50 percent of sagebrush habitat in a 5th code Hydrologic Unit Code (includes all lands) in contiguous blocks greater than 320 acres to support sagebrush obligate species and greater sage-grouse.	The Proposed Action would be consistent with this action because it is not expected to reduce any contiguous blocks of big sagebrush habitat to less than 320 acres.
2003 CNF RFP, as amended by the 2015 Greater Sage-Grouse ROD for Idaho and Southwest Montana	**GRSG-GEN-DC-001-Desired Condition**: The landscape for the greater sage-grouse encompasses large contiguous areas of native vegetation, approximately 6 to 62 square miles in area, to provide for multiple aspects of species life requirements. Within these landscapes, a variety of sagebrush-community compositions exist without invasive species, which have variations in subspecies composition, co-dominant vegetation, shrub cover, herbaceous cover, and stand structure to meet seasonal requirements for food, cover, and nesting for the greater sage-grouse.	The Proposed Action would be consistent with this desired condition. No large areas of contiguous sage-grouse habitat would be impacted under the Proposed Action. Further, no important habitat management areas or focal sagebrush areas would be impacted.
	GRSG-GEN-DC-002-Desired Condition: Anthropogenic disturbance is focused in non-habitat areas outside of priority, important, and general habitat management areas and sagebrush focal areas. Disturbance in general habitat management areas is limited, and there is little to no disturbance in priority and important habitat management areas and sagebrush focal areas except for valid existing rights and existing authorized uses.	The Proposed Action would meet this desired condition, as disturbance will not occur in priority, important, or general habitat management areas or focal sagebrush areas.
	GRSG-GEN-DC-003-Desired Condition: In all greater sage-grouse habitat, including all seasonal habitat, 70 percent or more of lands capable of producing sagebrush have from 10 to 30 percent sagebrush canopy cover and less than 10 percent conifer canopy cover. In addition, within breeding and nesting habitat, sufficient herbaceous vegetation structure and	The Proposed Action would meet the intent of this desired condition. Sagebrush habitat within the Study Area is marginal and is not known to support nesting, breeding, or large wintering populations.

Table 4.8-3 Compliance with BLM and USFS Management Direction for Greater Sage-Grouse under the Proposed Action

Source	Management Direction	Compliance under Proposed Action
	height provides overhead and lateral concealment for nesting and early brood rearing life stages. Within brood rearing habitat, wet meadows and riparian areas sustain a rich diversity of perennial grass and forb species relative to site potential. Within winter habitat, sufficient sagebrush height and density provides food and cover for the greater sage-grouse during this seasonal period.	
	GRSG-GEN-ST-004-Standard: In priority habitat management areas and sagebrush focal areas, do not issue new discretionary written authorizations unless all existing discrete anthropogenic disturbances cover less than 3 percent of the total greater sage-grouse habitat within the Biologically Significant Unit and the proposed project area, regardless of ownership, and the new use will not cause exceedance of the 3 percent cap.	Not applicable; the Proposed Action does not overlap priority habitat management areas or sagebrush focal areas.
	GRSG-GEN-ST-005-Standard: In priority, general, and important management areas and sagebrush focal areas, only allow new authorized land uses if, after avoiding and minimizing impacts, any remaining residual impacts to sage-grouse or its habitat are fully offset by compensatory mitigation projects that provide a net conservation gain to the species, subject to valid existing rights by applying beneficial mitigation actions.	Not applicable. The Proposed Action does not overlap priority habitat management areas or sagebrush focal areas.
	GRSG-GEN-ST-006-Standard: Do not authorize new surface disturbing and disruptive activities that create noise at 10dB above ambient measured at the perimeter of an occupied lek during lekking (March 1 to April 30) from 6 p.m. to 9 a.m.	The Proposed Action would be consistent with this standard. No occupied leks are anticipated to be impacted by the Proposed Action. The nearest occupied lek is located more than 7 miles southwest.
	GRSG-GEN-GL-007-Guideline: During breeding and nesting (from March 1 to June 15), surface disturbing and disruptive activities to nesting birds should be avoided.	The Proposed Action would meet the intent of this guideline. Nesting greater sage-grouse have not been observed in the Study Area and the nearest known active lek is more than 7 miles southwest. Nesting greater sage-grouse are not expected to use the Study Area; however, if discovered during ground-disturbing activities from March 1 to June 15, Agrium would avoid impacting or otherwise disrupting nesting grouse.
	GRSG-GEN-GL-008-Guideline: When breeding and nesting habitat overlaps with other seasonal habitat, habitat should be managed for breeding and nesting desired conditions.	The Proposed Action would meet the intent of this guideline, as breeding and nesting habitat is not expected to occur in the Study Area.
	GRSG-GEN-GL-009-Guideline: Development	The Proposed Action would meet the

Table 4.8-3 Compliance with BLM and USFS Management Direction for Greater Sage-Grouse under the Proposed Action

Source	Management Direction	Compliance under Proposed Action
	of tall structures within 2 miles from the perimeter of occupied leks as determined by local conditions, with the potential to disrupt breeding or nesting by creating new perching/nesting opportunities for avian predators or by decreasing the use of an area, should be restricted within nesting habitat.	intent of this guideline. There are no known active leks within 2 miles of the Study Area boundary.
	GRSG-AM-ST-010-Standard: If a hard trigger is identified, management direction applying to priority habitat management areas will be applied to important habitat management areas within the Conservation Area in Idaho, and the Sage-Grouse Implementation Task Force will evaluate available and pertinent data and recommend additional potential implementation level activities to the appropriate FS line officer in both Idaho and Southwest Montana.	No hard triggers for greater sage-grouse have been identified for the Proposed Action.
	GRSG-AM-ST-011-Standard: If a soft trigger is identified, the FS will review available and pertinent data in coordination with the Sage-Grouse Implementation Task Force, which may recommend potential implementation level activities to the appropriate agency line officer.	No soft triggers for greater sage-grouse have been identified for the Proposed Action. Should a soft (or hard) trigger ever be identified in the future, it is expected that the FS will review available data and coordinate with the Sage-Grouse Implementation Task Force to determine the need for any mitigation measures.
	GRSG-LR-SUA-O-012-Objective: In nesting habitat, retrofit existing tall structures with perch deterrents or other anti-perching devices.	Nesting habitat is not known to occur in the Study Area. The nearest known active lek is located more than 7 miles from the proposed overhead power line. The power line would be constructed to APLIC standards to, in part, minimize perching by raptors.
	GRSG-LR-SUA-ST-013-Standard: In priority and important habitat management areas and sagebrush focal areas, restrict issuance of new lands special-use authorizations for infrastructure, such as high-voltage t-lines.	Not applicable. The Proposed Action will not impact any PHMAs, IHMAs, or sagebrush focal areas.
	GRSG-LR-SUA-ST-014-Standard: In general habitat management areas, new lands special-use authorizations may be issued for infrastructure, such as high voltage t-lines, if they can be located within existing designated corridors or ROWs and the authorization includes stipulations to protect greater sage-grouse and its habitat.	No applicable. The Proposed Action will not impact any GHMAs for the greater sage-grouse.
	GRSG-LR-SUA-ST-015-Standard: In priority and important habitat management areas and sagebrush focal areas, do not authorize temporary lands special-uses that result in loss of habitat or long-term (greater than 5 years) negative impact on greater sage-grouse or its	Not applicable. The Proposed Action will not impact any PHMAs, IHMAs, or sagebrush focal areas.

Table 4.8-3 Compliance with BLM and USFS Management Direction for Greater Sage-Grouse under the Proposed Action

Source	Management Direction	Compliance under Proposed Action
	habitat.	
	GRSG-LR-SUA-ST-016-Standard: In priority, important, and general habitat management areas and sagebrush focal areas, require protective stipulations when issuing new authorizations that authorize infrastructure,	Not applicable. The Proposed Action will not impact any PHMAs, IHMAs, or sagebrush focal areas.
	GRSG-LR-SUA-ST-017-Standard: In priority, important, and general habitat management areas and sagebrush focal areas, locate upgrades to existing t-lines within the existing designated corridors or ROWs unless an alternate route would benefit the greater sage-grouse or its habitat.	Not applicable. The Proposed Action will not impact any PHMAs, IHMAs, or sagebrush focal areas.
	GRSG-LR-SUA-ST-018-Standard: In priority, important, and general habitat management areas and sagebrush focal areas, when a lands special-use authorization is revoked or terminated and no future use is contemplated, require the authorization holder to remove overhead lines and other infrastructure in compliance with 36 CFR 251.60(i).	Not applicable. The Proposed Action will not impact any PHMAs, IHMAs, or sagebrush focal areas.
	GRSG-LR-SUA-019-Guideline: In priority, important, and general habitat management areas and sagebrush focal areas, outside of existing designated corridors and ROWs, new t-lines and pipelines should be buried. If new t-lines and pipelines are not buried, locate them adjacent to existing t-lines and pipelines.	Not applicable. The Proposed Action will not impact any PHMAs, IHMAs, or sagebrush focal areas.
	GRSG-LR-SUA-GL-020-Guideline: The best available science and monitoring should be used to inform infrastructure siting in greater sage-grouse habitat.	Baseline greater sage-grouse surveys were completed for the project. No leks or other important sage-grouse habitats (e.g., nesting habitats) were identified within the Study Area. Further, the Proposed Action would impact minimal, marginal sagebrush habitat that is only expected to be used by transient individual grouse.
	GRSG-GRSGH-O-016-Objective: Every 10 years for the next 50 years, improve greater sage-grouse habitat by removing invading conifers and other undesirable species.	Conifers are generally lacking within the Study Area. The Proposed Action includes a reclamation program that would limit the spread of noxious weeds into native landscapes, including any sagebrush habitat, in the vicinity of the disturbance footprint.
	GRSG-GRSGH-ST-027-Standard: Design habitat restoration projects towards desired conditions.	Impacted sagebrush habitat would be reclaimed under the Proposed Action. The proposed seed mix is likely to cause the impacted areas to resemble high-evaluation rangeland habitat, though sagebrush may naturally colonize over time through successional processes. Note that, because existing sagebrush

Table 4.8-3 Compliance with BLM and USFS Management Direction for Greater Sage-Grouse under the Proposed Action

Source	Management Direction	Compliance under Proposed Action
		habitat is only marginally suitable for greater sage-grouse, the minimal loss of such habitat under the Proposed Action is not expected to impact the desired conditions of the CNF.
	GRSG-GRSGH-GL-028-Guideline: When removing conifers that are encroaching into greater sage-grouse habitat, avoid persistent woodlands (i.e., old growth relative to site or more than 100 years).	Conifers occur infrequently among aspen stands in the Study Area. Their encroachment on sagebrush habitats is not known to be an issue, but if they ever become an issue, the conifers would be managed accordingly.
	GRSG-GRSGH-GL-029-Guideline: In priority, important, and general habitat management areas and sagebrush focal areas, actions and authorizations should include design features to limit the spread and effect of undesirable non-native plant species.	Not applicable. PHMAs, IHMAs, GHMAs, or sagebrush focal areas would not be impacted by Proposed Action. Further, the reclamation plan for the project would limit the spread of noxious weeds and other undesirable non-native plant species in the Study Area.
	GRSG-GRSGH-GL-030-Guideline: To facilitate safe and effective fire management actions, in priority, important, and general habitat management areas and sagebrush focal areas, fuel treatments in high-risk areas should be designed to reduce the spread and/or intensity of wildlife or susceptibility of greater sage-grouse attributes to move away from desired conditions.	Not applicable. PHMAs, IHMAs, GHMAs, or sagebrush focal areas would not be impacted by the Proposed Action.
	GRSG-GRSGH-GL-031-Guideline: In priority, important, and general habitat management areas and sagebrush focal areas, native plant species should be used, when possible, to maintain, restore, or enhance desired conditions.	Not applicable. PHMAs, IHMAs, GHMAs, or sagebrush focal areas would not be impacted by the Proposed Action.
	GRSG-GRSGH-GL-032-Guideline: In priority and important habitat management areas and sagebrush focal areas, vegetation treatment projects should only be conducted if they maintain, restore, or enhance desired conditions.	Not applicable. PHMAs, IHMAs, GHMAs, or sagebrush focal areas would not be impacted by the Proposed Action.
	GRSG-RT-DC-066-Desired Conditions: In priority, important, and general habitat management areas and sagebrush focal areas within the forest transportation system and on roads and trails authorized under a special-use authorization, the greater sage-grouse experiences minimal disturbing during breeding and nesting (March 1 to June 15) and wintering (from November 1 to February 28) periods.	Not applicable. PHMAs, IHMAs, GHMAs, or sagebrush focal areas would not be impacted by the Proposed Action.
	GRSG-RT-ST-067-Standard: In priority, important, and general habitat management areas and sagebrush focal areas, do not	Not applicable. PHMAs, IHMAs, GHMAs, or sagebrush focal areas would not be impacted by the Proposed Action.

Table 4.8-3 Compliance with BLM and USFS Management Direction for Greater Sage-Grouse under the Proposed Action

Source	Management Direction	Compliance under Proposed Action
	conduct or allow new road or trail construction except when necessary for administrative access to existing and authorized uses, public safety, or to access valid existing rights.	
	GRSG-RT-ST-068-Standard: Do not conduct or allow road and trail maintenance activities within 2 miles from the perimeter of active leks during lekking (from March 1 to April 30) from 6 p.m. to 9 a.m.	The Proposed Action complies with this standard, as there are no known occupied leks within 2 miles of the Study Area.
	GRSG-RT-ST-069-Standard: In priority and important habitat management areas and sagebrush focal areas, do not allow public motor vehicle use on temporary energy development roads.	Not applicable. PHMAs, IHMAs, GHMAs, or sagebrush focal areas would not be impacted by Proposed Action. Further, public use of project roads would be prohibited.
	GRSG-RT-GL-070-Guideline: In priority and important habitat management areas and sagebrush focal areas, new roads and road realignments should be designed and administered to reduce collisions with greater sage-grouse.	Not applicable. PHMAs, IHMAs, GHMAs, or sagebrush focal areas would not be impacted by the Proposed Action.
	GRSG-RT-GL-071-Guideline: In priority and important habitat management areas and sagebrush focal areas, road construction within riparian areas and mesic meadows should be restricted.	Not applicable. PHMAs, IHMAs, GHMAs, or sagebrush focal areas would not be impacted by the Proposed Action.
	GRSG-RT-GL_072-Guideline: In priority and important habitat management areas and sagebrush focal areas, when decommissioning roads and unauthorized routes, restoration activity should be designed to move habitat towards desired conditions.	Not applicable. PHMAs, IHMAs, GHMAs, or sagebrush focal areas would not be impacted by the Proposed Action.
	GRSG-RT-GL-073-Guideline: In priority and important habitat management areas and sagebrush focal areas, dust abatement terms and conditions should be included in road-use authorizations when dust has the potential to affect the greater sage-grouse.	Not applicable. PHMAs, IHMAs, GHMAs, or sagebrush focal areas would not be impacted by the Proposed Action.
	GRSG-RT-GL-074-Guideline: In priority and important habitat management areas and sagebrush focal areas, road and road-way maintenance activities should be designed to reduce the risk of vehicle- or human-caused wildfires and the spread of invasive plants.	Not applicable. PHMAs, IHMAs, GHMAs, or sagebrush focal areas would not be impacted by the Proposed Action.
	GRSG-M-NEL-GL-098-Guideline: In priority and important habitat management areas and sagebrush focal areas, at the time of issuance of prospecting permits; exploration licenses and leases; or readjustments of leases, the FS should provide recommendations to the BLM for the protection of greater sage-grouse and its habitat.	Not applicable. PHMAs, IHMAs, GHMAs, or sagebrush focal areas would not be impacted by Proposed Action.

Table 4.8-3 Compliance with BLM and USFS Management Direction for Greater Sage-Grouse under the Proposed Action

Source	Management Direction	Compliance under Proposed Action
	GRSG-M-NEL-GL-099-Guideline: In priority and important habitat management areas and sagebrush focal areas, the FS should recommend to the BLM that expansion or readjustment of existing leases avoid, minimize, or mitigate the effects to greater sage-grouse and its habitat.	Not applicable. PHMAs, IHMAs, GHMAs, or sagebrush focal areas would not be impacted by the Proposed Action.

Source: BLM 2012a; USFS 2003

Gray Wolf

As discussed in **Table 3.8-1**, gray wolf use of the Study Area is likely limited to occasional transitory movements of individual wolves. Disruption of movement (anything that could influence wolves, if present, to travel around the periphery of the Study Area) could result from habitat removal, noise, human activity, or impacts to distribution of prey (e.g., the potential for prey such as big game to avoid the mine site could influence wolves to hunt outside the mine site). Generally, disruption to wolf movement from these impacts is expected to be negligible given the gray wolf's wide-ranging nature and irregular use of the site. If wolves do pass through the area during construction, mining, or reclamation, they could be at risk of vehicle collision along the haul road. Again, because of irregular use of the site, collision with vehicles is expected to be rare. Further, it is more likely that wolves would travel around the edges of the mine rather than along the haul roads during periods of increased human activity.

As described in **Section 3.3.1**, baseline surface water quality data indicate that streams and tributaries in and near the Study Area exhibit chemical levels, particularly for selenium, that exceed Idaho Cold-Water Aquatic Life Standards CCCs. Therefore, gray wolves could continue to be exposed to significant levels of COPCs (via drinking contaminated water or eating prey exposed to COPCs) whether the Proposed Action is built or not. As summarized in **Section 4.3.1.1.4**, the Proposed Action carries the potential to impact water quality in Blackfoot River, Angus Creek, and springs and wetlands in the Study Area. Potential impacts include the increase of concentrations of COPCs as listed in **Table 4.3-1**. Therefore, wolves could be at added risk of COPCs exposure under the Proposed Action. However, this risk is expected to be negligible given the gray wolf's wide-ranging nature, and irregular use of the site would lead to negligible and short-term exposure to the COPCs.

Overall, because of the lack of known packs or otherwise robust wolf population in the Study Area, impacts are expected to be limited to individual or small groups of wolves passing through the area. Because of the infrequent and wide-ranging nature of the gray wolf in the Study Area, disruption to movement associated with previously described impacts and exposure to COPCs are expected to be negligible. As such, a determination was made that the Proposed Action may impact individuals or habitat but is not expected to affect the species at a population level. The PFO ARMP includes the following management guidance for gray wolves:

Action SS-1.2.4:

1. In cooperation with IDFG, USFWS, and others:
    - Determine the distribution of wolves and key gray wolf habitat areas (dens, rendezvous sites, and crucial big game winter ranges).

  - o Cooperate in maintaining and improving gray wolf habitat by focusing on reducing human/wolf interactions and improving big game winter range.

2. Ensure that ongoing Federal actions support or do not preclude species recovery.
3. Ensure that new Federal actions support or do not preclude species recovery.
4. Protect gray wolves from disturbance that might result in displacement during critical periods.
5. Support conservation easements, cooperative management efforts, and other programs on adjacent non-Federal lands to support recovery of the gray wolf.

Minerals and Energy (ME)

1. Approve development of saleable or leasable minerals so as not to preclude species habitat conservation and recovery. This includes management of physical facilities, as well as disturbances to the species resulting from human uses.

Action SS-1.2.6: Gray wolf habitat (e.g., reproductive, rearing) will be conserved/managed in the following manner by:

- Analyzing habitat characteristics of public lands adjacent to the CNF in conjunction with the planned CNF evaluation to determine if suitable wolf habitat exists.
- Activities on public lands within the Yellowstone Nonessential Experimental Population Area (east of I-15) or the Central Idaho Nonessential Experimental Population Area (west of I-15) which will disturb within one mile of active gray wolf den sites and rendezvous sites between April 1 and June 30 when five or fewer breeding pairs are present will not be allowed.
- Coordinate habitat management with IDFG.

The CNF RFP includes the following management guidance for gray wolves:

Gray Wolf Habitat, Standard 1: Restrict intrusive human disturbances (motorized access, vegetation management, livestock grazing, etc.) within one mile around active den sites and rendezvous sites between April 1 and June 30 when there are five or fewer breeding pairs of wolves in the Yellowstone Nonessential Experimental Population Area (applies to the portion of the Forest east of Interstate 15) or the Central Idaho Nonessential Experimental Population Area (applies to the portion of the Forest west of Interstate 15). After six or more breeding pairs become established in each experimental population area, land use restrictions will not be necessary.

Gray Wolf Habitat, Standard 2: If and when wolves are de-listed, they will be managed in accordance with approved state management plans.

The Proposed Action would be consistent with aforementioned management guidance because it would not preclude maintenance, improvement, or conservation of gray wolf habitat or preclude or hinder the species' recovery.

North American Wolverine

Impacts to wolverines under the Proposed Action are described in **Section 4.8.1.1.1**.

Townsend's big-eared bat

As described in **Table 3.8-1**, no Townsend's big-eared bats were detected during baseline acoustic monitoring. Note that Townsend's big-eared bat has low-intensity calls that make acoustic detection difficult. Thus, the presence or absence of this species in the Study Area could not be fully confirmed based solely on the results of the baseline study (Rodriguez 2012; TRC 2012b). If present, it is expected that use of the Study Area by Townsend's big-eared bats would be infrequent and transitory (because of the lack of roost sites in the vicinity), and impacts would be expected to occur at the individual versus population level. Potential impacts of the Proposed Action on the Townsend's big-eared bat include the loss of foraging and commuting habitat, loss and degradation of water sources, mortality from vehicle collisions, changes in predator communities, and exposure to COPCs.

The Proposed Action would result in the loss or alteration of 468 acres of potential shrubland, woodland, wetland, and riparian foraging habitat. Habitat impacts would be long-term. The majority (96 percent) of disturbed habitat would be reclaimed and would eventually recover to high-elevation rangeland habitat types. However, losses of aspen, wetland, and riparian habitat would be permanent. Water sources used by the Townsend's big-eared bat could be indirectly altered by sedimentation and a reduction in water quantity. These impacts would be short-term, as they would occur primarily during construction and active mining.

Townsend's big-eared bats could collide with moving vehicles along the haul road, when vehicles are traveling the road between dusk and dawn. The bats could also be subject to increased mortality from predators, such as the great horned owl, raccoon, and weasel, which are relatively more tolerant of human disturbance. However, predators tend to prey on bats while asleep or when emerging from their roosts (Gruver and Keinath 2003), and because there no known roosts in the area, any predator impacts are expected to be opportunistic in nature. Mortalities are expected to be rare and limited to individual bats because use of the site is expected to be low and sporadic.

Water sources used by the Townsend's big-eared bat could be indirectly altered by sedimentation from runoff. Sediment runoff could impact water quality, but this impact is expected to be mitigated through implementation of year-long riparian constraints and use of surface water control structures to reduce or eliminate risk of surface water contamination. Therefore, indirect impacts on bats from runoff are expected to be negligible. Townsend's big-eared bats may be exposed to selenium and other COPCs by foraging on aquatic insects that emerge from the streams downgradient of the mine, or by drinking water from the streams. As described in **Section 3.3.1**, baseline surface water quality data indicate that streams and tributaries in and near the Study Area exhibit chemical levels, particularly for selenium, that exceed Idaho Cold-Water Aquatic Life Standards CCCs. Therefore, bats could continue to be exposed to significant existing levels of COPCs. The Proposed Action has potential to increase concentrations of COPCs in Blackfoot River, Angus Creek, and springs and wetlands in the Study Area, and bats could be at added risk of COPCs exposure. However, exposure is expected to be negligible, as the Townsend's big-eared bat anticipated infrequent/irregular use of the site (as a result of the lack of known roosting habitat in or near the Study Area) would lead to negligible and short-term exposure to the COPCs.

Overall, roosting sites (e.g., caves and mines) are not known in the Study Area or vicinity; therefore, impacts to Townsend's big-eared bats, if present, would be limited to individuals foraging in or moving through the area. Impacts on habitat would be long-term until the site is successfully reclaimed. Bats may collide with moving vehicles or infrastructure, especially between dusk and dawn. However, collision impacts, if any, are expected to be rare. Bats may already be exposed to COPCs given existing selenium levels in the watershed, and could be at risk of added exposure from the Proposed Action. However, as a result of anticipated infrequent use of the site, impacts of COPCs exposure on bats are expected to be negligible. For these reasons, a determination was made that the Proposed Action may impact individuals or habitat, but is not expected to impact the species at the population level. Compliance with applicable BLM and USFS management direction for sensitive bats is summarized in **Table 4.8-4**.

Table 4.8-4 Compliance with USFS and BLM Management Direction for Sensitive Bats under the Proposed Action

	Management Direction	Compliance under Proposed Action
2003 CNF RFP	**Wildlife, Bats, Guideline 1:** All abandoned underground mines should be evaluated as bat habitat prior to closure. As an alternative to collapsing mine entrances, gate abandoned mines to retain roosting and hibernation habitat for bats.	The Proposed Action would be consistent with this guidance, because no mines or caves known to be occupied by bats would be closed or otherwise impacted.
	Wildlife, Bats, Guideline 2: Gating of mines should be considered where human disturbance is disturbing/ displacing bats. Where gates are used, they should be designed in accordance with published literature.	The Proposed Action would be consistent with this guidance, because no mines or caves known to be occupied by bats would be closed or otherwise impacted.
	Wildlife, Bats, Guideline 3: Discourage or restrict entry to mines and caves known to be occupied by hibernating bats or bats with young. Exceptions include surveys conducted by qualified personnel.	The Proposed Action would be consistent with this guidance, because no mines or caves known to be occupied by bats would be closed or otherwise impacted.
	Wildlife, Bats, Guideline 4: Prior to closure of inactive or abandoned underground mines, surveys for cave-dependent species should be completed and mitigation measures implemented.	The Proposed Action would be consistent with this guidance, because no mines or caves known to be occupied by bats would be closed or otherwise impacted.
2012 PFO ARMP	**Action SS-1.3.3:** Sensitive bat species habitat (e.g., caves, underground mine openings) will be protected by gating or restricting human access.	The Proposed Action would be consistent with this guidance, because no mines or caves known to be occupied by bats would be closed or otherwise impacted.

Source: USFS 2003; BLM 2012a

Boreal Owl

If boreal owls are nesting in the vicinity of the mine, noise and human activity may disturb or disrupt nesting pairs. However, boreal owls are relatively tolerant of noise and human presence near their nest sites and are unlikely to abandon nests as a result of these factors (Hayward and Verner 1994). Activities could also result in the direct removal of boreal owl nests. No boreal owl nests have been found within the Study Area or vicinity. Even so, ground-disturbing activities would be planned outside of the avian nesting season (~March 1 to August 31). If ground-disturbing activities must extend into the nesting season, a nest clearance survey using agency-approved methods would be conducted within a 0.5-mile buffer of disturbance areas. If any nests are found, seasonal and spatial no-activity buffers, as described in the PFO ARMP (BLM 2012a), would be implemented.

Noise and activity from the Proposed Action may influence boreal owls to temporarily avoid areas near the Proposed Action during active mining. Boreal owls could also be directly impacted as a result of mortality through mechanisms, such as collision with aboveground structures (such as the overhead power line) and moving vehicles, particularly at night. Agrium would minimize collision risk on the power line by using APLIC design features such as appropriate spacing between conductors and grounded hardware, use of insulating or cover-up materials for perch management, and installation of bird flight diverters on the top grounding wire.

Eighty-three acres of potentially suitable boreal owl habitat (aspen forest) would be removed under the Proposed Action, or 16 percent of the aspen habitat in the Study Area. In addition to direct habitat loss, habitat removal could indirectly impact boreal owls by altering prey base and potentially increasing abundance of predators that are more tolerant of human activity, such as great horned owls. Most of the disturbed area would be reclaimed as soon as the area was no longer needed; however, reclaimed areas would not function as suitable habitat for boreal owls and would likely support a different prey community (favoring rodent species that are habitat generalists or grassland/shrubland species as opposed to mature forest species). Boreal owls may be exposed to selenium and other COPCs by foraging on small mammals and birds that inhabit the reclaimed overburden piles (where plant uptake of COPCs could occur). However, the risk of exposure causing chronic effects in boreal owls would likely be low given this species' tendency to forage in forested areas with natural openings rather than in extensive grassland or shrubland areas, where overburden piles would be reclaimed.

As a result of the relatively small area of mature forest that would be impacted, and lack of indication from baseline studies for a robust boreal owl population in the Study Area, direct and indirect impacts under the Proposed Action are unlikely to have population-level effects on this species. Overall, the Proposed Action, with the implementation of design features and measures to minimize impacts on raptors, may result in minor impacts on individuals or habitat over the long term.

The CNF RFP (USFS 2003) contains one guideline specific to boreal owls (Boreal Owl Habitat Guideline 1): "Within a 3,600-acre around all known boreal owl nest sites, maintain over 40 percent of the forested acres in mature and old age classes." This guideline would be met under the Proposed Action because there are no known nest sites in the Study Area, and even if there were, the Proposed Action would not impact enough aspen forest to change the distribution of forest age classes (which are already all either mature or old) in the Study Area.

Flammulated Owl

If flammulated owls are nesting in the vicinity of the mine, noise and human activity may disturb or disrupt nesting pairs. However, flammulated owls are relatively tolerant of noise and human presence near their nest sites and are unlikely to abandon nests as a result of these factors (Hayward and Verner 1994). Activities could also result in the direct removal of flammulated owl nests. Even so, ground-disturbing activities would be planned outside of the avian nesting season (~March 1 to August 31). If ground-disturbing activities must extend into the nesting season, a nest clearance survey using agency-approved methods would be conducted within a 0.5-mile buffer of disturbance areas. If any nests are found, seasonal and spatial no-activity buffers, as described in the PFO ARMP (BLM 2012a), would be implemented.

Noise and activity from the Proposed Action may influence flammulated owls to temporarily avoid areas near the Proposed Action during active mining. Flammulated owls could also be directly impacted as a result of mortality through mechanisms, such as collision with aboveground structures (such as the overhead power line) and moving vehicles, particularly at night. Agrium would minimize collision risk on the power line by using APLIC design features such as appropriate spacing between conductors and grounded hardware, use of insulating or cover-up materials for perch management, and installation of bird flight diverters on the top grounding wire.

Eighty-three acres of potentially suitable flammulated owl habitat (aspen forest) would be removed under the Proposed Action, or 16 percent of the aspen habitat in the Study Area. In addition to direct habitat loss, habitat removal could indirectly impact flammulated owls by altering prey base and potentially increasing abundance of predators that are more tolerant of human activity, such as great horned owls. Most of the disturbed area would be reclaimed as soon as the area was no longer needed; however, reclaimed areas would not function as suitable habitat for flammulated owls and would likely support a different prey community (favoring rodent species that are habitat generalists or grassland/shrubland species as opposed to mature forest species).

Flammulated owls may be exposed to selenium and other COPCs by foraging on small mammals and birds that inhabit the reclaimed overburden piles (where plant uptake of COPCs could occur). However, the risk of exposure causing chronic effects in flammulated owls would likely be low given this species' tendency to forage in forested areas with natural openings rather than in extensive grassland or shrubland areas, where overburden piles would be reclaimed.

As a result of the relatively small area of mature forest that would be impacted and lack of indication from baseline studies that flammulated owls are present in the Study Area, direct and indirect impacts under the Proposed Action are unlikely to have population-level effects on this species. Overall, the Proposed Action, with the implementation of design features and measures to minimize impacts on raptors, may result in minor impacts on individuals or habitat over the long term.

The CNF RFP (USFS 2003) contains one guideline specific to flammulated owls (Flammulated Owl Habitat Guideline 1): "Do not allow timber harvest activities within a 30-acre area around all known flammulated owl nest sites." This guideline would be met under the Proposed Action because there are no known nest sites in the Study Area.

<u>Great Gray Owl</u>

If great gray owls are nesting in the vicinity of the mine, noise and human activity may disturb or disrupt nesting pairs. Ground-disturbing activities could also result in the direct removal of great gray owl nests. As discussed in **Table 3.8-1**, great gray owl individuals and two potential nesting territories were detected in the Study Area during baseline surveys (TRC 2012a, 2012c). Therefore, ground-disturbing activities would be planned outside of the avian nesting season (~March 1 to August 31) to avoid possible impacts to nesting owls. If ground-disturbing activities must extend into the nesting season, a nest clearance survey using agency-approved methods would be conducted within a 0.5-mile buffer of disturbance areas. If any nests are found, seasonal and spatial no-activity buffers, as described in the PFO ARMP (BLM 2012a), would be implemented.

Noise and activity from the Proposed Action may influence great gray owls to temporarily avoid some areas of the Proposed Action during active mining. Great gray owls could also be directly impacted as a result of mortality through mechanisms, such as collision with aboveground structures (such as the overhead power line) and moving vehicles, particularly at night. Agrium would minimize collision risk on the power line by using APLIC design features such as appropriate spacing between conductors and grounded hardware, use of insulating or cover-up materials for perch management, and installation of bird flight diverters on the top grounding wire.

Eighty-three acres of potentially suitable great gray owl habitat (aspen forest) would be removed under the Proposed Action, or 16 percent of the aspen habitat in the Study Area. In addition to direct habitat loss, habitat removal could indirectly impact great gray owls by altering prey base and potentially increasing abundance of predators that are more tolerant of human activity, such as great horned owls. Most of the disturbed area would be reclaimed as soon as the area was no longer needed; however, reclaimed areas would not function as suitable habitat for great gray owls and would likely support a different prey community (favoring rodent species that are habitat generalists or grassland/shrubland species as opposed to mature forest species).

Great gray owls may be exposed to selenium and other COPCs by foraging on small mammals and birds that inhabit the reclaimed overburden piles (where plant uptake of COPCs could occur). However, the risk of exposure causing chronic effects in great gray owls would likely be low given this species' tendency to forage in forested areas with natural openings rather than in extensive grassland or shrubland areas, where overburden piles would be reclaimed.

As a result of the relatively small area of mature forest that would be impacted, direct and indirect impacts under the Proposed Action are unlikely to have population-level effects on this species. Overall, the Proposed Action, with the implementation of design features and measures to minimize impacts on raptors, may result in minor impacts on individuals or habitat over the long term.

The CNF RFP (USFS 2003) contains the following guidelines specific to great gray owl habitat:

- Within a 1,600-acre area around all known great gray owl nest sites, maintain over 40% of the forested acres in mature and old age classes.
- Restrict the use of strychnine poison to control pocket gophers within a ½ mile buffer around all active great gray owl nest sites.

The Proposed Action is expected to be consistent with these guidelines. There are no known active great gray owl nests in the Study Area; however, two potential nesting territories were noted during baseline surveys (TRC 2012a, 2012c). To avoid impacts to nesting owls, Agrium would plan ground-disturbing activities outside the avian nesting season (~March 1 to August 31). If this is not possible, a nest clearance survey would be conducted within 0.5 mile of disturbance areas. If a nest is found, a seasonal and spatial no-activity buffer would be implemented as described in the PFO ARMP (BLM 2012a). If a nest is within the disturbance footprint, Agrium may have to remove nest vegetation after the nesting season or after young have fledged. In such a case, the Proposed Action may no longer maintain compliance with this guideline if 40 percent of the forested acres in mature and old age classes within a 1,600-acre area around the nest cannot be maintained.

<u>Bald Eagle</u>

As discussed in **Table 3.8-1**, baseline surveys (TRC 2012b) indicate that there are no known bald eagle nesting sites in or within 1 mile of the Study Area. This will be verified before construction via nest clearance surveys should ground-disturbing activities occur during the bald eagle nesting season (February 1 to August 15). If a nest is discovered, a no-activity buffer of 0.5 mile would be implemented until young fledge per the PFO ARMP (BLM 2012a) guidelines. The CNF RFP Final EIS (USFS 2003) indicates that there are two historical, low-attendance bald eagle winter roost sites near the Study Area: along Diamond Creek and Narrows/Lane Creek. However, biologists did not note evidence of any winter roosts in or near the analysis area during baseline surveys (TRC 2012b,c). The PFO ARMP (BLM 2012a) calls for a 0.5-mile no-activity setback from bald eagle winter roosts from November 15 to April 15. A winter roost clearance survey would therefore be conducted should construction take place during this time. If a roost is found, the no-activity buffer previously mentioned would be implemented. Because of the lack of known nest and winter roost sites in or near the Study Area, the following impacts are expected to be limited to individual bald eagles flying through or potentially foraging therein.

Noise and activity from the Proposed Action may influence bald eagles to temporarily avoid some areas of the mine footprint during active mining. Bald eagles could be directly impacted as a result of mortality from collision with aboveground structures (such as the overhead power line) and moving vehicles. Numerous studies have been conducted and published on the interactions between raptors (including bald eagles) and transmission lines, and raptor electrocution continues to be a concern of state and federal agencies (USGS 1999; Lehman 2001; Erickson et al. 2005; Manville 2005; Mojica et al. 2009). To minimize these potential impacts, Agrium would use APLIC avian-friendly design measures, which could include appropriate spacing between conductors and grounded hardware, use of insulating or cover-up materials for perch management, and installation of bird flight diverters on the top grounding wire.

Twenty and a half acres of potentially suitable bald eagle foraging habitat (riparian and wetland areas) would be removed under the Proposed Action, or 6 percent of the riparian and wetland habitat in the Study Area. In addition to direct habitat loss, the impacts to aquatic habitats described in **Section 4.7** could alter the prey base for bald eagles; however, as noted in that section, substantial impacts on the overall fish population in the Study Area are unlikely. Because fish are a primary prey source for bald eagles, bald eagles may be relatively more susceptible than other raptors to toxic effects of COPC exposure. Peterson and Nebeker (1992) calculated a chronic water-borne selenium criterion specifically for bald eagles of 1.9 µg/L. As described in **Section 3.3**, baseline selenium concentrations in Angus Creek and the Blackfoot River already regularly exceed this value, especially during the spring runoff period. As described in **Section 4.3**, the Proposed Action would result in measureable loading of selenium and other COPCs into Angus Creek and the Blackfoot River, but the concentrations of these COPCs in surface water would be well below surface water standards (**Table 4.3-12 and Table 4.3-13**). Therefore, the Proposed Action would not significantly increase the risk of selenium exposure to bald eagles in the Study Area.

Because of the relatively small area of wetland and riparian foraging habitat that would be impacted, and the negligible to minor effects anticipated to occur to aquatic resources, direct and indirect impacts under the Proposed Action are unlikely to have population-level effects on bald eagles. Overall, the Proposed Action, with the implementation of design features and measures to minimize impacts on raptors, may have minor impacts on individuals or habitat over the long term.

The PFO ARMP (BLM 2012a) includes the following relevant management guidance for bald eagles:

Action SS-1.2.4: Conservation measures will be implemented to support species recovery as identified below by resources and uses:

- In cooperation with IDFG, USFWS, and others:
  - Continue to cooperate in determining the distribution of populations and suitable habitats.
  - Following current monitoring protocols continue to cooperate in conducting systematic nest surveys and monitoring.
  - Cooperate in the management of nest sites and communal roost sites to promote species conservation.
  - Cooperate in the maintenance and improvement of habitat in key foraging areas, for example, mule deer winter range, and aquatic and riparian habitat for fish and waterfowl, where a need exists.
  - Cooperate to maintain and develop nesting and roosting habitat for future use by bald eagles.

- Ensure that ongoing Federal actions support or do not preclude species conservation.
- Ensure that new Federal actions support or do not preclude species conservation.
- Protect bald eagles from disturbance that might result in displacement during critical periods.
- Implement adaptive management as needed to achieve conservation objectives.
- Support conservation easements, cooperative management efforts, and other programs on adjacent non-Federal lands to support conservation of the bald eagle.

Minerals and Energy (ME)

1. Approve development of saleable or leasable minerals so as not to preclude species habitat conservation. This includes management of physical facilities, as well as disturbances to the species resulting from human uses.

The Proposed Action would be consistent with these guidelines because pesticide/herbicide use would be in accordance with label instructions, the power line would be designed to minimize raptor electrocution risk, and the Proposed Action would not preclude coordination with other agencies or habitat conservation for the species.

The CNF RFP (USFS 2003) contains the following relevant guideline specific to bald eagle habitat: “Activities and developments should be designed to minimize conflicts with bald eagle wintering and migration habitat.” The Proposed Action would be consistent with this guideline, as impacts to bald eagle wintering and migration habitat would be minimal relative to the species’ home range size and dispersal capabilities. CNF RFP (2003) also contains a number of standards and guidelines for occupied nesting zones and home ranges. The Proposed Action would be consistent with these standards and guidelines given that no occupied nesting zones or home ranges are known to occur in or near the Study Area.

<u>Northern Goshawk</u>

If northern goshawks are nesting in the vicinity of the mine, noise and human activity may disturb or disrupt nesting pairs. No northern goshawk nests have been confirmed within the Study Area; however, pairs could establish nesting territories in the aspen forests in the Study Area in the future. Northern goshawks can be sensitive to disturbance at a nest site from nest construction through 20 days post-hatch (Squires and Kennedy 2006). Agrium would plan ground-disturbing activities outside of the goshawk nesting season (April 1 to August 15). However, if ground-disturbing activities must occur during the nesting season, a nest clearance survey using agency-approved methods would be conducted within 0.5 mile of disturbance areas. If any nests are found, a 0.5-mile seasonal no-activity buffer, per the PFO ARMP (BLM 2012a) guidelines, would be implemented. Further, management standards and guidelines for nest areas (within 200 acres of the nest) and post-fledgling family areas (within 400 acres of the nest), as described in the CNF RFP (2003), would be followed from September to March during ground-disturbing activities. Measures include, but are not limited to, no new road systems in nest and post-fledging family areas, maintain size class distribution of trees, and limit the maximum created canopy opening to less than 40 acres for post-fledgling family areas (no acres for nest areas)

Noise and activity from the Proposed Action may influence northern goshawks to temporarily avoid areas near the Proposed Action during active mining. Northern goshawks could also be directly impacted as a result of mortality from collision with aboveground structures (such as the overhead power line) and moving vehicles. Agrium would minimize collision risk on the power line by using APLIC design features such as appropriate spacing between conductors and grounded hardware, use of insulating or cover-up materials for perch management, and installation of bird flight diverters on the top grounding wire.

Eighty-three acres of potentially suitable northern goshawk habitat (aspen forest) would be removed under the Proposed Action, or 16 percent of the aspen habitat in the Study Area. In addition to direct habitat loss, habitat removal could indirectly impact northern goshawks by altering prey base and potentially increasing abundance of predators that are more tolerant of human activity, such as great horned owls. Most of the disturbed area would be reclaimed as soon as the area was no longer needed; however, reclaimed areas would not function as suitable nesting habitat for northern goshawks and would likely support a different prey community (favoring rodent species that are habitat generalists or grassland/shrubland species as opposed to mature forest species).

Northern goshawk may be exposed to selenium and other COPCs by foraging on small mammals and birds that inhabit the reclaimed overburden piles (where plant uptake of COPCs could occur). However, the risk of exposure causing chronic effects in northern goshawk would likely be low given this species' tendency to forage in forested areas with natural openings rather than in extensive grassland or shrubland areas, where overburden piles would be reclaimed.

Because of the relatively small area of mature forest that would be impacted, and lack of evidence from baseline studies that there are any active or historical northern goshawk territories within the Study Area, direct and indirect impacts under the Proposed Action are unlikely to have population-level effects on this species. Overall, the Proposed Action, with the implementation of design features and measures to minimize impacts on raptors, may result in minor impacts on individuals or habitat over the long term.

The CNF RFP (USFS 2003) provides standards and guidelines for management of forest habitat within active and historical northern goshawk nesting territories. Because the Study Area is not known to contain any active or historical nesting territories, the Proposed Action would be consistent with the CNF RFP relative to impacts on northern goshawks.

Peregrine Falcon

The Proposed Action is not expected to impact nesting peregrine falcons because of a lack of known nests or suitable nesting habitat in the Study Area. Therefore, the impacts described below would most likely affect small numbers of individual peregrine falcons that forage in the area or move through the Study Area during the non-breeding season.

Noise and activity from the Proposed Action may influence peregrine falcons to temporarily avoid areas near the Proposed Action during active mining. Peregrine falcons could be directly impacted as a result of mortality from collision with aboveground structures (such as the overhead power line) and moving vehicles. Agrium would minimize collision risk on the power line by using APLIC design features such as appropriate spacing between conductors and grounded hardware, use of insulating or cover-up materials for perch management, and installation of bird flight diverters on the top grounding wire.

Four hundred and sixty-eight acres of potentially suitable peregrine falcon foraging habitat (forest, shrubland, riparian, and wetland areas) would be removed under the Proposed Action, or 17 percent of the available habitat in the Study Area. In addition to direct habitat loss, the impacts to aquatic habitats described in **Section 4.7** could alter the prey base for peregrine falcons, which often consume water birds. However, as noted in that section, the impacts on aquatic habitats are anticipated to be minor. Because they consume water birds, peregrine falcons may be relatively more susceptible than other raptors to toxic effects of COPC exposure. As described in **Section 3.3**, baseline selenium concentrations in Angus Creek and the Blackfoot River already regularly exceed chronic aquatic life criteria, especially during the spring runoff period. Additional input of selenium and other COPCs into the watershed would be well below surface water standards under the Proposed Action, as described in **Section 4.3**. Therefore, the Proposed Action would not significantly increase the risk of selenium exposure to peregrine falcons in the Study Area above baseline levels.

Because the Study Area lacks nesting habitat for peregrine falcons, and peregrine falcons may only use the Study Area sporadically, direct and indirect impacts under the Proposed Action are unlikely to have population-level effects on this species. Overall, the Proposed Action, with the implementation of design features and measures to minimize impacts on raptors, may result in negligible impacts on individuals or habitat over the long term.

The CNF RFP (USFS 2003) contains the following standard and guideline specific to peregrine falcon habitat:

Standard 1: Within 15 miles of all known nest sites, prohibit all use of herbicides and pesticides which cause egg shell thinning as determined by risk assessment (USFS 1992).

Guideline 1: For proposed projects within two miles of known peregrine falcon nests, minimize such items as: (1) human activities (rock climbing, aircraft, ground and water transportation, high noise levels, and permanent facilities) which could cause disturbance to nesting pairs and young during the nesting period between March 15 and July 31; (2) activities or habitat alterations which could adversely affect prey availability.

These standards and guidelines would be met under the Proposed Action because Agrium would use only agency-approved herbicides and pesticides and because there are no known peregrine falcons nests within 2 miles of the Proposed Action.

Prairie Falcon

The Proposed Action is not expected to impact nesting prairie falcons because of a lack of known nests or suitable nesting habitat in the Study Area. Therefore, the impacts described below would most likely affect small numbers of individual prairie falcons that forage in the area or move through the Study Area during the non-breeding season.

Noise and activity from the Proposed Action may influence prairie falcons to temporarily avoid some areas of the Proposed Action during active mining. Prairie falcons could be directly impacted as a result of mortality from collision with aboveground structures (such as the overhead power line) and moving vehicles. Agrium would minimize collision risk on the power line by using APLIC design features such as appropriate spacing between conductors and grounded hardware, use of insulating or cover-up materials for perch management, and installation of bird flight diverters on the top grounding wire.

Three hundred and sixteen acres of potentially suitable prairie falcon foraging habitat (high-elevation rangeland and sagebrush) would be removed under the Proposed Action, or 19 percent of the available habitat in the Study Area. The majority (99 percent) of this habitat loss would be short-term because most areas would be reclaimed once mining had ceased. Reclaimed areas would again provide potential foraging habitat for prairie falcons, initially supporting a grassland community, which would recover to shrubland over the long term.

Because the Study Area lacks nesting habitat for prairie falcons, which may only use the Study Area sporadically, direct and indirect impacts under the Proposed Action are unlikely to have population-level effects on this species. Overall, the Proposed Action, with the implementation of design features and measures to minimize impacts on raptors, may result in negligible impacts on individuals or habitat over the long term.

Neither the PFO ARMP nor the CNF RFP provides specific management guidance for prairie falcons.

Columbian sharp-tailed grouse

As described in **Section 3.8.2**, no Columbian sharp-tailed grouse leks or nesting grounds were confirmed in the Study Area during baseline surveys (TRC 2012b). Public observation data indicate that small groups of grouse (two to four individuals) were observed congregating on an IDL section of land near the Study Area; however, no active lekking was confirmed (IDFG 2016). A study found that sharp-tailed grouse hens can move up to 1 mile from the lek to nest, and that mean winter movements from lek to winter habitat is 2 miles (USFS 2003). Given that no leks have been confirmed within 2 miles of the Study Area, nesting and wintering grouse may be limited in the area, and past observations of individuals or small groups of grouse may indicate that the site is used more opportunistically for foraging or transient movement. Therefore, the following impacts are expected to be limited to foraging and transient grouse.

Noise and activity from the Proposed Action would likely cause Columbian sharp-tailed grouse to temporarily avoid some areas of the Proposed Action during active mining. Columbian sharp-tailed grouse would be at risk of collision with moving vehicles along the haul road. The haul road would also fragment formerly contiguous areas of sagebrush shrubland and create a potential barrier to grouse movement, especially during periods of heavy truck traffic.

Three hundred and thirty-six acres of potentially suitable Columbian sharp-tailed grouse foraging and wintering habitat (high-elevation rangeland, sagebrush, and riparian areas) would be directly removed under the Proposed Action, or 19 percent of the available habitat in the Study Area. The majority (99 percent) of this habitat loss would be short-term because most areas would be reclaimed once mining had ceased. Reclaimed areas would eventually recover to shrubland and again provide potential habitat for Columbian sharp-tailed grouse over the long term.

Under the Proposed Action, the power line may provide hunting perches for raptors and ravens, which may indirectly result in increased predation on Columbian sharp-tailed grouse in the Study Area. The power line would be constructed in compliance with APLIC standards to minimize raptor perching and thereby reduce predation on Columbian sharp-tailed grouse.

Over the long term, Columbian sharp-tailed grouse may be exposed to selenium and other COPCs by foraging on plant matter on the reclaimed overburden piles. However, individuals foraging in reclaimed areas during the winter likely migrate to other areas during the breeding season, which would limit the risk of chronic effects.

Because Columbian sharp-tailed grouse use the Study Area sporadically, primarily during the non-breeding season, the Proposed Action is unlikely to have population-level effects on this species. Overall, the Proposed Action may result in minor impacts on individuals or habitat over the long term.

CNF RFP (USFS 2003) management guidelines for Columbian sharp-tailed grouse would be the same as those described for greater sage-grouse. In addition, the CNF RFP includes the following standard specific to Columbian sharp-tailed grouse:

Wildlife, Management Indicator Species, Standard 1 - In project analyses affecting grassland and open canopy sagebrush habitats used by Columbian sharp-tailed grouse, assess impacts to habitat and populations for the grouse.

Overall, the Proposed Action is expected to comply with CNF RFP guidelines, as there are no known active Columbian sharp-tailed grouse leks within 2 miles of the Study Area, and impacts are not expected to affect the species at the population level. Further, the Proposed Action would not hinder cooperation with other state and federal agencies or private landowners to survey, inventory, or manage grouse habitats.

The PFO ARMP (BLM 2012a) provides management guidance for Columbian sharp-tailed grouse within 4 miles of leks for protection of winter habitat. There are no known leks within 4 miles of the Proposed Action. Therefore, the Proposed Action would be consistent with the CNF RFP and PFO ARMP with respect to Columbian sharp-tailed grouse.

Willow Flycatcher

To comply with the Migratory Bird Treaty Act (MBTA), Agrium would minimize the potential for direct mortality of willow flycatchers and other migratory birds by clearing vegetation from potential nesting habitat outside of the breeding season. If willow flycatchers are nesting in the vicinity of the mine, noise and human activity may disturb or disrupt nesting pairs. As discussed in **Section 4.6.1.1.2**, noise can negatively impact small birds by interfering with acoustic communication and eliciting an avoidance response.

Three acres of potentially usable willow flycatcher habitat (shrub/scrub wetland) would be removed under the Proposed Action, or 4 percent of the shrub/scrub wetland habitat in the Study Area. This loss of habitat would be permanent because reclaimed areas would be seeded with upland vegetation rather than being restored to their baseline riparian habitat type. These impacts would be short-term, as they would occur primarily during construction and active mining.

Willow flycatchers may be exposed to selenium and other COPCs by foraging on aquatic insects that emerge from the streams downgradient of the mine. The extent to which selenium toxicity might limit willow flycatcher populations in southeast Idaho is unstudied; however, in general, baseline selenium concentrations do not seem to limit migratory bird populations in the region (Ratti et al. 2006). Under the Proposed Action, additional loading of selenium and other COPCs into streams would be well below surface water standards, as described in **Section 4.3**. Therefore, the Proposed Action would not significantly increase the risk of selenium exposure to willow flycatchers at concentrations higher than baseline levels.

Because of the relatively small area of riparian habitat that would be impacted, direct and indirect impacts under the Proposed Action are unlikely to have population-level effects on this species. Overall, the Proposed Action, with the implementation of design features and measures to minimize impacts on migratory birds, may result in minor impacts on individuals or habitat over the long term.

The PFO ARMP (BLM 2012a) does not provide any specific management direction for the willow flycatcher.

Loggerhead Shrike

To comply with the MBTA, Agrium would minimize the potential for direct mortality of loggerhead shrikes and other migratory birds by clearing vegetation from potential nesting habitat outside of the breeding season. If loggerhead shrikes are nesting in the vicinity of the mine, noise and human activity may disturb or disrupt nesting pairs. As discussed in **Section 4.6.1.1.2**, noise can negatively impact small birds by interfering with acoustic communication and eliciting an avoidance response.

Three hundred and sixteen acres of potentially suitable loggerhead shrike habitat (big sagebrush shrubland and high-elevation rangeland) would be removed under the Proposed Action, or 19 percent of the habitat in the Study Area. The majority (99 percent) of this habitat loss would be short-term because most areas would be reclaimed once mining had ceased. Reclaimed areas would eventually recover to shrubland and again provide potential habitat for loggerhead shrikes over the long term.

Under the Proposed Action, the power line may provide a new perching and hunting opportunity for loggerhead shrikes. However, it may also provide a hunting perch for predators such as raptors and ravens. The power line would be constructed in compliance with APLIC standards to minimize raptor perching and thereby reduce predation on loggerhead shrikes and other migratory birds.

Because of the relatively small area of shrubland habitat that would be impacted, as well as reclamation practices that would return the site to grassland and eventually to shrubland habitat after cessation of mining, direct and indirect impacts under the Proposed Action are unlikely to have population-level effects on loggerhead shrikes. Overall, the Proposed Action, with the implementation of design features and measures to minimize impacts on migratory birds, is expected to result in long-term but minor impacts on this species.

The PFO ARMP (BLM 2012a) does not provide any specific management direction for the loggerhead shrike.

Sage Sparrow and Brewer's Sparrow

Primary impacts to sage sparrows and Brewer's sparrows under the Proposed Action may include direct removal of active nests and nesting habitat, disruption of nesting activity from noise and human activity, and indirect effects from potential exposure to COPCs.

If mine construction were to occur during the nesting season, active sage sparrow and Brewer's sparrow nests could be inadvertently destroyed (and eggs, chicks, and brooding adults could be killed) by construction equipment. To comply with the MBTA, Agrium would minimize the potential for direct mortality of migratory birds by clearing vegetation from potential nesting habitat outside of the nesting season. If sage sparrows or Brewer's sparrows are nesting in the vicinity of the mine, noise and human activity may disturb or disrupt nesting pairs. As discussed in **Section 4.6.1.1.2**, noise can negatively impact small birds by interfering with acoustic communication and eliciting an avoidance response.

One hundred and sixty-five acres of potentially suitable sage sparrow and Brewer's sparrow habitat (big sagebrush shrubland) would be removed under the Proposed Action, or 21 percent of the habitat in the Study Area. The majority (99 percent) of this habitat loss would be temporary because most areas would be reclaimed once mining had ceased. Areas reclaimed with the southwest aspects seed mix would eventually recover to big sagebrush shrubland and again provide potential habitat for sage sparrows and Brewer's sparrows over the long-term.

Under the Proposed Action, the power line may provide a hunting perch for predators such as raptors and ravens. The power line would be constructed in compliance with APLIC standards to minimize raptor perching and thereby reduce predation on sage sparrows, Brewer's sparrows, and other migratory birds.

Sage sparrows and Brewer's sparrows may be exposed to selenium and other COPCs by foraging on insects and plant matter on the reclaimed overburden piles. The extent to which selenium toxicity might limit populations of these species in southeast Idaho is unstudied; however, in general, baseline selenium concentrations do not seem to limit migratory bird populations in the region (Ratti et al. 2006). Therefore, impacts of added COPCs exposure from the Proposed Action are not expected to significantly impact sage and Brewer's sparrows.

Because of the relatively small area of big sagebrush habitat that would be impacted, as well as reclamation practices that would return much of the site to big sagebrush habitat after cessation of mining, direct and indirect impacts under the Proposed Action are unlikely to have population-level effects on sage sparrows or Brewer's sparrows. Overall, the Proposed Action, with the implementation of design features and measures to minimize impacts on migratory birds, may result in long-term but minor impacts on individuals or habitat.

The PFO ARMP (BLM 2012a) does not provide specific management direction for the sage sparrow or Brewer's sparrow.

Calliope Hummingbird

To comply with the MBTA, Agrium would minimize the potential for direct mortality of calliope hummingbirds and other migratory birds by clearing vegetation from potential nesting habitat outside of the breeding season. If calliope hummingbirds are nesting in the vicinity of the mine, noise and human activity may disturb or disrupt nesting pairs. As discussed in **Section 4.6.1.1.2**, noise can negatively impact small birds by interfering with acoustic communication and eliciting an avoidance response.

Eighty-six acres of potentially suitable calliope hummingbird habitat (shrub/scrub wetland and aspen forest) would be removed under the Proposed Action, or 14 percent of the habitat in the Study Area. This loss of habitat would be permanent because reclaimed areas would be seeded with upland grasses and shrubs rather than being restored to their baseline riparian or aspen forest habitat type. In addition, as discussed in **Section 4.5.1.1.2**, riparian habitats used by the calliope hummingbird could be indirectly altered by sedimentation and a reduction in water quantity. These impacts would be short-term, as they would occur primarily during construction and active mining.

Calliope hummingbirds may be exposed to selenium and other COPCs by foraging on plant nectar within riparian areas downgradient of the mine. The extent to which selenium toxicity might limit calliope hummingbird populations in southeast Idaho is unstudied; however, in general, baseline selenium concentrations do not seem to limit migratory bird populations in the region (Ratti et al. 2006). The Proposed Action would raise the concentration of selenium and other COPCs in downstream surface waters by an amount well below surface water standards, as described in **Section 4.3**. Therefore, the Proposed Action would not significantly increase the risk of selenium exposure to calliope hummingbirds above baseline levels.

Because of the relatively small area of riparian and forest habitat that would be impacted, direct and indirect impacts under the Proposed Action are unlikely to have population-level effects on this species. Overall, the Proposed Action, with the implementation of design features and measures to minimize impacts on migratory birds, may result in long-term but minor impacts on individuals or habitat.

The PFO ARMP (BLM 2012a) does not provide specific management direction for the calliope hummingbird.

Trumpeter Swan

To comply with the MBTA, Agrium would clear vegetation from potential nesting habitat outside of the breeding season; therefore, direct impacts to trumpeter swan nests are not anticipated. Even if no nests are present within the Proposed Action, noise and human activity may disturb or disrupt nesting pairs if nests are present in the vicinity of the mine. Trumpeter swans are known to be sensitive to human disturbance, and human activity near nest sites may lead to nest failure (Mitchell and Eichholz 2010). Furthermore, noise and human presence near wintering areas may lead to mortality or reduced reproductive potential (Mitchell and Eichholz 2010).

Trumpeter swans could also be directly impacted as a result of mortality from collision with aboveground structures (such as the overhead power line) and moving vehicles. Agrium would minimize collision risk on the power line by using APLIC design features such as appropriate spacing between conductors and grounded hardware and installation of bird flight diverters on the top grounding wire.

Twenty and a half acres of potentially suitable trumpeter swan habitat (wetlands and riparian areas) would be removed under the Proposed Action, or 6 percent of the wetland habitat in the Study Area. Most of the disturbed area would be reclaimed as soon as the area was no longer needed; however, reclaimed areas would not function as suitable trumpeter swan habitat, and wetland losses would be permanent. In addition, as discussed in **Section 4.5.1.1.2**, wetland habitats used by trumpeter swans could be indirectly altered by sedimentation and a reduction in water quantity. These impacts would be short-term, as they would occur primarily during construction and active mining.

Water birds such as trumpeter swans may be susceptible to toxic effects of COPC exposure in surface waters and aquatic food sources. As described in **Section 3.3**, baseline selenium concentrations in Angus Creek and the Blackfoot River already regularly exceed chronic aquatic life criteria, especially during the spring runoff period. Additional input of selenium and other COPCs into the watershed would be well below surface water standards under the Proposed Action, as described in **Section 4.3**. Therefore, the Proposed Action would not significantly increase the risk of selenium exposure to trumpeter swans in the Study Area above baseline levels.

Because of the relatively small area of wetland habitat that would be impacted, and lack of evidence from baseline studies that the Study Area supports nesting trumpeter swans, direct and indirect impacts under the Proposed Action are unlikely to have population-level effects on this species. Overall, the Proposed Action, with the implementation of design features and measures to minimize impacts on migratory birds, may result in long-term but minor impacts on individuals or habitat.

The CNF RFP (USFS 2003) provides the following standard for trumpeter swan nesting habitat: *Maintain suitable trumpeter swan nesting habitat conditions in Elk Valley Marsh and other sites.* There is no known trumpeter swan nesting in the Study Area; however, the Proposed Action would not be consistent with maintaining potentially usable nesting habitat, as it would result in the permanent removal of 20.5 acres of wetland habitat and could indirectly degrade nesting habitat through releases of sediment and COPCs.

American White Pelican

There are no known American white pelican breeding colonies in the Study Area; therefore, direct impacts on nesting birds are unlikely. Flocks of foraging pelicans are sensitive to human encroachment and may disperse if approached (Knopf and Evans 2004). Noise and activity from the Proposed Action may influence American white pelicans to temporarily avoid some areas of the

Proposed Action during active mining. American white pelicans could also be directly impacted as a result of mortality from collision with aboveground structures (such as the overhead power line) and moving vehicles. Agrium would minimize collision risk on the power line by using APLIC design features such as appropriate spacing between conductors and grounded hardware and installation of bird flight diverters on the top grounding wire.

Twenty and a half acres of potentially suitable American white pelican habitat (wetlands and riparian areas) would be removed under the Proposed Action, or 6 percent of the wetland habitat in the Study Area. Most of the disturbed area would be reclaimed as soon as the area was no longer needed; however, reclaimed areas would not function as suitable pelican habitat, and wetland losses would be permanent. In addition, as discussed in **Section 4.5.1.1.2**, wetland habitats used by American white pelicans could be indirectly altered by sedimentation and a reduction in water quantity. These impacts would be short-term, as they would occur primarily during construction and active mining.

Water birds such as American white pelicans may be susceptible to toxic effects of COPC exposure in surface waters and aquatic food sources. As described in **Section 3.3**, baseline selenium concentrations in Angus Creek and the Blackfoot River already regularly exceed chronic aquatic life criteria, especially during the spring runoff period. Additional input of selenium and other COPCs into the watershed would be well below surface water standards under the Proposed Action, as described in **Section 4.3**. Therefore, the Proposed Action would not significantly increase the risk of selenium exposure to American white pelicans in the Study Area above baseline levels.

Because of the relatively small area of wetland habitat that would be impacted, and lack of evidence from baseline studies that the Study Area supports nesting American white pelicans, direct and indirect impacts under the Proposed Action are unlikely to have population-level effects on this species. Overall, the Proposed Action, with the implementation of design features and measures to minimize impacts on migratory birds, may result in long-term but minor impacts on individuals or habitat.

The PFO ARMP includes the following action specific to American white pelican habitat: "**Action SS-1.3.10:** American white pelican habitat on BLM-administered public lands will be managed in coordination with IDFG to maintain habitat requirements to sustain viable populations." As the Proposed Action would not affect pelican habitats to an extent that would preclude a viable population, this alternative would be consistent with ARMP guidance for this species.

<u>Harlequin Duck</u>

As there is no suitable habitat, and this species is not expected to occur in the Study Area, the Proposed Action would have no impact on harlequin ducks.

<u>White-faced Ibis</u>

There are no known white-faced ibis breeding colonies in the Study Area; therefore, direct impacts on nesting birds are unlikely. Noise and activity from the Proposed Action may influence white-faced ibis to temporarily avoid some areas of the Proposed Action during active mining. White-faced ibis could also be directly impacted as a result of mortality from collision with aboveground structures (such as the overhead power line) and moving vehicles. Agrium would minimize collision risk on the power line by using APLIC design features such as appropriate spacing between conductors and grounded hardware and installation of bird flight diverters on the top grounding wire.

Twenty and a half acres of potentially suitable white-faced ibis habitat (wetlands and riparian areas) would be removed under the Proposed Action, or 6 percent of the wetland habitat in the Study Area. Most of the disturbed area would be reclaimed as soon as the area was no longer needed; however, reclaimed areas would not function as suitable ibis habitat, and wetland losses would be permanent. In addition, as discussed in **Section 4.5.1.1.2**, wetland habitats used by white-faced ibis could be indirectly altered by sedimentation and a reduction in water quantity. These impacts would be short-term, as they would occur primarily during construction and active mining.

Water birds such as white-faced ibis may be susceptible to toxic effects of COPC exposure in surface waters and aquatic food sources. As described in **Section 3.3**, baseline selenium concentrations in Angus Creek and the Blackfoot River already regularly exceed chronic aquatic life criteria, especially during the spring runoff period. Additional input of selenium and other COPCs into the watershed would be well below surface water standards under the Proposed Action, as described in **Section 4.3**. Therefore, the Proposed Action would not significantly increase the risk of selenium exposure to white-faced ibis in the Study Area above baseline levels.

Because of the relatively small area of wetland habitat that would be impacted, and lack of evidence from baseline studies that the Study Area supports nesting white-faced ibis, direct and indirect impacts under the Proposed Action are unlikely to have population-level effects on this species. Overall, the Proposed Action, with the implementation of design features and measures to minimize impacts on migratory birds, may result in long-term but minor impacts on individuals or habitat.

The PFO ARMP (BLM 2012a) does not provide specific management direction for the white-faced ibis.

<u>Black Tern</u>

To comply with the MBTA, Agrium would clear vegetation from potential nesting habitat outside of the breeding season. Therefore, direct impacts to black tern nests are not anticipated. Even if no nests are present, project noise and activity may influence black terns to temporarily avoid some areas of the Proposed Action during active mining. Black terns could also be directly impacted as a result of mortality from collision with aboveground structures (such as the overhead power line) and moving vehicles. Agrium would minimize collision risk on the power line by using APLIC design features such as appropriate spacing between conductors and grounded hardware and installation of bird flight diverters on the top grounding wire.

Twenty and a half acres of potentially suitable black tern habitat (wetlands and riparian areas) would be removed under the Proposed Action, or 6 percent of the wetland habitat in the Study Area. Most of the disturbed area would be reclaimed as soon as the area was no longer needed; however, reclaimed areas would not function as suitable black tern habitat, and wetland losses would be permanent. In addition, as discussed in **Section 4.5.1.1.2**, wetland habitats used by black terns could be indirectly altered by sedimentation and a reduction in water quantity. These impacts would be short-term, as they would occur primarily during construction and active mining.

Water birds such as black terns may be susceptible to toxic effects of COPC exposure in surface waters and aquatic food sources. As described in **Section 3.3**., baseline selenium concentrations in Angus Creek and the Blackfoot River already regularly exceed chronic aquatic life criteria, especially during the spring runoff period. Additional input of selenium and other COPCs into the watershed would be well below surface water standards under the Proposed Action, as described in **Section 4.3**. Therefore, the Proposed Action would not significantly increase the risk of selenium exposure to black terns in the Study Area above baseline levels.

Because of the relatively small area of wetland habitat that would be impacted, and lack of evidence from baseline studies that the Study Area supports nesting black terns, direct and indirect impacts under the Proposed Action are unlikely to have population-level effects on this species. Overall, the Proposed Action, with the implementation of design features and measures to minimize impacts on migratory birds, may result in long-term but minor impacts on individuals or habitat.

The PFO ARMP (BLM 2012a) does not provide specific management direction for the black tern.

Columbia Spotted Frog

As Columbia spotted frogs are not known to occur in the CNF or in Caribou County, there would be no impacts on this species under the Proposed Action.

Boreal Toad, Northern Leopard Frog, Common Garter Snake

Impacts to these three species would be similar to those described for amphibians and reptiles generally in **Section 4.7.1.1.4**. Proposed Action impacts would include the permanent loss of 20.5 acres of riparian/wetland habitat, potential mortalities of individuals crossing the haul road, as well as potential introduction of sediment and COPCs into the watershed. Overall, impacts may be long-term and moderate on individuals or habitat.

The PFO ARMP (BLM 2012a) contains the following applicable guidance for special status amphibian species:

Action SS-1.3.5: Populations of boreal toads and Northern leopard frogs will be identified and inventoried and where populations are located, permitted activities will be managed to maintain quality frog and or toad habitat by:

- Managing riparian areas to make progress towards or achieving PFC.
- Increasing pool habitat based upon site potential.
- Mitigating or adjusting activities having adverse effects on boreal toad and Northern leopard frog habitats.

Furthermore, the CNF RFP (USFS 2003) contains the following guidelines for special status amphibian species:

1. Ensure habitats in the Tincup Creek Drainage and other known toad breeding locations are managed to maintain or improve the existing population and distribution of western toads.
2. Ensure habitats in the Toponce area and other known northern leopard frog breeding locations are managed to maintain or improve the existing population and distribution of the frogs.
3. Maintain amphibian habitats when developing and modifying springs and wetlands.

Neither the BLM nor the USFS guidance would be met under the Proposed Action, as the boreal toad and northern leopard frog are known to breed in the Study Area, yet the Proposed Action would result in the permanent loss of 20.5 acres of breeding habitat for these species. The permanent loss of breeding habitat in the Study Area would be counter to the goals of improving and expanding existing populations of these species.

Fish (Yellowstone cutthroat trout, northern leatherside chub)

Impacts to special status fish species would be the same as those generally described for fish in **Section 4.7.1.1.3** and include the potential for long-term habitat alteration as a result of the removal and alteration of riparian vegetation in the AIZ, the potential for the short-term release of sediment into the watershed, and the potential for the release of COPCs into the watershed. Overall, impacts would be long-term and moderate.

Action SS-1.3.9 in the PFO ARMP provides management direction for the Yellowstone cutthroat trout. A number of conservation actions are included under Action SS-1.3.9. The Proposed Action would be consistent with most of the conservation actions except the following:

- Enhance and maintain channel integrity, channel processes, water quality, salmonid habitat and habitat connectivity.
- Strive to eliminate or significantly reduce threats to present or potential cutthroat trout distribution within their historic range and to habitat quality and quantity.
- Strive to achieve the criteria for highest quality trout habitats as described in the Cutthroat Trout Matrix.

The Proposed Action would be inconsistent with these actions because it would impact water quality and quantity in known cutthroat trout-bearing streams (Angus Creek and the Blackfoot River) over the short term, result in the permanent loss of 20.5 acres of wetlands adjacent to these streams, and contribute to moderate and long-term increases in COPC concentrations within these waterways.

4.8.1.1.2 Special Status Plant Species

As discussed in **Section 3.8.3**, there are no identified plant species listed as threatened, endangered, or proposed under the ESA in Caribou County (USFWS 2015b). No CNF sensitive plant species or CNF Forest Watch rare plant species have been documented in the baseline studies. Additionally, no BLM sensitive plant species were documented during baseline studies. Therefore, impacts to sensitive plants are not anticipated to occur and are not analyzed further.

4.8.1.2 Rasmussen Collaborative Alternative

Overall impacts of the RCA on threatened, endangered, and special status species would be similar in nature to those under the Proposed Action, but would vary slightly for some species. The overall impact of the RCA on threatened, endangered, and special status species would be long-term and negligible to minor. Individual species are discussed below.

4.8.1.2.1 Threatened, Endangered, Proposed, and Candidate Species

Canada Lynx

Impacts to the Canada lynx under the RCA would be similar to those described in **Section 4.8.1.1** for the Proposed Action. Noise and human activity associated with the RCA would likely cause lynx to travel around the periphery of the Study Area but would not impede broad-scale movements of lynx or preclude the use of the linkage area. Over the long term, human activity would cease, and reclaimed areas are expected to recover to high-elevation rangeland habitat. Because disturbance would be small in scale relative to the overall size of linkage habitat on the CNF, most of the disturbed habitat would be reclaimed, and Canada lynx presence is expected to be limited to transient use of linkage habitat, the RCA may affect, but is not likely to adversely affect, the Canada lynx.

Compliance with applicable USFS, BLM, and Canada Lynx Conservation Assessment Strategy management directions for Canada lynx is summarized in **Table 4.8-5**. In addition, the following management directions were reviewed and found to not be applicable to a phosphate mine project:

- Northern Rockies Lynx Management Direction Guideline All G1; Standard LAU S1; Vegetation Management Activities and Practices (VEG) objectives, standards, and guidelines; Livestock Management (GRAZ) objectives, standards, and guidelines; Human Use Projects (HU) objectives and guidelines; and Linkage Areas (LINK) objectives, standards, and guidelines (note the LINK objectives, standards, and guidelines are specific to grazing activities, highway construction, and areas of intermingled land ownership)
- CNF RFP (USFS 2003) Lands Objective 1 and Lands Standard 1

Table 4.8-5 Compliance with USFS and BLM Management Direction for Canada Lynx under the RCA

	Management Direction	Compliance under the RCA
2003 CNF RFP	**Forest Vegetation DFC 1**: Forested habitats display a diversity of structure and composition. Productive and diverse populations of plants are maintained or restored.	The RCA would not hinder attainment of or progress towards this DFC. On a site-specific scale, impacts to forested habitat would be 132 acres. On a Forest-wide scale, this is minor and insignificant, totaling only 0.02 percent of the total 550,000 acres of forested habitat available in the CNF RFP (USFS 2003).
	Forest Vegetation DFC 2: In conifers, a range of structural stages exists where 30 to 40 percent of the acres are in mature and old age classes. Early successional stages are maintained through endemic insect and disease disturbance, vegetation management and fire. Patterns are within historical ranges of variability with functional corridors present.	The RCA would not hinder this DFC. No conifer habitat would be affected.
	Forest Vegetation DFC 3: Conifer types are maintained and disturbance processes are restored through vegetation management, endemic insect / disease disturbances, & fire.	The RCA would not hinder attainment of or progress towards this DFC. No conifer habitat would be affected.
	Forest Vegetation DFC 4: Quaking aspen communities are moving towards historical ranges with fire and other practices influencing structural class distribution and patterns across the landscape. Aspen forests are managed to achieve desired vegetative conditions with 20 to 30 percent in mature and old age classes, and to reduce the decline of aspen acres as a result of succession of aspen to conifer.	The RCA would not hinder attainment of or progress towards this DFC. On a site-specific scale, impacts to aspen communities would total 132 acres. However, on a Forest-wide scale, this impact would be minimal and would total only 0.05 percent of 268,000 acres of aspen and aspen/conifer mix habitat available in the CNF (USFS 2003). Further, currently, 93 percent of the aspen stands in the 5th code HUC are in old/mature age classes based on USFS mapping. All of the aspen stands that would be impacted under the RCA are in mature/old age classes. On-site inventory showed that no acres that currently meet Region Four “Old-growth” definitions would be impacted on USFS lands. Therefore, the RCA would not negatively impact the distribution of aspen forest age classes and would be consistent with maintaining at least 20 percent mature/old age classes in the 5th code HUC that encompasses the Study Area. Proponent funding for offsite mitigation may include aspen restoration that could reduce this impact. Mitigation would make the RCA consistent with this goal.

Table 4.8-5 Compliance with USFS and BLM Management Direction for Canada Lynx under the RCA

	Management Direction	Compliance under the RCA
	Non-forest DFC-1: Non-forested ecosystems: are resilient, diverse, and functioning within their site potential; display a diversity of structure and composition; and are within their historical range of variability (HRV).	The RCA would not hinder attainment of or progress towards this DFC. Impacts to non-forested ecosystems would largely be temporary, and they would be reclaimed with a variety of native plant species.
	Non-forest DFC-2: Non-forested ecosystems reflect a mosaic of multiple-aged shrubs, forbs, and native grasses with management emphasis on maintaining a diverse sustainable plant community. Fire regimes exist on an approximate 20 to 40 year return cycle. Patterns are within historical ranges with 30 to 50 percent of the shrubs in greater than fifteen percent canopy cover class.	The RCA would not hinder attainment of or progress towards this DFC. Impacts to non-forested ecosystems would largely be temporary, and they would be reclaimed with a variety of native plant species. Over the long term, reclaimed areas would recover to high-elevation rangeland similar to baseline conditions.
	Non-forest DFC-3: Rehabilitation or restoration of native shrub communities is accomplished, where site potential permits.	The RCA would not hinder attainment of or progress towards this DFC. Over 110 years, reclaimed areas would recover to high-elevation rangeland similar to baseline conditions. Under the RCA, the reclamation seed mix contains native grasses, forbs, and shrubs (including big sagebrush) to help reach baseline conditions over the long term.
	Non-forest DFC-4: On areas capable of tall forb dominance, tall forb types reflect historical ranges of ground cover leading into the winter season. Composition reflects a mosaic dominance of tall forb indicator species. Disturbance regimes demonstrate stable or upward trend in tall forb indicator species. Patterns are within the historical range. Historical tall forb sites, which currently are not capable of tall forb dominance, are managed to maintain watershed stability.	The RCA would not hinder attainment of or progress towards this DFC. Tall forbs would re-establish in reclaimed areas from surrounding habitats.
	Non-forest DFC-5: Woodland types including mountain mahogany, juniper and maple have multiple-aged shrub layers and a balanced shrub/herbaceous understory. Patterns are within historical ranges.	The RCA would not hinder attainment of or progress towards this DFC. The Study Area does not contain these woodland types.
	Vegetation Goal 1: Diverse forested and non-forested ecosystems are maintained within their historic range of variability or restored through time with emphasis on aspen, aspen-conifer, mixed conifer, big sagebrush, mountain brush and tall forbs.	Short-term impacts of the RCA would not be consistent with this goal; however, after reclamation activities were completed and the site had recovered to high-elevation rangeland habitat (110 years), the goal would be met. Proponent funding for offsite mitigation may include aspen restoration that could reduce this impact. Mitigation would make the RCA consistent with this goal.
	Vegetation Goal 2: Aspen forests are managed to reduce or halt the decline of aspen acres as a result of succession of aspen to conifer.	The RCA would be inconsistent with this goal, as it would permanently remove 132 acres of aspen. This loss is not expected to impact the overall aspen health of the CNF given that stands in the Study Area are not diverse, are patchy, and are relatively small. The reclaimed acres are expected to return to high-elevation rangeland/shrubland and over time through succession. Proponent funding for offsite mitigation may include aspen restoration that could reduce this impact. Mitigation would make the RCA consistent

Table 4.8-5 Compliance with USFS and BLM Management Direction for Canada Lynx under the RCA

	Management Direction	Compliance under the RCA
		with this goal.
	Vegetation Goal 3: Forested ecosystems are moving towards a balance of age and size classes in each forested vegetation type on a watershed or landscape scale. Early seral species are recruited and sustained while still providing a diversity of successional stages.	The RCA would be consistent with the attainment of or progress towards this goal. The removal of 132 acres of forest habitat would not measurably impact the distribution of forest stand age classes on the CTNF or at the landscape scale. Currently, 93 percent of the aspen stands in the 5PthP code HUC are in old/mature age classes based on USFS mapping. All of the aspen stands that would be impacted under the RCA are in mature/old age classes. On-site inventory showed that no acres that currently meet Region Four "Old-growth" definitions would be impacted on USFS lands. Therefore, the RCA would not negatively impact the distribution of aspen forest age classes and would be consistent with maintaining at least 20 percent mature/old age classes in the 5PthP code HUC that encompasses the Study Area. Proponent funding for offsite mitigation may include aspen restoration that could reduce this impact.
	Vegetation Goal 4: Sagebrush steppe and mountain shrub habitats are moving toward a balance of age, canopy cover, and size class on a watershed or landscape scale that is within their HRV.	The RCA would be consistent with attainment of or progress towards this goal after reclamation activities were completed and the site had recovered to high-elevation rangeland habitat.
	Vegetation Goal 7: Biodiversity is maintained or enhanced by managing for a diverse array of habitats tied to natural process occurrence and distribution of plant communities.	The RCA would be consistent with attainment of or progress towards this goal. Habitat changes resulting from the RCA would be localized to the mine footprint. Maintenance of existing biodiversity on the CTNF is expected.
	Vegetation Standard 2: In each 5th code HUC which has the ecological capability to produce forested vegetation, the combination of mature and old age classes (including old growth) shall be at least 20 percent of the forested acres. At least 15 percent of all the forested acres in the HUC are to meet or be actively managed to attain old growth characteristics.	The RCA would be consistent with this standard. Currently, 93 percent of the aspen stands in the 5PthP code HUC are in old/mature age classes based on USFS mapping. All of the aspen stands that would be impacted under the RCA are in mature/old age classes. On-site inventory showed that no acres that currently meet Region Four "Old-growth" definitions would be impacted on USFS lands. Therefore, the RCA would not negatively impact the distribution of aspen forest age classes and would be consistent with maintaining at least 20 percent mature/old age classes in the 5PthP code HUC. Proponent funding for offsite mitigation may include aspen restoration that could reduce this impact.
	Wildlife Goal 2: Wildlife biodiversity is maintained or enhanced by managing for vegetation and plant communities within their historical range of variability.	The RCA would be consistent with attainment of or progress towards this goal. Habitat changes resulting from the RCA would be localized to the mine footprint and would not impact wildlife biodiversity on the Forest.
	Wildlife Goal 3: Maintain multiple vegetation layers in woody riparian habitats that are stable or increasing with all age classes (seedlings, young plants, mature and decadent) represented to support native bird communities and other wildlife.	The RCA would be consistent with this goal, as it was designed to avoid all disturbance to woody riparian habitat (shrub/scrub wetland).
	Wildlife Goal 5: Maintain, and where necessary and feasible, provide for habitat connectivity across forested and non-forested landscapes.	The RCA would be consistent with attainment of or progress towards this goal. Over the short term, project facilities would fragment some of the shrub habitats in the Study Area, but these areas would be

Table 4.8-5 Compliance with USFS and BLM Management Direction for Canada Lynx under the RCA

	Management Direction	Compliance under the RCA
		reclaimed following active mining; therefore, habitat connectivity would not be impacted over the long term.
2012 BLM PFO ARMP	**Goal FW-2:** Provide for the diversity of native and non-native species as part of an ecologically healthy system.	The RCA would be consistent with this goal because the majority of disturbed areas would be reclaimed with a mixture of native grass, forb, and shrub species. Plant species richness on reclaimed areas is anticipated to be similar to baseline species richness. Over the long term, reclaimed areas are predicted to recover to high-elevation rangeland habitat.
	Objective FW-2.1: Maintain or improve native and desired non-native species habitat and the connectivity among habitats.	The RCA would be consistent with this objective because the majority of disturbed areas would be reclaimed with a mixture of native grass, forb, and shrub species. Reclaimed areas would eventually return to high-elevation rangeland habitat. The RCA is not anticipated to significantly disrupt habitat connectivity over the long term.
	Goal SS-1: Manage special status species and their habitats to provide for their continued presence and conservation as part of an ecologically healthy system.	The RCA would be consistent with this goal. Most disturbed lands would be reclaimed with native plant species and would recover to high-elevation rangeland over the long term.
	Objective SS-1.1: Conserve, inventory, and monitor species status species.	Agrium contracted TRC conduct baseline lynx surveys from 2010 to 2012 for the Study Area (TRC 2012a, 2012b, 2012c).
	Action SS-1.1.1: USFWS will be consulted consistent with ESA requirements.	The BLM and the USFS have consulted and would continue to consult with the USFWS per all applicable ESA requirements.
	Action SS-1.1.3: Appropriate actions, conservation measures, and guidelines that contribute to the continued presence and conservation of special status species will be considered.	Impacts to lynx are expected to be minor and insignificant. As such, mitigation measures specific to lynx have not been determined to be necessary.
	Objective SS-1.2: Maintain or improve the quality of listed species habitat by managing public land activities to support species recovery and the benefit of those species.	One hundred and thirty one acres of aspen habitat would be permanently lost under the RCA. However, over the long term, 91 percent of disturbed areas would be reclaimed to high-elevation rangeland, and the RCA would not hinder habitat connectivity in the linkage area. Therefore, it would not negatively impact lynx recovery.
	Action SS-1.2.1: Consistent with ESA requirements, the USFWS will be consulted regarding activities concerning listed species.	The BLM and the USFS have consulted and would continue to consult with the USFWS and other agencies as needed.
	Action SS-1.2.2: Identified actions to maintain or improve listed species habitat will be modified through the ESA consultation process.	No actions to maintain or improve listed species habitat have yet been identified through the ESA consultation process. Such actions are not anticipated to be necessary because the RCA would have minor, but insignificant, impacts on lynx and would not significantly impact the linkage area.
	Action SS-1.2.3: Seasonal restrictions will be implemented for listed species.	Seasonal restrictions are not planned for lynx, as the Study Area is in a linkage area that is not regularly used by lynx.

Source: USFS 2007, 2003

North American Wolverine

Impacts to wolverines would be similar to those described in **Section 4.8.1.1.1** for the Proposed Action, except that the RCA would all but eliminate the potential for wildlife to be exposed to added

COPCs as a result of the proposed store-and-release cover system and elimination of overburden piles downgradient of the pit. Noise and human activity associated with the RCA would likely cause wolverines to travel around the periphery of the Study Area but would not impede broad-scale movements of wolverines. Over the long term, human activity would cease, and reclaimed areas would recover to high-elevation rangeland habitat. Overall impacts to wolverines are not likely to jeopardize their continued existence because of the small number of individual wolverines that potentially use the Study Area and the wide-ranging nature of this species.

Compliance with applicable USFS management directions for North American wolverines is summarized in **Table 4.8-6**.

Table 4.8-6 Compliance with USFS and BLM Management Direction for North American Wolverine under the RCA

Source	Management Direction	Compliance under the RCA
2003 Caribou Forest Plan	**Wildlife, Desired Future Conditions, Objective 1 (Wolverine Habitat):** Within two years of signing the ROD, complete a GIS analysis to identify potential wolverine natal den sites. Within four years of the ROD, survey potential wolverine natal den sites to document wolverine presence and assess suitability as natal denning habitat.	There is no potential for denning as the Study Area is located at too low an altitude and lacks talus slopes that could provide denning habitat.
	Wolverine Guideline 1: Restrict intrusive disturbance within one mile around known active den sites, March 1 to March 15.	No wolverine den sites are known to occur within or near the Study Area. The Study Area does not provide suitable denning habitat.
	Wildlife, Sensitive Species, Guideline 1: Survey for the presence of sensitive species if suitable habitats are found within a project area a minimum of once prior to or during project development.	Winter track surveys were conducted for the Project in 2012 (TRC 2012a; 2012c).

4.8.1.2.2 USFS Sensitive and Management Indicator Species and BLM Sensitive Species

In general, impacts to sensitive and Management Indicator Species under the RCA would be similar to those described in **Section 4.8.1.1.2** for the Proposed Action, except where noted below. Compliance with BLM and USFS management direction for sensitive species would be the same as under the Proposed Action, except where noted below.

Greater Sage-grouse

The RCA would be similar to the Proposed Action in that it would result in the long-term loss of only 8 more acres of big sagebrush habitat. The RCA would eliminate the need for an overhead power line, which would result in reduced impacts on greater sage-grouse from predator perching and power line avoidance. Other impacts to greater sage-grouse would be the same as those described in **Section 4.8.1.1.1** for the Proposed Action. Overall, the RCA may have a minor, long-term impact on individuals or habitat.

Compliance with applicable BLM and USFS management direction for greater sage-grouse is summarized in **Table 4.8-7**. In addition, the following management direction was reviewed and found to not be applicable to a phosphate mine project:

- CNF RFP (USFS 2003) Sage-grouse Guideline 1

Table 4.8-7 Compliance with BLM and USFS Management Direction for Greater Sage-Grouse under the RCA

Source	Management Direction	Compliance under the RCA
2012 PFO ARMP	**Objective VE-4.1:** In Low-and Mid-Elevation Shrub and Mountain Shrub types, commensurate with site potential, maintain or increase Land Health Condition (LHC)-A acres as described below so the landscape is composed of a diversity of desirable/native herbaceous and shrub/woody species consisting of at least 15-25% sagebrush canopy cover in greater sage-grouse habitat in the Low-and Mid-Elevation Shrub types and at least 25% shrub cover in the Mountain Shrub type.	The RCA would be consistent with this objective because the seed mix selected for reclamation contain a variety of native grass, forb, and shrub species (including sagebrush species). Additional native species are predicted to colonize reclaimed areas over time through natural successional processes. Shrub cover would initially be lost in disturbed areas, but over time, it is anticipated to recover. Reclaimed areas would likely resemble the baseline high-elevation rangeland habitat type; however, they would include a big sagebrush component that would provide marginal habitat for sage-grouse.
	Objective SS-1.1.: Conserve, inventory, and monitor special status species.	The RCA would be consistent with this objective. The minor loss of marginal sage-grouse habitat in the Study Area would not hinder BLM efforts to conserve, inventory, and monitor greater sage-grouse.
	Action SS-1.1.3.: On a case by case basis, appropriate actions (e.g., timing and spatial closures, habitat avoidance/restrictions, and agency specific guidance), conservation measures and guidelines that contribute to the continued presence and conservation of special status species will be considered to minimize the potential for the listing of species. Appropriate actions, conservation measures and guidelines that may be considered include: Conservation Plan for Greater Sage-Grouse (Idaho Sage-grouse Advisory Committee 2006).	The BLM and USFS are using current guidelines for sage-grouse management against which to assess impacts including the BLM Instructional Memoranda 2012-043 and 2012-044 and the *Conservation Plan for Greater Sage-Grouse* (Idaho Sage-grouse Advisory Committee 2006). Based on information from baseline surveys (TRC 2012a, 2012b, 2012c), the RCA is not expected to impact breeding or nesting sage-grouse. The mine site is not in designated grouse habitat. Seasonal restrictions contained in the ARMP do not apply to mining activities. (Action PP-ME-2.5.5 -Seasonal restrictions would not apply to the operation and maintenance of solid leasable mineral production facilities unless the findings of analysis demonstrate the continued need for such mitigation and that less stringent, project-specific mitigation measures would be insufficient.)
	Objective SS-1.2.: Maintain or improve the quality of listed species habitat by managing public land activities to support species recovery and the benefit of those species.	The RCA would be consistent with this objective. The minor loss of marginal sage-grouse habitat in the Study Area would not hinder recovery of the greater sage-grouse.
	Action SS-1.3.6.: To the extent possible and to promote conservation, Greater sage-grouse habitat will be managed consistent with the *Conservation Plan for Greater Sage-grouse in Idaho* (IDFG 2006) or any future revisions/amendments and or current BLM guidance. Appropriate actions, conservation measures and guidelines that may be considered include, but are not limited to: • Continue efforts to map populations and habitat for greater sage-grouse. Map seasonal (lek, nesting, brood-rearing and winter) habitats along with source and isolated populations. • Establish goals for greater sage-grouse habitat conservation at the local level in conjunction with IDFG and local working groups for protection and maintenance of existing	The RCA would be consistent with BLM management direction for greater-sage grouse. No key or important sage-grouse habitats, as mapped by the BLM or IDFG, would be impacted by the RCA. There would be no temporary disturbance within 0.6 mile of occupied leks or permanent disturbance within 2 miles of occupied leks. The RCA would not hinder BLM efforts to map important sage-grouse habitats; establish goals for sage-grouse habitat conservation; or protect, manage, or monitor key habitats and sage-grouse populations.

Table 4.8-7 Compliance with BLM and USFS Management Direction for Greater Sage-Grouse under the RCA

Source	Management Direction	Compliance under the RCA
	populations and restoration goals. • Protect and maintain suitable habitats and reconnect separated populations based upon the following priorities: 1. Key habitats 2. Source habitats (S1) 3. Restoration areas (R1, R2) 4. Areas that link isolated populations • Commensurate with site potential, manage key habitat for a range of sagebrush canopy cover averaging 15 to 25 percent (11 to 31 inches in height); at least 15 percent grass cover; and 10 percent cover of a diversity of forbs. • Monitor progress and adjust activities to make progress towards greater sage-grouse goals and objectives. • In areas where grouse habitats are fragmented by land ownership pattern, cooperate with IDFG and local working groups to identify and maintain long-term habitat by acquiring conservation easements or bringing crucial habitats into public ownership. • In cooperation with IDFG identify areas where application of pesticides for grasshopper or Mormon cricket control may negatively affect grouse broods. Identify a cooperative strategy to review requests for pesticide application in these identified locations. • Active sage-grouse leks will be protected during the lekking season from temporary human disturbance (e.g., routine maintenance, inspections, and construction activities) by requiring a minimum buffer of 0.6 miles. • New infrastructure facilities/structures (e.g., major power transmission lines, power distribution lines, communications towers, and temporary meteorological towers) requiring permanent surface occupancy will be sited in a manner that avoids sage-grouse habitat to the extent possible and will be placed at least 2.0 miles from occupied leks or other important sage-grouse seasonal habitats as identified locally. • Future permitted/authorized activities will be evaluated on a site specific basis for potential threats consistent with the Conservation Plan for Greater Sage-grouse in Idaho (IDFG 2006) and mitigated through the NEPA process. • Restore shrub-steppe habitats in the following priority: 1. source areas 2. restoration areas 3. areas that link isolated populations	

Table 4.8-7 Compliance with BLM and USFS Management Direction for Greater Sage-Grouse under the RCA

Source	Management Direction	Compliance under the RCA
2003 CNF RFP, as amended by the 2015 Greater Sage-Grouse ROD for Idaho and Southwest Montana	**GRSG-GEN-DC-001-Desired Condition:** The landscape for the greater sage-grouse encompasses large contiguous areas of native vegetation, approximately 6 to 62 square miles in area, to provide for multiple aspects of species life requirements. Within these landscapes, a variety of sagebrush-community compositions exist without invasive species, which have variations in subspecies composition, co-dominant vegetation, shrub cover, herbaceous cover, and stand structure to meet seasonal requirements for food, cover, and nesting for the greater sage-grouse.	The RCA would be consistent with this desired condition. No large areas of contiguous sage-grouse habitat would be impacted under the Proposed Action. Further, no important habitat management areas or focal sagebrush areas would be impacted.
	GRSG-GEN-DC-002-Desired Condition: Anthropogenic disturbance is focused in non-habitat areas outside of priority, important, and general habitat management areas and sagebrush focal areas. Disturbance in general habitat management areas is limited, and there is little to no disturbance in priority and important habitat management areas and sagebrush focal areas except for valid existing rights and existing authorized uses.	The RCA would meet this desired condition as disturbance would not occur in PHMAs, IHMAs, GHMAs, or focal sagebrush areas.
	GRSG-GEN-DC-003-Desired Condition: In all greater sage-grouse habitat, including all seasonal habitat, 70 percent or more of lands capable of producing sagebrush have from 10 to 30 percent sagebrush canopy cover and less than 10 percent conifer canopy cover. In addition, within breeding and nesting habitat, sufficient herbaceous vegetation structure and height provides overhead and lateral concealment for nesting and early brood rearing life stages. Within brood rearing habitat, wet meadows and riparian areas sustain a rich diversity of perennial grass and forb species relative to site potential. Within winter habitat, sufficient sagebrush height and density provides food and cover for the greater sage-grouse during this seasonal period.	The RCA would meet the intent of this desired condition. Sagebrush habitat within the Study Area is marginal and is not known to support nesting, breeding, or large wintering populations.
	GRSG-GEN-ST-004-Standard: In priority habitat management areas and sagebrush focal areas, do not issue new discretionary written authorizations unless all existing discrete anthropogenic disturbances cover less than 3 percent of the total greater sage-grouse habitat within the Biologically Significant Unit and the proposed project area, regardless of ownership, and the new use will not cause exceedance of the 3 percent cap.	Not applicable; the RCA does not overlap PHMAs or sagebrush focal areas.
	GRSG-GEN-ST-005-Standard: In priority, general, and important management areas and sagebrush focal areas, only allow new authorized land uses if, after avoiding and minimizing impacts, any remaining residual impacts to sage-grouse or its habitat are fully offset by compensatory mitigation projects that provide a net conservation gain to the species, subject to valid existing rights by applying beneficial mitigation actions.	Not applicable. The RCA does not overlap PHMAs or sagebrush focal areas.

Table 4.8-7 Compliance with BLM and USFS Management Direction for Greater Sage-Grouse under the RCA

Source	Management Direction	Compliance under the RCA
	GRSG-GEN-ST-006-Standard: Do not authorize new surface disturbing and disruptive activities that create noise at 10dB above ambient measured at the perimeter of an occupied lek during lekking (March 1 to April 30) from 6 p.m. to 9 a.m.	The RCA would be consistent with this standard. No occupied leks are anticipated to be impacted by the RCA. The nearest occupied lek is located more than 7 miles southwest.
	GRSG-GEN-GL-007-Guideline: During breeding and nesting (from March 1 to June 15), surface disturbing and disruptive activities to nesting birds should be avoided.	The RCA would meet the intent of this guideline. Nesting greater sage-grouse have not been observed in the Study Area, and the nearest known active lek is more than 7 miles southwest. Nesting greater sage-grouse are not expected to use the Study Area.
	GRSG-GEN-GL-008-Guideline: When breeding and nesting habitat overlaps with other seasonal habitat, habitat should be managed for breeding and nesting desired conditions.	The RCA would meet the intent of this guideline, as breeding and nesting habitat is not expected to occur in the Study Area.
	GRSG-GEN-GL-009-Guideline: Development of tall structures within 2 miles from the perimeter of occupied leks as determined by local conditions, with the potential to disrupt breeding or nesting by creating new perching/nesting opportunities for avian predators or by decreasing the use of an area, should be restricted within nesting habitat.	The RCA would meet the intent of this guideline. There are no known active leks within 2 miles of the Study Area boundary.
	GRSG-AM-ST-010-Standard: If a hard trigger is identified, management direction applying to priority habitat management areas will be applied to important habitat management areas within the Conservation Area in Idaho, and the Sage-Grouse Implementation Task Force will evaluate available and pertinent data and recommend additional potential implementation level activities to the appropriate FS line officer in both Idaho and Southwest Montana.	No hard triggers for greater sage-grouse have been identified for the RCA.
	GRSG-AM-ST-011-Standard: If a soft trigger is identified, the FS will review available and pertinent data in coordination with the Sage-Grouse Implementation Task Force, which may recommend potential implementation level activities to the appropriate agency line officer.	No soft triggers for greater sage-grouse have been identified for the RCA. Should a soft (or hard) trigger ever be identified in the future, it is expected that the FS will review available data and coordinate with the Sage-Grouse Implementation Task Force to determine the need for any mitigation measures.
	GRSG-LR-SUA-O-012-Objective: In nesting habitat, retrofit existing tall structures with perch deterrents or other anti-perching devices.	Nesting habitat is not known to occur in the Study Area. The nearest known active lek is located more than 7 miles from the proposed overhead power line. The power line would be constructed to APLIC standards to, in part, minimize perching by raptors.
	GRSG-LR-SUA-ST-013-Standard: In priority and important habitat management areas and sagebrush focal areas, restrict issuance of new lands special-use authorizations for infrastructure, such as high-voltage t-lines.	Not applicable. The RCA would not impact any PHMAs, IHMAs, or sagebrush focal areas.
	GRSG-LR-SUA-ST-014-Standard: In general habitat management areas, new lands special-use authorizations may be issued for infrastructure, such as high voltage t-lines, if they can be located	No applicable. The RCA would not impact any GHMAs for the greater sage-grouse.

Table 4.8-7 Compliance with BLM and USFS Management Direction for Greater Sage-Grouse under the RCA

Source	Management Direction	Compliance under the RCA
	within existing designated corridors or ROWs and the authorization includes stipulations to protect greater sage-grouse and its habitat.	
	GRSG-LR-SUA-ST-015-Standard: In priority and important habitat management areas and sagebrush focal areas, do not authorize temporary lands special-uses that result in loss of habitat or long-term (greater than 5 years) negative impact on greater sage-grouse or its habitat.	Not applicable. The RCA would not impact any PHMAs, IHMAs, or sagebrush focal areas.
	GRSG-LR-SUA-ST-016-Standard: In priority, important, and general habitat management areas and sagebrush focal areas, require protective stipulations when issuing new authorizations that authorize infrastructure,	Not applicable. The RCA would not impact any PHMAs, IHMAs, or sagebrush focal areas.
	GRSG-LR-SUA-ST-017-Standard: In priority, important, and general habitat management areas and sagebrush focal areas, locate upgrades to existing t-lines within the existing designated corridors or ROWs unless an alternate route would benefit the greater sage-grouse or its habitat.	Not applicable. The RCA would not impact any PHMAs, IHMAs, or sagebrush focal areas.
	GRSG-LR-SUA-ST-018-Standard: In priority, important, and general habitat management areas and sagebrush focal areas, when a lands special-use authorization is revoked or terminated and no future use is contemplated, require the authorization holder to remove overhead lines and other infrastructure in compliance with 36 CFR 251.60(i).	Not applicable. The RCA would not impact any PHMAs, IHMAs, or sagebrush focal areas.
	GRSG-LR-SUA-019-Guideline: In priority, important, and general habitat management areas and sagebrush focal areas, outside of existing designated corridors and ROWs, new t-lines and pipelines should be buried. If new t-lines and pipelines are not buried, locate them adjacent to existing t-lines and pipelines.	Not applicable. The RCA would not impact any PHMAs, IHMAs, or sagebrush focal areas.
	GRSG-LR-SUA-GL-020-Guideline: The best available science and monitoring should be used to inform infrastructure siting in greater sage-grouse habitat.	Baseline greater sage-grouse surveys were completed for the project. No leks or other important sage-grouse habitats (e.g., nesting habitats) were identified within the Study Area. Further, the RCA would impact minimal, marginal sagebrush habitat that is only expected to be used by transient individual grouse.
	GRSG-GRSGH-O-016-Objective: Every 10 years for the next 50 years, improve greater sage-grouse habitat by removing invading conifers and other undesirable species.	Conifers are generally lacking within the Study Area. The RCA includes a reclamation program that would limit the spread of noxious weeds into native landscapes, including any sagebrush habitat in the vicinity of the disturbance footprint.
	GRSG-GRSGH-ST-027-Standard: Design habitat restoration projects towards desired conditions.	Impacted sagebrush habitat will be reclaimed under the RCA. The proposed seed mix includes many grass, forb, and shrub species, including big sagebrush.

Table 4.8-7 Compliance with BLM and USFS Management Direction for Greater Sage-Grouse under the RCA

Source	Management Direction	Compliance under the RCA
	GRSG-GRSGH-GL-028-Guideline: When removing conifers that are encroaching into greater sage-grouse habitat, avoid persistent woodlands (i.e., old growth relative to site or more than 100 years).	Conifers occur infrequently among aspen stands in the Study Area. Their encroachment on sagebrush habitats is not known to be an issue, but if they ever become an issue, the conifers would be managed accordingly.
	GRSG-GRSGH-GL-029-Guideline: In priority, important, and general habitat management areas and sagebrush focal areas, actions and authorizations should include design features to limit the spread and effect of undesirable non-native plant species.	Not applicable. PHMAs, IHMAs, GHMAs, or sagebrush focal areas would not be impacted by RCA. Further, the reclamation plan for the project would limit the spread of noxious weeds and other undesirable non-native plant species in the Study Area.
	GRSG-GRSGH-GL-030-Guideline: To facilitate safe and effective fire management actions, in priority, important, and general habitat management areas and sagebrush focal areas, fuel treatments in high-risk areas should be designed to reduce the spread and/or intensity of wildlife or susceptibility of greater sage-grouse attributes to move away from desired conditions.	Not applicable. PHMAs, IHMAs, GHMAs, or sagebrush focal areas would not be impacted by the RCA.
	GRSG-GRSGH-GL-031-Guideline: In priority, important, and general habitat management areas and sagebrush focal areas, native plant species should be used, when possible, to maintain, restore, or enhance desired conditions.	Not applicable. PHMAs, IHMAs, GHMAs, or sagebrush focal areas would not be impacted by the RCA.
	GRSG-GRSGH-GL-032-Guideline: In priority and important habitat management areas and sagebrush focal areas, vegetation treatment projects should only be conducted if they maintain, restore, or enhance desired conditions.	Not applicable. PHMAs, IHMAs, GHMAs, or sagebrush focal areas would not be impacted by the RCA.
	GRSG-RT-DC-066-Desired Conditions: In priority, important, and general habitat management areas and sagebrush focal areas within the forest transportation system and on roads and trails authorized under a special-use authorization, the greater sage-grouse experiences minimal disturbing during breeding and nesting (March 1 to June 15) and wintering (from November 1 to February 28) periods.	Not applicable. PHMAs, IHMAs, GHMAs, or sagebrush focal areas would not be impacted by the RCA.
	GRSG-RT-ST-067-Standard: In priority, important, and general habitat management areas and sagebrush focal areas, do not conduct or allow new road or trail construction except when necessary for administrative access to existing and authorized uses, public safety, or to access valid existing rights.	Not applicable. PHMAs, IHMAs, GHMAs, or sagebrush focal areas would not be impacted by the RCA
	GRSG-RT-ST-068-Standard: Do not conduct or allow road and trail maintenance activities within 2 miles from the perimeter of active leks during lekking (from March 1 to April 30) from 6 p.m. to 9 a.m.	The Proposed Action complies with this standard, as there are no known occupied leks within 2 miles of the Study Area.
	GRSG-RT-ST-069-Standard: In priority and important habitat management areas and sagebrush focal areas, do not allow public motor vehicle use on temporary energy development roads.	Not applicable. PHMAs, IHMAs, GHMAs, or sagebrush focal areas would not be impacted by RCA. Further, public use of project roads, unless authorized, would be prohibited.

Table 4.8-7 Compliance with BLM and USFS Management Direction for Greater Sage-Grouse under the RCA

Source	Management Direction	Compliance under the RCA
	GRSG-RT-GL-070-Guideline: In priority and important habitat management areas and sagebrush focal areas, new roads and road realignments should be designed and administered to reduce collisions with greater sage-grouse.	Not applicable. PHMAs, IHMAs, GHMAs, or sagebrush focal areas would not be impacted by the RCA.
	GRSG-RT-GL-071-Guideline: In priority and important habitat management areas and sagebrush focal areas, road construction within riparian areas and mesic meadows should be restricted.	Not applicable. PHMAs, IHMAs, GHMAs, or sagebrush focal areas would not be impacted by the RCA.
	GRSG-RT-GL_072-Guideline: In priority and important habitat management areas and sagebrush focal areas, when decommissioning roads and unauthorized routes, restoration activity should be designed to move habitat towards desired conditions.	Not applicable. PHMAs, IHMAs, GHMAs, or sagebrush focal areas would not be impacted by the RCA.
	GRSG-RT-GL-073-Guideline: In priority and important habitat management areas and sagebrush focal areas, dust abatement terms and conditions should be included in road-use authorizations when dust has the potential to affect the greater sage-grouse.	Not applicable. PHMAs, IHMAs, GHMAs, or sagebrush focal areas would not be impacted by the RCA.
	GRSG-RT-GL-074-Guideline: In priority and important habitat management areas and sagebrush focal areas, road and road-way maintenance activities should be designed to reduce the risk of vehicle- or human-caused wildfires and the spread of invasive plants.	Not applicable. PHMAs, IHMAs, GHMAs, or sagebrush focal areas would not be impacted by the Proposed Action.
	GRSG-M-NEL-GL-098-Guideline: In priority and important habitat management areas and sagebrush focal areas, at the time of issuance of prospecting permits; exploration licenses and leases; or readjustments of leases, the FS should provide recommendations to the BLM for the protection of greater sage-grouse and its habitat.	Not applicable. PHMAs, IHMAs, GHMAs, or sagebrush focal areas would not be impacted by the RCA.
	GRSG-M-NEL-GL-099-Guideline: In priority and important habitat management areas and sagebrush focal areas, the FS should recommend to the BLM that expansion or readjustment of existing leases avoid, minimize, or mitigate the effects to greater sage-grouse and its habitat.	Not applicable. PHMAs, IHMAs, GHMAs, or sagebrush focal areas would not be impacted by the RCA.

Source: BLM 2012a; USFS 2003

Gray Wolf

Impacts to gray wolves from the RCA would be similar to those described in **Section 4.8.1.1.2** for the Proposed Action, except that the RCA would all but eliminate the potential for wildlife to be exposed to added COPCs as a result of the proposed store-and-release cover system and elimination of overburden piles downgradient of the pit. Noise and human activity associated with the RCA would likely cause wolves to travel around the periphery of the Study Area but would not impede broad-scale movements of wolves. Over the long term, human activity would cease, and reclaimed areas would recover to high-elevation rangeland habitat. Overall impacts to wolves would be long-term but negligible under the RCA.

Wolverine

Impacts to wolverines under the RCA are discussed in section **4.8.1.2.1**.

Townsend's big-eared bat

The RCA would result in the loss or alteration of 73 more acres of potential foraging habitat for this species compared with the Proposed Action. Other impacts would be similar to those described in **Section 4.8.1.1.2** for the Proposed Action, except that the RCA would all but eliminate the potential for wildlife to be exposed to added COPCs as a result of the proposed store-and-release cover system and elimination of overburden piles downgradient of the pit. Overall, impacts to Townsend's big-eared bats under the RCA would be long-term and minor.

Boreal Owl

The type of impacts that could occur to the boreal owl would be similar to those described in **Section 4.8.1.1.2** for the Proposed Action. Compared with the Proposed Action, the RCA would result in the direct loss of 48 more acres of aspen habitat. The RCA would eliminate the risk of power line collision and predator perching because it would not use an overhead power line. Overall, impacts to boreal owls under the RCA would be long-term and minor.

Flammulated Owl

The type of impacts that could occur to the flammulated owl would be similar to those described in **Section 4.8.1.1.2** for the Proposed Action. Compared with the Proposed Action, the RCA would result in the direct loss of 48 more acres of aspen habitat. The RCA would eliminate the risk of power line collision and predator perching because it would not use an overhead power line. Overall, impacts to flammulated owls under the RCA would be long-term and minor.

Great Gray Owl

The type of impacts that could occur to the great gray owl would be similar to those described in **Section 4.8.1.1.2** for the Proposed Action. Compared with the Proposed Action, the RCA would result in the direct loss of 48 more acres of aspen habitat. The RCA would eliminate the risk of power line collision because it would not use an overhead power line. Overall, impacts to great gray owls under the RCA would be long-term and minor.

Bald Eagle

The type of impacts that could occur to the bald eagle would be similar to those described in **Section 4.8.1.1.2** for the Proposed Action, except that the RCA would all but eliminate the potential for wildlife to be exposed to added COPCs as a result of to the proposed store-and-release cover system and elimination of overburden piles downgradient of the pit. Compared with the Proposed Action, the RCA would result in no direct loss of wetland and riparian habitat. The RCA would eliminate the risk of power line collision and electrocution because it would not use an overhead power line, and it would minimize the potential for COPC mobilization to streams because of the elimination of permanent external overburden piles downslope of the mine and the use of the modified store-and-release cover. Overall, impacts to bald eagles under the RCA would be long-term and negligible.

Northern Goshawk

The type of impacts that could occur to the northern goshawk would be similar to those described in **Section 4.8.1.1.2** for the Proposed Action. Compared with the Proposed Action, the RCA would result in the direct loss of 48 more acres of aspen habitat. The RCA would eliminate the risk of power line collision because it would not use an overhead power line. Overall, impacts to northern goshawks under the RCA would be long-term and minor.

Peregrine Falcon

The type of impacts that could occur to the peregrine falcon would be similar to those described in **Section 4.8.1.1.2** for the Proposed Action. Compared with the Proposed Action, the RCA would result in the direct loss of 73 more acres of forest; shrubland; and rangeland, riparian, and wetland foraging habitat. The RCA would eliminate the risk of power line collision because it would not use an overhead power line, and it would eliminate the potential for COPC mobilization to streams. Overall, impacts to peregrine falcons under the RCA would be long-term and negligible.

Prairie Falcon

The type of impacts that could occur to the prairie falcon would be similar to those described in **Section 4.8.1.1.2** for the Proposed Action. Compared with the Proposed Action, the RCA would result in the direct loss of 8 fewer acres of high-elevation rangeland and big sagebrush foraging habitat. The RCA would eliminate the risk of power line collision because it would not use an overhead power line. Overall, impacts to prairie falcons under the RCA would be long-term and negligible.

Columbian sharp-tailed grouse

The type of impacts that could occur to the Columbian sharp-tailed grouse would be similar to those described in **Section 4.8.1.1.2** for the Proposed Action, except that the RCA would all but eliminate the potential for wildlife to be exposed to added COPCs as a result of the proposed store-and-release cover system and elimination of overburden piles downgradient of the pit. Compared with the Proposed Action, the RCA would result in the direct loss of 53 more acres of high-elevation rangeland and sagebrush habitat. The RCA would eliminate the risk of predator perching along the power line because it would not use an overhead power line. Overall, impacts to Columbian sharp-tailed grouse under the RCA would be long-term and minor.

Willow Flycatcher

The type of impacts that could occur to the willow flycatcher would be similar to those described in **Section 4.8.1.1.2** for the Proposed Action; however, impacts would be reduced in magnitude under the RCA. Compared with the Proposed Action, the RCA would result in no direct loss of shrub/scrub wetland habitat. Because the RCA was designed to avoid impacts to riparian habitats, the RCA would be much less likely to inadvertently destroy willow flycatcher nests or disrupt breeding willow flycatchers compared with the Proposed Action. It would also be less likely to degrade riparian habitats through sedimentation or releases of COPCs into surface waters. For these reasons, the RCA would have long-term negligible impacts on willow flycatchers.

Loggerhead Shrike

The type of impacts that could occur to the loggerhead shrike would be similar to those described in **Section 4.8.1.1.2** for the Proposed Action, except that the RCA would all but eliminate the potential for wildlife to be exposed to added COPCs as a result of the proposed store-and-release cover system and elimination of overburden piles downgradient of the pit. Compared with the Proposed Action, the RCA would result in the direct loss of 53 more acres of high-elevation rangeland and big sagebrush habitat. The RCA would eliminate the risk of predator perching along the power line because it would not use an overhead power line. Overall, impacts to loggerhead shrikes under the RCA would be long-term and minor.

Sage Sparrow and Brewer's Sparrow

The type of impacts that could occur to the sage sparrow and Brewer's sparrow would be similar to those described in **Section 4.8.1.1.2** for the Proposed Action, except that the RCA would all but eliminate the potential for wildlife to be exposed to added COPCs as a result of the proposed store-and-release cover system and elimination of overburden piles downgradient of the pit. Compared with the Proposed Action, the RCA would result in the direct loss of 8 more acres of sagebrush habitat. However, overall long-term loss of habitat under the RCA would be greater compared with the Proposed Action because reclaimed areas would be most likely to recover to high-elevation rangeland, which may not be as suitable for use by these species as the baseline big sagebrush habitat in the Study Area. The RCA would eliminate the risk of predators perching along the power line because it would not use an overhead power line. Overall, impacts to sage sparrow and Brewer's sparrow under the RCA would be long-term and minor.

Calliope Hummingbird

The type of impacts that could occur to the calliope hummingbird would be similar to those described in **Section 4.8.1.1.2** for the Proposed Action. Compared with the Proposed Action, the RCA would result in the direct loss of 48 more acres of aspen forest habitat for this species, but 3 fewer acres of shrub/scrub wetland habitat. Because the RCA was designed to avoid most impacts to riparian habitats, the RCA would be less likely to degrade riparian habitats through sedimentation or releases of COPCs into surface waters. Therefore, there would be less risk that calliope hummingbirds could be exposed to COPCs by feeding on plant nectar within the Study Area. Overall, impacts to the calliope hummingbird under the RCA would be long-term and minor.

Trumpeter Swan

The type of impacts that could occur to the trumpeter swan would be similar to those described in **Section 4.8.1.1.2** for the Proposed Action; however, impacts would be reduced in magnitude under the RCA. Compared with the Proposed Action, the RCA would result in no direct loss of wetland habitat. Because the RCA was designed to avoid most impacts to wetlands and riparian habitats, the RCA would be much less likely to disrupt breeding trumpeter swans compared with the Proposed Action. The RCA would not include an overhead power line; there would be no risk of power line collision or predator perching under the RCA. The RCA would also be less likely to degrade riparian habitats through sedimentation or releases of COPCs into surface waters. For these reasons, the RCA would have long-term negligible impacts on trumpeter swans.

American White Pelican

The type of impacts that could occur to American white pelicans would be similar to those described in **Section 4.8.1.1.2** for the Proposed Action; however, impacts would be reduced in magnitude under the RCA. Compared with the Proposed Action, the RCA would result in no direct loss of wetland habitat. Because the RCA was designed to avoid impacts to wetlands and riparian habitats, the RCA would be much less likely to disturb foraging American white pelicans compared with the Proposed Action. The RCA would not include an overhead power line; therefore, there would be no risk of power line collision or predator perching under the RCA. The RCA would also be less likely to degrade riparian habitats through sedimentation or releases of COPCs into surface waters. For these reasons, the RCA would have long-term negligible impacts on American white pelicans.

Harlequin Duck

As there is no suitable habitat, and this species is not expected to occur in the Study Area. The RCA would have no impact on harlequin ducks.

White-faced Ibis

The type of impacts that could occur to white-faced ibis would be similar to those described in **Section 4.8.1.1.2** for the Proposed Action; however, impacts would be reduced in magnitude under the RCA. Compared with the Proposed Action, the RCA would result in no direct loss of wetland habitat. Because the RCA was designed to avoid impacts to wetlands and riparian habitats, the RCA would be much less likely to disturb foraging white-faced ibis compared with the Proposed Action. The RCA would not include an overhead power line; therefore, there would be no risk of power line collision or predator perching under the RCA. The RCA would also be less likely to degrade riparian habitats through sedimentation or releases of COPCs into surface waters. For these reasons, the RCA would have long-term negligible impacts on white-faced ibis.

Black Tern

The type of impacts that could occur to the black tern would be similar to those described in **Section 4.8.1.1.2** for the Proposed Action; however, impacts would be reduced in magnitude under the RCA. Compared with the Proposed Action, the RCA would result in no direct loss of wetland habitat. Because the RCA was designed to avoid impacts to wetlands and riparian habitats, the RCA would be much less likely to disrupt breeding black terns compared with the Proposed Action. The RCA would not include an overhead power line; therefore, there would be no risk of power line collision or predator perching under the RCA. The RCA would also be less likely to degrade riparian habitats through sedimentation or releases of COPCs into surface waters. For these reasons, the RCA would have long-term negligible impacts on black terns.

Columbia Spotted Frog

As Columbia spotted frogs are not known to occur in the CNF or in Caribou County, there would be no impacts on this species under the RCA.

Boreal Toad, Northern Leopard Frog, Common Garter Snake

Impacts to these three species would be similar to those described for amphibians and reptiles generally in **Section 4.7.1.1.4**. Compared with the Proposed Action, the RCA would result in no direct loss of wetland habitat. Because the RCA was designed to avoid impacts to wetlands and riparian habitats, the RCA would be much less likely to result in inadvertent mortality of special status amphibians and reptiles by crushing with construction equipment or vehicles. The RCA would also be less likely to degrade riparian habitats through sedimentation or releases of COPCs into surface waters. For these reasons, the RCA would have long-term negligible impacts on boreal toads, northern leopard frogs, and common garter snakes. In contrast to the Proposed Action, the RCA would be consistent with BLM and USFS guidance for special status amphibians and reptiles because it would allow for maintenance of aquatic habitat and wetlands providing habitat for these species.

Fish (Yellowstone cutthroat trout, northern leatherside chub)

Impacts to special status fish species would be the same as those generally described for fish in **Section 4.7.1.2.3**. Impacts would be reduced in severity and scale relative to those that would occur under the Proposed Action because the RCA would avoid most direct removal of wetland habitat, would eliminate permanent external overburden piles downslope of the mine, and would incorporate a store-and-release cover system that would help to protect downstream water quality. Furthermore, the RCA would eliminate the need to construct road crossings over fish-bearing streams. Overall, impacts to special status fish species would be long-term and negligible under the RCA. In contrast to the Proposed Action, the RCA would be consistent with BLM and

USFS guidance for special status fish species because it would allow for maintenance of aquatic habitat and wetlands, providing habitat for these species.

4.8.1.2.3 Special Status Plant Species

As discussed in **Section 4.8.1.1.3** for the Proposed Action, no impacts to sensitive plants are anticipated to occur under the RCA.

4.8.1.3 No Action Alternative

Under the No Action Alternative, the federal phosphate leases would not be developed at this time. The No Action Alternative would result in no new impacts to special status plant or animal species in the Study Area. The No Action Alternative would maintain the current status of special status species and populations in and around the Study Area. However, this does not preclude future development of the federal phosphate leases under a different mine plan.

4.8.2 Irreversible and Irretrievable Commitment of Resources

Under the Proposed Action, the loss of aspen and wetland/riparian habitat is considered an irreversible commitment of resources and would have long-term impacts on special status species using those habitats. Although the Mine and Reclamation Plan would re-establish upland grassland and shrub vegetation in disturbed areas after mining operations end, it is not anticipated that aspen would re-establish because the existing root stock would be removed. Impacted wetland and riparian areas would be re-seeded with upland vegetation, and while off-site mitigation would be required to offset wetland impacts under the CWA, the loss of wetland and riparian habitat within the Study Area would be considered irreversible. Under the RCA, this irreversible commitment of resources would largely be limited to loss of aspen habitat because the RCA would avoid direct loss of wetland/riparian habitat. As a result of the reductions in habitat, special status wildlife species that use aspen habitats may decline in abundance within the analysis area. The reduction in biological diversity within aspen habitats in and around the Study Area would be considered an irreversible commitment of resources.

4.8.3 Unavoidable Residual Adverse Effects

Based on the HEA, reclamation would offset 55 percent of the wildlife habitat services lost under the Proposed Action, with a net debit of 3,279 residual DSAYs of lost wildlife habitat services (Arcadis 2015c). This loss of wildlife habitat services would be an unavoidable, long-term, residual adverse effect of the Proposed Action on special status wildlife species. The RCA would result in a greater net DSAY debit (with 65 percent of wildlife habitat services offset by reclamation, the net debit is 3,367 DSAYs), and would have a relatively lower overall residual adverse effect on special status wildlife species than the Proposed Action.

4.8.4 Mitigation Measures

Agrium would incorporate protective measures for USFS sensitive species, management indicator species, and BLM sensitive species in accordance with standards, guidelines, goals, actions, and objectives in the 2012 BLM PFO ARMP and 2003 USFS CTNF RFP.

<u>Wildlife habitat</u>: The area of proposed impact to wildlife habitat has been minimized to the greatest extent feasible. Further, on-site reclamation would partially offset any loss of wildlife habitat necessary for the construction of the project. The majority of the total disturbed area would be reclaimed with native grass, forb, and (in the case of the RCA) shrub plant species. As

described in **Section 2.3.7.9**, Agrium has agreed to use a hypothetical mitigation project to calculate cost to mitigate all of the DSAY debit from the RCA in lieu of performing a mitigation project themselves. The project and cost estimate would be described in a Wildlife Habitat Mitigation Plan prepared by Agrium after the Final EIS is published, but before the BLM ROD is signed. This document would include four components: 1) details of the hypothetical mitigation project(s); 2) the gain in DSAY values from the hypothetical project and assumptions; 3) a calculation of the total cost to offset the DSAY debit using the hypothetical mitigation project as a basis; 4) description of the provisions of the corresponding in-lieu fee to a third party.

The cost of the final hypothetical mitigation actions would be calculated in coordination with the Agencies. The BLM and other agency wildlife trustees would identify a third-party recipient of the in-lieu fee and confirm that the fee would be spent in accordance with the wildlife habitat mitigation objectives. After the ROD is signed, Agrium would provide the in-lieu fee to the third party.

- <u>Sensitive Raptors (including Eagles)</u>: To minimize noise and disturbance impacts to nesting raptors, Agrium would apply species-specific raptor nest buffers as detailed in Table B-2 of Appendix B of the ARMP. In addition, Agrium would plan ground-clearing activities during the non-nesting season to minimize potential impacts to nesting birds. Under the Proposed Action, Agrium would implement APLIC raptor-friendly design measures on the 0.7-mile overhead power line that would be constructed. These may include, but would not be limited to, a 60-inch separation between conductors or grounded hardware as well as the use of insulating or cover-up materials for perch management.
- <u>Landbirds/Sensitive Small Birds</u>: Agrium would plan ground-clearing activities during the non-nesting season (~April 1 to July 31) to minimize potential impacts to upland nesting birds.
- <u>Sensitive Upland Game Birds:</u> The mine site is not in designated grouse habitat. Seasonal restrictions contained in the ARMP do not apply to mining activities. Action PP-ME-2.5.5 - Seasonal restrictions would not apply to the operation and maintenance of solid leasable mineral production facilities unless the findings of analysis demonstrate the continued need for such mitigation and that less stringent, project-specific mitigation measures would be insufficient.
- <u>Sensitive Water Birds</u>: Agrium would plan ground-clearing activities during the non-nesting season to minimize potential impacts to nesting water birds. No shrub/scrub wetland nesting habitat is planned to the disturbed by the RCA.
- Wetlands, Other Surface Waters, and Sensitive Aquatic/Riparian Species (Amphibians, Reptiles, and Fish):
    - Agrium would design and implement BMPs to control erosion, sedimentation, and the release of COPCs to protect surface waters in and around the project. The RCA would use the 6-foot-thick store-and-release Cover C to minimize the potential for uptake of COPCs in vegetation or transport of COPCs to downstream waters.
    - No known fish-bearing streams would be crossed under the RCA. The haul road would intersect some small mountain streams, but Agrium would install culverts to maintain passage.
    - Fugitive dust would be mitigated or minimized by the application of water and, as necessary, supplementary dust suppressants such as magnesium chloride or calcium chloride, thereby abating possible impacts to water quality including but not limited to TDS, COPCs, or turbidity.

- o Storm water control structures would be described in the Project SWPPP and would include several types of designs to reduce or eliminate risk of surface water contamination. Runoff retention basins for runoff water and silt would be constructed at strategic locations before mining activities occur in that area to collect and contain water exposed to mining disturbances or overburden materials. Conveyance ditches constructed along the outer perimeter of the stockpile sites would transfer surface water runoff from these sites and carry it to runoff retention basins. Stockpiles would be stabilized with vegetation, straw wattles, and silt fences to minimize erosion.
- o An SPCC Plan would be developed before construction and operations, providing direction for preventing and controlling potential spills; describing the aboveground tanks and secondary containment structures for bulk petroleum products, solvents, and antifreeze; identifying the routine monitoring requirements; and describing BMPs for management of pollutants of concern.
- o Agrium would prepare an EMP identifying a groundwater and surface water monitoring network to monitor compliance with IDEQ water quality standards.

4.9 VISUAL RESOURCES

Issue: What are the potential visual impacts on the scenic landscape?

Indicators:

- Change in scenic attractiveness from various public and occupied points within the analysis area including post-reclamation changes
- Compliance with the Visual Quality Objectives (VQOs) of the CNF RFP
- Compliance with the objectives of Visual Resource Management (VRM) system per the PFO ARMP
- Implementation of mining BMPs for managing light pollution

Under the CNF RFP (USFS 2003), the scenic environment of the CTNF will be maintained through adherence to existing VQOs. VQOs of Modification occur in generally "unseen areas" of potential phosphate mining areas (USFS 2003).

4.9.1 Direct and Indirect Impacts

Impact analysis for visual resources involves determining the degree of visual change (contrast) between the existing landscape features and the changes that would be produced by the Proposed Action or the RCA. Using the USFS VQO and the BLM VRM systems, as described in **Section 3.9.1**, the analysis for visual resources involved determining whether the potential visual impacts from Proposed Action components and surface-disturbing activities would meet the VQOs established for the Study Area. Under the Proposed Action and the RCA, there would be some degree of visual change to the Study Area because some project components and areas cleared of vegetation would be visible from publically accessible locations and residences (occupied points); however, the Study Area is remote and seen by a relatively small number of people. The Proposed Action would create a large, dramatic visual impact to National Forest visitors, Blackfoot Wildlife Management Area (WMA) visitors, and other land users who travel the Blackfoot River Road. In addition, nighttime lighting of facilities under the Proposed Action and RCA could impact visibility of the nighttime sky within some portions of the analysis area.

4.9.1.1 Proposed Action

Under the Proposed Action, direct and indirect impacts to visual resources would include the introduction of project components and mine-related activities to the existing natural landscape for the 5.8-year duration of the Proposed Action. The project-related structures, landforms including pit walls, and activities would introduce new elements and visual contrasts compared to the existing landscape character. Under the Proposed Action, short-term, localized effects to the visual character of the landscape would result from removal of vegetation, including timber, and exposure of soils of contrasting colors and textures relative to the surrounding landscape. Mine-related vehicles and equipment would be observed traveling to and from the mine for the 3.9-year life of proposed mining activities.

Key observation points (KOPs) are locations from which the Study Area could be visible from travel corridors, recreation use areas, and residences. The potential viewers (casual observers) of the Study Area would be local residents and ranchers; mine personnel; and motorists traveling on portions of Blackfoot River Road, Diamond Creek Road, Rasmussen Valley Road, and Lanes Creek County Road, as well as recreation users within the Blackfoot WMA and surrounding federal lands.

Views of the Study Area are limited from paved highways, towns, and cities because it is surrounded by mountain ranges and rugged terrain, which screen some portions of the Study Area from view. One KOP location was selected as representative of these key viewing areas for the preparation of visual simulations that depict the appearance of proposed mining disturbance. KOP 1 is located within the Blackfoot River WMA, near the Stocking Ranch, as shown on **Figure 4.9-1**. The KOP looks northeast toward the Proposed Action components.

A computer-generated visual simulation was created by photographing the existing landscape at a KOP, then modifying the photograph to show the Proposed Action components as seen from the KOP. The visual simulation serves as an aid to visualizing the changes associated with mining and reclamation to identify the degree of visual contrast of the Proposed Action components relative to the existing and surrounding landscape. **Figure 4.9-1** illustrates existing conditions as seen from KOP 1. Based on the visual simulation of the Proposed Action components, as seen from KOP 1 (**Figure 4.9-1**), the overburden piles, ore stockpiles, backfilled areas, walls of the pit excavations, power line, and the haul road and would be visible from KOP 1. The ore stockpile would appear as light to medium brown, flat or rounded forms. The overburden piles, backfilled areas, and active mining area would introduce medium to light brown, flat or rounded forms with medium to coarse textures. The proposed landforms would be visible below the skyline and low on the horizon in the foreground-middleground distance zone (**Section 3.9.1**). From the background distance zone, the scale of the landforms would be subordinate to the existing landscape and would be very difficult to discern. The colors and textures of the ore stockpile, overburden piles, backfilled areas, and active mining area would represent a moderate to strong degree of contrast relative to the colors and textures of the surrounding landforms and vegetation. The Proposed Action components and facilities would appear as visible alterations to the existing landscape for the duration of the Proposed Action.

Construction of the haul road and the power line spur parallel to and north of the haul road would introduce new linear features to the existing landscape. The proposed haul road would appear as a thin, light to medium brown, horizontal line within the middleground distance zone. The road would not be vegetated during operations; therefore, the tan to light brown colors and fine to medium texture of the proposed road would contrast with the green colors and medium to coarse textures of the existing surrounding vegetation cover. The proposed haul road would result in a weak to moderate degree of contrast in form, line, color, and texture relative to the elements of the existing landscape in the surrounding middleground area because it would be low on the horizon. These contrasts are anticipated to be difficult to discern from the background because they would blend into the horizon.

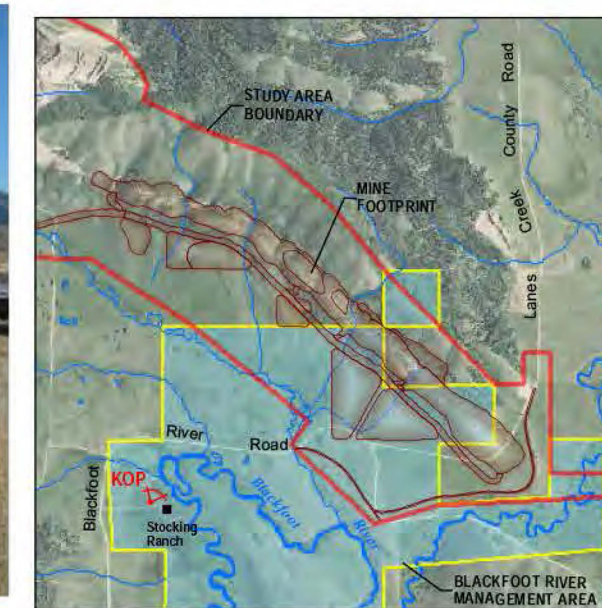
The proposed power line might be visible from KOP 1 as a faint diagonal line behind the haul road, and the removal of trees and shrubs along the power line corridor would create a color contrast with the surrounding vegetation. As seen from KOP 1, the overall visual effect of the power lines would be small in scale relative to the surrounding landscape and unlikely to attract attention because the poles would be low on the horizon and are anticipated to blend into the background. The impacts from the poles may be noticeable when structures are sky-lined; however, the overburden piles and the existing hilly terrain would screen the poles by allowing the vertical forms to blend to some degree into the surrounding variable textures and colors of the slopes in the background. The proposed power line would result in a weak degree of contrast in form, line, color, and texture relative to the elements of the existing landscape in the surrounding middleground distance zone.

The visual intrusion of mine-related workers, vehicles and vehicle lights, heavy equipment, the bustle of activities, and associated dust would detract from the visual quality of the surrounding landscape in the immediate vicinity of the Study Area. Although slopes and vegetative screening would likely obscure direct views of project-related components and activities, at times vehicle lights and dust raised by vehicle and equipment movements would be visible. Pit walls would be noticeable contrasts to the surrounding landscape until pits are backfilled.

Some recreationists may find the visual impact of the proposed facilities and mine-related activities detrimental to the recreational experience, as the natural setting would be modified with a strong industrial element, and opportunities for solitude would be reduced. Impacts to recreation are addressed in **Section 4.10**. Others would find interest in a view of large-scale mining activities.

During night hours, the Proposed Action would have a substantially different type of impact on visual resources than during day hours. Mine facilities would be lit at night in compliance with Mine Safety and Health Administration (MSHA) illumination requirements for worker safety. Lights would be used on project equipment and vehicles during nighttime operations, and stationary lights would be positioned at various locations within the mine area. Night-lighting is generally visible for longer distances than the proposed project facilities, and activities would be visible during daylight hours.

Mine lighting would affect dark night skies until the completion of active mining. Lights would be visible from the mine at night, but overall effects to dark night skies would be similar to those from current operations at the Rasmussen Ridge Mines. Subsequent reclamation would reduce the effects (illuminated mining activities) to dark night skies. During and after reclamation, there would be few or no remaining lights and little or no residual affects to dark night skies. Use of project lights would contribute to the illumination of the night sky in an area that is largely uninhabited. With the exception of lights from vehicles traveling on nearby roads, existing mining exploration equipment, and homesteads, there are few existing light sources in the analysis area. Because the ambient light level is low, any lights used for the Proposed Action would be surrounded by an otherwise dark, unlit background. The brightness of the lights would create a strong contrast against the backdrop of the black or nearly black background night sky. As illumination of the night sky increases over an uninhabited and dark area, the number of stars and constellations that are visible would be reduced, and the night sky would be adversely impacted.



Location Map of KOP

Key observation point (KOP) 1 is located within the Blackfoot River Management Area, near the Stocking Ranch. The KOP faces northeast and provides a view of the mine site.

GM = Growth Medium

RASMUSSEN VALLEY MINE	
FIGURE 4.9-1 *Proposed Action* *Existing Conditions and Visual Simulation*	
ANALYSIS AREA: Caribou County, Idaho	
Date: 08/26/2015	Prepared By: JC
File: K\CO1553\Image\2015_DEIS\PA_Visual_Simulation.ai	

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As standard practice for mining, light fixtures would be placed at the lowest practical height and directed at the ground or work areas to avoid being cast skyward or over long distances. Shields or louvers would be used on light fixtures, and full cut-off type fixtures would be used where possible. With implementation of the proposed type of night-lighting, night-lighting from the facilities would be minimized.

As mining progresses under the Proposed Action, reclamation would be started on the mined out areas. Some coarse and durable materials that would be placed on angle-of-repose slopes that are not revegetated may be darker than naturally exposed rock surfaces in the area. Over time, as the rock weathers, these changes may become less visible and may more closely resemble naturally occurring rock surfaces in the surrounding area.

After mine closure is complete, long-term visual impacts would be reduced by reclamation and revegetation. Successfully revegetated areas would reduce differences in color and texture among disturbed and undisturbed areas. Based on the visual simulation for reclamation conditions (**Figure 4.9-1**), reseeded areas may appear as somewhat different colors and textures compared with the surrounding landscape. After successful reclamation, the vegetative cover of the reclaimed landscape is anticipated to be a mixture of grasses, forbs, and shrubs.

Unreclaimed pit walls, water management facilities, and reclaimed overburden piles would represent long-term modifications to topography and the existing landscape character in localized areas. The reclaimed landscape may mimic surrounding topography and vegetative cover so that the existing landscape character would be retained to the extent possible over the long term.

The USFS land within the Study Area, including the areas visible from KOP 1, are designated VQO Modification as defined in the USFS RFP. Human modifications to the natural landscape resulting from the Proposed Action would occur within a landscape that contains existing man-made modifications, including the Rasmussen Ridge Mines, mining and exploration activities, and roads. The VQO of Modification allows the greatest change in the landscape, including management activities that dominate the original characteristic landscape. Implementation of the Proposed Action would add industrial components to a landscape currently characterized by a natural appearance. Under the Proposed Action, there would be large-scale visual changes to the characteristic landscape, but the Proposed Action would meet the USFS VQO of Modification.

Table 4.9-1 summarizes compliance with applicable standards and guidelines from the CNF RFP (USFS 2003) with regard to visual resources under the Proposed Action.

Table 4.9-1 Compliance with Applicable Caribou Forest Plan Standards and Guidelines for Visual Resources under the Proposed Action

Standard and Guideline	Compliance under Proposed Action
Scenic Resources Guideline 1: Opportunities to improve scenic integrity should be considered in proposed vegetative treatments.	Project design features, BMPs, and the Mine and Reclamation Plan (Agrium 2011) are the elements of the Proposed Action designed to reduce environmental impacts to visual resources. Existing vegetation would be protected to the extent practical by limiting surface disturbance to those areas needed for operations. After mine closure is complete, long-term visual impacts would be reduced by reclamation and revegetation. The final grading of the disturbed areas would create landforms that would blend with the surrounding, undisturbed topography to the extent practicable. During

Table 4.9-1 Compliance with Applicable Caribou Forest Plan Standards and Guidelines for Visual Resources under the Proposed Action

Standard and Guideline	Compliance under Proposed Action
	reclamation, native plant species from genetically local sources will be used to the extent practical. Successfully revegetated areas would reduce differences in color and texture among disturbed and undisturbed areas. After successful reclamation, the vegetative cover of the reclaimed landscape is anticipated to be a mixture of grasses, forbs, and shrubs. The visual character of the reclaimed landscape would approach surrounding topography and vegetative cover so that the existing landscape character would be retained to the extent possible over the long term. The Proposed Action is in compliance with RFP standards and this guideline.

Source: USFS 2003

Although BLM lands constitute a relatively small portion of the land within the Study Area, some of the Proposed Action components visible from KOP 1 would be located in areas designated as VRM Class III (partial retention) as defined in the PFO ARMP. The BLM's Visual Contrast Rating (VCR) System, as described in the BLM Manual H-8431 (BLM 1986), was used to describe and analyze the effects of the Proposed Action on visual resources. As part of the analysis process, a VCR worksheet was developed for KOP 1 to help describe visual impacts associated with the Proposed Action. The basic elements (form, line, color, and texture) of the Proposed Action component were then compared to those of the existing landscape to quantify the degree of contrast. The results of this comparison and expected degree of contrast were applied to determine whether the basic design elements of the Proposed Action are consistent with the management objectives for VRM Class III areas. For public lands managed for the objectives for VRM Class III areas, the level of change to the characteristic landscape should be moderate. Management activities may attract attention but should not dominate the view of the casual observer. Changes should repeat the basic elements found in the predominant natural features of the characteristic landscape.

Based on the results of the VCR worksheet, the Proposed Action landforms would result in a moderate to strong degree of contrast in form, line, color, and texture relative to the elements of the existing landscape in the surrounding foreground-middleground area. The Proposed Action components would be visible but would not be likely to attract attention or dominate the casual observer's view from KOP 1 because the landforms would be more than 1 mile away, below the skyline and low on the horizon, and anticipated to blend into the horizon; therefore, the visual contrast of the Proposed Action components would comply with BLM's management objectives of VRM Class III areas. Overall, the impacts of the Proposed Action to scenic attractiveness would be long-term and minor.

4.9.1.2 Rasmussen Collaborative Alternative

Under implementation of the RCA, the mine footprint would be 18.2 acres larger than that for the Proposed Action. Pit development under the RCA would be sequenced, consisting of nine phases, with a 7.1-year duration, beginning at the north end of the mine and generally progressing south. This progression would be in contrast to the Proposed Action mining sequence, which would begin at the southern end of the Rasmussen Valley deposit and progress north over nine phases. Similar to the Proposed Action, as mining progresses, reclamation would be started on the mined out areas, and the maximum unreclaimed pit disturbance at any one time would be minimized. Upon completion of mining operations, small portions of footwall (limestone) exposures would remain in the reclaimed pit. The pit backfill would be capped with the approved store-and-release cover system.

Based on the visual simulation of the RCA as seen from KOP 1 (**Figure 4.9-2**), the GM stockpiles, backfilled areas, the walls of the pit excavations, and the haul road would be visible from KOP 1. Similar to the Proposed Action, the landforms would be visible in the foreground-middleground distance zone (**Section 3.9.1**). Under the RCA, the GM stockpiles, backfilled areas, and active mining area would introduce medium to light brown, flat or rounded forms with medium to coarse textures below the skyline in the foreground-middleground area and would remain unvegetated during operations; therefore, the brown colors and medium to coarse textures of the GM stockpiles, backfilled areas, and active mining area would contrast with the green colors and medium to course textures of the existing surrounding vegetation. Under the RCA, the GM stockpiles, backfilled areas, and active mining area would introduce medium to light brown, flat or rounded forms with medium to coarse textures below the skyline in the foreground-middleground area and would remain unvegetated during operations; therefore, the brown colors and medium to coarse textures of the GM stockpiles, backfilled areas, and active mining area would contrast with the green colors and medium to course textures of the existing surrounding vegetation. Although the appearance of the landforms would vary in size as mining progresses, the GM stockpiles and backfilled areas associated with the RCA may be less noticeable relative to the Proposed Action landforms. The project components and facilities would appear as visible alterations to the existing landscape in the surrounding areas for the life of proposed mining activities.

Under the RCA, the West Side Haul Road would be constructed concurrent with the mine phases rather than at the beginning of mining, as described for the Proposed Action. Construction of HR-5 would be completed before mining of RCA Phase 1. HR-5 would be constructed between the terminus of the West Side Haul Road at the northern extent of the Lease and the existing Wooley Valley Tipple Haul Road north of South Rasmussen Mine. Relative to the Rasmussen Valley Haul Road under the Proposed Action, the haul road for the RCA would be less visible because it would be located farther to the north. The proposed haul road would result in a weak to moderate degree of contrast in form, line, color, and texture relative to the elements of the existing landscape in the surrounding middleground-background area because the haul road would be low on the horizon and is anticipated to be difficult to discern from the background.

After mine closure is complete, long-term visual impacts would be reduced by reclamation and revegetation. Successfully revegetated areas would reduce differences in color and texture among disturbed and undisturbed areas. Based on the visual simulation for reclamation conditions (**Figure 4.9-2**), reseeded areas may appear as somewhat different in color and texture compared with the surrounding landscape.

Although the mine footprint would be slightly larger under the RCA, and the pit development sequencing would differ from the phases described for the Proposed Action, the visual effects would be similar in type, intensity, and duration to those described for the Proposed Action. There would be essentially the same effects to dark night skies as those described for the Proposed Action during mining and after reclamation. Under the RCA, there would be large-scale visual changes to the characteristic landscape; however, the RCA would meet the USFS VQO of Modification.

The portions of the RCA overburden piles, backfilled areas, and active mining area visible from KOP 1 would be located in area designated as VRM Class III (partial retention) as defined in the PFO ARMP. Based on the results of the VCR worksheet, the RCA landforms would result in moderate to strong degree of contrast in form, line, color, and texture relative to the elements of the existing landscape in the surrounding foreground-middleground area. The RCA components would be visible but would not be likely to attract attention or dominate the casual observer's view from KOP 1 because the landforms would be more than 1 mile away, below the skyline and low on the horizon, and anticipated to blend into the horizon; therefore, the visual contrast of the Proposed Action components would comply with BLM's management objectives of VRM Class III areas. The overall impacts of the RCA to scenic attractiveness would be long-term and minor.

4.9.1.3 No Action Alternative

Under the No Action Alternative, the Proposed Action would not be constructed as planned. There would be no project-related impacts to visual resources. Existing mining-related facilities and activities within the analysis area, including the Rasmussen Ridge Mines, would continue to be visible under the No Action Alternative.

4.9.2 Irreversible and Irretrievable Commitment of Resources

Unreclaimed pit walls, water management facilities, and reclaimed overburden piles would represent irreversible modifications to topography and the existing landscape character; however, reclamation would minimize the effects to visual resources. The reclaimed landscape may mimic surrounding topography, and vegetative cover would be predominantly grasses.

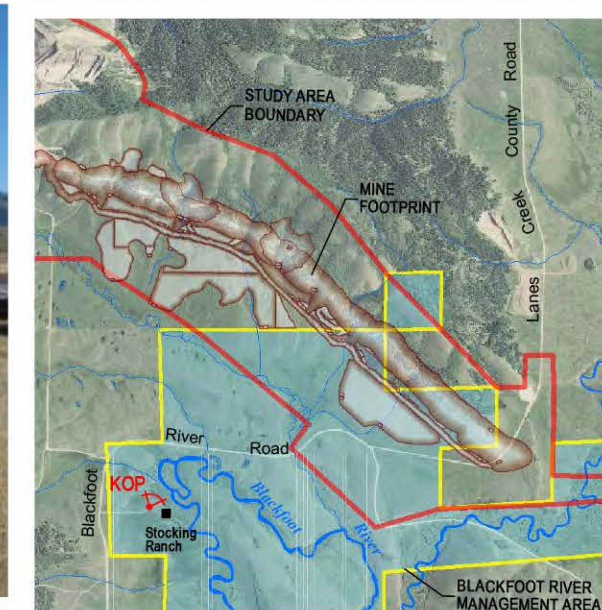
4.9.3 Unavoidable Residual Adverse Effects

Extensive backfill has been proposed under both the Proposed Action and the RCA. After reclamation is complete, minimal residual impacts to the visual quality of the analysis area would be expected. There would be minimal modification of the scenic attractiveness in background views along a limited number of public roadways resulting from the contrasting color and texture of the disturbed areas relative to the undisturbed landscape of surrounding areas.

4.9.4 Mitigation Measures

Under the Mine and Reclamation Plan (Agrium 2011), the final grading of the disturbed areas would create landforms that would blend with the surrounding, undisturbed topography to the extent practical. The disturbed areas would be reclaimed using a seed mix composed of grasses, forbs, and shrubs. As a result, reclaimed areas would represent a shift from a plant community composed predominantly of aspen/conifer forest and sagebrush to one composed mostly of grasses. There is likely to be a minor visual contrast from the vegetation community of the reclaimed areas compared with the background landscape.

Project design features, BMPs, and the Mine and Reclamation Plan (Agrium 2011) are the elements of the Proposed Action designed to reduce environmental impacts to visual resources. Additional mitigation measures are not deemed necessary.



Location Map of KOP

Key observation point (KOP) 1 is located within the Blackfoot River Management Area, near the Stocking Ranch. The KOP faces northeast and provides a view of the mine site.

GM = Growth Medium

RASMUSSEN VALLEY MINE

FIGUIRE 4.9-2
Rasmussen Collaborative Alternative
Existing Conditions and Visual Simulation

ANALYSIS AREA: Caribou County, Idaho
Date: 03/18/2016 | Prepared By: JC
File: K\CO1553\Image\2016_FEIS\RCA_Visual_Simulation.ai

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4.10 LAND USE, ACCESS, AND TRANSPORTATION

Issue: What are the potential effects to approved range allotments for livestock grazing within and adjacent to the Study Area?

Indicators:

- Estimated short- and long-term displacement of range allotments by mine facilities (reduced number of grazing allotments)
- Calculated change in forage production, carrying capacity, or rangeland condition of grazing allotments
- Estimated reduction in acreage suitable for range allotments as a result of insufficient water availability (changes to the number of watering points and locations) or unsuitable water quality (high levels of selenium or other COPCs)
- Reduction in diversity of vegetation or forage value as a result of reclamation species mix (increased occurrence of invasive or noxious species) within grazing allotments
- Potential for vegetative uptake of COPCs to exceed action levels

Issue: What are effects of increased traffic on public roads used for mine access and associated increased potential for traffic accidents?

Indicators:

- Estimated increase in average daily traffic on public roads in the analysis area as a result of proposed mining activities
- Estimated increased number of heavy-duty vehicles and heavy equipment traveling on public roads

Issue: What are the potential effects to existing recreational uses (hunting, fishing, hiking, wildlife viewing, winter recreation and the Blackfoot River WMA) or other land uses, including effects on public access to recreational areas?

Indicators:

- Acres of temporary and long-term impacts to land uses
- Indirect effects to the Blackfoot River WMA, including displacement of game during hunting seasons and changes to the quality of the recreational experience
- Displacement of recreational or other land uses by mine-related activities
- Diminished quality of the recreational experience or indirect effects to other land uses
- Restricted public access to recreation areas or other land use areas

Both the CNF RFP and the PFO ARMP include management guidance for lands leased for phosphate ore mining and for KPLAs: Prescription 8.2.2.(g) in the CNF RFP "allows for the exploration/development of existing leases," and acknowledges the infrastructure necessary for development of existing leases (e.g., haul roads, overburden dump sites, earth-moving equipment). With respect to the lease modification application, the PFO ARMP, Action ME-1.2.3 states that leasable and salable mineral resources will be available for development according to related laws and regulations and at the discretion of the BLM, and after full coordination with the surface management agency, and Action ME-1.2.4 states that leasable minerals on the CNF will be managed consistent with the CNF RFP.

4.10.1 Direct and Indirect Impacts

4.10.1.1 Proposed Action

4.10.1.1.1 Grazing

The Rasmussen Valley Cattle Allotment (RVCA) includes five units that are suitable for grazing: Units 1B, 2A, 2B, 3A, and 3B. The RVCA permits 1,392 head-months (HMs) of grazing. Almost the entirety of RVCA Unit 3A is included in the Study Area. Conservatively assuming that the entirety of Unit 3A would be rendered unsuitable for grazing during operation of the Proposed Action, this would result in a loss of 200 HMs, or approximately 14 percent of the HMs permitted in the RVCA.

During operation of the Proposed Action, it is possible that all of Unit 3A will not be available for livestock grazing. If this occurs, several actions will have to occur.

1- The USFS will have to reduce stocking rates on the RVCA to reflect the loss in available forage production in Unit 3A. The reduction on the RVCA would be 200 HMs if the entire Unit 3A is closed to grazing during the Proposed Action. This would represent a moderate impact to the permittee that uses Unit 3A.

2- The USFS will have to reduce the stocking rate by 86 HMs if the Proposed Action only restricts livestock grazing within the footprint area associated with the Proposed Action. If the Proposed Action is approved, this will require additional fencing in Unit 3A that would control access of livestock into areas of mining operations. This would represent a lesser impact than loss of 200 HMs as described above.

3- The Little Long Valley Unit could gain 169 HMs if additional water was developed in the southwest corner of the pasture and fencing was constructed to keep livestock away from the Blackfoot River Road going through the Blackfoot Narrows. If this option were to occur, the RVCA would possibly only be reduced by 31 HMs. Additional reductions could occur if it is found that the improved area will not support the projected numbers. This would represent a lesser impact than loss of 200 or 86 HMs as described above.

The 9 acres rendered unusable for grazing in the Henry Olsen Sheep and Goat Allotment (HOSGA) equates to only 0.08 percent of the HOSGA. The impact during operations to the HOSGA would be negligible.

Approximately 420 acres of State of Idaho-owned lands within the Study Area are also actively used for grazing; these lands support 68 HMs. Impacts to these lands under the Proposed Action would be negligible, as only 500 feet of the proposed Rasmussen Valley Haul Road would cross the southwestern corner of the state-owned lands, removing 1.4 acres of land (or 0.3 percent of the area) from use.

Private lands within the Study Area are also actively used for grazing. Information provided by users of these private lands indicates that 180 to 215 cow-calf pairs are grazed on private lands that are either partially or wholly within the Study Area. Under the Proposed Action, the proposed Rasmussen Valley Haul Road would cross these lands. The haul road would result in 20 acres of direct impacts as a result of these lands being removed from grazing use. Indirect impacts could also include: the haul road would divide the lands currently used for grazing, which may result in lands on both sides of the haul road becoming unsuitable for grazing; further, noise and dust generated by vehicles using the haul road may also result in portions of the private lands located adjacent to the haul road being removed from the area suitable for grazing. If current users of the private lands opt to discontinue use of these lands, and if other grazing lands are not available, the cow-calf pairs grazed on these lands may be lost (i.e., removed from the owner's existing inventory). A January, 2015 survey conducted by the U.S. Department of Agriculture (USDA) estimated 22,500 cows and calves in Caribou County. Using information in the 2012 Census of Agriculture suggests that each animal was worth $906, or $940 in current (2015) dollars. Therefore, the loss of a maximum of 430 animals would equate to a loss of 2 percent of the cows and calves in the county and a loss in value of $390,000. At the state and county levels, this loss would be negligible; however, impacts to individual cattle owners could be moderate depending on the total number of animals grazed and the amount of grazed lands outside the Study Area that would not be impacted by the Proposed Action. Impacts to individuals could be reduced if owners or users of the land continue to use unaffected acreage for grazing.

As noted in **Section 4.3.1**, the Proposed Action would result in the release of COPCs, including selenium, in shallow groundwater and surface waters at concentrations that exceed applicable Idaho standards. The presence of COPCs in shallow groundwater and surface waters may make it necessary for owners to remove their cattle from affected lands, which would result in impacts similar to those described above. During and following the cessation of mining at the Proposed Action, more than 96 percent of the Proposed Action would be reclaimed. As described in **Chapter 2**, the objectives of reclamation are, among others, to re-establish regional drainage patterns; to provide vegetative cover suitable to stabilize the surface; and to re-establish the pre-mining multiple land uses of recreation, wildlife habitat, and livestock grazing where authorized. Reclamation seed mixes have been selected to provide forage for livestock and wildlife. It is expected that this seed mix will result in establishment of high-elevation rangeland plant communities, and in recovery of the disturbed areas and the restoration of those areas to suitable rangeland. Further, appropriate BMPs to control invasive and noxious plant species would be implemented throughout the duration of the Proposed Action. Therefore, in the long term, impacts to the quality of grazing lands would be negligible to minor, and a minor improvement may be realized in the years immediately following reclamation in any given area.

Table 4.10-1 summarizes compliance with the CNF RFP with regard to grazing management under the Proposed Action.

Table 4.10-1 Compliance with Applicable Caribou Forest Plan Standards and Guidelines for Grazing Management

Standard/Guideline	Compliance under Proposed Action
Range Resources Guideline 3: Seeding or establishment of monocultures should be avoided, and efforts should be made to establish and/or maintain a variety of desirable grass, forbs, and shrub species.	This guideline would be met under the Proposed Action. Areas no longer needed for mining would be reclaimed with a variety of predominantly native plant species that are adapted to the local climate. The seed mix includes bunchgrasses, forbs, and shrubs for structural diversity.
Forage Utilization Guideline 1: Apply upland forage utilization levels to all allotments as shown in Table 3.6 in the CFP RFP, unless determined through development of site-specific standards in the allotment management	This guideline would be met under the Proposed Action through issuance of Annual Operating Instructions for the RVCA.
Livestock Grazing Permits Guideline 1: Permittees may be allowed motorized access to maintain or develop range improvements assigned in their grazing permits or for other authorized administrative activities. AMPs and Annual Operating Instructions should include direction to comply; travel permits should be issued to authorize this use.	This guideline would be met under the Proposed Action through issuance of Annual Operating Instructions for the RVCA.
Prescription 2.7.2(d)/Livestock Grazing Guideline 1: Livestock grazing use in the uplands should not exceed the utilization levels below unless site specific analysis shows	This guideline would be met under the Proposed Action through issuance of Annual Operating Instructions for the RVCA.

Table 4.10-1 Compliance with Applicable Caribou Forest Plan Standards and Guidelines for Grazing Management

Standard/Guideline	Compliance under Proposed Action
that higher levels are appropriate: • 20 percent of the current year's growth of key browse species. • 45 percent of the current year's growth of key herbaceous species	
Prescription 8.2.2/Livestock Grazing Guideline 1: These areas may be opened to grazing after meeting the restoration criteria identified in the mine reclamation plan.	This guideline would be met under the Proposed Action.

Source: USFS 2003

4.10.1.1.2 Traffic

Under the Proposed Action, the workforce and equipment currently being used at the Rasmussen Ridge Mines would transition to the Proposed Action as the ore is exhausted. Because the Proposed Action represents a continuation of current activities at the Rasmussen Ridge Mines, no increase in the workforce or numbers of construction vehicles is anticipated. The workforce and mining-related vehicles are expected to travel to the Proposed Action along the same routes that they currently travel to the Rasmussen Ridge Mines and in the same numbers. Consequently, no increase in the average daily traffic on public roads is anticipated, and no increase in the number of heavy vehicles traveling on public roads is anticipated. No impacts to traffic or motorist safety are anticipated under the Proposed Action. The impacts on traffic from the Proposed Action would be short-term and negligible. There are no CNF RFP standards or guidelines applicable to traffic associated with the Proposed Action.

4.10.1.1.3 Recreation

The Study Area includes 1,008 acres of federal lands and 833 acres of state lands open for recreation; of that, 410 acres are located in the Blackfoot River WMA. The Proposed Action would directly impact 38 acres of BLM land, 203 acres of USFS land, and 137 acres of state land. Given the industrial nature of the Proposed Action, recreation either would be restricted or prohibited on the disturbed lands and on additional undisturbed areas for the duration of the Proposed Action, or recreationists would not choose to use nearby areas that would be accessible. The acreage lost to recreational use under the Proposed Action is a small fraction of the lands that would remain open to recreation in the area. The CTNF alone accounts for 2.6 million acres of unaffected land that would remain open to recreation, and 2,000 acres in the Blackfoot River WMA would remain open to recreation. The acreage of lands available for recreation that would be reduced under the Proposed Action is negligible at the local and regional scales given the large acreage that would remain available.

There are no developed recreational facilities (e.g., campsites) on lands that would be impacted under the Proposed Action. One parking area within the Blackfoot River WMA and a portion of a trail located on the Blackfoot River WMA would be lost. Given the number of other trails located in the vicinity to which existing users could displace and the availability of the other three parking areas, access to the Blackfoot River WMA would not be impacted. CTNF motorized all-terrain vehicle (ATV) trails 322 and 322B would be temporarily lost through the mining process. The loss of these trails and the parking area would be long-term and have a moderate, site-specific impact, but a negligible local or regional impact. After mining, the USFS and Agrium would determine the locations of ATV trails to access the area in coordination with the roads to access the monitoring wells. This would amend the CTNF Travel Plan to accommodate the new location of the ATV trails.

There are no data on the number of individuals who recreate on the majority of the lands that could be impacted by the Proposed Action. Data from the Blackfoot River WMA conservatively indicate that 200 people per year visited the WMA in the 2002-2012 period. Of these, 70 percent visited to fish, 15 percent visited to hunt, with the remainder visiting for ‘viewing’ and other purposes. Given the available data on number of visitors and their recreational activities, impacts to users would be minimal.

During operation of the Proposed Action, impacts to the majority of users of the Blackfoot River WMA would be indirect. The new mining operations would represent a new industrial activity on and near Blackfoot River MWA lands, with corresponding increases in noise, activity, and dust that may result in a deterioration of the recreational experience. Direct impacts would be realized by those recreationists who use the trail that would be lost and the lands that would be closed (e.g., hikers, snowmobilers, and others whose recreation is tied to the land) and hunters and wildlife viewers who pursue species on lands that would be closed to recreation under the Proposed Action. In both cases, these impacts would be moderate and site-specific, but negligible at the local and regional scales. Displaced users of the land could use one of the many other trails in the vicinity of the Proposed Action or other public lands in the area, and hunters and wildlife viewers could continue to pursue game species on public and private lands (where permitted) to which these species would likely migrate when the Proposed Action begins.

Following cessation of activities under the Proposed Action, including reclamation, both direct and indirect impacts to recreation may be realized. While better than 96 percent of the area disturbed by the Proposed Action would be reclaimed and re-opened for recreation, these areas may not be desired for some recreational uses because of the altered topography and vegetation. Conversely, other recreationists (for instance, hunters) may find these areas desirable, because the revegetated areas may provide better forage or cover for some types of game species than the original habitat.

In summary, given the relatively small area that would be directly or indirectly impacted under the Proposed Action, the large area surrounding the Proposed Action to which recreationists could disperse, and the relatively few visitors to the area around the Proposed Action, overall impacts to recreation would be long-term, moderate, and site-specific, but negligible at the local and regional scales.

Table 4.10-2 summarizes compliance with the CNF RFP with regard to recreation under the Proposed Action.

Table 4.10-2 Compliance with Applicable Caribou Forest Plan Standards and Guidelines for Recreation under the Proposed Action

Standard/Guideline	Compliance under Proposed Action
Transportation/Access Guideline 1: The construction of new or maintenance of existing, motorized and non-motorized access routes should be consistent with the ROS class in which they are located.	This guideline would be met; the re-establishment of ATV trails following active mining operations would be consistent with the Recreation Opportunity Spectrum (ROS) class in which they are located, in this case those portions of the Proposed Action haul road that are in the Roaded Modified class.
Transportation/Trails Guideline 1: Protection measures for forest system trails should be included in management activity plans and authorizations.	This guideline would be met; trail sections lost during active mining operations would be re-established.
Source: USFS 2003	

4.10.1.2 Rasmussen Collaborative Alternative

Impacts to grazing would be reduced under the RCA. Impacts to the amount of land suitable for grazing would be reduced as a result of the relocation of the haul road, which would eliminate any potential direct or indirect impacts to private grazing lands located within the central and western portions of the Study Area. However, the relocation of the haul road would reduce the area of state lands suitable for grazing. Additionally, the design of the RCA would result in no impacts to surface water and shallow groundwater quality. Therefore, there would be no impact to surface water quality under the RCA, and thus no potential impacts to the suitability of lands for grazing. Implementation of the RCA would result in a lessening of the impacts presented in **Section 4.10.1.1**; impacts to grazing under the RCA would be negligible at all scales.

Potential impacts to traffic and recreation under the RCA would be equivalent to those presented above for the Proposed Action. The location of haul road traffic would be different under the RCA, but the impacts would be comparable. The RCA would not include the HR-1 crossing of Rasmussen Valley Road, but the Wooley Valley Tipple Haul Road would remain active. The additional acreage to be mined would have minor additional effects on the amount of land available for recreational uses, but these minor additional effects would not change the results of the analysis presented in **Section 4.10.1.1**. The modified mine plan and activities would have similar effects on wildlife species, and thus impacts to game hunters similar to those described for the Proposed Action above. The modified mine plan may lessen potential effects to hydrology and water quality which, in combination with the reduced impacts to wetlands, would reduce impacts to aquatic species including game fish. The reduction in these impacts would not change the results of the analysis presented in **Section 4.10.1.1**.

4.10.1.3 No Action Alternative

Under the No Action Alternative, traffic on local public roadways would be reduced because of the loss of mining and ore processing positions. No impacts to recreation or recreationists would be realized, and no impacts to the availability or quality of grazing lands would be realized.

4.10.2 Irreversible and Irretrievable Commitment of Resources

There would be only negligible to minor irretrievable commitment of grazing and recreational resources associated with the Proposed Action or the RCA.

4.10.3 Unavoidable Residual Adverse Effects

The Proposed Action and the RCA would result in only minor residual adverse effects on grazing and recreational resources, and no effects related to traffic. The Proposed Action would result in a small amount of unreclaimed land, which would be unusable for both recreation and grazing. No long-term, residual adverse effects on wildlife species or habitat are anticipated. The No Action Alternative would not result in any unavoidable residual adverse effects.

4.10.4 Mitigation Measures

To partially mitigate the temporary loss of HMs as a result of mining activity in the Angus Creek pasture of the RVCA, Agrium is proposing to provide water on the southwest side of the Little Long Valley pasture. The proposal is for Agrium to drill a water well, and the water would be pumped to water troughs. If a suitable place is not found for a well, Agrium would propose to place a pipeline from a well on Agrium's property and pump it to water troughs to be located on the southwest side of Little Long Valley pasture. The southwest side of the Little Long Valley pasture has limited grazing from livestock because of the lack of water and the Blackfoot River being fenced out. Some of the HMs temporarily lost in the Angus Creek pasture would be moved to the Little Long Valley pasture. This would decrease the economic impacts and effects to the local ranchers. The Little Long Valley pasture would not be grazed beyond the capacity of the suitable rangeland within the pasture. The USFS grazing permits associated with the RVCA would not be subject to a net increase in HMs. Agrium is also proposing to build a boundary fence on the south end of the Little Long Valley pasture to facilitate livestock using the southwest side of this pasture. To minimize impacts to wildlife, any fencing constructed would be wildlife-friendly. This would include the use of smooth wire (non-barbed wire) into fence construction and ensuring spacing of the wires that allows wild ungulates to cross over or under. No other specific mitigation measures for land use, access, and transportation have been proposed at this time.

4.11 CULTURAL RESOURCES

Issue: What are the potential impacts to important cultural resources in the disturbed area?

Indicators:

- Number of historic properties (cultural sites eligible for the National Register of Historic Places [NRHP]) impacted by the Proposed Action

The goals of the DFCs for cultural resources in the CNF RFP are general goals for the identification, evaluation, and protection of the resources for educational, scientific, and public benefit. There are no standards or guidelines specific to cultural resources for any of the prescription areas in the Study Area.

4.11.1 Direct and Indirect Impacts

The entire area of potential effects (APE) of the Proposed Action and the RCA (the cultural resources survey area) has been inventoried for the presence of cultural resources. As discussed in **Section 3.11**, 28 cultural resources have been identified within the cultural resources survey area. All of these sites have been recommended to be not eligible for special protection or mitigation under the National Historic Preservation Act (NHPA). The CTNF and the Idaho State Historic Preservation Office (SHPO) have concurred with these recommendations. Therefore, no historic properties (cultural sites eligible for the NRHP) have been identified in the cultural resources survey area. The general goals of the DFCs for heritage (i.e., cultural) resources in the CNF RFP are that the resources be identified, evaluated, and protected for educational, scientific, and public benefit. There are no standards and guidelines for the management of cultural resources in the CNF RFP specific to the prescription areas in the Study Area. Regulations implementing Section 106 of the NHPA (36 CFR 800) require that historic properties be considered for federal undertakings. There are no cultural sites listed on or eligible for the NRHP (historic properties) that need to be protected, preserved, or enhanced under the planning criteria of the PFO ARMP. The results of cultural resources studies have been considered in the development of the Proposed Action and RCA.

4.11.1.1 Proposed Action

Under the Proposed Action, no historic properties are within areas of proposed disturbance. Therefore, the Proposed Action would have no impact to known historic properties. Effects of the Proposed Action to cultural resources would be long-term and negligible.

4.11.1.2 Rasmussen Collaborative Alternative

No historic properties are within areas of proposed disturbance of the RCA. The RCA would have no impact to known historic properties. Effects of the RCA to cultural resources would be long-term and negligible.

4.11.1.3 No Action Alternative

Under the No Action Alternative, the Rasmussen Valley Mine would not be developed, and there would be no effect to known historic properties.

4.11.2 Irreversible and Irretrievable Commitment of Resources

Cultural resource sites are non-renewable resources. Any plan or design that would result in adverse impacts to historic properties would be an irreversible and irretrievable commitment of resources. No historic properties have been identified in the Rasmussen Valley Mine Survey Area. Therefore, the Proposed Action or the RCA would not result in irreversible and irretrievable commitment of historic properties.

4.11.3 Unavoidable Residual Adverse Effects

The Proposed Action or the RCA would not result in unavoidable residual adverse impacts to historic properties.

4.11.4 Mitigation Measures

Twenty-eight cultural resource observations were made in the field. None were recommended to be historic properties; therefore, historic properties would not be impacted by the Proposed Action or the RCA. If any unidentified cultural resources are discovered during the mining process or associated activities, operations in the immediate area of the discovery would be halted. The discovery would be reported to the BLM or CTNF, and the BLM or CTNF or its authorized representatives would document and evaluate the discovery. If necessary, a treatment plan would be developed and implemented.

4.12 TRIBAL TREATY RIGHTS AND INTERESTS

Issue: What are the potential impacts on the Shoshone Bannock Tribal members to exercise their treaty rights in the Study Area?

Indicators:

- Changes in the quality and quantity of culturally valued resources on unoccupied public land, including groundwater and surface water, culturally significant plant species, grazing resources, and wildlife
- Acres of traditional use areas that would be available or unavailable during mining activities

Issue: What are the potential impacts to natural resources and resources of cultural significance to Shoshone-Bannock Tribal members, including diminishing or destroying the traditional value of sites and resources?

Indicators:

- Changes in uptake of COPCs by wildlife and vegetation in mining disturbed areas and areas that are reclaimed
- Visibility of disturbances to adjoining areas
- Known historic properties affected
- Changes in the natural setting of the traditional resources that would diminish their value to traditional practices
- Rendering of culturally important natural resources (including culturally significant plant species) unfit for harvest or consumption

A goal of the DFCs for tribal coordination in the CNF RFP is that "Culturally significant items and sites are identified, protected and treated within the context of the culture that identifies and values them." Awareness of the context of tribal culture that may identify and value important items, sites, and resources entails sustained communication and coordination with the Tribes.

4.12.1 Direct and Indirect Impacts

As outlined in **Section 3.12**, the federal government has a unique trust relationship with federally recognized American Indian tribes including the Shoshone and Bannock Tribes. The BLM and the CTNF have a responsibility and obligation to consider and consult on potential effects to natural resources related to the Tribes' treaty rights, uses, and interests under the federal laws, EOs, and the 1868 Fort Bridger Treaty between the U.S. and the Shoshone and Bannock Tribes (U.S. Congress 1868). In addition, the NHPA and its implementing regulations (36 CFR 800), the American Indian Religious Freedom Act (AIRFA), EO 13175: Consultation and Coordination with Indian Tribal Governments, and EO No. 13007: Indian Sacred Sites contain requirements for consulting with tribes on the potential effects of federal actions on tribal interests. The Native American Graves Protection and Repatriation Act (NAGPRA) requires that concerned tribes be consulted if human remains that may be Native American or objects of cultural patrimony are discovered. Resources or issues of interest to the Tribes that could involve their traditional use or treaty rights include tribal historic and archaeological sites, sacred sites and traditional cultural properties (TCPs), traditional use sites, fisheries, traditional use plants (including culturally significant plant species) and animal species, vegetation (including noxious and invasive, non-native species), air and water quality, wildlife, access to lands and continued availability of traditional resources, land status, and the visual quality of the environment. As reflected in the indicators listed above, tribal concerns include potential changes in the quality and quantity of groundwater and surface water, traditionally valued vegetation (culturally significant plants), grazing resources, and wildlife. Changes in quality of these resources may include increased uptake of COPCs by vegetation and wildlife, changes in the natural setting of traditional resources that would diminish their value to traditional practices; diminished value of traditional hunting, fishing, and gathering areas; rendering of culturally important natural resources unfit for harvest or consumption; and impairment of access to resource areas. In addition, some cultural resources that are not considered to be historic properties may have traditional value to the Tribes. Many of these resources or issues overlap with other resource concerns discussed in this assessment, but also must be dealt with in consultation with the Tribes. Tribal consultation to date has not identified culturally unique resources in this Study Area, including any sacred sites. Disruption of the habitat and excavation of the earth for mining would be considered spiritual harm to Mother Earth and would be irreversible and irretrievable.

4.12.1.1 Proposed Action

There would be no changes in land status associated with the Proposed Action, and those portions of the Study Area that are currently unoccupied public land would retain that status. However, there would be substantial areas of disturbance on those federal lands. Tribal access to areas of unoccupied public land would be restricted for safety reasons during mining and reclamation, preventing the exercise of tribal treaty rights and traditional uses in these areas. Adverse effects to tribal treaty rights, interests, and tribal concerns include potential changes in the quality and quantity of groundwater and surface water, traditionally valued vegetation (culturally significant plants), grazing resources, and wildlife. Changes in quality of these resources may include increased uptake of COPCs by vegetation and wildlife; changes in the natural setting of traditional resources that would diminish their value to traditional practices; diminished value of traditional hunting, fishing, and gathering areas; rendering of culturally important natural resources unfit for harvest or consumption; and impairment of access to resource areas. Tribal access would be restored after reclamation, but some of the reclamation may take many years. In addition, disruption of the habitat and excavation of the earth for mining would be considered spiritual harm to Mother Earth and would be irreversible and irretrievable.

The Proposed Action would result in adverse impacts to some of the natural resources that the Tribes may desire in the exercise of their treaty rights. Long-term impacts would be associated with the disturbance or displacement of plant and wildlife species that are used for traditional purposes and subsistence and would be minor.

4.12.1.2 Rasmussen Collaborative Alternative

The RCA would not result in changes in land status for traditional use or treaty rights. The areas and impacts of disturbance on unoccupied public lands would be similar to those under the Proposed Action with some additional disturbance at the north end adjacent to the South Rasmussen Mine. Although there would be as much as 73 acres more disturbance under the RCA than under the Proposed Action, none of the RCA disturbance would be to wetlands. As with the Proposed Action, the RCA would also result in adverse impacts to some of the natural resources that the Tribes may desire in the exercise of their treaty rights. Long-term impacts would be associated with the disturbance or displacement of plant and wildlife species that are used for traditional purposes and subsistence and would be minor.

4.12.1.3 No Action Alternative

Under the No Action Alternative, the Proposed Action or RCA would not be authorized, and there would be no project-related adverse impact to known tribal treaty rights and interests.

4.12.2 Irreversible and Irretrievable Commitment of Resources

Mining would result in long-term partial or complete loss of access to traditional resources on the impacted public lands during mining and initial reclamation. Over time, access to unoccupied public lands and resources would be restored. Valued and traditional resources, including vegetative resources and wildlife habitat, would be reclaimed or replaced. However, the spiritual values of "sogobia" (Mother Earth) are non-renewable. Spiritual harm to "sogobia" would be an irreversible and irretrievable commitment of resources.

4.12.3 Unavoidable Residual Adverse Effects

No potential for unavoidable residual adverse impact to tribal treaty rights and interests has been identified.

4.12.4 Mitigation Measures

Potential impacts to traditional use or treaty rights that have been identified include short-term interruption of access to the lands to exercise treaty rights and traditional uses. No specific impacts to traditional resources or uses that are not available in other areas have been identified. If adverse impacts to traditional resources or uses were identified, mitigation measures specific to those resources would be developed through consultation among the Tribes and the Agencies.

4.13 SOCIAL AND ECONOMIC CONDITIONS

Issue: What are the potential adverse or beneficial socioeconomic impacts including employment, ancillary businesses, agriculture, and tax base?

Indicators:

- Changes in employment and personal income; distribution of jobs within industrial sectors
- Payments to local and regional businesses providing goods and services to current operation/projections of payments
- Economic value of land in agricultural use (employment, tax, and other revenue)
- Corporate contributions to local/state tax and other revenues over time
- Relative change in property values

Issue: What are the potential impacts on tourism and recreation economy?

Indicators:

- Estimated changes in acres open to recreation compared to acres closed to recreation
- Tourism and recreation value per acre
- Estimated changes in economic contribution of tourism and recreation in the area and changes over time

Issue: What are the potential impacts of the closure of the mine, resulting in decreased domestic phosphate production, effect of reduced fertilizer supply, increased price on national agriculture, and increased foreign natural resource dependence?

Indicators:

- Percentage of U.S. phosphate fertilizer market derived from Agrium CPO Plant production and ability of other domestic and foreign sources to satisfy this demand, if necessary

The first goal listed under Prescription 8.2.2(g) in the CNF RFP is that the exploration and development of existing leases "Provide for phosphate resource development with consideration given to biological, physical, social, and economic resources." There are no standards or guidelines for the implementation of this goal for social and economic resources.

4.13.1 Direct and Indirect Impacts

The analysis area for the socioeconomic environment is Caribou, Bear Lake, and Bannock Counties in Idaho, and Lincoln County (Star Valley area) in Wyoming. Actions or decisions that influence the economic feasibility of the mining operations would also be reflected in the socioeconomic environment. Mine economics have an effect on employment; salaries; property tax payments; royalties going to schools, roads, and bridges; net proceeds of mining tax revenues; and local purchases by the mine operator and its employees.

4.13.1.1 Proposed Action

Overall impacts of the Proposed Action to social and economic conditions would be short-term and major. Aspects of social and economic conditions are discussed in the following sections.

4.13.1.1.1 Population

The Proposed Action would result in no impacts to the population of the analysis area. It is expected that the workforce and equipment currently excavating the deposits at the Rasmussen Ridge Mines would shift to the Proposed Action as the Rasmussen Ridge Mines deposits are exhausted. Because no new workers would be hired under the Proposed Action, no in-migration of new workers and their families is expected; thus, there would be no impacts to population, housing, or community services.

4.13.1.1.2 Economy and Employment

The Proposed Action would result in no changes in employment or distribution of jobs within industrial sectors. It is expected that the workforce and equipment currently excavating the deposits at the Rasmussen Ridge Mines would shift to the Proposed Action as the Rasmussen Ridge Mines deposits are exhausted. The direct and indirect effects of current operations at the Rasmussen Ridge Mines, including the positive effects of direct, indirect, and induced employment, would be extended for another 3.9-year duration of active mining under the Proposed Action when compared with the No Action Alternative. Therefore, the Proposed Action would preserve the 1,700 direct, indirect, and induced employment positions supported by the Proponent’s current activities within the Study Area and elsewhere in Idaho.

<u>Payments to Businesses</u>

The Proponent’s current facilities spend more than $85 million in the Study Area per year. It is expected that operations under the Proposed Action would begin as the Rasmussen Ridge Mines deposits are exhausted. Businesses that currently provide goods and services in support of activities at the Rasmussen Ridge Mines are expected to continue to provide those goods and services during operation of the Proposed Action, and thus payments to businesses on the order of $85 million per year (or $340 million over the approximate 4-year life of the mine) would be realized.

<u>Agricultural Use</u>

As presented in **Section 3.10.3**, portions of the Study Area are leased for the grazing of cattle and sheep. Mining exploration work has occurred on Federal Phosphate Lease I-05975, which underlies the Proposed Action, since 2008. As described in **Section 4.10**, 975 acres of current grazing allotments would be rendered temporarily unavailable for grazing during the Proposed Action.

As discussed in **Section 4.10.4**, to partially mitigate the temporary loss of HMs as a result of mining activity in the Angus Creek pasture of the RVCA, Agrium is proposing to provide water on the southwest side of the Little Long Valley pasture. This would decrease the economic impacts and effects to the local ranchers. Given the small amount of this land compared to the entirety of grazing lands in the area, impacts to the agricultural economy would be negligible.

Tourism/Recreation

The Proposed Action would result in disturbance of 380 acres of state and federal lands. Given the activities on these lands under the Proposed Action, there would be a long-term loss of lands available or usable for recreational purposes. These 380 acres of state and federal lands represent a very small portion of the total acreage of state and federal lands in the area that would remain open for recreation. The CTNF alone accounts for 2.6 million acres of land that is open to recreation. Although there are no data on the number of individuals who recreate on the majority of the lands that would be impacted the Proposed Action, data from the Blackfoot River WMA conservatively indicate that 200 people per year visited the WMA in the 2002-2012 period. Of these, 70 percent visited to fish, 15 percent visited to hunt, with the remainder visiting for 'viewing' and other purposes. These data suggest that the area is not heavily visited.

According to data from the USFS National Visitor Use Monitoring program, each acre of the CTNF generates $127 in visitor spending per year. The lands on which project components would be located would no longer be available for hunting; however, the Proposed Action would likely also cause game species to disperse to adjacent, non-impacted lands, where those species would remain available for hunting. Assigning this value to state lands also open to recreation in the Study Area results in a potential loss of $48,260 per year as a result of 380 acres of state and federal land being unavailable for recreation. However, this loss may not be realized in practice given the large area that would remain available for recreation and that these other areas may be preferred or superior for recreation given the mining activity in the vicinity of the Proposed Action.

As presented in **Section 3.10.3.4**, hunting is a recreational activity pursued in the area around the Proposed Action. Given the small area of land that the Proposed Action would disturb, and the large area available for recreational purposes in the vicinity, impacts to the recreation and tourism industry would be negligible.

4.13.1.1.3 Unemployment and Labor Force

The Proposed Action would result in no changes in employment or the size of the labor force. It is expected that the workforce and equipment currently excavating the deposits at the Rasmussen Ridge Mines would shift to the Proposed Action as the Rasmussen Ridge Mines deposits are exhausted. The direct and indirect effects of current operations at the Rasmussen Ridge Mines (including the positive effects of direct, indirect, and induced employment) would be extended for another 3.9 years of active mining under the Proposed Action when compared with the No Action Alternative, and thus there would be no impact to unemployment rates or the size or composition of the labor force in the Study Area.

4.13.1.1.4 Income

The Proponent's current activities generate $181 million in personal income per year throughout Idaho, with $65 million in personal income generated in Caribou County alone. It is expected that the workforce and equipment currently excavating the deposits at the Rasmussen Ridge Mines would shift to the Proposed Action as the Rasmussen Ridge Mines deposits are exhausted. The direct and indirect effects of current operations at the Rasmussen Ridge Mines (including the positive effects of direct, indirect, and induced employment and the associated personal income generated from that employment) would be extended for another 3.9 years of active mining under the Proposed Action when compared with the No Action Alternative. Therefore, the Proposed Action would result in the continued generation of $181 million in personal income per year throughout Idaho, with $65 million in personal income continuing to be generated in Caribou County alone. Over the life of proposed mining activities, the Proposed Action would generate $724 million in personal income throughout Idaho, and $260 million in personal income in Caribou County alone, over the approximate 4-year life of the mine.

4.13.1.1.5 Housing

The Proposed Action would result in no impacts to the price or availability of housing in the analysis area. It is expected that the workforce and equipment currently excavating the deposits at the Rasmussen Ridge Mines would shift to the Proposed Action as the Rasmussen Ridge Mines deposits are exhausted. Because no new workers would be hired under the Proposed Action, no in-migration of new workers and their families is expected; thus, there would be no impacts to housing.

<u>Property Values</u>

The area surrounding the Proposed Action has been the site of phosphate mining for decades, and the Proposed Action represents a continuation of this historical activity. The Proposed Action is largely located on state and federal lands, although some components of the Proposed Action would be located on private lands. Owners of these private lands would be compensated for the use of the surface estate.

The value of private property in the vicinity of the Proposed Action may be affected by the development of the mine because of actual or perceived changes in the environment. It is beyond the scope of this EIS to predict in detail how such land values would be impacted. However, the Proposed Action would affect some of the areas' characteristics or amenities that subjectively affect property values (e.g., noise, aesthetics, and traffic). These impacts may be positive or negative and may change over time as desired property characteristics change. With the exception of the lands on which project components would be located, the existing uses of private property in the area would not be impacted. Given that the large majority of the private lands in the area are used for agricultural purposes, and that agricultural production on private lands would not be impacted, the value of these agricultural lands would likely be unaffected.

4.13.1.1.6 Community Services

The Proposed Action would result in no impacts to community services (including schools, emergency services, law enforcement, and social services). It is expected that the workforce and equipment currently excavating the deposits at the Rasmussen Ridge Mines would shift to the Proposed Action as the Rasmussen Ridge Mines deposits are exhausted. Because no new workers would be hired under the Proposed Action, no in-migration of new workers and their families is expected; thus, there would be no impacts to community services.

4.13.1.1.7 Public Finance

The Proposed Action would ensure that the beneficial impacts to public finance in the Study Area generated by current operations at the Rasmussen Ridge Mines would continue to be realized over the life of proposed mining activities.

During the Proposed Action, Caribou County would continue to receive revenues from property taxes, fees, and permits. The current direct fiscal impacts made to state and local governments are presented in **Section 3.13.5**. Because the Proposed Action represents a continuation of current mining activities, there would be no perceptible change in the amount of these revenues. Caribou County can expect to continue to collect $1.65 million annually in property taxes from Proponent-owned property and other project-related properties (or $6.5 million over the life of proposed mining activities).

Federal lease royalties are paid on any production from a lease in accordance with the terms specified by the BLM, as included in the Lease. Minimum royalty rates are not less than 5 percent of the gross value of production from leased deposits at the mine, or not less than 25 cents per ton, whichever is greater, for the right "to mine and dispose of all the phosphate rock and associated and related minerals hereafter referred to as leased deposits." Federal law requires royalties and other revenues collected from federal phosphate leases be split equally between the state where the activity occurs, the U.S. Bureau of Reclamation (funding federal water projects) and the U.S. Treasury. The state receives 50 percent of royalty revenues, placing the revenues in a general fund and a special revenue fund for mineral impacts. Typically, Caribou County receives 10 percent of the general fund revenues received by the state. Assuming a gross value of $39.33 per ton and a life-of-mine production of 11.2 million tons, the estimated total federal royalties could be $19.7 million over the 3.9-year duration of active mining. The state would receive $9.85 million over the life of proposed mining activities, and $985,000 would be received by Caribou County over the life of proposed mining activities.

A mine license tax, payable to the State of Idaho Tax Commission, would be assessed at a rate of 1 percent of the net value of ores mined or extracted (or the net value of royalties received). The sums are remitted to the state treasurer, who then places 66 percent to the credit of the general fund of the state and 34 percent to the credit of the abandoned mine reclamation fund created by the provisions of section 47-1703, Idaho Code. The value to the state of the mine license tax would fluctuate over the life of proposed mining activities as a result of changes in the price of phosphate ore and the cost of mining. In 2013 and 2014, Idaho collected mine license taxes of $959,166 and $842,686, respectively. Phosphate mining accounts for 12 percent of the value of mineral production in Idaho, and the Proposed Action could account for 50 percent of the phosphate mined in Idaho in any given year during its production. Assuming a hypothetical $1,000,000 in mine license taxes in the future, the Proposed Action would generate $60,000 in mine license tax. In addition to the mine license tax, the state would continue to receive sales taxes from the expenditures of the Proposed Action as well as from the expenditures of those employed directly and indirectly as a result of the Proposed Action. Because the Proposed Action represents a continuation of current mining activities, there would be no perceptible increase in these tax payments to the state in a given year.

4.13.1.2 Rasmussen Collaborative Alternative

The impacts realized under the RCA would be generally equivalent to those presented above for the Proposed Action. The modifications to the Proposed Action included in the RCA would not substantially affect the numbers of employees but would extend the life of active mining by 10 months. The additional acreage to be mined would have minor additional effects on agricultural and recreational uses of the land, but these minor additional effects would not change the results of the analysis presented in **Section 4.13.1.1**. The additional volume of ore to be mined would result in small increases in personal income, payments to businesses, and local/state tax and other revenues. These small increases would be positive and would not change the results of the analysis presented in **Section 4.13.1.1**. Under the RCA, Agrium's mining activities would continue; thus, there would be no impacts associated with closure of the mine. Overall effects of the RCA on social and economic conditions would be short-term and major.

4.13.1.3 No Action Alternative

The analysis in this section is largely focused on Caribou County, as both the proposed mine and existing processing facilities are located in Caribou County, and because two thirds of employees at the existing mine and processing facility reside in Caribou County. Therefore, any potential impacts would be most severely realized in Caribou County, with lesser impacts realized in other jurisdictions. Impacts to Lincoln County, Wyoming would be negligible because few of the current employees live outside of Idaho. Overall impacts of the No Action Alternative to social and economic conditions would be long-term and major.

4.13.1.3.1 Population

The No Action Alternative would result in the loss of the 480 jobs associated with the currently operating Rasmussen Ridge Mines and Agrium's processing facility. As the deposits in the Rasmussen Ridge Mines are exhausted, operations would cease under the No Action Alternative. The loss of each direct employment position could also result in the loss of two or more indirect or induced employment positions throughout the economy (Qu and Anderson 2014). Given that similarly compensated positions are few in number outside of the phosphate mining and processing industries, it is likely that the loss of employment would also trigger a loss in population as workers leave the area to find other opportunities.

4.13.1.3.2 Economy and Employment

The No Action Alternative would result in the loss of the 480 jobs associated with the currently operating Rasmussen Ridge Mines and Agrium's processing facility. Under the Proposed Action, employees currently working at the Rasmussen Ridge Mines would transfer to the deposits to be mined under the Proposed Action; however, under the No Action Alternative, these employees would not have a new deposit to which to transfer when the deposits in the Rasmussen Ridge Mines are exhausted; thus, an undetermined number of these mining positions would be eliminated. Some displaced employees may find employment at other mines in the area; however, it is unknown what number of displaced employees would be hired elsewhere, as currently operating mines are assumed to be fully staffed. In addition, the loss of the phosphate ore under the No Action Alternative could result in a reduction in employment at Agrium's fertilizer manufacturing facilities. Also, Union Pacific Railroad would no longer be paid to transport Agrium's mined ore to the fertilizer plant.

Caribou County is economically dependent upon phosphate mining and processing. Approximately 30 percent of the county's gross regional product ($115 million) is attributed to Agrium's current mining and ore processing operations. Under the No Action Alternative, purchases from businesses that support the mining and processing industries would be reduced. The reductions would be proportional to the reduction in overall phosphate mining and processing under the No Action Alternative. If the No Action Alternative resulted in closure of the Proponent's processing facilities as a result of insufficient volumes of phosphate ore being available, or premature closing of the facilities, losses to businesses throughout the economy could be major and unmitigable, as this facility (and the mines that provide its ore) anchors the economy of Caribou County. Losses to businesses in other affected locales would be less than those realized in Caribou County, but could be minor to moderate. Losses would be greatest to businesses that are more directly dependent upon the phosphate mining and processing industry than other businesses that may have a more diverse base of business.

Agricultural Use

The No Action Alternative would have no impacts on the agricultural industry in the vicinity of the Proposed Action.

Tourism/Recreation

The No Action Alternative would have no impacts on tourism or recreation in the vicinity of the Proposed Action.

4.13.1.3.3 Unemployment and Labor Force

The No Action Alternative would result in the loss of the 480 jobs associated with the currently operating Rasmussen Ridge Mines and Agrium's processing facility. Some displaced employees may find employment at other mines in the area; however, it is unknown what number of displaced employees would be hired elsewhere, as currently operating mines are assumed to be fully staffed. Given that similarly compensated positions are few in numbers outside of the phosphate mining and processing industries, it is likely that the loss of employment would also trigger a loss in population as workers leave the area to find other opportunities. This would result in an increase in unemployment and a reduction in the labor force in the Study Area.

4.13.1.3.4 Income

As presented in **Section 3.13**, the average annual wages associated with mining and manufacturing in Caribou County are considerably higher than those for other industrial sectors. Consequently, the loss of these high-paying jobs would be felt throughout the economy, particularly as the loss of each direct employment position could also result in the loss of two or more indirect or induced employment positions throughout the economy that are supported by the mining and processing of phosphate ore and the spending of these highly paid employees. If all 480 positions associated with the mining and processing of phosphate ore were eliminated under the No Action Alternative, $123 million in compensation (pay and benefits) could be lost throughout the state, with $65 million potentially lost in Caribou County. This loss would account for 27 percent of the total compensation of all employees in Caribou County, and the loss of 20 percent of the employment positions in the county (Peterson 2013). These impacts to employment and personal income throughout the economy in Caribou County would be major and unmitigable, and could range from negligible to minor at the relevant scales in the other affected locales.

4.13.1.3.5 Housing

The No Action Alternative would result in the loss of the 480 jobs associated with the currently operating Rasmussen Ridge Mines and Agrium's processing facility. Given that similarly compensated positions are few in number outside of the phosphate mining and processing industries, it is likely that the loss of employment would also trigger a loss in population as workers leave the area to find other opportunities. The loss of employment would result in workers putting their houses up for sale and terminating leases on rental properties. The loss of employment could also spark concern for the overall health and future of the phosphate mining industry in southeast Idaho, perhaps putting downward pressure on housing prices and increasing availability.

Property Values

The No Action Alternative could have a negative impact on property values. A loss of employment under the No Action Alternative would result in workers putting their houses up for sale and terminating leases on rental properties. The loss of employment could also spark concern for the overall health and future of the phosphate mining industry in southeast Idaho, perhaps putting downward pressure on housing prices and property values. These impacts would be minor to moderate.

4.13.1.3.6 Community Services

The No Action Alternative would result in the loss of the 480 jobs associated with the currently operating Rasmussen Ridge Mines and Agrium's processing facility. The loss of employment positions and potential loss of population as affected workers leave the area would reduce the demand for community services at the same time as the No Action Alternative would result in lowered funding for those services (sales and property taxes would be reduced, thus reducing the budget available to fund community services).

4.13.1.3.7 Public Finance

Selection of the No Action Alternative would result in a reduction in sales, use, and property tax revenues generated by phosphate mining operations once existing operations at the Rasmussen Ridge Mines cease. Agrium directly pays $1.1 million annually in property taxes to taxing districts within Caribou County, which is 14 percent of all property taxes paid in the county (Peterson 2013). These property tax revenues would be lost or considerably reduced, as would taxes paid by employees, and by secondary businesses and their employees. This would result in a decrease in Caribou County's overall revenues, as well as revenues in other analysis area counties from the circulation of payroll dollars. This impact could range from negligible (in areas where few individuals or businesses are employed or supported by the phosphate mining or processing industries) to moderate or major in areas like Caribou County, which are heavily dependent upon phosphate mining or processing.

The federal government would realize a loss of royalty payments totaling an estimated $19.7 million that would have been paid over the life of proposed mining activities under the Proposed Action, and would realize a decrease in the corporate income tax paid by Agrium. These impacts would be negligible.

Under the No Action Alternative, the State of Idaho and Caribou County would not receive royalty proceeds dispersed to the state by the federal government. Further, the state would not collect the mine license tax of 1 percent of the value of ores mined or extracted, and would realize a decrease in the corporate income tax paid by Agrium. These impacts would be negligible to minor at the relevant scales.

4.13.1.3.8 Agricultural Use

The No Action Alternative would have no impacts on the agricultural industry in the vicinity of the Proposed Action.

4.13.1.3.9 Impacts under the No Action Alternative

The preceding sections address the potential local and regional impacts associated with the cessation of mining activities under the No Action Alternative. Impacts could also be realized at a national scale.

In 2013, phosphate rock ore was mined by six firms at 11 mines in four states and upgraded to an estimated 32.3 million tons of marketable product. More than 85 percent of total domestic output was sourced in Florida and North Carolina, with the remainder produced in Idaho and Utah. Imports of ore totaled 2.6 million tons, resulting in a net import reliance of 3 percent of apparent consumption in the U.S. This net import reliance is considerably less than the 16 and 13 percent rates seen in 2010 and 2011, respectively (USGS 2014d). The current annual wet phosphoric acid production capacity in the U.S. is 10.5 million tons. Facilities in Idaho account for 863,000 tons of capacity, and Agrium's facility produces 538,000 tons of phosphate fertilizers per year (CRA 2009; Agrium 2014). There are currently 77 establishments identified as phosphatic fertilizer manufacturers. Fourteen of these are large establishments with more than 100 workers like Agrium's facility (U.S. Census Bureau [USCB] 2014a). In the first two quarters of 2014, fertilizer manufacturing facilities were operating at 78 percent of capacity (USCB 2014b).

Cessation of mining activities and the closure of Agrium's processing facility would have only a minor impact on the supply of phosphate, the supply of fertilizer, and the costs of agricultural production in the U.S. Less than 15 percent of phosphate ore mined in the U.S. is mined in Idaho, and only 15 percent of the global production is sourced from the U.S.; therefore, impacts to the supply of phosphate would be negligible. The Proponent's facility accounts for less than 5 percent of the phosphatic fertilizer produced in the U.S., and existing facilities have unused capacity; therefore, impacts to the supply of fertilizer would be negligible to minor. Because there would be only negligible to minor impacts to the supply of fertilizer, there would be only negligible to minor increases to the cost of agricultural production in the U.S. Cessation of mining activities and the closure of Agrium's processing facility would likely result in only a negligible to minor increase in the dependence on foreign sources of phosphate. The underutilized capacity at existing facilities could, if necessary, maintain domestic production rates.

4.13.2 Irreversible and Irretrievable Commitment of Resources

There would be no irreversible or irretrievable commitment of social or economic resources associated with the Proposed Action or the RCA.

4.13.3 Unavoidable Residual Adverse Effects

The Proposed Action and the RCA would not have unavoidable residual adverse effects on social or economic resources. The No Action Alternative would result in some social dislocations and economic changes at the county and local levels beginning when mining at the Rasmussen Ridge Mines ceases.

4.13.4 Mitigation Measures

As discussed in **Section 4.13.1.1.2**, to partially mitigate the temporary loss of HMs as a result of mining activity in the Angus Creek pasture of the RVCA, Agrium is proposing to provide water on the southwest side of the Little Long Valley pasture. This would decrease the economic impacts and effects to the local ranchers. Given the small amount of this land compared to the entirety of grazing lands in the area, impacts to the agricultural economy would be negligible. No other mitigation measures for socioeconomic resources have been proposed for any alternative.

4.14 ENVIRONMENTAL JUSTICE

Issue: What disproportionately high and adverse human health or environmental effects on people of race, color, religion, or income, including the Shoshone-Bannock Tribes population who exercise treaty rights on federal lands, could be realized?

Indicators:

- High or adverse human health effect
- High or adverse environmental effect
- Disproportionately high or adverse human health or environmental effect on people of a specific race, color, religion, or income group, including Shoshone-Bannock Tribal members

The first goal listed under Prescription 8.2.2(g) in the CNF RFP is that the exploration and development of existing leases "Provide for phosphate resource development with consideration given to biological, physical, social, and economic resources." There are no standards or guidelines for the implementation of this goal for social and economic resources.

4.14.1 Direct and Indirect Impacts

On February 11, 1994, EO 12898, "Federal Action to Address Environmental Justice in Minority Populations and Low-Income Populations" was published in the Federal Register (59 FR 7629). The order requires federal agencies to identify and address disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority and low-income populations.

4.14.1.1 Proposed Action

The Proposed Action is located on uninhabited lands. The nearest concentration of population is in Soda Springs, which is located more than 15 miles from the Proposed Action. The demographic composition of the Census County Division in which the Proposed Action is located approximates that of Census Tract 9602 (which includes the eastern portion of Caribou County, including the City of Soda Springs) and the State of Idaho as a whole. Therefore, there are no communities in the vicinity of the Proposed Action that are minority as a whole, and none would be exposed to high and adverse environmental impacts.

The Fort Hall Indian Reservation is located 30 miles west of the mine site. As shown in **Table 3.14-1**, those identifying as minorities or as Hispanic or Latino comprise a majority on the Fort Hall Reservation and Off-Reservation Trust Lands. The Shoshone-Bannock Tribes represent both a population (readily identifiable collection of persons) and a community (readily identifiable social group who reside in a specific locality, share government, and have a common cultural and historical heritage). The Proposed Action is not directly associated with or located in proximity to the Fort Hall Indian Reservation, but because of treaty rights and interests in public lands in the region, the Proposed Action could have disproportionate impacts on the population of the Reservation. These potential impacts are addressed in **Section 4.12**.

As presented in **Section 3.14**, data indicate that the numbers of people living in Caribou County and in Census Tract 9602 whose income is below the poverty level is lower than that of the State of Idaho as a whole, and that there are no individuals living in the Census County Division in which the Proposed Action is located whose income is below the poverty level. There are low-income populations in the vicinity of the Proposed Action; however, none would be exposed to adverse environmental impacts.

Impacts of the Proposed Action to the Shoshone-Bannock Tribe would be long-term and minor. Impacts to remaining populations using the Study Area would be long-term and negligible.

4.14.1.2 Rasmussen Collaborative Alternative

The environmental justice impacts realized under the RCA would be generally equivalent to those presented above for the Proposed Action.

4.14.1.3 No Action Alternative

Environmental justice impacts under the No Action Alternative would be the same as those described for the Proposed Action. Although the No Action Alternative may result in significant and unmitigable impacts to employment and the local economy, there is no indication that these impacts would be disproportionately realized by minority or low-income populations.

4.14.2 Irreversible and Irretrievable Commitment of Resources

There would be no irreversible or irretrievable commitments of resources for environmental justice.

4.14.3 Unavoidable Residual Adverse Effects

There would be no unavoidable residual adverse effects related to environmental justice.

4.14.4 Mitigation Measures

No specific mitigation measures for environmental justice have been proposed for any alternative.

4.15 HAZARDOUS MATERIALS AND SOLID WASTES

Issue: What is the potential for accidental spills from generation, handling, use, and storage of fuels, hazardous materials, and wastes?

Indicators:

- Compliance with appropriate local, state, and federal standards for handling of fuels, hazardous materials, and solid wastes

4.15.1 Direct and Indirect Impacts

This section describes the potential impacts associated with hazardous materials and wastes under implementation of the Proposed Action or the RCA. Under either of these, fuels, hazardous materials, and wastes would be transported, stored, and used in accordance with appropriate local, state, and federal regulations.

4.15.1.1 Proposed Action

Under implementation of the Proposed Action, wastes would be managed in compliance with appropriate local, state, and federal regulations and recycled or disposed of in existing permitted and agency-approved facilities. Used lubricants and solvents would be characterized according to the Resource Conservation and Recovery Act (RCRA) requirements and would be managed appropriately. Non-hazardous solid waste, trash, and other non-mineral waste would be hauled from the mine site by licensed waste disposal contract services for disposal off site.

The term “hazardous wastes” designates materials defined in 40 CFR Part 261.3 and regulated under RCRA. The Proposed Action is anticipated to be a “small-quantity generator” as defined under RCRA because Agrium would generate less than 100 kilograms of hazardous waste per month. Hazardous wastes are regulated from the point of generation to the point of disposal. Trucks would infrequently transport small quantities of hazardous and solid wastes to permitted off-site disposal facilities.

Under the Proposed Action, the materials to be used are listed in **Table 2.3-5**. Hazardous materials and wastes would be stored in the new fuel storage area and vehicle maintenance shop (**Figure 2.3-2**). Hazardous materials would continue to be used, and wastes would be generated at rates similar to those at the existing Rasmussen Ridge Mines.

The primary transportation route from Soda Springs to the new fuel storage area and shop would be via State Highway 34, Blackfoot River Road, and the existing haul road to the new West Side

Haul Road to the mine site. Transportation of fuels, hazardous materials, and wastes associated with the Proposed Action would comply with appropriate federal regulations.

Management practices for hazardous materials and wastes would continue in the same manner as currently implemented at Rasmussen Ridge Mines. No spills in quantities higher than the regulatory reporting limits have occurred during operation of the Rasmussen Ridge Mines (Guedes 2015).

Fuels and other liquid petroleum products, solvents, antifreeze, and most of the hazardous materials to be used for the Proposed Action would be stored in multiple aboveground tanks to reduce the risk of spillage and to meet containment requirements. Barriers would be installed under and around fuel tanks to comply with applicable regulatory requirements for secondary containment of petroleum products. Fuel would be dispensed at the new fuel storage area directly or by fuel trucks in compliance with appropriate local, state, and federal regulations.

Inadvertent spills and releases of fuels and hazardous materials or wastes may occur. Agrium would implement an SPCC Plan to meet the requirements of Title 40 CFR 112. The SPCC Plan would provide management direction for preventing and controlling potential spills. The SPCC Plan would include an inventory the aboveground tanks and secondary containment structures for bulk petroleum products, solvents, and antifreeze; identify the routine monitoring requirements; and describe the BMPs for the pollutants of concern. Pollutants of concern are defined as any fuels, chemicals, or other materials with the potential to be released from the site via storm water runoff from the fuel storage area, vehicle maintenance shop, or other areas.

Compliance with the SPCC Plan and applicable government regulations would reduce the risk of a large-scale release of hazardous materials or wastes. With implementation of timely spill response procedures, an accidental spill of hazardous materials or wastes associated with the Proposed Action is unlikely to pose environmental or public health and safety risks. With continued implementation of the management practices for hazardous materials and wastes as currently implemented at Rasmussen Ridge Mines, impacts of the Proposed Action associated with hazardous materials and wastes are anticipated to be short-term and negligible.

4.15.1.2 Rasmussen Collaborative Alternative

Under the RCA, the hazardous materials to be used would be the same as those for the Proposed Action (**Table 2.3-4**). Hazardous materials would be used and wastes generated at the same rates as those for the Proposed Action. Management practices for hazardous materials and wastes would continue in the same manner as currently implemented at Rasmussen Ridge Mines.

Unlike the Proposed Action, the RCA eliminates the need for new fuel facilities. Under the RCA, the haul road would route mine traffic past the existing fuel facilities at the Rasmussen Ridge Mines; therefore, the storage area for fuels and hazardous materials would be the existing shop and maintenance facilities at the Rasmussen Ridge Mines (**Figure 2.5-4**).

The transport route for hazardous materials and wastes would be the same route that is currently used at the Rasmussen Ridge Mines. The primary transportation route from Soda Springs to the shop at the existing Rasmussen Ridge Mines would be via State Highway 34, Blackfoot River Road, and the existing haul road to the mine site.

Fuels and other liquid petroleum products, solvents, antifreeze, and most of the hazardous materials to be used for the RCA would be stored in aboveground tanks in the existing shop area at the Rasmussen Ridge Mines. The total fuel storage capacity at the Rasmussen Ridge Mines shop facility is 40,000 gallons. Similar to current operations, fuel would be stored in multiple aboveground tanks to reduce the risk of spillage and meet containment requirements. Barriers under and around fuel tanks would meet applicable requirements for secondary containment of petroleum products. Fuel would be distributed from this site directly to equipment or through the use of fuel trucks that comply with relevant federal and state regulations.

Compliance with the SPCC Plan and applicable government regulations would reduce the risk of a large-scale release of hazardous materials or wastes. Relative to the Proposed Action, the use of the existing fuel storage area and shop at the Rasmussen Ridge Mines would limit potential spills to previously disturbed areas. Impacts associated with hazardous materials and wastes would be similar to those described for the Proposed Action. With continued implementation of the management practices for hazardous materials and wastes currently implemented at Rasmussen Ridge Mines, impacts associated with hazardous materials and solid wastes are anticipated to be short-term and negligible.

4.15.1.3 No Action Alternative

Under the No Action Alternative, the facilities would not be constructed or operated; therefore, no additional hazardous materials would be used in the assessment area, and no additional solid or hazardous wastes would be generated. In the short term, hazardous materials would continue to be used and wastes generated by the Rasmussen Ridge Mines at rates similar to current conditions; however, the quantities of hazardous materials use and wastes generated would ultimately decline as mining is completed at the Rasmussen Ridge Mines. There would be no project-related impacts associated with hazardous materials or solid wastes.

4.15.2 Irreversible and Irretrievable Commitment of Resources

Implementation of any of the action alternatives would result in irreversible or irretrievable commitment of the fuels and hazardous materials consumed by the project.

4.15.3 Unavoidable Residual Adverse Effects

None of the action alternatives would have unavoidable residual adverse effects related to hazardous materials or solid wastes.

4.15.4 Mitigation Measures

No specific mitigation measures are proposed to address hazardous materials and wastes, as the handling and storage of those materials are already controlled by a body of laws and regulations.

4.16 PUBLIC HEALTH AND SAFETY

Issue: Would the project result in potentially adverse effects to public health and safety?

Indicators:

- Changes in levels of dust, selenium, or other COPCs in transport media (air, water, fish, wildlife) and in natural resources that exceed appropriate local, state, and federal standards for public health and safety

4.16.1 Direct and Indirect Impacts

This section describes the potential impacts to public health and safety under implementation of the Proposed Action or the RCA. Under either of these alternatives, Agrium would comply with existing and appropriate local, state, and federal regulatory requirements to minimize impacts to the environment or public human health and safety. Mining activities would comply with appropriate air quality, surface water, and groundwater quality standards.

4.16.1.1 Proposed Action

The active mining areas would be restricted from public access for security and safety reasons. Agrium personnel would visually survey the mine areas for livestock daily. Livestock would be immediately removed from any areas of risk.

The mining activities described under the Proposed Action have the potential to impact surface waters by introducing pollutants, such as sediment, selenium, and other COPCs, via inadvertent spills and by releases of stormwater runoff that has contacted exposed overburden. Agrium would design and implement BMPs to control erosion and sediment transport, and to minimize the potential for a release of COPCs to protect surface waters in and around the Proposed Action, and to prevent exceedances of water quality standards.

As described in **Section 4.3**, groundwater quality impacts by selenium and other COPCs are a concern at phosphate mines in southeast Idaho. Agrium would protect groundwater resources by managing all material during the Proposed Action and by implementation of BMPs designed to control infiltration and percolation of precipitation into backfill and overburden.

There could be adverse effects to public health and safety if selenium is released to the environment during mining operations and subsequently bioaccumulates in the food chain to affect fish, livestock, or wildlife consumed by the public. The impact to vegetation associated with selenium bioaccumulation would be localized to the reclaimed areas. All reclamation would be required to meet the vegetation COPC action level concentrations documented in the PFO ARMP.

At reclamation, any Meade Peak-containing material from haul roads, berms, or water management structures would be placed as backfill within the mine. Water management structures would be cleaned of any materials potentially containing selenium or other COPCs before the originally excavated materials are used to fill the structures.

Under implementation of the Proposed Action, inadvertent spills and releases of fuels and hazardous materials or wastes may occur. The most probable spills would be fuel, hydraulic oil, and coolant from mobile equipment. Numerous local, state, and federal laws regulate the storage, use, recycling, disposal, and transportation of hazardous materials, wastes, and fuels. An SPCC Plan would be developed before construction and operations, providing direction for preventing and controlling potential spills and describing BMPs to minimize the potential for releases of COPCs. In the event of an inadvertent spill or release of hazardous materials or wastes, standard response and cleanup practices would be implemented, but there could be some short-term effects on water quality and some aquatic species if spilled materials reached nearby streams. The potential for such spills to occur would be limited to mine and haul road areas, and the potential for stream impact would be limited. These impacts are considered to be negligible to minor, site-specific, and short-term. An accidental spill of hazardous materials or wastes is unlikely to pose public health and safety risks.

Implementation of BMPs at the Proposed Action consistent with those currently used at Rasmussen Ridge Mines would reduce the risk of a large-scale release of hazardous materials or wastes and minimize the potential for exposure of the public to COPCs. No adverse effects to public health and safety are anticipated to occur from implementation of the Proposed Action. The impacts of the Proposed Action to public health and safety would be short-term and negligible.

4.16.1.2 Rasmussen Collaborative Alternative

Under the RCA, potential impacts to public health and safety would be similar to those described for the Proposed Action; however, the RCA would incorporate a store-and-release cover system that would reduce percolation of precipitation through backfill and overburden areas, thus reducing the release of COPCs to groundwater. The elimination of permanent external overburden piles downslope from the mine would eliminate the potential for release of selenium or other COPCs to surface water under the RCA. Under the RCA, the potential for bioaccumulation of selenium or other COPCs in the aquatic food chain would be minimized.

Implementation of BMPs in the RCA including covering mine overburden with a protective earthen cover would reduce the risk of a large-scale release of hazardous materials or wastes and minimize the potential for exposure of the public to COPCs. No adverse effects to public health and safety are anticipated to occur from implementation of the RCA. The impacts of the RCA to public health would be short-term and negligible.

4.16.1.3 No Action Alternative

Under the No Action Alternative, the facilities would not be constructed or operated; therefore, there would be no project-related impacts to public health and safety. However, this does not preclude future development of the federal phosphate leases under a different mine plan. In the short term, mining activities would continue at Rasmussen Ridge Mines similar to current conditions.

4.16.2 Irreversible and Irretrievable Commitment of Resources

Implementation of BMPs at the Rasmussen Valley Mine consistent with those currently implemented at Rasmussen Ridge Mines would minimize the potential for exposure of the public to COPCs. No irreversible or irretrievable long-term effects to public health and safety are anticipated to occur as a result from implementation of the Proposed Action or the RCA.

4.16.3 Unavoidable Residual Adverse Effects

Implementation of BMPs at the Rasmussen Valley Mine consistent with those currently implemented at the Rasmussen Ridge Mines would minimize the potential for exposure of the public to COPCs. No residual adverse impacts to public health and safety would result from implementation of the Proposed Action or the RCA.

4.16.4 Mitigation Measures

Project design features and BMPs of the Proposed Action are designed to reduce impacts to public health and safety from dust, selenium, or other COPCs in transport media. Compliance with the existing body of laws and regulations would minimize potential impacts to public health and safety; therefore, no specific mitigation measures are proposed.

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CHAPTER 5
CUMULATIVE EFFECTS

Cumulative effects are those impacts on the environment that result from the incremental impact of an action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such action (40 Code of Federal Regulations [CFR] 1508.7). The analysis is performed for each resource within areas called Cumulative Effects Areas (CEAs). The CEAs are described in the subsections below and vary by resource. For the purposes of analysis in this Final Environmental Impact Statement (Final EIS), reasonably foreseeable future actions were identified as those activities which are approved and those activities that have been submitted but are not yet underway. These activities include mining or exploration applications submitted but not yet agency approved and activities for which exploration and planning is underway and an approximate area of disturbance has been identified. These criteria were not based on a time range. The primary source of information was the mining plan and application information from the Bureau of Land Management (BLM) and U.S. Forest Service (USFS).

Cumulative effects can result from individually minor, but collectively major, actions taken over a period of time. Major past and present land uses in the area, which are also projected to continue into the future, include roads or trails, timber harvesting, wildfires, livestock grazing, agriculture, and mining. Dispersed recreation (including hunting and fishing) and residential development also occur in parts of the CEAs.

The configuration of the Proposed Action and Rasmussen Collaborative Alternative (RCA), as well as public scoping input gathered for this Final EIS, provided the foundation for identifying the CEAs. Cumulative effects are evaluated in terms of the specific resource, ecosystem, and human community being impacted; therefore, the boundaries of the CEAs vary by resource. An attempt was made for each environmental resource to determine the extent to which the environmental effect could be reasonably detected, and then include the geographic areas of resources that would be impacted by the environmental effect. However, for simplicity, ease of cumulative impact analysis, and in an attempt to avoid having only slightly different CEAs for some resources, the CEA boundaries were identical for those resources where it seemed reasonable and conservative to do so. The CEA boundaries are sized to prevent dilution of the cumulative effects over large areas. Guidance from the Council on Environmental Quality (CEQ), *Considering Cumulative Effects – January 1997*, was used in identifying geographic boundaries and, ultimately, the CEA for each resource. The CEA for each environmental resource is described below in the specific resource subsections. Figures for the various CEAs are also included.

5.1 GEOLOGY, MINERALS, AND PALEONTOLOGY

5.1.1 CEA Boundary

The CEA for geology, minerals, topography, and paleontology (shown on **Figure 5.1-1)** occupies an area of 799 square miles (511,360 acres). This includes the majority of the Southeast Idaho Phosphate District, including known phosphate leasing areas (KPLAs), in Bear Lake, Bonneville, and Caribou Counties, Idaho. Within this CEA, there are 43,644 acres of current federal phosphate leases, 8.6 percent of the total CEA area. The CEA does not encompass the inactive Gay Mine, which is located in portions of Bingham, Bannock, and Caribou Counties, because of its geographic and hydrologic remoteness from mines within the CEA. The Gay Mine is located 20 miles west of the nearest KPLA near the northwest corner of the Southeast Idaho Phosphate District, and in the Snake River watershed. Although the Gay Mine is part of the same mining district as most other mines in the CEA, the others produce ore from a tight cluster of anticlines and synclines in the Blackfoot River or Bear Lake Watersheds. An exception is made for the active Smoky Canyon Mine to account for recent and reasonably foreseeable future phosphate mining activities there.

5.1.2 Introduction

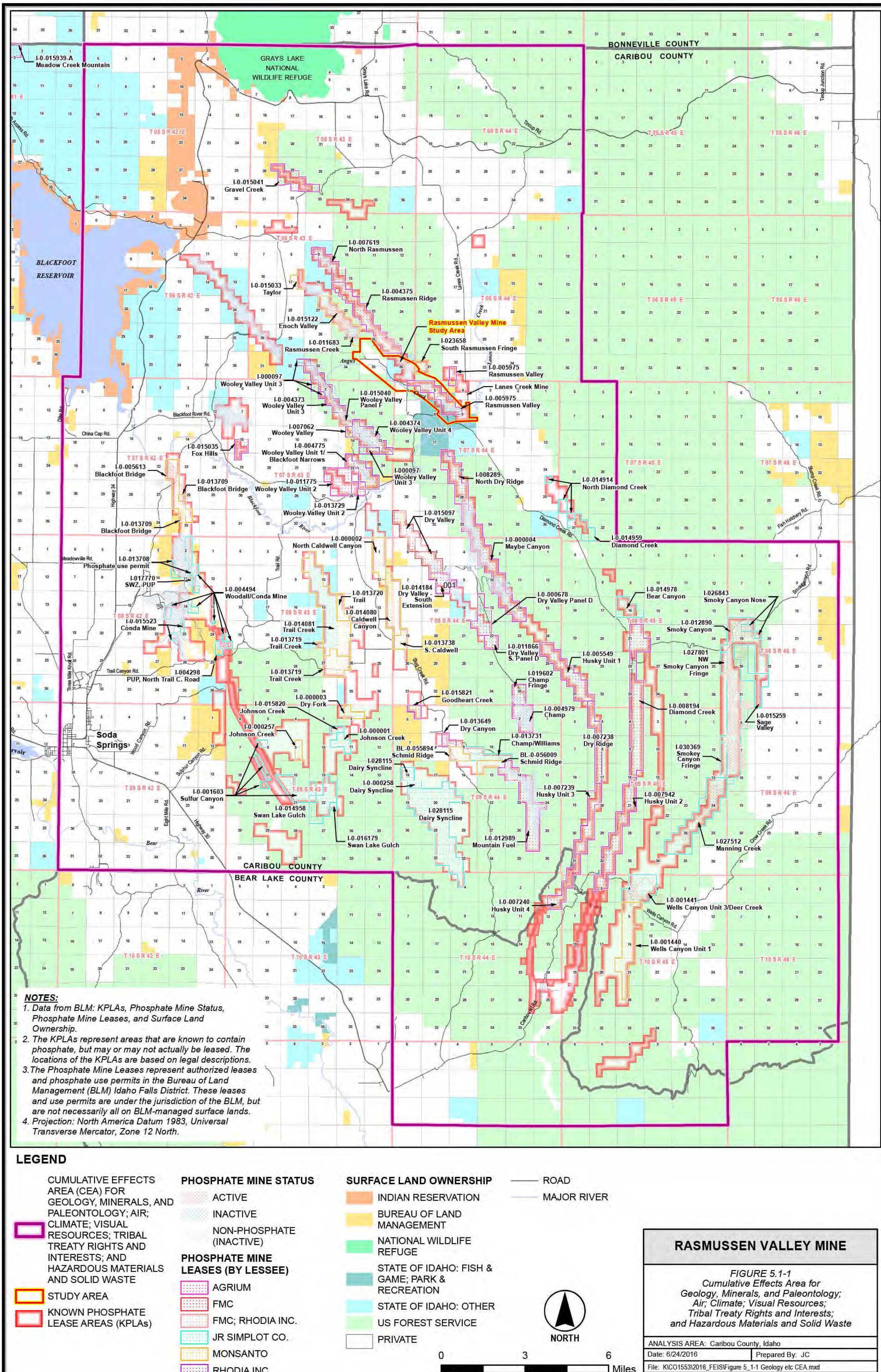
Within the CEA, implementation of the Proposed Action or RCA and other reasonably foreseeable activities would have potential effects related to mineral resource depletion, topographic changes, exposure of seleniferous materials, and other constituents of potential concern (COPCs) to weathering processes and subsequent mobilization through meteoric water seepage; geotechnical instability; and discovery, damage, or removal of paleontological resources. Impacts to these resources from past, present, and reasonably foreseeable future phosphate mining operations are generally confined to specific phosphate mining properties (KPLAs and federal phosphate leases) within the CEA.

Ground-disturbing activities are the primary cause of impacts to paleontological resources. Lesser impacts to currently undiscovered or unrecognized geologic and mineral resources can also result from these activities. Within the CEA, ground-disturbing activities consist of mining processes, and to a lesser extent, construction of transportation infrastructure. Impact types include direct destruction of resources and the loss of contextual geologic and paleontological data. Production of phosphate ore has historically been an important socioeconomic process within the CEA, and is expected to continue to be important in the future. Mining is expected to continue within the CEA until all economically recoverable phosphate has been produced from current and future federal phosphate leases.

Past, present, and reasonably foreseeable actions within the CEA have resulted or would result in both beneficial (e.g., production and understanding of phosphate and other geologic and mineral resources) and adverse (e.g., destruction of fossils) impacts on this resource group. The total (historical and reasonably foreseeable) cumulative disturbance of geologic resources within the CEA as a result of phosphate mining would directly affect 5.5 percent of the CEA. Because phosphate mining affects higher volumes of rock across larger aerial extents than other activities in the CEA, the contribution from activities other than phosphate mining to cumulative adverse impacts within the CEA are expected to be minor.

5.1.3 Past and Present Activities

The cumulative effects analysis includes all past, present, and reasonably foreseeable future phosphate mining activity in the eastern half of Caribou County and northern Bear Lake County. However, more emphasis is to be placed on mines that commenced operation after 1970 because the data for those mines are more complete and because of limited statutory or contractual requirements, the earlier mines and lessees were allowed to abandon sites and relinquish leases without extensive reclamation. A total of 32 phosphate mines have been developed in southeastern Idaho (28 in the CEA) since mining began in the early 20th century. Of these, 12 were small underground mines that are mined out and closed. Surface disturbances from these underground mining operations are typically 1 acre or less. Three former underground mines: Waterloo, Conda, and Maybe Canyon, were converted to surface mining operations, and surface disturbances from these operations are noticeable (Lee 2000).



BONNEVILLE COUNTY
CARIBOU COUNTY
GRAYS LAKE NATIONAL WILDLIFE REFUGE
BLACKFOOT RESERVOIR
Rasmussen Valley Mine Study Area
Soda Springs
CARIBOU COUNTY
BEAR LAKE COUNTY
NOTES:
1. Data from BLM: KPLAs, Phosphate Mine Status, Phosphate Mine Leases, and Surface Land Ownership.
2. The KPLAs represent areas that are known to contain phosphate, but may or may not actually be leased. The locations of the KPLAs are based on legal descriptions.
3. The Phosphate Mine Leases represent authorized leases and phosphate use permits in the Bureau of Land Management (BLM) Idaho Falls District. These leases and use permits are under the jurisdiction of the BLM, but are not necessarily all on BLM-managed surface lands.
4. Projection: North America Datum 1983, Universal Transverse Mercator, Zone 12 North.
LEGEND
CUMULATIVE EFFECTS AREA (CEA) FOR GEOLOGY, MINERALS, AND PALEONTOLOGY; AIR; CLIMATE; VISUAL RESOURCES; TRIBAL TREATY RIGHTS AND INTERESTS; AND HAZARDOUS MATERIALS AND SOLID WASTE
STUDY AREA
KNOWN PHOSPHATE LEASE AREAS (KPLAs)
PHOSPHATE MINE STATUS
ACTIVE
INACTIVE
NON-PHOSPHATE (INACTIVE)
PHOSPHATE MINE LEASES (BY LESSEE)
AGRIUM
FMC
FMC; RHODIA INC.
JR SIMPLOT CO.
MONSANTO
RHODIA INC.
SURFACE LAND OWNERSHIP
INDIAN RESERVATION
BUREAU OF LAND MANAGEMENT
NATIONAL WILDLIFE REFUGE
STATE OF IDAHO: FISH & GAME; PARK & RECREATION
STATE OF IDAHO: OTHER
US FOREST SERVICE
PRIVATE
ROAD
MAJOR RIVER
NORTH
0 3 6 Miles
RASMUSSEN VALLEY MINE
FIGURE 5.1-1
Cumulative Effects Area for Geology, Minerals, and Paleontology; Air; Climate; Visual Resources; Tribal Treaty Rights and Interests; and Hazardous Materials and Solid Waste
ANALYSIS AREA: Caribou County, Idaho
Date: 6/24/2016
Prepared By: JC
File: K:\CO1553\2016_FEIS\Figure 5_1-1 Geology etc CEA.mxd

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The majority of mines in the region have been open pit operations. Total disturbances at active and inactive mines within the CEA are summarized in **Table 5.1-1**. Although volumes of mined ore and overburden material may be better indicators of disturbances to geologic and paleontological resources, volumetric data may either be non-existent for older mines or proprietary in the cases of current or recently operating mines.

Table 5.1-1 Total Disturbances for Active and Inactive Mines in the Region

Mine	Years of Operation	Disturbed Area (Acres)
Waterloo	1907 to 1920, 1945 to 1960	196
Hot Springs	1907 to 1911, 1954 to 1956	0.5
Paris Canyon	1917 to 1926	<2 (estimate)
Rattlesnake Canyon	1920 to 1926	0.4
Bear Lake	1920 to 1921	0.1
Conda and Trail Canyon	1920 to 1984	1,572
Home Canyon	1916 to 1924	0.8
Consolidated	1920 to 1921, 1930 to 1938	<1 (estimate)
Bennington Canyon	1907 to 1912, 1939 to 1942	2 (estimate)
Wyodak	1942 to 1943	<1 (estimate)
Ballard	1952 to 1969	635
North and South Maybe Canyon	1951 to 1995	1,028
Georgetown Canyon	1958 to 1964	251
Wooley Valley	1955 to 1989	808
Diamond Gulch	1960	32
Fall Creek	1955 to 1964	<1 (estimate)
Mountain Fuel	1966 to 1967, 1985 to 1993	781
Henry	1969 to 1989	1,074
Bloomington Canyon	1972 to 1975	<1
Pritchard Creek	1975 to 1976	2 (estimate)
Lanes Creek	1978 to 1989, 2015 to Present	42
Champ and Champ Extension	1982 to 1985	460
Smoky Canyon	1982 to Present	3,168
Enoch Valley	1990 to Present	645
Rasmussen Ridge Mines[1]	1991 to Present	858
South Rasmussen	2003 to 2015	390
Dry Valley	1992 to 2014	1,082
Blackfoot Bridge	2013 to Present	420
	Estimated Total Disturbed Acres	**13,454**

Notes:

1 Includes North Rasmussen Ridge, Central Rasmussen Ridge, and South Rasmussen Ridge Mines

Sources: BLM and USFS 2007; BLM 2014; P4 2014

There are currently five active phosphate mines in the Southeast Idaho Phosphate District: Smoky Canyon (Simplot), Rasmussen Ridge Mines (Agrium), Enoch Valley (P4), Lanes Creek (Agrium), and Blackfoot Bridge (P4). Each of the currently operating mines simultaneously performs mining and reclamation activities in different parts of the mines. Reclamation activities may include reducing pit highwalls, backfilling mined-out pits with overburden, grading and shaping backfill and overburden piles, applying topsoil or growth medium (GM) to prepare for seeding, seeding and revegetating, tree planting, and removing or adjusting ditches and ponds to handle the post-closure surface water management. Some reclamation activities have been required and implemented since surface mining for phosphate began in southeast Idaho in the late 1940s, However, because reclamation activities were not necessarily required, or may have been negotiated based on limited statutory or lease contract requirements, mines and lessees before

1970 were often released from lease liabilities without backfilling, regrading, or reseeding of disturbed areas (Causey and Moyle 2001). In spite of this, natural succession has revegetated many areas at old mine sites. Extensive reclamation of phosphate mines began in the 1970s with the passage of Federal Land Policy and Management Act (FLPMA) and the State of Idaho's 1971 Surface Mining Act. All mines since that time have reclaimed amenable disturbed lands using the above activities. In the late 1990s the regulatory agencies and industry became aware of the extensive selenium contamination of reclamation vegetation at virtually all areas of past mining and reclamation. In some cases, surface or ground water has also been impacted. Because of this, operation and reclamation activities at new and existing mines have been modified to prevent future occurrences. Most of the historical mines are now being investigated and remediated using Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and related authorities to eliminate unacceptable environmental risk from selenium and other COPCs. Initiation of work at two remaining sites (Dry Valley and Wooley Valley) is scheduled to begin in the near future. Although extensive reclamation activities have been conducted at historical sites, the presence of COPCs in vegetation and water needs to be assessed and remediation work conducted before reclamation can be judged complete by the environmental and land management agencies. Because of this, the portion of the mined-out areas at previously approved mines that has been reclaimed is unclear.

Within the CEA, additional major earth-moving activities include construction of roads and aggregate pits. These features exist within the CEA, and primarily impact topographic resources, with lesser influences on geologic, mineral, and paleontological resources. The impact of aggregate pits on geologic resources is negligible in comparison to phosphate mining.

5.1.4 Foreseeable Future Activities

Demand for phosphate fertilizers and phosphorous, coupled with limited supplies of available phosphate rock across the world, is expected to continue into the foreseeable future. Worldwide production is expected to increase by 14 percent from 2013 to 2017 (USGS 2014d). Domestic prices have varied despite increasing demand. Phosphate rock production in the U.S. is expected to remain at approximately 31 million tons per year (USGS 2013). Florida and North Carolina currently produce 85 percent of all phosphate rock in the U.S. Idaho and Utah produce the remainder (USGS 2014d). Average annual production in the CEA is expected to be approximately 3.6 million tons per year, consistent with previous years (USGS 2012).

Approved and reasonably foreseeable disturbances (including the Proposed Action or the RCA) expected from existing leases issued by federal and state governments and private entities in the CEA are summarized in **Table 5.1-2**. Of the 17,391 acres of approved or reasonably foreseeable future disturbances and current disturbances at mines within the CEA, 905 acres are scheduled or likely to remain unreclaimed (**Table 5.1-2**). This unreclaimed area represents 5.2 percent of the initial disturbance, and 2 percent of the KPLAs in the CEA.

Table 5.1-2 Reasonably Foreseeable Disturbance Expected from Phosphate

Mine	Approved Disturbance (acres)	Reasonably Foreseeable Disturbance (Not Yet Approved) (acres)	Future Net Unreclaimed Area[1] (acres)
Smoky Canyon (Including Panels F and G)	3,886	15	91
Blackfoot Bridge	768		65
Enoch Valley	834	--	26
North Rasmussen Ridge	430	--	52
Central Rasmussen Ridge	231	--	0

Table 5.1-2 Reasonably Foreseeable Disturbance Expected from Phosphate

Mine	Approved Disturbance (acres)	Reasonably Foreseeable Disturbance (Not Yet Approved) (acres)	Future Net Unreclaimed Area[1] (acres)
South Rasmussen Ridge	246	--	0
South Rasmussen	380		
East Smoky Panel	--	847	10
Dairy Syncline	--	1,779	110
Diamond Creek/Freeman Ridge	--	1,200	47
Husky 1/North Dry Ridge	--	1,051	41
Trail Creek	--	1,000	39
Dry Ridge	--	1,000	39
Caldwell Canyon	--	1,200	47
Paris Hills	--	150	6
Total All Mines	**6,775**	**8,242**	**573**

Notes:

1 An average of 3.9 percent of currently agency-approved disturbances are approved to remain unreclaimed. These areas consist mostly of non-reclaimable features such as pit walls. This average was applied to anticipated, but not-yet-approved future disturbances (except Dairy Syncline) to determine reasonably foreseeable unreclaimed areas.

Source: BLM 2015b

5.1.5 Cumulative Activities

The total disturbance for the Proposed Action would be 468 acres, 451 acres (96 percent) of which would be reclaimed through reseeding and recontouring to near-original topography. The total potential disturbance for the RCA would be 541 acres, of which 518 acres (96 percent) would be reclaimed. The total area of long-term disturbance resulting from the Proposed Action (17 acres) and from the RCA (42 acres) would be less than 0.01 percent of the total area within the CEA. The 468 acres, when combined with agency-approved unreclaimed disturbances, existing disturbances at previously approved mines within the CEA, and reasonably foreseeable future disturbance, a total of 23,000 acres would be disturbed, at least temporarily, including the Proposed Action or the RCA. This represents 37 percent of federal phosphate-leased areas and 4.5 percent of the total area in the CEA.

If all KPLAs within the CEA are developed to the extent that 90 percent of each federal phosphate lease is disturbed through excavation, construction, or other ancillary activities, 39,300 acres (7.7 percent of the CEA) would be disturbed at some point. The volumetric equivalent of geological, mineral, and paleontological resources that would be disturbed is uncertain because each mine would design mine plans according to geologic and market constraints unique to each phosphate lease.

5.1.6 Cumulative Effects

The cumulative result of the Proposed Action or the RCA, when combined with known past, present, and foreseeable (approved and not-yet-approved) future disturbances in the CEA, would include the long-term surface disturbance of 23,007 acres. Of this affected area, less than 1 percent of the CEA (640 acres) would remain unreclaimed over the long term as a result of currently agency-approved or reasonably foreseeable disturbances remaining from required reclamation and CERCLA remediation activities. Estimates of unreclaimed areas from older mines listed in **Table 5.1-1** are unavailable. Cumulative effects to geologic, mineral, and paleontological resources are difficult to determine without estimates of mined volumes of rock within the CEA. However, it is likely that the phosphate resources of the CEA would eventually be depleted.

Because of increasing world-wide demand for phosphate, it is likely that there would be no reduction in current phosphate production levels. As prices increase and readily available resources decrease, phosphate ore that is deeper, lower-grade, and more difficult to process may be targeted for development. Those less economic resources, covered by pit backfill or overburden piles, would be less likely to be developed than if they were not covered.

Geological, mineral, and paleontological resources within the CEA are affected primarily by mining and other construction activities. Negative effects of mining operations can include the destruction and loss of paleontological resources. Positive effects can include discovery of paleontological and mineral resources. Likewise, mining excavations and geological characterization can also provide geologic data, such as local stratigraphy, geologic structure, and geochemistry, that could otherwise not be determined from the surface.

Stability of geologic formations, landforms, and topography is affected by man-made and natural phenomena within the CEA. Pit walls and overburden piles associated with mining operations or road cuts associated with road, highway, and railway construction can all contribute to instability. Geotechnical stability typically only affects the local area of disturbance for most construction activities. Unstable overburden piles at the edges of federal phosphate leases may affect other resources outside the lease boundary. For example, overburden pile slope failures at Wooley Valley Mine and North Maybe Canyon Mine have directly impacted surface water quality in Angus Creek and East Mill Creek, respectively (Lee 2000; USFS 2008). Slope failures have also been recognized elsewhere in the CEA, including at the Conda-Woodall Mountain Mine (IDEQ and USEPA 2011). Remaining pit walls would not present an instability issue under either the Proposed Action or the RCA. Under the RCA, stability of the empty portion of the South Rasmussen Mine would be increased as a result of adding more backfill. Because the individual disturbances within the CEA are small in comparison to the overall size of the CEA, cumulative effects related to geotechnical stability are unlikely. Overall, cumulative effects to geotechnical stability are short-term and negligible.

Cumulative effects resulting from rock excavation and placement on paleontological resources within the CEA are anticipated to be similar for the Proposed Action and RCA because the Meade Peak Member of the Phosphoria Formation is the primary source of phosphate ore in the Southeast Idaho Phosphate District. As a result, paleontological resources within the Meade Peak Member of the Phosphoria Formation have likely been affected by all other phosphate mines in the CEA. Similarly, because of their stratigraphic position proximate to the Phosphoria Formation, impacts to the Dinwoody and Wells Formations have likely been impacted by other phosphate mines within the CEA. As such, impacts to paleontological resources within those geologic units under the Proposed Action or RCA would be additive to other disturbances within the CEA. Overall, cumulative effects to paleontological resources are long-term and minor.

Under the No Action Alternative, the Rasmussen Valley Mine would not be constructed, and there would be no effects to geology, minerals, and paleontology.

5.2 AIR RESOURCES, CLIMATE, AND NOISE

5.2.1 Air Quality

5.2.1.1 CEA Boundary

The CEA for air resources is the same tight cluster of anticlines and synclines in the upper Blackfoot River and Bear Lake Watersheds defined for geology, minerals, and paleontology

(**Figure 5.1-1**). This region is characterized by generally north- to northwest-trending mountains, ridges, and valleys and constitutes a comparatively discrete area for air movement. Cumulative effects to air quality will be assessed from the existing mine operations in the area, which will include the eastern half of Caribou County and a portion of Bear Lake County. It is likely that there would be little or no contribution to cumulative effects to air resources.

5.2.1.2 Introduction

The CEA is within a region of generally north- to northwest-trending mountain ranges and valleys. There are currently five active phosphate mines in the Southeast Idaho Phosphate District: Smoky Canyon, Blackfoot Bridge, Enoch Valley, Lanes Creek, and Rasmussen Ridge Mines. Additionally, the Dry Valley mine is in its reclamation phases (BLM 2014). The CEA also encompasses Agrium's and Monsanto's phosphate ore processing plants near Soda Springs.

The Study Area for the proposed Rasmussen Valley Mine is 55 miles (90 km) from the Grand Teton National Park boundary. Grand Teton National Park is classified as a Class I Area. The federal Clean Air Act requires that Class I areas be evaluated for haze and visibility impacts if a new or major-modification facility is planned within 60 miles (100 km) of a Class I Area.

5.2.1.3 Past and Present Activities

Past and present activities that contribute to impacts in the CEA include the continued operations of phosphate mines, phosphate processing plants, lumber harvesting, grazing, wildfires, controlled burns, and traffic on paved and unpaved roads. The CEA has been and is presently located within an area designated as an attainment area or unclassified for all National Ambient Air Quality Standards (NAAQS). Particulate matter with a nominal diameter of 10 microns or less (PM_{10}) is the most common air pollutant emission associated with phosphate mining, and mining is the major activity that produces fugitive dust in the area. Other past and present sources of impacts include residential and small industrial heating sources such as natural gas, oil, and wood. These sources are primarily located in Soda Springs, the impacts are minimal, and are expected to remain approximately equal to present conditions.

The South Rasmussen, Lanes Creek, and Rasmussen Ridge Mines are adjacent to the Proposed Action and RCA. Air quality impacts from those mines are the nearest past and present mining operations to the Proposed Action or the RCA. As the operations at Rasmussen Ridge Mines conclude, the equipment from the mine would be transported and used at the proposed Rasmussen Valley Mine. The nearby Lanes Creek Mine will operate during the transition and would overlap with the closing of the Rasmussen Ridge Mines and development of infrastructure at the Proposed Action or RCA. The South Rasmussen Mine is in final reclamation, awaiting the outcome of the Agencies' decisions on the Rasmussen Valley Mine proposal.

5.2.1.4 Foreseeable Future Activities

Foreseeable air quality disturbances include the continued operations and development of new phosphate mines, phosphate processing plants, lumber harvesting, grazing, wildfires, controlled burns, traffic on paved and unpaved roads, and residential and industrial heating sources.

The foreseeable air quality impacts from the Proposed Action or the RCA are estimated to be roughly equal to those produced by the Rasmussen Ridge Mines. As noted above, the Rasmussen Ridge Mines are expected to conclude mining operations in 2017, and at that time, the Proposed Action or the RCA would begin. The Proposed Action or the RCA would take the place of the Rasmussen Ridge Mines and would have roughly the same impacts. There would be minimal change to impacts contributing to cumulative impacts.

5.2.1.5 Cumulative Activities

Mining, wildfires, and controlled burns have the greatest potential to affect air quality in the CEA. Additional to the activities described in the past, present, and foreseeable future, natural sources of fugitive dust can develop from wind erosion, especially in arid conditions and areas of sparse vegetation.

Cumulative activities for the Proposed Action or the RCA would be similar and would not pose different impacts to air quality within the CEA or to the closest Class I area (Grand Teton National Park).

5.2.1.6 Cumulative Effects

Wildfire emissions, when added to existing concentrations of air pollutants, could contribute to cumulative effects that result in non-attainment of the particulate standards in specific areas. Controlled burns are conducted in compliance with state regulations for protection of air quality and only when ambient air quality standards would not be exceeded. The Idaho Department of Environmental Quality (IDEQ) provides updated air quality conditions to the public on their air quality monitoring website. Depending on the proximity of fires to the mine and the prevailing wind direction, emissions from the fires could add to those from the mining operations. Smoke disperses rapidly in most cases, and effects to air quality are limited to the duration of the fires. It is not possible to quantify these effects in this CEA as a result of the uncertainty of these conditions; therefore, it is not meaningful to determine the cumulative effects of adding the particulate emissions from the Proposed Action or RCA to potential smoke emissions from fires. The Proposed Action or RCA would comply with the existing NAAQS and applicable state and federal regulations for air quality.

Impacts to air quality from the Proposed Action or the RCA may result from wind-blown dust and fuel-burning equipment at the mine or facilities (including generators) and vehicle emissions. These impacts, along with ongoing impacts from wildfires and controlled burns, contribute to the cumulative effects of past, present, and reasonably foreseeable future activities. The Study Area is in attainment for all NAAQS criteria pollutants, has relatively good air quality, and the Proposed Action or the RCA would meet ambient air quality standards.

Cumulative effects resulting from the Proposed Action or the RCA would not impact air resources beyond the current condition within the CEA. The source of the impacts from Agrium would shift from their operations at Rasmussen Ridge Mines to the Proposed Action or the RCA and continue throughout the life of proposed mining activities. The addition of the Proposed Action or RCA to the increased cumulative effects on air quality would be short-term and negligible.

5.2.2 Climate and Climate Change

5.2.2.1 CEA Boundary

The Proposed Action or the RCA and other phosphate mining activities can be viewed within the same CEA as geology, minerals, and paleontology (**Figure 5.1-1**), and is also based on the regional atmospheric system. The CEA is the Southeast Idaho Phosphate District, which includes the eastern half of Caribou County and a portion of Bear Lake County.

5.2.2.2 Introduction

The CEA is within a region of generally north- to northwest-trending mountain ranges and valleys. It is expected that the Rasmussen Ridge Mines operations would phase out, and the Proposed Action or the RCA would begin shortly thereafter. Carbon dioxide (CO_2), which has an atmospheric residence time of more than 100 years, is the primary greenhouse gas (GHG) contributing to recent climate change. Through animals and plant respiration, volcanic eruptions, and ocean-atmospheric exchange, CO_2 is naturally forming. Human activities (such as burning of fossil fuels) contribute CO_2 to the atmosphere, which cumulatively increases the total generated CO_2 emissions with the naturally forming CO_2 from the carbon cycle activities (USEPA 2015b). GHG emissions from the Proposed Action or the RCA would be roughly similar to those at the currently operating Rasmussen Ridge Mines and would constitute an additional contribution to cumulative impacts.

5.2.2.3 Past and Present Activities

The past and present activities generating GHG emissions are directly related to phosphate mining operations, public traffic through and to recreational locations within the CEA, operation of agricultural equipment, residential and small industrial heating sources, and other commercial and industrial activities. Quantitative data on these varied sources are not readily available; their contribution is small compared to phosphate mining and processing, and they are expected to remain approximately equal to present contribution.

5.2.2.4 Foreseeable Future Activities

Foreseeable GHG-generating activities include the continued operations and the development of new phosphate mining and processing projects, ongoing and general traffic, agricultural operations, small industrial heating sources, and other commercial and industrial activities. Quantitative data on these varied sources that are not directly associated with phosphate mining are not readily available, but their contribution is small compared to phosphate mining and processing operations, and they are expected to remain approximately equal to present contributions for the CEA. As technology advances, implementation of other types of equipment (such as renewable power sources or hydrogen fuel cells) for operations within the CEA may be more economically feasible in the future. Lower GHG-emitting engines for vehicles may possibly reduce GHG emissions in the foreseeable future.

5.2.2.5 Cumulative Activities

Phosphate mining, processing, and mine remediation; agricultural operations; deforestation; and burning of fossil fuels such as coal, oil, and natural gas for power-generating engines are all activities within the CEA contributing to GHG emissions. Other natural activities (such as soil respiration and decomposition and plant and animal respiration) are sources of GHG emissions, which account for a much larger impact than human sources. Human sources of GHG emissions are much smaller in scale than natural sources, but carry the potential to upset the balance in the existing carbon cycle (DOE 2008). The Proposed Action and RCA include only phosphate mining operations and do not incorporate phosphate processing. Phosphate processing activities are ongoing at the Conda Phosphate Plant 5 miles north of Soda Springs, Idaho on State Route 34. The phosphate processing plant contributes to GHG emissions at a larger scale than the mining activities, as CO_2 is produced not only by fossil fuel combustion but also from wet-processing of phosphate rock to generate phosphoric acid (USEPA 2011b) with CO_2 as a byproduct.

5.2.2.6 Cumulative Effects

Phosphate mining and processing contributes to GHG emissions within the CEA. Active mines in the CEA for climate are Smoky Canyon, Blackfoot Bridge, Enoch Valley, Lanes Creek, and the Rasmussen Ridge Mines, which contribute to the cumulative GHG emissions (BLM 2015c). Active phosphate mine remediation activities include current work at the North and South Maybe Mines.

The foreseeable future includes the completion of mining at mines such as the Rasmussen Ridge Mines. GHG emissions from closed mines not under active remediation construction would no longer contribute to the cumulative effects during the life of proposed mining activities. Agrium's contribution to climate change effects as a result of the Rasmussen Valley Mine and cumulative activities would be similar to existing conditions because GHG emissions generated from the Rasmussen Ridge Mines would end, while the Rasmussen Valley Mine operations would begin to generate GHG. Therefore, Agrium's contribution to the cumulative effects would continue at the same rate, and the effects would increase at the same rate for the additional life of the Rasmussen Valley Mine.

With the final federal rule to mandate GHG reporting (40 CFR Part 98) for emission sources emitting 25,000 metric tons of carbon dioxide equivalence (CO_2e) or more per year, additional data will become available in the future to quantify cumulative effects of GHG emissions in the CEA. Although CO_2e production from this project is estimated to be lower than the federal reporting limit, it will contribute to global climate change based on U.S. Environmental Protection Agency (USEPA) studies. Climate change has been linked to the rise of average temperatures across the United States. In addition, other climate patterns, such as reduced ice and snow cover, are becoming more common. Precipitation patterns across the country are speculated to be influenced by GHG concentrations in the atmosphere. Discussion in the recent years includes the abnormal droughts and extreme rainfall across the country. Researchers are less certain about these relationships with GHG emissions than the association with temperature.

Phosphate mining and processing has been ongoing in the region since the early 1900s and increased in the latter half of that century. Comparative data on climate have not been linked to mining activity, but it can be assumed that the GHG emissions from mining and processing of phosphate have contributed to climatic trends. The major contributors in this scenario are the processing plants. The addition of GHG from the Proposed Action or RCA to the cumulative GHG emissions within the CEA would have a long-term and negligible effect on climate change.

There are predicted long-term trends in climate change that would affect aspects of long-term reclamation. The U.S. Global Change Research Program (USGCRP) states, "Changes in the timing of streamflow related to changing snowmelt are already observed and will continue, reducing the supply of water for many competing demands and causing far-reaching ecological and socioeconomic consequences" (Mote et al. 2014). Current climate models for the northwestern U.S. indicate that warmer winter temperatures will shift the average timing of snowmelt and surface water runoff to earlier in the year. Runoff and infiltration for the proposed cover systems is expected to increase during the winter months and early spring, but will be lower during the late spring and summer. Climate models also predict a 13 percent increase in storms with precipitation greater than 1 inch. This change would increase the average volume of runoff and infiltration generated by individual storms, but it is uncertain if the total volume of runoff and infiltration during an average year would be greater or less than currently predicted. This may result in changes in the effectiveness of cap-and-cover designs and unanticipated differences in the species composition of reclamation vegetation.

An increase in precipitation may increase infiltration rate but may also increase vegetation density and the associated increased transpiration. The result may be an increase in percolation rate and site-related COPC leaching through the proposed cover systems. However, increased infiltration will also increase groundwater flux, resulting in greater dilution of leaching COPCs in the underlying aquifer systems. For decreases in precipitation under assumed global climate change, the overall rate of precipitation infiltrating the cover may be lower, but it may be offset by the increased percentage of storms with precipitation of more than 1 inch or a decrease in vegetative cover and associated transpiration.

5.2.3 Noise

5.2.3.1 CEA Boundary

The CEA for noise is the Study Area, adjacent mining activity at the Rasmussen Ridge Mines, and sensitive noise receptors within 1.5 miles including the area along Blackfoot River Road and Lanes Creek County Road (**Figure 5.2-1**). This CEA also includes all other nearby receptors, where the noise produced from the operations may affect residents' lives. Noise from mining is attenuated by vegetation and topography to levels that are not detectable to humans over long distances. Noise related to access traffic and haul roads is important to persons along nearby public roads and to all nearby residences.

5.2.3.2 Introduction

Within the noise impacts CEA, the only operating mines that may overlap in time with the Proposed Action or the RCA are the Rasmussen Ridge Mines, the Enoch Valley Mine (limited two year reactivation), and the Lanes Creek Mine. When mining begins for the Proposed Action or the RCA, the Rasmussen Ridge Mines and the Enoch Valley mining operations would have ceased, but reclamation would continue. There may be a gap in time between the end of mining at the Rasmussen Ridge Mines and the beginning of mining at the Proposed Action or the RCA, but the nearby Lanes Creek Mine would continue to operate during this period. Noise impacts from the Proposed Action or the RCA would replace the impacts generated from the Rasmussen Ridge Mines operations. The existing mines do not impact sensitive receptors in the CEA. The effects of adding the Proposed Action or the RCA to existing and foreseeable future disturbances are not expected to result in adverse cumulative impacts.

5.2.3.3 Past and Present Activities

Past and present disturbances contributing to noise include vehicular traffic on State Highway 34, Blackfoot River Road, Lanes Creek Road, the haul roads, and from the railroad at the Wooley Valley Tipple. Noise from vehicular traffic and the railroad is short-term and intermittent. Past inactive mine operations within the noise CEA would no longer contribute to noise impacts.

5.2.3.4 Foreseeable Future Activities

Foreseeable noise contributions include the continued operations and the development of new phosphate mining and processing projects, vehicular traffic, and the railroad at the Wooley Valley Tipple. Noise from vehicular traffic and the railroad would be short-term and intermittent. As the Rasmussen Ridge Mines, adjacent and northwest of the Proposed Action or the RCA, begins to cease operations, the noise from the Proposed Action or the RCA would replace the noise impacts from the past mine operations. If a future mine were to begin operating in the CEA or within 2 miles of the Study Area, there is potential for cumulative noise impacts.

5.2.3.5 Cumulative Activities

Past, present, and reasonably foreseeable noise activities in the CEA have been and would be predominantly associated with noise localized to the mining areas.

Cumulative activities for the Proposed Action or the RCA would remain the same and would not impact differently for noise levels within the CEA.

5.2.3.6 Cumulative Effects

Noise sources from the Proposed Action or the RCA would not impact sensitive receptors within the CEA. The nearest residence or area of human activity is a seasonal residence 0.5 mile south of the Study Area. The noise from Rasmussen Valley Mine and other mining operations would likely not overlap unless new nearby mines are developed within the CEA. Instead, noise would be localized to each phosphate mine. The cumulative noise profile from the Study Area to the closest sensitive receptors would result in unnoticeable or minor change in noise activities, as the Proposed Action or the RCA would replace the noise impacts from the Rasmussen Ridge Mines operations.

It is possible that the proposed Lanes Creek Mine operations would overlap temporally with operations at the Rasmussen Valley Mine. Therefore, the probability of cumulative noise pollution in the CEA may increase noise impacts from cumulative haul activities from all mine activities. Cumulative effects resulting from within the CEA are anticipated to be similar for the Proposed Action or the RCA, and would not impact differently within the CEA. The addition of Proposed Action or RCA to the increased cumulative effects to noise resources would be short-term and negligible.

Under the No Action Alternative, the Rasmussen Valley Mine would not be constructed, and there would be no effects to air resources, climate, and noise.

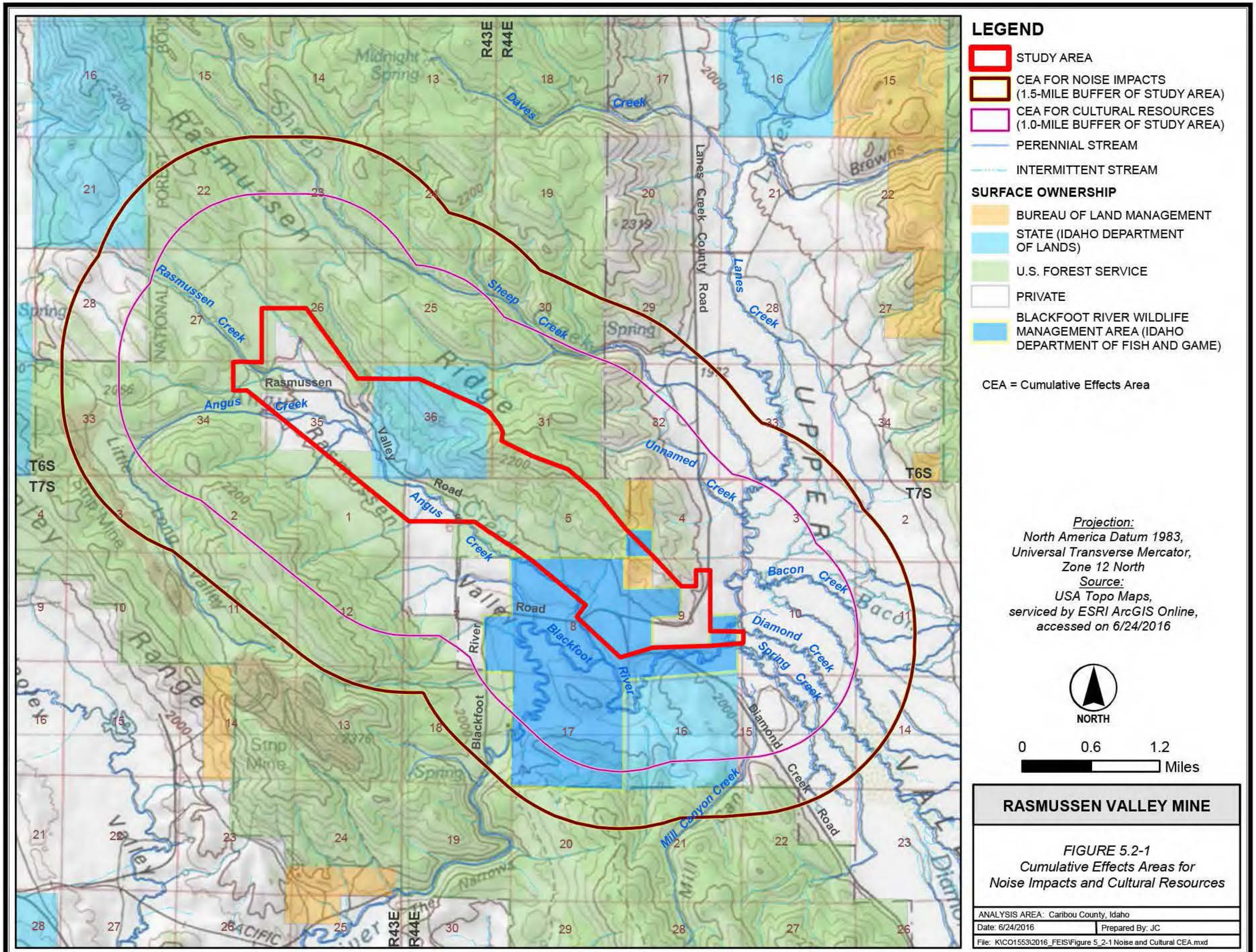

FIGURE 5.2-1
Cumulative Effects Areas for Noise Impacts and Cultural Resources

ANALYSIS AREA: Caribou County, Idaho
Date: 6/24/2016
Prepared By: JC
File: K:\CO1553\2016_FEIS\Figure 5_2-1 Noise and Cultural CEA.mxd

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5.3 WATER RESOURCES

5.3.1 CEA Boundary

Analysis of the effects of the Proposed Action and the RCA on water resources is limited to the mining influenced area in the vicinity of the Rasmussen Valley Mine. The water resources analysis area is the same as that described for the geology analysis area (**Section 4.4.1**) and extends beyond the Study Area to include areas that may be incorporated into the contaminant fate-and-transport model developed for the analysis.

The water resources analysis area boundaries are chosen to encompass the entire Study Area and surrounding topographic and geologic features. The southern boundary follows the trace of the Blackfoot Fault, a major strike-slip fault with upwards of 1 mile of displacement. The western boundary encompasses the southwestern flank of Rasmussen Valley and includes the Henry Thrust Fault. The northern boundary includes the Rasmussen Fault, a large strike-slip fault with nearly 1 mile of displacement in the vicinity of the Study Area. The northeastern corner is extended to encompass the Study Area, and the eastern boundary is drawn to include Lanes Creek and a portion of the Upper Valley (**Figure 3.1-1**).

The CEA for water resources is the Upper Blackfoot River drainage basin and its contributing tributaries (**Figure 5.3-1**). This includes the Upper Blackfoot River Watershed (Hydrologic Unit Code [HUC] 1704020702) and Lanes Creek-Diamond Creek Watershed (HUC 1704020701) from the headwaters of Lanes Creek to the Blackfoot Reservoir 10 miles to the west. The CEA encompasses 223,389 acres within the eastern portion of the Blackfoot Sub-basin (HUC 17040207) that may be affected by the Proposed Action or RCA and other existing and reasonably foreseeable future projects. CEA boundaries, as well as locations of past and present mining activities, are depicted on **Figure 5.3-1**.

5.3.2 Introduction

Cumulative effects on water resources resulting from other past and present activities in the CEA include primarily phosphate mining, ranching, and farming, but also include timber harvesting; livestock grazing; wildfires and fire suppression activities; road building; and development of domestic, commercial, and industrial land parcels.

Water quality issues in the CEA include COPCs leaching from phosphate mine overburden and sedimentation from a variety of other sources such as road construction, timber harvesting, livestock grazing, and any other ground-disturbing activities. Agricultural practices also impact water quality through the introduction of fertilizers and animal and vegetation waste. Various land use practices, such as mining, farming, grazing, and construction activities, can impact surface water by affecting volume and timing of surface runoff and through alteration of natural channel morphology.

Cumulative effects to surface water resources may include increases of COPC concentrations from the Proposed Action (although not from the RCA or No Action Alternatives) and sediment load in streams, ponds, and springs, and impacts to water quantity related to changes in volume and timing of surface runoff.

Cumulative effects to groundwater resources may include increases of COPC loading in local-, intermediate-, and regional-scale aquifers and changes in depth to groundwater as a result of pumping or decreased infiltration rates.

5.3.3 Past and Present Activities

Many human activities have affected streams, riparian areas, and watersheds in the CEA. Beginning about 1870, logging decreased forest cover in many of the more accessible forested tributary valley and foothill areas, which resulted in reduced infiltration and increased storm runoff peaks and volumes. Intensive livestock grazing on open lands over years depleted soils of upper organic layers, which absorb and hold rain and snowmelt. Organic layers increase the volume of moisture available later in the year and decrease runoff volumes and peak flows (USDA 2009).

Exclusion of fire in the 1900s has increased transpiration rates through change in vegetation communities, which translated to lower groundwater recharge and summertime streamflows. Reduction of willows from agricultural practices in the 1950s contributed to bank stability problems, causing increased sediment loading in streams from bank erosion and overly widened channels. It also resulted in higher water temperatures as a result of loss of shading vegetation along stream banks. Construction of roads and the use of off-road motorized vehicles such as all-terrain vehicles (ATVs) have increased the soils erosion in the watershed (USDA 2009).

Previous phosphate mining operations have left open pits and overburden piles scattered throughout the watershed. Older mining practice reclaimed surfaces or otherwise left overburden with elevated levels of selenium and other COPCs either exposed at the surface, or with thin or no cover. Older overburden piles generally do not have engineered covers to restrict infiltration, and the surfaces may have shallow slopes or rough surfaces that do not minimize infiltration of precipitation. Water seepage from many of the overburden disposal sites contain COPCs at elevated concentrations that may be transported into streams (USDA 2009). Selenium is the COPC of greatest regulatory concern in the CEA.

As of 2012, 18 large-scale open pit phosphate mines were present in southeast Idaho. At that time, five were active, and 13 were inactive (Mebane et al. 2015). Twelve of these mines are located within the CEA boundary (**Figure 5.3-1**), and four of the mines within the water resources CEA are active. Total disturbances related to past, present, or currently agency-approved mining and mining-related activities are estimated to be 8,841 acres (**Table 5.3-1**). An additional 7,230 acres of disturbance from phosphate mining that is not yet approved is reasonably foreseeable.

Investigations under the CERCLA have been initiated for six of the mines to assess the contamination and potential risks associated with the sites. Previously approved mining sites that are being evaluated under CERCLA include the Enoch Valley Mine, Ballard Mine, North Maybe Canyon Mine, South Maybe Canyon Mine, Champ Mine, and Mountain Fuel Mine. Currently, there are four operations actively mining phosphate within the CEA: Blackfoot Bridge Mine, Enoch Valley Mine, Lanes Creek Mine, and Rasmussen Ridge Mines. Dry Valley Mine and Henry Mine have been reclaimed, and South Rasmussen Mine is currently in its reclamation phase. The Wooley Valley Mine has been mined out.

Past and present mining activities in the CEA have resulted in increased selenium concentrations in the Blackfoot River and some of its tributaries. In 2001, IDEQ began an annual, mid-May, synoptic survey of selenium concentrations at 21 locations in the Upper Blackfoot River Watershed to assess water quality impacts from phosphate mining operations. In cooperation with BLM, the U.S. Geological Survey (USGS) collected time series (2001-2014) water quality parameters at a single location on Blackfoot River near the inlet to the Blackfoot Reservoir (USGS stream gage13063000). Results of both of these efforts have been evaluated by Mebane et al. (2015) to support an understanding of selenium in runoff in the Upper Blackfoot River Watershed.

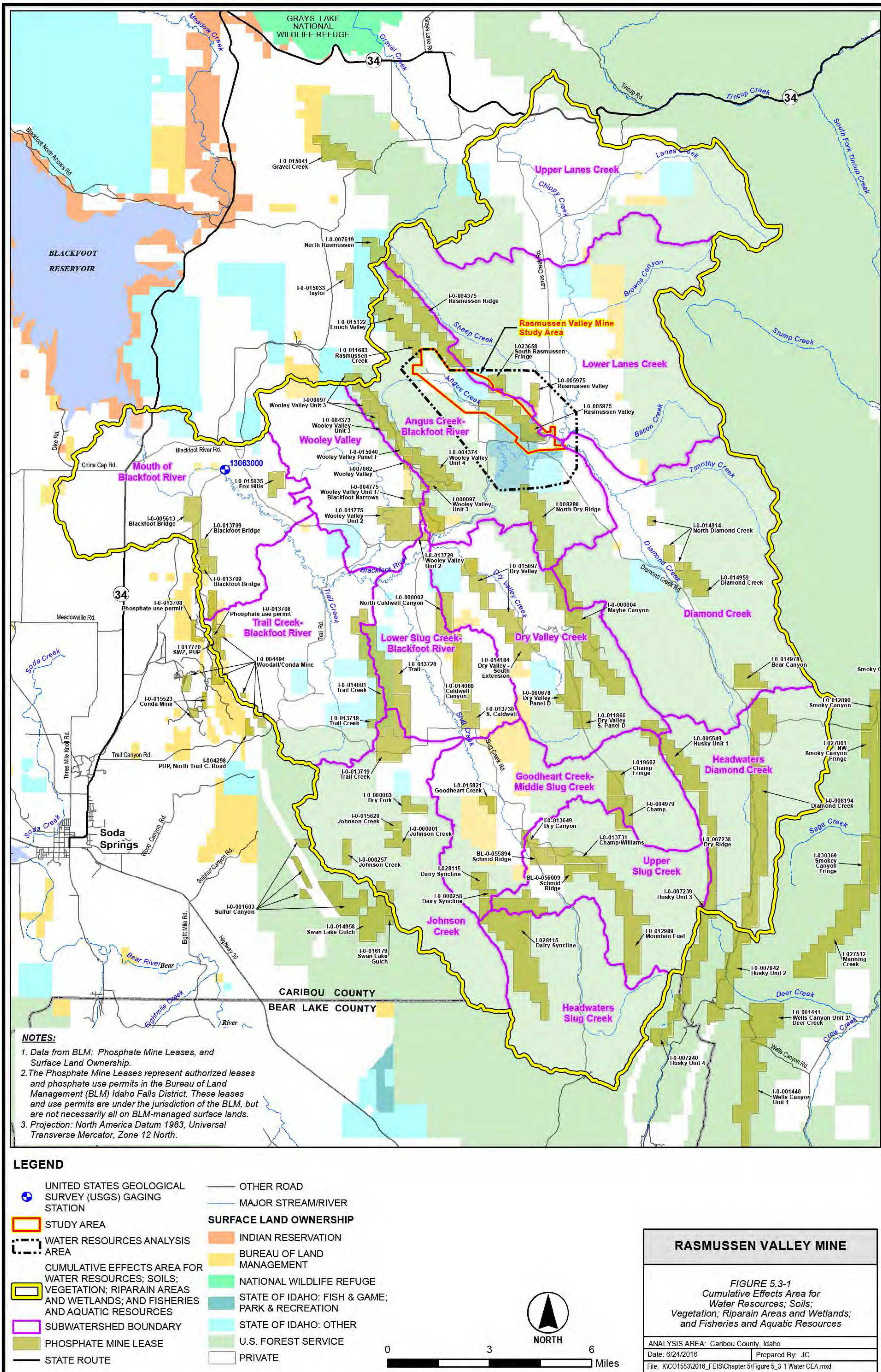
GRAYS LAKE NATIONAL WILDLIFE REFUGE
BLACKFOOT RESERVOIR
Upper Lanes Creek
Lower Lanes Creek
Rasmussen Valley Mine Study Area
Angus Creek-Blackfoot River
Wooley Valley
Mouth of Blackfoot River
13063000
Trail Creek-Blackfoot River
Lower Slug Creek-Blackfoot River
Dry Valley Creek
Diamond Creek
Headwaters Diamond Creek
Goodheart Creek-Middle Slug Creek
Upper Slug Creek
Johnson Creek
Headwaters Slug Creek
Soda Springs
CARIBOU COUNTY
BEAR LAKE COUNTY
NOTES:
1. Data from BLM: Phosphate Mine Leases, and Surface Land Ownership.
2. The Phosphate Mine Leases represent authorized leases and phosphate use permits in the Bureau of Land Management (BLM) Idaho Falls District. These leases and use permits are under the jurisdiction of the BLM, but are not necessarily all on BLM-managed surface lands.
3. Projection: North America Datum 1983, Universal Transverse Mercator, Zone 12 North.
LEGEND
UNITED STATES GEOLOGICAL SURVEY (USGS) GAGING STATION
STUDY AREA
WATER RESOURCES ANALYSIS AREA
CUMULATIVE EFFECTS AREA FOR WATER RESOURCES; SOILS; VEGETATION; RIPARAIN AREAS AND WETLANDS; AND FISHERIES AND AQUATIC RESOURCES
SUBWATERSHED BOUNDARY
PHOSPHATE MINE LEASE
STATE ROUTE
OTHER ROAD
MAJOR STREAM/RIVER
SURFACE LAND OWNERSHIP
INDIAN RESERVATION
BUREAU OF LAND MANAGEMENT
NATIONAL WILDLIFE REFUGE
STATE OF IDAHO: FISH & GAME; PARK & RECREATION
STATE OF IDAHO: OTHER
U.S. FOREST SERVICE
PRIVATE
NORTH
0 3 6 Miles
RASMUSSEN VALLEY MINE
FIGURE 5.3-1
Cumulative Effects Area for Water Resources; Soils; Vegetation; Riparain Areas and Wetlands; and Fisheries and Aquatic Resources
ANALYSIS AREA: Caribou County, Idaho
Date: 6/24/2016
Prepared By: JC
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Table 5.3-1 Total Existing and Reasonably Foreseeable Disturbances for Phosphate Mines in the Water Resources CEA

Mine	Years of Operation	Disturbed Area (Acres)
Ballard	1952 to 1969	635
North and South Maybe Canyon	1951 to 1995	1,028
Wooley Valley	1955 to 1989	808
Mountain Fuel	1966 to 1967, 1985 to 1993	781
Henry	1969 to 1989	1,074
Lanes Creek	1978 to 1989, 2015 to Present	214
Champ and Champ Extension	1982 to 1985	460
Enoch Valley	1990 to Present	808
Rasmussen Ridge Mines	1991 to Present	858
South Rasmussen	2003 to Present	390
Dry Valley	1992 to 2014	1,082
Blackfoot Bridge	2013 to Present	703
Dairy Syncline	Not yet approved*	1,779 (estimate)
Diamond Creek/Freeman Ridge	Not yet approved*	1,200 (estimate)
Husky 1/North Dry Ridge	Not yet approved*	1,051 (estimate)
Trail Creek	Not yet approved*	1,000 (estimate)
Dry Ridge	Not yet approved*	1,000 (estimate)
Caldwell Canyon	Not yet approved*	1,200 (estimate)
Estimated Total Disturbed Acres		**16,071**

Notes:

* From **Table 5.1-2**, Reasonably Foreseeable Disturbance Expected from Phosphate

Sources: BLM and USFS 2007; BLM 2014; P4 2014

Based on this evaluation, the Idaho chronic aquatic life criterion continuous concentrations (CCC) for selenium of 5 micrograms per liter (µg/L) was exceeded in the majority of the samples during peak stream runoff in May of each year. Exceedances were less frequent during April and June of each year. No exceedances occurred outside the April to June spring timeframe. Low-flow season (August to October) selenium concentrations increased slightly from 2001 to 2012, but no trends were obvious for other seasons (Mebane et al. 2015). Trends in selenium during the low-flow period in 2013 and 2014 (data not tracked in Mebane et al. 2015) may indicate a flatter trend than previously reported. Selenium concentrations in the Upper Blackfoot River Watershed tend to correlate positively with streamflow (i.e., high concentrations are typically observed in years with high streamflows). Water years 2006 through 2008 were exceptions to this generalization, which suggests that streamflow is not the only factor controlling selenium concentrations in the river (Mebane et al. 2015).

The study (Mebane et al. 2015) also showed that the majority of the selenium loads passing the USGS stream gauge at the outlet of the watershed could be attributed to a single tributary (East Mill Creek), which enters the Blackfoot River through Spring Creek. Selenium loads decreased by about half from East Mill Creek before reaching the Blackfoot River, suggesting that much of the selenium is at least temporarily removed from the water column by uptake by aquatic vegetation or by losses to sediment (Mebane et al. 2015).

The historical water quality impacts have led IDEQ to list portions of the Blackfoot River and several of its tributaries, or reaches of tributaries (including State Land Creek, Dry Valley Creek, Chicken Creek, Maybe Creek, Spring Creek, Upper Mill Canyon, Diamond Creek, Rasmussen Creek, and Angus Creek) within the CEA as Category 5 impaired waterbodies under Section

303(d) of the Clean Water Act (CWA; IDEQ 2014c). The most frequently identified causes of impairment in the CEA are selenium, dissolved oxygen, *Escherichia coli*, and temperature (IDEQ 2014c). These designations are important, as they represent a situation where cumulative effects to surface water have reached a regulatory threshold where actions to reduce impacts to the water bodies must be undertaken and newly proposed activities cannot add measurable impacts to the water bodies.

Additionally, the Blackfoot River and several tributaries (including Slug Creek, Dry Valley Creek, Chicken Creek, Maybe Creek, Diamond Creek, Lanes Creek, Bacon Creek, Sheep Creek, Angus Creek, Rasmussen Creek, and State Land Creek) have been identified as Category 4a waters impaired by sediment loads with USEPA-approved total maximum daily loads (TMDLs; IDEQ 2014c).

5.3.4 Foreseeable Future Activities

Foreseeable future activities that carry the potential to affect water resources in the CEA include future phosphate mining activities on areas that have not been developed, currently operating phosphate mines, remediation of inactive mines, agricultural and livestock range land uses, and construction activities resulting in ground disturbance.

Reasonably foreseeable future mining activities within the CEA are illustrated on **Figure 5.3-1**. Approximately 7,230 acres of mining-related disturbances can be expected in the reasonably foreseeable future (50 years) within the CEA. These include three near future (currently processing applications) surface mining phosphate operations at Dairy Syncline, Husky1/North Dry Ridge, and Caldwell Canyon Mines (**Table 5.3-1**).

CERCLA investigations and remedial actions may occur at phosphate mining sites within the CEA. Remedial activities could include regrading, capping, and revegetation of existing overburden piles or backfills; backfilling of pits; and removal of overburden that was placed as cross-valley fills. Remedial activities would be designed to mitigate existing sources of COPCs associated with these sites and minimize contaminated seepage from existing overburden disposal facilities and sediment loading to surface water from past mining disturbances.

Phosphate mining is an important economic resource for the State of Idaho with national and worldwide demand for agriculture and chemical use; therefore, it is anticipated that the trend for phosphate mining resource development within the watershed will continue into the future at a similar pace.

5.3.5 Cumulative Activites

Past, ongoing, or reasonably foreseeable activities or events would have a cumulative effect on water resources under the Proposed Action or the RCA. Of all identified developments within the CEA, mining carries the greatest potential to cumulatively impact water resources. However, other activities, such as farming, grazing, road construction, and recreational uses, also carry the potential to cumulatively affect water resources.

5.3.6 Cumulative Effects

Cumulative impacts to groundwater quality would primarily occur where metals are mobilized during mining at proposed and operating mines, and by leaching of COPCs from overburden at active, historical, and future phosphate mines. Contaminant fate-and-transport modeling results indicate that, under the Proposed Action, contamination of shallow- and intermediate-scale aquifers at Rasmussen Valley Mine would be localized and of limited extent, and would not cumulatively affect the groundwater quality in the CEA outside of the Study Area. Modeling results also suggest that impacts from intermediate-scale aquifers will not reach the Wells Regional Aquifer. However, groundwater quality within the Wells Regional Aquifer may be cumulatively affected by mining activities in the CEA. The Proposed Action or the RCA would be located along the regional groundwater flow path, but upgradient from the Enoch Valley, South Rasmussen, and Rasmussen Ridge Mines. Contamination from these mines, when combined with the predicted COPC loading of groundwater from the selected alternative, would carry the potential to result in cumulative impacts to the Wells Regional Aquifer. The Lanes Creek Mine is hydrologically located within the same regional aquifer but on a separate flow path from the Rasmussen Valley Mine.

Although the presence of Rasmussen Fault (which is conceptualized as a partial barrier to groundwater flow) to the northwest of the Study Area will likely interrupt plume migration further downgradient of the fault location, potential discontinuities or breaks within the fault line could allow contaminant plumes to migrate and laterally expand beyond the fault line. The potential cumulative impacts to groundwater quality in the regional aquifer within the CEA are expected to be minor to moderate and long-term for the Proposed Action. There would be no cumulative affects to shallow- and intermediate-scale aquifers in the CEA due to elimination of external overburden piles under the RCA. As described in **Section 4.3.1.2.4**, the RCA would also result in reduced loading of COPCs to the Wells Regional Aquifer due to the implementation of store-and-release Cover C; therefore, the cumulative impacts to Wells Regional Aquifer would be reduced compared to the Proposed Action.

Impacts from groundwater withdrawals during mining would be temporary and would only occur during active dewatering for mining below the water table for the Proposed Action. Pumping for mine dewatering would be limited to 7 to 8 months during the Phase 1 operation of the Proposed Action. Mine dewatering would not be required for the RCA. Impacts related to groundwater withdrawals in the CEA outside of the Study Area would be negligible to minor, localized, and short-term. In the long term, reduced infiltration may occur as a result of capping overburden piles and backfills. Cumulative impacts to groundwater quantity may also occur from pumping related to irrigation, municipal and domestic water supply, and other industrial activities. These potential cumulative impacts to groundwater quantity in the CEA are expected to be long-term and negligible.

Cumulative impacts to surface water quality would occur primarily as a result of contaminated runoff from overburden at the previously approved mines impacting nearby surface water features. The Proposed Action or the RCA would be located downstream from the Wooley Valley, Enoch Valley, and Rasmussen Ridge Mines. Tributaries to Angus Creek are within areas of previous mining disturbance from the above mentioned mines and could result in cumulative impacts to Angus Creek. Additionally, direct recharge through mine features, such as overburden disposal areas, can impact surface water features through migration of leached contaminants via shallow groundwater, or leaching from contaminated shallow to intermediate groundwater flow systems may infiltrate into the regional flow system. Although the regional flow system does not discharge to surface water features (including Blackfoot River) within the analysis area (**Figure 5.3-1**), it could potentially transport and discharge contaminants into surface water features in the CEA but at concentrations which may not be detectable or pose a threat.

Soil erosion within the CEA has contributed to reduced water quality in various surface water bodies. The Final 2012 Integrated 303(d)/305(b) Report (IDEQ 2014c) lists the Blackfoot River, as well as several tributaries (Slug Creek, Dry Valley Creek, Chicken Creek, Maybe Creek, Diamond Creek, Lanes Creek, Bacon Creek, Sheep Creek, Angus Creek, Rasmussen Creek, and State Land Creek) as Category 4a waters impaired by sediment loads with USEPA-approved TMDLs (IDEQ 2014c). Excessive sediment levels in the CEA have not been attributed to a specific source and have likely resulted from a combination of activities within the CEA.

As discussed in **Section 5.3.3**, the Blackfoot River has been impacted by increased selenium concentrations from phosphate mining activities in the CEA. The predicted Rasmussen Valley Mine project-related selenium load under the Proposed Action would result in minor increases of instream concentrations in Blackfoot River and moderate increases of instream concentrations in Angus Creek. Based on the impact analysis discussed in **Section 4.3.1.2.3**, there would be no project-related impacts from selenium loading to surface water features under the RCA. Cumulative effects to surface water quality resulting from past, present, and other foreseeable future mining activities in the CEA are moderate to major and long-term until remediation actions at inactive mines reduce selenium load to streams. Additional effects from the Proposed Action or the RCA would have negligible impacts within the CEA.

Surface-disturbing activities from mining and reclamation at Rasmussen Valley Mine would increase sediment loads to streams. However, the implementation of best management practices (BMPs) would reduce this sediment loading. These effects are expected to be most pronounced during rainstorms and spring runoff. BMPs and other controls would result in negligible sediment loading. Cumulative increases in sediment loads within CEA are expected to be minor, local, and short-term.

Long-term increased runoff as a result of capping of reclaimed areas may result from some or all of the mines within the CEA. These impacts would be localized and negligible in the CEA.

Under the No Action Alternative, the Rasmussen Valley Mine would not be constructed, and there would be no new project-related effects to water resources.

5.4 SOILS

5.4.1 CEA Boundary

The CEA for soils is illustrated on **Figure 5.3-1**. Soil and water resources share the same CEA as a result of the indirect effect that soil disturbance has on surface water quality from erosion and sediment transport as discussed in **Section 5.3.5**.

5.4.2 Introduction

Direct impacts to soil resources typically occur as a result of ground-disturbing activity. Activities affecting soils, and that are themselves affected by soil disturbance within the CEA, could include mining; farming; ranching; livestock grazing; wildfires; fire suppression activities; timber harvest and management; road building; recreation; and development of domestic, commercial, and industrial land parcels. Potential impacts to soil resources include damage or removal of topsoil and subsoil profiles and structure, slope failure, and weathering processes and subsequent erosion. Although disturbed soil will develop new profiles over extended periods of time, cumulative impacts to soils can include the loss of productivity and increased risk of exposure to people and facilities due to slope failures.

The most extensive impacts to soils in the CEA would likely result from mining, agricultural, and timber harvesting activities. Because the success of mine reclamation largely depends on reuse of stockpiled or live-handled topsoil, and because all mines are required to implement a Storm Water Pollution Prevention Plan (SWPPP), impacts to soils beyond initial disturbance and relocation (e.g., soil loss through erosion) are minimized. The success of the agricultural industry is also inherently dependent on maintaining soil quantity and quality, and soil management practices are widely implemented during these activities. Forest management activities on the Caribou-Targhee National Forest (CTNF) include timber sales, livestock grazing, and public recreation. Extensive portions of the soil resource CEA are located on lands administered by the CTNF. Activities in these areas are subject to management goals and standards provided in the Caribou National Forest (CNF) Revised Forest Plan (RFP; USFS 2003). Forest management activities (including timber sales, livestock grazing, and public recreation) are not expected to contribute to cumulative effects on soil resources within the CEA.

5.4.3 Past and Present Activities

Past and present disturbances within and near the CEA are similar to those discussed in **Section 5.3.3**. Many former and current human activities within the CEA can increase sediment loads to streams. Improper livestock grazing carries the potential to affect soil resources by decreasing the vegetative cover, damaging surface horizons (e.g., organic horizons, mineral crusts, microbiotic crusts [if present], which increases the erodibility of soils), and increasing compaction (which decreases soil tilth). Localized damage in areas adjacent to waterways can destroy stream banks.

Mining activities have major impacts on soil resources within in the CEA. Soils are directly impacted by removal and storage during open pit excavations and subsequent replacement during reclamation. Successful reuse of soils is a primary goal of mine reclamation and is a critical component of maintaining soil productivity. Soil disturbances related to approved past and present mining and mining-related activities within the CEA are estimated to be 9,600 acres. This acreage does not include reasonably foreseeable future disturbances that are not yet approved (8,400 acres).

Typical recreation activities in the CEA include hunting, fishing, and other outdoor activities. Generally, these activities have a lesser impact on soils resources than other uses as a result of their intermittent and seasonal nature. Effects on soils resources as a result of past and present recreation are limited to compaction from off-road vehicle travel, runoff from dirt roads, and hiking or pack trails.

Soil erosion hazards across the Study Area are generally low or moderate (**Table 3.4-5**). Soil survey data are not available for the majority of the CEA; however, Natural Resources Conservation Service (NRCS) data for southeastern Bingham County (immediately north of the CEA) and portions of the CTNF northeast of the CEA indicate that soil erosion hazards within the CEA likely range from low to moderate along valley floors and from moderate to severe in the mountain ranges and foothills (NRCS 2014a).

5.4.4 Foreseeable Future Activities

Mining could occur on lease areas that have not been developed, which would result in disturbance to soil resources. Reasonably foreseeable future mining activities within the CEA are summarized in **Table 5.1-2**. Approximately 8,400 acres of reasonably foreseeable disturbances can be expected within the CEA, of which 549 acres would remain unreclaimed.

Future quantities, extents, and types of grazing activities within the CEA are not expected to vary from current activities. Present rates of soil loss in agricultural areas are expected to be maintained in the foreseeable future. Changes to private agricultural lands and disruption of soils are likely as portions of these lands are converted into low-density residential areas. Caribou County has identified infilling of existing city limits and impact areas rather than expansion into rural areas as a growth goal (Caribou County 2006). Although it is difficult to ascertain the level of effect, implementation of policies intended to encourage such growth and maintain large tracts of open space within the county (e.g., Policies 2.1.1 and 13.1.1) may slightly discourage future development of agricultural lands and loss of soil resources and slightly reduce the potential for long-term cumulative effects. Timber sales are anticipated to continue similar to current levels, with constraints on soil disruption similar to those in recent years (USFS 2003). No known changes to transportation or recreational uses beyond those identified in the Proposed Action and RCA have been proposed that would affect soil resources within the CEA.

5.4.5 Cumulative Activities

Cumulative disturbances of soil resources within the CEA as a result of past, present, and reasonably foreseeable developments, including the Proposed Action or the RCA, would primarily be the result of phosphate mining activities and agricultural practices. Additional disturbances of soils as a result of timber sales and residential development would also occur but would be of smaller scale.

5.4.6 Cumulative Effects

Combined past, present, and reasonably foreseeable future mining activities within the CEA are expected to directly affect 10,500 acres, or 4.7 percent, of the soils CEA. As for Rasmussen Valley Mine, future mines are expected to salvage, stockpile, and replace soils during reclamation and to use soil erosion and sediment transport BMPs to control soil loss from disturbance areas. Soil productivity would decrease, and soil erosion rates would increase on disturbed soils. The impact duration from soil disturbance is expected to vary according to mine-specific reclamation practices. Other than the long-term soil profile development, impacts would not be expected to extend more than 3 or 4 years beyond final reclamation. The 549 acres of unreclaimed disturbances from all mining activities in the area would represent a long-term impact to less than 1 percent of soils within the CEA.

BMPs would be designed to contain sediment derived from mining disturbance. Because soil loss would be controlled by installation of sediment ponds, collection ditches, and implementation of other BMPs, soil erosion as a result of the Proposed Action or the RCA is expected to be minimal.

Agricultural, recreational, forestry, and land development activities would continue to contribute to soil loss within the CEA. Similarly, increased regulatory control on soil erosion, verified by reclamation monitoring, is expected to minimize impacts to soil productivity and erosion within the CEA. The short- and long-term contributions of the Proposed Action or the RCA to cumulative effects on soil resources are expected to be minor in the CEA.

Under the No Action Alternative, the Rasmussen Valley Mine would not be constructed, and there would be no new effects to soil resources.

5.5 VEGETATION, RIPARIAN AREAS, AND WETLANDS

5.5.1 CEA Boundary

The CEA for vegetation, riparian areas, and wetlands is the same as that defined for surface water and soils. The CEA for vegetation, riparian areas, and wetlands encompasses the Upper Blackfoot

River Watershed (HUC 1704020702) and Lanes Creek-Diamond Creek Watershed (HUC 1704020701) from the headwaters of Lanes Creek to the Blackfoot Reservoir 10 miles to the west. The CEA encompasses 223,389 acres within the eastern portion of the Blackfoot Sub-basin (HUC 17040207) that may be affected by the Proposed Action or the RCA and other existing and reasonably foreseeable future projects. CEA boundaries, as well as locations of past and present mining activities, are depicted on **Figure 5.3-1**.

5.5.2 Introduction

Vegetation disturbance in the CEA occurs from activities associated with mining, agriculture, grazing, vegetation management, wildfires, controlled burns, and off-road vehicle use. The reasonably foreseeable developments in the CEA include the continuation of past and present disturbances. **Table 5.5-1** provides the vegetation types and the amount of acreage that each vegetation type occupies within the CEA. The CEA as described above is a larger area than the vegetation analysis area discussed in **Chapter 4**. Vegetation and fresh water accounts for 99 percent of the CEA (USGS 2001). According to available quantitative data, 8,002 acres of past and present land uses and direct disturbances to vegetation (developed, quarries, mines, gravel pits, oil wells, cultivated cropland, pasture, and harvested forest) have occurred within the CEA (**Table 5.5-1**), which represents 4 percent of the total CEA. Note that this does not include other disturbances in the CEA that are not quantifiable (e.g., vegetation alteration from livestock grazing).

Table 5.5-1 Existing Land Cover in Vegetation CEA

Cover Type	Acres
Undisturbed ("Native") Land Cover Types	
Inter-Mountain Basins Montane Sagebrush Steppe	54,060
Rocky Mountain Aspen Forest and Woodland	36,406
Rocky Mountain Lodgepole Pine Forest	34,022
Inter-Mountain Basins Big Sagebrush Steppe	27,286
Middle Rocky Mountain Montane Douglas-fir Forest and Woodland	20,740
Rocky Mountain Lower Montane Riparian Woodland and Shrubland	11,304
Rocky Mountain Alpine-Montane Wet Meadow	8,971
Northern Rocky Mountain Lower Montane, Foothill and Valley Grassland	6,429
Rocky Mountain Subalpine-Montane Mesic Meadow	5,890
Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland	4,947
Rocky Mountain Subalpine Mesic Spruce-Fir Forest and Woodland	3,314
Northern Rocky Mountain Montane-Foothill Deciduous Shrubland	884
Inter-Mountain Basins Curl-leaf Mountain Mahogany Woodland and Shrubland	453
Inter-Mountain Basins Aspen-Mixed Conifer Forest and Woodland	336
North American Arid West Emergent Marsh	105
Northern Rocky Mountain Subalpine-Upper Montane Grassland	32
Open Water (Fresh)	18
Rocky Mountain Poor-Site Lodgepole Pine Forest	7
Rocky Mountain Foothill Limber Pine-Juniper Woodland	4
Rocky Mountain Subalpine-Montane Riparian Shrubland	1
Northern Rocky Mountain Subalpine Deciduous Shrubland	1
Rocky Mountain Subalpine-Montane Riparian Woodland	1
Rocky Mountain Lower Montane-Foothill Shrubland	<1
Subtotal	**215,211**
Disturbed ("Human-altered") Land Cover Types	
Cultivated Cropland	4,550
Developed, Open Space	1,097

Table 5.5-1 Existing Land Cover in Vegetation CEA

Cover Type	Acres
Harvested Forest - Grass/Forb Regeneration	816
Harvested Forest - Northwestern Conifer Regeneration	670
Quarries, Mines, Gravel Pits and Oil Wells	359
Pasture/Hay	275
Harvested Forest-Shrub Regeneration	211
Developed, Low Intensity	24
Developed, Medium Intensity	<1
Subtotal	**8,002**
Grand Total	**223,213**

Source: USGS 2001

According to National Wetland Inventory (NWI) data, 13,767 acres of palustrine wetlands (including forested, scrub-shrub, unconsolidated bottom permanently flooded [freshwater pond]); lacustrine wetlands including unconsolidated bottom permanently flooded (lake); and riverine wetlands are present within the CEA (**Table 5.5-2**; USFWS 2015b). Direct impacts to wetlands and riparian areas within the CEA have occurred. Many activities that have affected vegetation and wetlands in the past are expected to continue in the reasonably foreseeable future (e.g., agriculture, grazing, recreation, and mining).

Table 5.5-2 Existing Wetlands in CEA

Wetland Type	Cowardin Classification	Acres
Freshwater Emergent	Palustrine, Emergent, Persistent, Temporarily flooded/Saturated/Seasonally flooded/Semipermanently flooded (PEM1A/B/C/F)	11,425
Freshwater Forested/ Scrub-shrub Wetland	Palustrine, Scrub-shrub, Broad-leaved Deciduous/Forested, Needle-leaved Evergreen, Saturated (PSS1/FO4B) Palustrine, Forested, Broad-leaved Deciduous, Temporarily Flooded/Seasonally Flooded (PFO1A/C) Palustrine, Scrub-shrub, Broad-leaved Deciduous/Needle-leaved Evergreen Seasonally Flooded (PSS1/4C) Palustrine, Scrub-shrub, Broad-leaved Deciduous/Emergent, Persistent, Temporarily Flooded (PSS1/EM1A) Palustrine, Scrub-shrub, Broad-leaved Deciduous, Temporarily Flooded/Saturated/Seasonally Flooded/Semipermanently Flooded (PSS1A/B/C/F)	1,812
Freshwater Pond	Palustrine, Unconsolidated bottom, permanently flooded (PUBH) Palustrine, Unconsolidated bottom/Emergent, Persistent, Semipermanently Flooded (PUB/EM1F)	163
Lake	Lacustrine, Limnetic, Unconsolidated Bottom, Permanently Flooded (L1UBH)	89
Riverine	Riverine, Lower Perennial, Unconsolidated Bottom, Permanently Flooded (R2UBH) Riverine, Upper Perennial, Unconsolidated Bottom, Permanently Flooded (R3UBH)	276
Other	N/A	2
Total		**13,767**

Source: USFWS 2015b

5.5.3 Past and Present Activities

5.5.3.1 Vegetation

Table 5.5-1 indicates the acreage of disturbance from various past and present sources in the CEA, which totals 8,002 acres for quantified disturbance in the USGS (2001) land cover layer. Based on this layer, the principal past and present anthropogenic disturbances to vegetation within the CEA include quarries, mines, gravel pits, and oil well drilling pads, accounting for 4 percent of disturbance; agriculture (cultivated cropland, pasture/hay) accounting for 60 percent of disturbance; harvest forest activities accounting for 21 percent of disturbance; and developed areas accounting for 14 percent of disturbance.

Livestock grazing has also been a historical and traditional use of lands in the CEA. Improper livestock grazing could alter vegetation community composition. In addition, improper grazing activities can result in specific, localized damage in riparian areas.

A different dataset for mining activity indicates that 5,956 acres of land in the CEA have been disturbed by historical phosphate mining activity, as shown on **Figure 5.1-1** (Causey and Moyle 2001). There are an additional 2,889 acres of agency-approved disturbance in the vegetation CEA (**Table 5.1-2**, less acreage for Smoky Canyon, which is outside the CEA) for a total of 8,845 acres of historical and present phosphate mine disturbance in the CEA. However, much of this area has been reclaimed and supports grassland and shrubland plant communities that vary in plant species composition and structure depending on the seed mix, reclamation technique, and volunteer establishment of plants from surrounding undisturbed native areas.

Areas of vegetation with elevated levels of selenium have been found growing on some reclaimed mine sites in the CEA, particularly those sites with vegetation growing directly in Meade Peak overburden with no topsoil. The practice of growing reclamation vegetation directly in Meade Peak overburden was discontinued. Mines now salvage topsoil and use it as GM instead of shale. In the 1990s, mining practices also changed to minimize the release of selenium.

The IDEQ sampled terrestrial vegetation at the Conda and Ballard Mines as part of an area-wide risk assessment study. This study found selenium concentrations ranging from 8.9 to 39 milligrams per kilogram (mg/kg) at the Ballard Mine and from 1.5 to 20 mg/kg at the Conda Mine (IDEQ 2003). Mackowiak et al. (2004) conducted a study of trace element concentrations in plants sampled at the Wooley Valley Unit 1, 3, and 4 overburden piles and undisturbed sites at Dairy Syncline, Deer Creek, Dry Valley, Maybe Canyon, and Rasmussen Ridge. The authors found the highest tissue selenium concentrations in plants growing in highly disturbed soils (more precisely primarily altered shale overburden used as GM, not redistributed native soils), such as those comprising the Wooley Valley overburden piles. Grasses, shrubs, and forbs growing on overburden piles generally exhibited lower average selenium concentrations (18 mg/kg, 6 mg/kg, and 3 mg/kg, respectively) than legumes and trees, which yielded average selenium concentrations of 80 mg/kg and 52 mg/kg. In comparison, background selenium concentrations in terrestrial plants have been reported to range from 0.01 to 0.6 mg/kg (Ohlendorf 2003).

The acreage of vegetation in the CEA with elevated selenium concentrations has not been quantified. Studies indicate that vegetation with elevated selenium concentrations is associated with historical mines. The historical mines occupy 5,956 acres, or 3 percent, of the CEA (based on a spatial data set prepared by Causey and Moyle 2001). The acreages associated with the historical mine sites that exceed the BLM action level of 5 mg/kg have not been quantified, but investigations show that not all historical mine areas contain vegetation with concentrations of selenium higher than the 5 mg/kg action level; therefore, it is expected that the area of exceedances occupies less than 5,956 acres (Causey and Moyle 2001).

5.5.3.2 Wetlands

Past and present activities that occur in the CEA, such as agricultural land uses, mining, roads, buildings, and other facilities, likely contributed to wetland impacts. Today, programs administered by various regulatory agencies have greatly reduced or eliminated a potential net loss of wetlands through some type of mitigation, whether it is enhancement, restoration, or creation.

Indirect and direct impacts resulting from agricultural activities may include draining, flooding, leveling, and grazing in wetlands. These impacts are relatively transient and reversible. In contrast, roads, buildings, and mines may have long-term or permanent impacts on wetlands as a result of long-term changes in topography and hydrology.

Indirect impacts to wetlands, such as those resulting from sedimentation and selenium contamination, have likely occurred as well in the CEA, but are difficult to quantify.

In 2014, the USGS released a report summarizing more than a decade of data (2001 to 2012) on selenium levels in streams across the Upper Blackfoot River Watershed (Mebane et al. 2015). The USGS collected selenium data from the Blackfoot River near the outlet of the Blackfoot Reservoir near Henry, Idaho from 2001 to 2012. Dissolved selenium concentrations at this site ranged from 0.5 to 11.4 µg/L, and 31 percent of the samples exceeded the State of Idaho CCC concentration of 5 µg/L. Most of the exceedances were measured in May of each year, and all exceedances occurred from April to June (coinciding with the spring runoff season). Concurrently with the USGS single-point sampling, the IDEQ sampled selenium at 21 locations along the main stem of the Blackfoot River and its tributaries in May of each year. Selenium concentrations measured during the IDEQ sampling effort ranged from less than 2 µg/L to 870 µg/L in 176 samples. Examination of the IDEQ data in concert with the USGS data revealed that the majority of the selenium loads passing the USGS sampling point could be attributed to a single stream (East Mill Creek), which is located downstream of the North Maybe Canyon Mine and enters the Blackfoot River through Spring Creek. Selenium loads decreased by about half from East Mill Creek before reaching the Blackfoot River, which suggests that aquatic vegetation or sediments sequester much of the selenium in the creek, at least temporarily (Mebane et al. 2015). Wetlands are known to filter and sequester pollutants including selenium (Peltier et al. 2003; Hansen et al. 1998; Mickle 1993). Therefore, it is possible that elevated selenium concentrations have occurred in wetland waters, plants, and sediments across the CEA given the results of the Mebane et al. (2015) study.

The USGS and IDEQ analyses published in Mebane et al. (2015) were limited to data collected through 2012. Data collection is ongoing. Preliminary inspection of the two most recent years of data (2013 and 2014) reveals noticeable differences from the previous data. First, most selenium concentrations during spring peak-flow periods in 2013 and 2014 were lower than those in several of the preceding years, although an anomalously high concentration of 0.0138 milligrams per liter (mg/L; 13.8 µg/L) on May 13, 2013 was recorded. Second, from 2001 through 2012, selenium concentrations showed an increasing upward trend during the generally low-flow period between August and October, especially from 2004 through 2012 (Mebane et al. 2015). However, visual inspection of the most recent 2 years of data suggests that this upward trend has not continued. In 2014, selenium concentrations during low-flow periods were lower than in recent years and generally lower than the surface water standard of 0.005 mg/L (USGS 2015). Therefore, existing impacts to wetlands in the CEA from selenium may be less severe than the older data would indicate.

5.5.3.3 Noxious Weeds

No quantitative data are available on the acres currently affected by noxious weeds within the CEA or the number of acres that have been treated to combat noxious weeds. Quantified land disturbances totaling 8,002 acres of past and present surface disturbances (based on GAP landcover data [USGS 2001]), 5,956 acres of historical mining disturbance (based on Causey and Moyle 2001), and 2,889 acres of current ongoing mining (**Table 5.1-2**, excluding acreage for Smoky Canyon, which is outside the CEA) have potentially introduced and increased the susceptibility for the establishment of noxious weeds in 8 percent of the CEA (16,847 acres out of 223,213). Additional spread of noxious weeds by livestock in grazed areas is also likely to have occurred; however, this acreage cannot be quantified.

5.5.3.4 Fire Management

From 1980 through 2013, more than 1,200 acres of the CEA have burned in wildfires (WFDSS 2013). The majority of the vegetation in the CEA was historically classified as Fire Regime IV, which is characterized by 35- to 100+-year fire frequency and high (stand replacement) severity (greater than 75 percent of the dominant overstory vegetation replaced). Low-elevation shrub and perennial grasses are cover types commonly associated with Fire Regime IV.

Many of the cover types near the Study Area have been subjected to wildland fire that is not within the historical range of variability (BLM 2008a). Large or uncharacteristic fires in these cover types can threaten people and property, as well as the resiliency, integrity, and long-term sustainability of ecosystem components and processes. Fires are occurring more frequently and are burning more severely in some cover types. For example, the invasion of the sagebrush steppe by invasive annual species, such as cheatgrass and medusahead wildrye, has substantially increased fine fuels in this cover type, making it more susceptible to large, frequent, and uncharacteristic fires. In other vegetation cover types, fires are occurring less frequently than they have historically, which causes undesirable changes in vegetation species composition and structure and an accumulation of hazardous fuel levels. For example, because of long-term fire suppression, juniper species are expanding their range at the expense of sagebrush steppe, and dry conifer cover types are slowly replacing aspen and some mountain shrub cover types (BLM 2008a). Within these vegetation types, prescribed burns have been used as a management tool for fuel management, which reduces the potential for wildfires.

Since 1996, wildland fires have occurred in the region at an overall accelerated rate, mostly as a result of vegetation changes and changed conditions like cheatgrass invasion into sagebrush steppe cover types. To a lesser extent, the area has experienced decreases in fire frequency and attendant increases in fire severity in its aspen, dry conifer, and mountain shrub cover types. These vegetation cover types require more frequent disturbance to decrease fuel loads, facilitate aspen and forb regeneration, and decrease fire intensity. Altered fire regimes (changes in fire frequency, severity, and size) not only threaten resources, such as wildlife habitat, cultural resources, air or visual quality, and grazing, but also affect public and firefighter safety within and around areas of human development (BLM 2008a).

5.5.3.5 Pollinators

Past and present activities that have impacted pollinator habitat (and therefore pollinators) would be the same as those described for vegetation in **Section 5.5.3.1.**

5.5.4 Foreseeable Future Activities

5.5.4.1 Vegetation

The reasonably foreseeable developments within the CEA that would affect vegetation include phosphate mining and transmission line development. This includes the reasonably foreseeable activities in **Table 5.1-2**, except for Smoky Canyon, which is outside of the vegetation CEA, plus 112 to 188 acres for the Hooper Springs Transmission Line (Bonneville Power Administration 2013). Together, these quantified reasonably foreseeable activities total 8,415 acres. Additional alteration and disturbance to vegetation from unquantifiable activities, such as livestock grazing, housing development, and conversion to cropland, is also expected to continue in the future.

Impacts related to vegetation containing selenium at historical phosphate mines in the CEA would be expected to continue until remedial action measures are completed. New phosphate mines are likely to incorporate BMPs and cover designs that limit potential for selenium uptake by vegetation, unlike past mines that were constructed without consideration for the potential of selenium release (IDEQ 2006).

5.5.4.2 Wetlands

Activities that may result in impacts to wetlands in the CEA, but cannot be quantified as a result of lack of data, include road maintenance, livestock grazing, and other activities, such as those conducted on private lands. There is also the possibility that future mining within the CEA would directly impact wetlands, though mitigation measures would likely be implemented to compensate for these impacts. Future indirect impacts to wetlands from sedimentation and selenium contamination are also possible. BMPs would be implemented for all direct and indirect impacts.

5.5.4.3 Noxious Weeds

Foreseeable future ground-disturbing actions, such as phosphate mining, agriculture use, recreation, logging, and livestock grazing, all carry the potential to increase noxious weeds in the CEA. Foreseeable actions that occur on federal land would include application of mitigation measures to reduce the introduction and spread of noxious weeds.

5.5.4.4 Fire Management

Alteration of vegetation through fire suppression and spread of invasive species would continue to alter fire regimes in the CEA in the foreseeable future. The Pocatello Field Office (PFO) Approved Resource Management Plan (ARMP) and CNF RFP provide management direction for fire and fuels within their areas of jurisdiction. These plans incorporate the National Fire Plan direction into existing land use plans by emphasizing the increased use of fire including prescribed burns and wildfires. This would approximate the historical role of fire and prepare sites for restoration treatments.

5.5.4.5 Pollinators

Foreseeable future actions that result in loss of vegetation, such as those described in **Section 5.4.3.1**, carry the potential to impact pollinators by direct loss of habitat. Loss of habitat could cause pollinators to avoid disturbed areas of the CEA and could alter pollinator species composition.

5.5.5 Cumulative Activities

5.5.5.1 Vegetation

The potential new disturbance to vegetation from the Proposed Action (up to 468 acres) or RCA (541 acres), added to known past, present, and reasonably foreseeable future disturbances (16,847 acres of past and present disturbance and 8,415 acres of reasonably foreseeable disturbance, for a grand total of 25,262 acres; **Table 5.1-2** and **Table 5.5-1**), results in 12 percent of the CEA being disturbed (25,729 acres out of 223,213) for the Proposed Action and 12 percent for the RCA (25,810 acres out of 223,213). The majority of this quantified disturbance is a result of phosphate mining, though it should be noted that an additional amount of unquantified disturbance to vegetation occurs in the CEA as a result of livestock grazing and other activities. Natural revegetation and reclamation would re-establish vegetation relatively quickly to most areas disturbed by mining, although the vegetation composition and community type would be changed and modified from its pre-disturbance state. Approximately 17 acres (0.01 percent of the CEA) of vegetation for the Proposed Action and 23 acres of vegetation for the RCA (0.02 percent of the CEA), either as part of pit walls or part of the proposed county road realignment would not be reclaimed and would remain barren over the long term. In contrast to the Proposed Action, the RCA would reclaim an additional 58 acres of existing disturbed area that was approved by the Idaho Department of Lands (IDL) to remain unreclaimed under P4's South Rasmussen Mine Reclamation Plan (P4 2014), which represents 0.03 percent of the CEA.

No site-wide increases of vegetation with selenium concentrations higher than action levels in the CEA are expected under the Proposed Action or the RCA, and no substantial contribution to cumulative effects would occur to vegetation in the CEA from this potential impact. Under either the Proposed Action or the RCA, seed mixes have been developed to avoid the use of selenium accumulator species. Therefore, there would be no corresponding cumulative effects of COPCs on vegetation from the Proposed Action or RCA.

5.5.5.2 Wetlands

In addition to past and present impacts, implementation of the Proposed Action would result in a maximum direct disturbance of 20.5 acres of wetlands. This proposed wetland disturbance would be 0.2 percent of the total wetlands in the CEA. The RCA would result in no impacts to wetlands and non-wetland waters of the U.S. (WOUS). Proposed Action impacts would result in cumulative impact to wetlands when added to past, present, and reasonably foreseeable future disturbances to wetlands. The acres of wetland impact from the Proposed Action would require compensatory mitigation under the CWA administered by the U.S. Army Corps of Engineers (USACE). Due to the small size of wetlands impact, the RCA may or may not require compensatory mitigation under the CWA administered by the USACE. The type of mitigation for the impacts would be determined in consultation with the USACE. The Proposed Action would also result in indirect impacts to wetlands consisting of addition of selenium and other COPCs into the waters downgradient of the mine. The RCA was designed to avoid indirect impacts to wetlands.

5.5.5.3 Noxious Weeds

Adding the proposed disturbance to vegetation as a result of the Proposed Action (447 acres) or the RCA (541 acres) would increase the potential of cumulative effect of disturbed acres susceptible to noxious weed invasion within the CEA. However, as a result of the existing, limited establishment of noxious weeds in the Study Area and proposed weed prevention measures, including measures to limit the introduction or spread of weeds by work vehicles, and control or treatment requirements that would be in place, contribution of noxious weeds by the Proposed

Action or the RCA would be limited; therefore, the overall cumulative effect within the CEA would be limited as well.

5.5.5.4 Fire Management

Under the Proposed Action, 83 acres of aspen forest would be removed and replaced with a grass-dominated vegetation community following reclamation. The RCA would result in removal of 132 acres of aspen forest. This would replace less than 0.2 percent of the CEA that currently has an aspen fire regime (Fire Regime III) with a perennial grass fire regime (Fire Regime IV; Hardy et al. 2001; BLM 2008a) under the Proposed Action and 0.4 percent under the RCA. The fire frequency would be similar under the two fire regimes, but Fire Regime IV is characterized by more severe, stand-replacing fires (in which more than 75 percent of the dominant overstory vegetation is replaced). The shift from shrubland to grassland and eventual succession back to shrubland is not expected to alter the fire regime because Idaho shrublands below 7,500 feet in elevation and perennial grasslands are both classified as Fire Regime IV (BLM 2008a).

The replacement of 83 (under the Proposed Action) or 132 (under the RCA) acres of Fire Regime III area with Fire Regime IV area would impact less than 0.2 percent of the CEA for the Proposed Action and 0.4 percent for the RCA. The disturbed land could also cumulatively add to the amount of land deviating from natural fire regimes if natural characteristics were altered by noxious weed invasions. Noxious weeds can carry the potential to increase fire frequency and severity, which lowers the potential for native shrubs and bunchgrasses to established in disturbed areas (BLM 2008a). Monitoring and control measures for noxious weeds would be implemented under either the Proposed Action or the RCA, as described in the Environmental Management Plan (EMP; **Appendix B**).

5.5.5.5 Pollinators

The potential new disturbance to vegetation communities (all of which include some plant species that can be used by pollinators) from the Proposed Action (447 acres) or RCA (541 acres), added to known past, present, and reasonably foreseeable future disturbances (16,847 acres of past and present disturbance and 8,415 acres of reasonably foreseeable disturbance, for a grand total of 25,262 acres). The majority of this quantified disturbance is a result of phosphate mining, but an additional amount of unquantified disturbance to vegetation occurs in the CEA as a result of livestock grazing and other activities.

Natural revegetation and reclamation would re-establish pollinator habitat relatively quickly to most areas disturbed by mining, although the vegetation composition and community type may be changed and modified from its pre-disturbance state. It is expected that most mining projects would use seed mixes that include native or non-invasive plants, some or most of which would be pollinator-friendly. This is the case for seed mixes selected for both the Proposed Action and RCA

5.5.6 Cumulative Effects

5.5.6.1 Vegetation

Although there are areas of historical reclamation with elevated selenium and other COPCs in the CEA, it is not expected that either the Proposed Action or the RCA would add to these areas or any impacts from vegetation with elevated COPCs. The thickness of the reclamation covers in the Proposed Action and the RCA would limit the amount of root mass that could or would be in contact with Meade Peak overburden, thus preventing the accumulation of selenium over the 5 mg/kg action level in vegetation. The seed mixes used for reclamation were designed to avoid plants with tap roots that could contact the Meade Peak overburden. Consequently, reclamation vegetation is not anticipated to accumulate COPCs; therefore, although there would be additional acreage of disturbed vegetation, it would not exacerbate any current issues with selenium in vegetation in the CEA. Future mines would likely incorporate closure practices and BMPs that would minimize selenium uptake as well. Additionally, as historical mine reclamation is remediated through the CERCLA process, the area of the overall acreage of reclamation vegetation with elevated COPCs may decrease.

Disturbance from either the Proposed Action or the RCA would include many temporary disturbances and would be short-term and minor. Over the long term, there would be only minor contributions to cumulative effects. Reclamation after mining would replace existing vegetation with grassland, which would then be subject to the process of succession. Unreclaimed areas (pit walls and the county road realignment) and removal of aspen forest (which is not expected to regenerate in reclaimed areas), totaling 83 acres for the Proposed Action and 132 acres for the RCA, would be a long-term, negligible cumulative impact affecting 0.2 percent of the aspen in the CEA for the Proposed Action and 0.4 percent of the aspen in the CEA for the RCA. The overall vegetation cumulative effects with the addition of the Proposed Action or RCA would be long-term and minor.

5.5.6.2 Wetlands

The lost functions and values of the wetlands in the Study Area for the Proposed Action would be mitigated, resulting in a cumulative impact that is negligible and long-term. The RCA would not have wetland impacts; therefore, the cumulative impacts would be short-term and negligible.

Cumulative impacts due to sedimentation under the Proposed Action or the RCA are anticipated to be short-term and negligible if at all due the use of BMPs to control erosion at the mine. The Proposed Action would contribute to elevated COPC concentrations in downgradient wetlands in the Upper Blackfoot River watershed. The addition of the elevated COPCs would be a long-term, negligible cumulative impact as a result of the predicted low incremental increases in COPCs in surface waters in the CEA. The RCA eliminates the associated potential for releases of COPCs to wetlands.

5.5.6.3 Noxious Weeds

Disturbed lands are more susceptible to weed infestations; however, invasive species monitoring and control measures would be implemented under either the Proposed Action or RCA, as discussed in the EMP (**Appendix B**). These control measures, together with ongoing county, state, and federal weed control efforts being conducted across the CEA, would help minimize cumulative impacts of noxious weeds over the long term. Overall, cumulative effects of noxious weeds for the Proposed Action or the RCA would be long-term and negligible.

5.5.6.4 Fire Management

Because of the small area involved, the long-term cumulative effects of the altered fire regimes under the Proposed Action or the RCA would be negligible. Under both alternatives, the majority of disturbed areas would be revegetated with native plant species, and invasive plant species would be controlled as necessary. These measures would help ensure that the site was restored to the baseline fire regime over the long term, thereby minimizing cumulative effects.

Under the No Action Alternative, the Rasmussen Valley Mine would not be constructed, and there would be no new effects to vegetation, riparian areas, and wetlands.

5.5.6.5 Pollinators

Disturbance from either the Proposed Action or the RCA would include many temporary vegetation and pollinator habitat disturbances and would be short-term and minor. Over the long term, there would be only minor contributions to cumulative effects. Reclamation after mining would replace existing vegetation with grassland, which would then be subject to the process of succession. Proposed seed mixes for the Proposed Action and RCA include forb and shrub species that are pollinator-friendly. Unreclaimed areas (pit walls and the county road realignment) and removal of aspen forest and associated forbs that may be used by pollinators (which is not expected to regenerate in reclaimed areas), totaling 83 acres for the Proposed Action and 132 acres for the RCA, would be a long-term, negligible cumulative impact affecting 0.2 percent of the aspen in the CEA for the Proposed Action and 0.4 percent of the aspen in the CEA for the RCA. The overall pollinator cumulative effects from habitat impacts with the addition of the Proposed Action or RCA would be long-term and minor.

5.6 TERRESTRIAL WILDLIFE

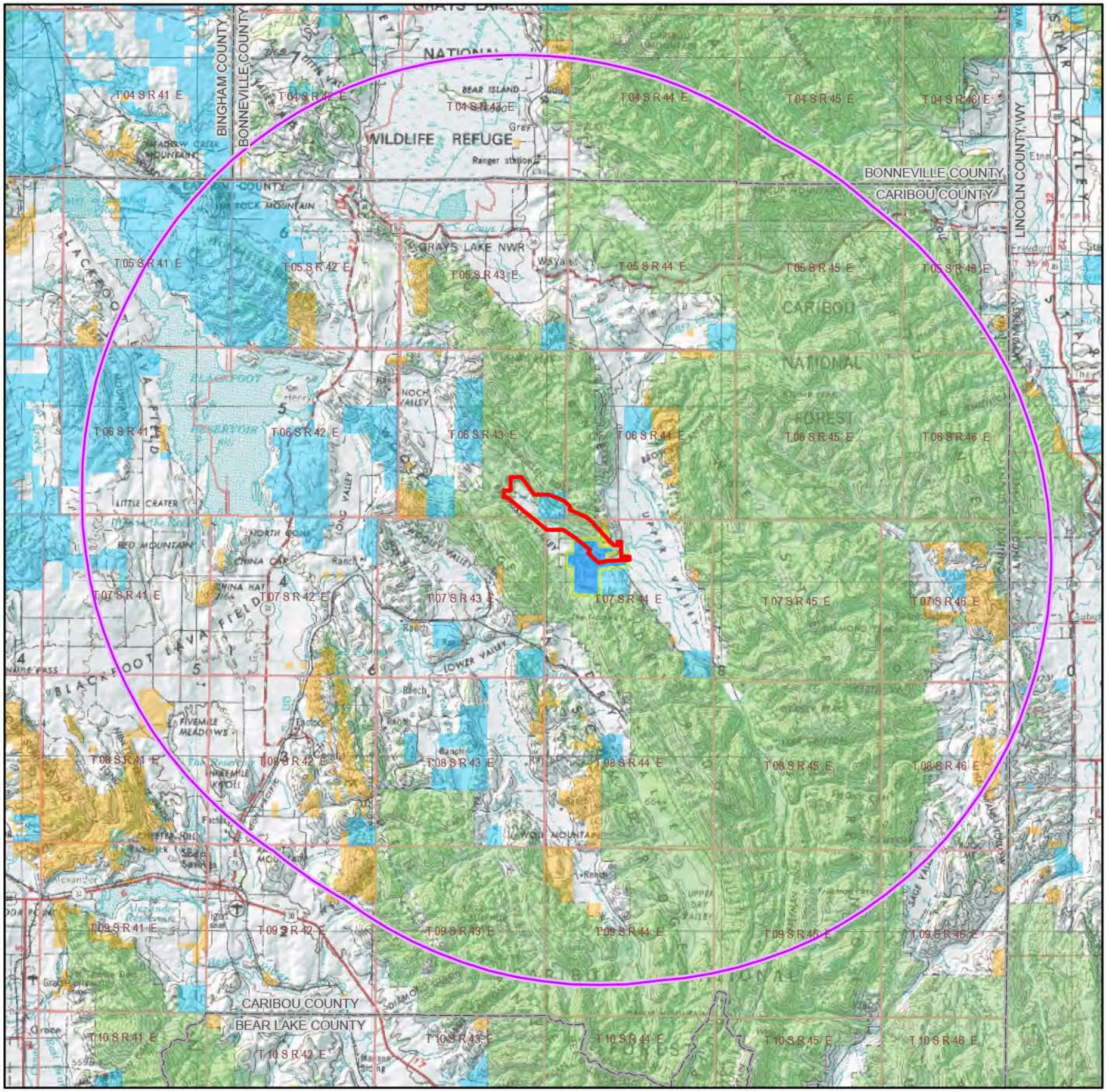
5.6.1 CEA Boundary

The CEA for terrestrial wildlife (**Figure 5.6-1**) includes suitable habitat for species of concern within a 15-mile radius of the Study Area. This area includes public lands administered by the USFS, the BLM, and the State of Idaho. There are no federally designated wild and scenic rivers, wilderness areas, Areas of Critical Environmental Concern (ACECs), or Research Natural Areas (RNAs) within this CEA. The state-administered Blackfoot River Wildlife Management Area (WMA) is located at the south end of the Study Area. The CEA includes the area affected by past, present, and reasonably foreseeable future development activities within this area. The cumulative effects of habitat fragmentation from development on wildlife populations and habitats at and around the mine are a concern.

Most impacts to wildlife would occur within or immediately adjacent to the Study Area and would affect individuals with home ranges overlapping with or immediately adjacent to the Study Area. An area with a 15-mile radius is large enough to encompass the home ranges of the most mobile wildlife individuals in the Study Area, such as large predatory mammals. The home ranges of small and less mobile individuals would be found well within this range. It is unknown to what extent larger, more mobile wildlife would be displaced and what the impacts of displacement on resident populations would be; however, given the scale of the Proposed Action or the RCA, it is unlikely that any short- or long-term adverse impacts to wildlife species would occur beyond the identified CEA.

5.6.2 Introduction

GAP landcover data (USGS 2001) were used to quantify habitat types in the CEA, as this data source focuses on habitat identification, provides habitat categories similar to those delineated in site-specific baseline studies (BC 2012a), and covers the entire CEA. According to GAP landcover data (USGS 2001), sagebrush, coniferous forest, aspen forest, and wetland/riparian areas are the dominant wildlife habitat types within the CEA (**Table 5.6-1**). Other native habitats (including grassland, open water, and other types of shrubland) are present throughout the CEA in smaller quantities. This diversity in habitat types allows for many wildlife species, including a wide variety of mammals and birds, to utilize the area.



LEGEND

STUDY AREA

CEA FOR TERRESTRIAL WILDLIFE; THREATENED, ENDANGERED, AND SENSITIVE SPECIES (15-MILE BUFFER OF STUDY AREA)

SURFACE OWNERSHIP

BUREAU OF LAND MANAGEMENT

STATE (IDAHO DEPARTMENT OF LANDS)

U.S. FOREST SERVICE

PRIVATE

BLACKFOOT RIVER WILDLIFE MANAGEMENT AREA (IDAHO DEPARTMENT OF FISH AND GAME)

CEA = Cumulative Effects Area

Projection:
North America Datum 1983, Universal Transverse Mercator, Zone 12 North
Source:
USA Topo Maps, serviced by ESRI ArcGIS Online, accessed on 8/30/2016

NORTH

0 3 6 Miles

RASMUSSEN VALLEY MINE

FIGURE 5.6-1
Cumulative Effects Areas for Terrestrial Wildlife; Threatened, Endangered, and Sensitive Species

ANALYSIS AREA: Caribou County, Idaho
Date: 8/30/2016 Prepared By: JC
File: K:\CO1553\2016_FEIS\Figure 5_6-1 Terrestrial Wildlife etc CEA.mxd

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Table 5.6-1 Existing Land Cover in Wildlife CEA

Cover Type	Acres	Percentage
Sagebrush Shrubland	189,462	33.6
Coniferous Forest	137,617	24.4
Aspen Forest	80,598	14.3
Wetland/Riparian	80,238	14.2
Cropland	31,260	5.5
Grassland	17,113	3.0
Open Water	10,110	1.8
Other Shrubland	6,511	1.2
Developed	4,777	0.8
Harvested Forest	2,504	0.4
Pasture	1,837	0.3
Quarries, Mines, Gravel Pits, Oil Wells	1,348	0.2
Introduced Grassland	10	0.0
Total	**563,385**	**100.0**

Source: USGS 2001

According to preliminary IDFG data (Wackenhut 2014) and the CNF RFP (USFS 2003), elk and moose winter range, mule deer summer range, and some elk parturition areas occur in the wildlife CEA. Other mammals in the wildlife CEA include small herbivores (e.g., rabbits), omnivores (e.g., rodents), bats, and medium- to large-sized carnivores (red fox and coyote). There are several species of upland game birds found in the wildlife CEA including ruffed grouse, greater sage-grouse, Columbian sharp-tailed grouse, and dusky grouse. Greater sage-grouse cumulative effects are discussed in **Section 5.8**. Habitat for migratory birds occurs throughout the wildlife CEA and includes every listed cover type. Suitable habitat for nesting and foraging raptors occurs throughout the wildlife CEA. According to the USGS (USGS 2001), there are 10,000 acres of open water habitats in the CEA. These open water habitats may be used by a wide variety of water birds for foraging, brood-rearing, and nesting.

5.6.3 Past and Present Activities

Within the CEA, quantified past and present disturbances based on the GAP landcover data (USGS 2001) have resulted from agriculture (cropland and pasture; 33,097 acres); roads, buildings, and other development (4,777 acres); timber harvests (2,504 acres); and quarries, mines, gravel pits, and oil wells (1,348 acres; **Table 5.6-1**). A different dataset for mining activity in the CEA indicates that 9,943 acres have been disturbed by mining (primarily from historical phosphate mining activity shown on **Figure 5.1-1**; Causey and Moyle 2001). There are an additional 6,775 acres of agency-approved mining disturbance in the wildlife CEA (**Table 5.1-2**) for a total of 16,718 acres of historical and present phosphate mine disturbance in the CEA. However, much of this area has been reclaimed and supports grassland and shrubland wildlife habitat.

Wildfires have disturbed more than 3,800 acres in the CEA since 1980 (WFDSS 2013). Range allotments, which have affected vegetation through grazing, occur on more than 91,000 acres (16 percent) of the CEA, but it is not possible to quantify the extent of grazing impacts to wildlife habitat.

Additional unquantified past and present activities in the CEA that may affect wildlife include residential and commercial development; vegetation management activities on private lands; roads; power lines; and recreational uses such as hunting, fishing, ATV and snowmobile use, camping, and picnicking.

5.6.4 Foreseeable Future Activities

Specific future land impacts on private lands in the CEA are difficult to quantify as a result of lack of data, but would be an area smaller than the private land ownership area. Past and present actions on private land within the CEA have mainly included mining, agriculture, and grazing activities, and these are anticipated to continue in the future. Occasional instances of housing development have also occurred on the large ranches within the CEA, and this is also anticipated to continue.

Table 5.1-2 lists foreseeable future mining activities, the only quantified proposed activities on public land that could impact wildlife habitat throughout the wildlife CEA. These quantified foreseeable future disturbances total 8,242 acres (**Table 5.1-2**). The Hooper Springs Power Line will impact an additional 112 to 188 acres in the foreseeable future (Bonneville Power Administration 2013), for a total of up to 8,430 acres of quantified reasonably foreseeable disturbance to wildlife habitat.

5.6.5 Cumulative Activities

The foremost impact to wildlife within the CEA has been and will continue to be habitat changes associated with development, mining, agriculture, grazing, and timber harvest. Based on GAP landcover data (USGS 2001), quantified past disturbance to wildlife habitat measures 41,726 acres or 7 percent of the CEA. A different dataset for mining activity in the CEA indicates that 9,943 acres have been disturbed by historical mining (primarily from phosphate mining activity shown in **Figure 5.1-1**; Causey and Moyle 2001). There are an additional 6,775 acres of agency-approved mining disturbance in the wildlife CEA (**Table 5.1-2**) for a total of 16,718 acres of historical and present phosphate mine disturbance in the CEA. Including these acres raises the past disturbance in the CEA to 58,444 acres or 10 percent of the CEA.

The reasonably foreseeable future disturbances quantified in **Table 5.1-2**, with the addition of the Hooper Springs Power Line, total 8,430 acres. When added to the past and present disturbances, these future disturbances would increase the disturbance of lands in the CEA to 12 percent (66,874 acres disturbed out of 563,385 total acres). Adding the potential new disturbance of the Proposed Action to vegetation, including wetlands, (447 acres) or the RCA (541 acres) to that total increases the overall percent of disturbance by less than 0.1 percent, a negligible amount relative to the size of the CEA.

5.6.6 Cumulative Effects

The cumulative activities within the CEA may have a wide array of effects on wildlife. Some types of activities, such as timber harvest, vegetation treatments, and fires, may be beneficial for wildlife species that utilize forest openings or early seral stages. The majority of habitat conversion from timber harvest is in the form of forest removal followed by reforestation with a short period of early seral (non-climax grass or shrub) conditions. This habitat conversion would cause forest-dependent wildlife using the affected areas to disperse in search of new areas. In contrast, most wildfires in the CEA have affected the scrub/shrub (largely sagebrush) vegetation type. The flush of new vegetation growth following a fire may provide a beneficial food source for wildlife such as big game. Once active mining had ceased under the Proposed Action or RCA, the newly reclaimed area may likewise benefit wildlife through new growth of a variety of native forbs and grasses that could provide forage for a number of species.

Negative impacts to wildlife within the CEA include loss of habitat; displacement; and fragmentation as a result of fires, mining, timber harvesting, roads, private land development, agriculture, and recreation. Other impacts that are not quantified include the effects of noise on wildlife, habitat fragmentation, and displacement from mining, roads, and recreational activities. Additionally, small, less mobile wildlife (such as small mammals and reptiles that cannot relocate outside of disturbance areas) are subject to direct mortality and localized population reductions from ground-disturbing activities.

In general, displacement of larger, more mobile wildlife from habitat disturbance decreases survival rates of affected individuals to some degree and increases competition. Mine construction and operation could temporarily cause some wildlife, such as big game, carnivores, and raptors (which generally prefer areas free from anthropogenic noise and activity), to avoid the portion of the CEA close to mining. Implementing the Proposed Action or RCA would result in the displacement of mobile wildlife from the Study Area and the surrounding habitat into adjacent undisturbed areas, where competition in already-occupied habitats may increase. Displacement carries the potential to result in a minor cumulative impact to mobile wildlife for the duration of the Proposed Action or the RCA. Overall, the Proposed Action would cause more cumulative displacement and habitat loss in wetland and riparian habitats, whereas the RCA would cause more cumulative displacement and habitat loss in aspen forest, sagebrush, and high-elevation rangeland habitats.

Past and present disturbances from roads and mining activities have resulted in fragmentation of certain wildlife populations and their habitats. While larger, more mobile species may be able to traverse or route around mines, small, relatively immobile animals (such as reptiles and small mammals) may be subject to isolation as formerly contiguous habitats are disturbed by features such as roads and mines. These types of features may also increase the amount of "edge" in formerly contiguous habitats, decreasing habitat quality for species such as some small breeding birds (Paton 1994; Baker and Dillon 2000, Ruefenacht and Knight 2000; Fahrig 2003). Fragmentation effects within the CEA have not been quantified by the land management agencies. Implementing the Proposed Action would result in additional fragmentation to wildlife habitat and could isolate populations of small, immobile wildlife. However, this impact would be minor, as the habitats in the Study Area and surrounding landscape are naturally patchy. Thus, a minor cumulative effect to wildlife from fragmentation impacts would potentially occur for the duration of the Proposed Action. The cumulative effects of habitat fragmentation under the RCA would be reduced relative to the Proposed Action because the RCA would consolidate some disturbance (including the main haul road) in already disturbed areas.

Wildlife may be subject to direct mortality from a variety of sources including collisions with vehicles, fences, and power lines, and small ground-dwelling animals may be trampled by livestock, but these effects are not quantifiable. The Proposed Action would contribute to cumulative effects of power lines in the CEA because it would include installation of an overhead power line that would pose a mortality risk to birds and provide potential perching opportunities for avian predators. This risk would not exist under the RCA. Both alternatives could cumulatively contribute to wildlife mortality through vehicle collisions along the haul road during active mining.

Many game species are hunted within the CEA. Human presence in the form of recreation may disturb many species of wildlife. Human disturbance during periods of the year when wildlife are otherwise stressed (such as during the winter) can further stress wildlife and affect their survivorship. Wintering big game may be subject to harassment by recreationists, particularly if available hiding and escape cover is reduced by other activities. Both alternatives would cumulatively contribute to displacement and stress on wintering big game. Under the Proposed Action, there would be 47 acres of direct disturbance to elk and deer winter range, and under the

RCA there would be 83 acres of direct disturbance to elk and deer winter range (based on USFS [2003] mapping).

Wildlife are affected by livestock grazing as a result of competition for forage, direct mortality by trampling (e.g., small mammals, reptiles, and amphibians), and alteration of plant communities. As described in the Canada Lynx Conservation Assessment Strategy (Interagency Lynx Biology Team 2013), both domestic livestock and wildlife ungulate grazing may change the structure or composition of native plant communities. Proper rotation and stocking rates can minimize these effects. Livestock grazing on the CNF is conducted in compliance with standards and guidelines contained in the CNF RFP (USFS 2003), and livestock grazing on BLM lands is conducted in compliance with the PFO ARMP (BLM 2012a). There is currently no grazing on the WMA, but it is not prohibited in the management plan. Grazing conducted in compliance with agency management guidance is expected to have minimal impacts on wildlife and their habitat. Neither alternative would change native rangeland plant communities over the long term because 96 to 99 percent of the disturbance (depending on the alternative) would be reclaimed within native grass, forb, and shrub species. Once reclaimed, each alternative would allow for grazing similar to baseline conditions.

Noxious weed invasions are another source of unquantified wildlife impacts in the CEA. Noxious weeds can affect wildlife habitat by displacing native plant species and altering fire regimes. Wildfires in sagebrush may result in the establishment of invasive weeds that can establish quickly after fire and exclude native perennials, reducing habitat for sagebrush-dependent species (Zouhar 2003). Each alternative would increase the potential for noxious weed invasion in the Study Area. However, BMPs would be implemented to minimize the potential for cumulative effects of noxious weeds (BMPs that would minimize noxious weed impacts include keeping mining disturbances to a minimum for as short a timeframe as possible, with overburden areas and pit backfill advancing in concert with the active pit; monitoring and controlling noxious weed infestations; using certified weed-free seed, mulch, and straw bales; and developing and implementing an annual noxious weed treatment plan).

All species are potentially vulnerable to the toxic effects of selenium accumulation. Other nearby phosphate mines exhibit increased concentrations of selenium and other metals in water, aquatic plants, aquatic invertebrates, and fish near the Study Area (Hamilton and Buhl 2003). Increasing concentrations of selenium in surface water and groundwater seeps and springs may lead to reduced reproductive success in certain terrestrial wildlife of the region. Selenium contamination is expected to continue below certain operating and reclaimed phosphate mines in the foreseeable future. New phosphate mines are likely to incorporate BMPs that limit the potential for selenium contamination of the environment, unlike certain past mines that were constructed without regard for or knowledge of selenium contamination (IDEQ 2006).

Big game foraging on reclaimed mine overburden piles in the wildlife CEA have been exposed to elevated levels of selenium. One past study found selenium levels as high as 13.06 mg/kg in elk liver and 0.92 mg/kg in elk muscle tissue. The level found in elk liver was high enough for the Idaho Bureau of Community and Environmental Health to advise people to avoid eating elk liver in large quantities from elk harvested on historical phosphate mine areas (BCEH 2006).

Two studies completed in the southeastern Idaho phosphate region suggest that increased selenium from mining has not affected bird populations or reproductive success at the population level (Skorupa et al. 2002; Ratti et al. 2006). The overall risk at the population level depends not only on the level of selenium contamination, but also on the attractiveness of the site to breeding birds. Therefore, the authors concluded that “high potential for risk did not seem to be realized on a large scale as a result of the relative scarcity of breeding water birds at most sites surveyed”

(Skorupa et al. 2002). However, the authors caution that there could be many sites in the phosphoria region that have not been assessed for breeding bird use, and that further sampling may reveal higher levels of risk (Skorupa et al. 2002).

In 1999 and 2000, Ratti et al. (2006) tested selenium levels in 544 bird eggs from mine and reference sites in southeastern Idaho, and in 2001, the authors monitored the nest success of 623 American robin and red-winged blackbird nests at these sites. The authors concluded, "on a population level, American robin and red-winged blackbird reproductive success in southeastern Idaho was not impaired by existing levels of selenium in avian eggs. Based on our multi-species data and more-specific data on American robins and red-winged blackbirds, we conclude that there are no negative effects on reproductive success of the general avian community at this time." The authors also acknowledge that negative effects may be occurring in some bird species immediately adjacent to mine sites, where high selenium concentrations (>10 µg/g) were observed in eggs (Ratti et al. 2006). Selenium exposure for some groups of wildlife, such as bats and game birds, has not been studied in the CEA under the Proposed Action or RCA. Under the Proposed Action, wildlife may be exposed to selenium through uptake and accumulation of selenium in wetland and riparian vegetation and percolation of selenium and other COPCs into surface water. Under the RCA, selenium and COPC impacts to surface waters and associated wetland and riparian vegetation has been avoided by removing the external overburden piles that were the potential source of these impacts. Under the Proposed Action or RCA, risk of selenium exposure from vegetation growing on the reclamation is anticipated to be negligible in the context of the CEA as a whole as a result of the relatively small area that would be reclaimed, the use of a deep cover, and the avoidance of the use of selenium accumulator plant species for revegetation.

Wildlife drinking from surface waters fed by groundwater downgradient of the Proposed Action could be exposed to elevated concentrations of selenium, manganese, cadmium, zinc, and nickel under the Proposed Action. However, increases in COPCs in surface waters would be negligible, and exposure to COPCs through drinking water is considered less of a risk to wildlife than exposure via bioaccumulation through the food chain (ITRC 2011). Wildlife species that eat aquatic insects, plants, and fish, and those that prey upon species consuming these foods, may be at risk of toxicity associated with exposure to COPCs within and around the Study Area. The direct and indirect effects of COPC exposure under the Proposed Action would be long-term and negligible to minor, depending on a variety of factors including the susceptibility of the species and the degree to which the species preys on aquatic food sources. The additional cumulative effect of the Proposed Action on the CEA would be long-term and negligible. This risk would be low as a result of the expected low increases in COPC concentrations in surface waters. In contrast to the Proposed Action, the RCA would carry a negligible potential to contribute COPCs to the watershed; therefore, the cumulative effects under this alternative would be negligible.

Regarding wildlife habitat services, of the two alternatives, the RCA would have greater overall cumulative effects on wildlife because it would result in a greater residual debit in wildlife habitat services, based on the Habitat Equivalency Analysis (HEA; residual debit of 3,279 residual discounted service area years [DSAYs] for the Proposed Action versus 3,367 under the RCA). The Proposed Action would have greater cumulative effects on wildlife species that use wetland and riparian areas and sagebrush habitats, whereas the RCA would have greater cumulative effects on wildlife species that use aspen forest and high-elevation rangeland habitats. Cumulative effects of habitat fragmentation and power line collision would be lower under the RCA than under the Proposed Action.

In summary, adding the Proposed Action or the RCA disturbances to past, present, and foreseeable future disturbances would result in short- and long-term, negligible to minor cumulative effects to wildlife. Cumulative effects will be reduced by the Proponent funding a third party conservation organization that will implement off-site mitigation projects, thus reducing the cumulative impact of the Rasmussen Valley Mine. The amount of the funding will be based on the estimated cost to mitigate the lost wildlife habitat services (residual debit) as determined by the HEA.

Under the No Action Alternative, the Rasmussen Valley Mine would not be constructed, and there would be no cumulative effects to terrestrial wildlife.

5.7 FISHERIES AND AQUATIC RESOURCES

5.7.1 CEA Boundary

The CEA for fisheries and aquatic resources encompasses the Upper Blackfoot River Watershed (HUC 1704020702) and Lanes Creek-Diamond Creek Watershed (HUC 1704020701) from the headwaters of Lanes Creek to the Blackfoot Reservoir 10 miles to the west. The CEA encompasses 223,389 acres within the eastern portion of the Blackfoot Sub-basin (HUC 17040207) that may be affected by the Proposed Action and other existing and reasonably foreseeable future projects. CEA boundaries, as well as locations of past and present mining activities, are depicted on **Figure 5.3-1**.

5.7.2 Introduction

Fisheries and aquatic resources are affected by surface water quality, which is discussed above in **Section 5.3**. Activities or phenomena that affect water resources within the CEA, and consequently fisheries and aquatic habitat, include mining; farming; ranching; livestock grazing; wildfires; fire suppression activities; road building; and development of domestic, commercial, and industrial land parcels. These activities, particularly mining, can increase the mobilization of selenium, other COPCs, and sediments. Many of these activities also affect the volume and timing of surface runoff, directly altering aquatic habitat. Cumulative effects to fisheries and aquatic resources may include changes in concentrations of selenium and other COPCs, and changes in sediment load in waterways.

5.7.3 Past and Present Activities

Past activities within the CEA that have impacted fisheries and aquatic resources include livestock grazing, agriculture, vegetation management, road construction, and phosphate mining. Acres of disturbance in the CEA associated with most of these activities are shown in **Table 5.1-1** and **Table 5.5-1**. Activities taking place within the aquatic influence zone (AIZ) have removed or altered riparian vegetation, which has contributed to the degradation of instream habitat.

The IDEQ assessed 85 miles of the Blackfoot River and its tributaries between 1997 and 2000. The agency determined that, along portions of the river, the Blackfoot River's beneficial uses (coldwater aquatic life, salmonid spawning, recreation, domestic water supply, agricultural water supply, industrial water supply, wildlife habitat, and aesthetics) are impaired by sediment, nutrients, organics, and unknown pollutants (IDEQ 2006).

Sedimentation can reduce the foraging and reproductive success of some species of macroinvertebrates, disrupt fish migration, and impair the respiratory systems and gills of macroinvertebrates and fish. Species composition and numbers of macroinvertebrates can be altered by increased sedimentation and resultant habitat changes (Waters 1995). In the CEA, possible causes of sedimentation have included agriculture, grazing, and road construction.

Approximately 93 percent of the BLM Pocatello Field Office planning area is open to grazing by either cattle or sheep (BLM 2006). Grazing allotments occur on 33,618 acres in the CEA (BLM 2008b). Improper livestock grazing in AIZs and riparian areas can increase sediment load to watersheds through increased instream trampling, increased disturbance and erosion from overgrazed stream banks, reduced sediment trapping by riparian and instream vegetation, decreased bank stability, and increased peak flows from compaction (Waters 1995). The USFS has standards and guidelines that are monitored and enforced to prevent improper grazing practices that can lead to these problems.

Road construction has also impacted streams and wetlands in the CEA. Roads can disrupt the natural hydrology of watersheds by concentrating runoff, which is then directed to streams at higher flow rates, leading to widening or deepening of channels. Such changes in flow rate and stream morphology can negatively impact some species and benefit others, leading to shifts in community composition. Second, use of roads can lead to sedimentation of water bodies by contributing to erosion. Third, unless culverts are properly placed and maintained, roads can create barriers to stream flow and alter stream hydrology, isolating populations of aquatic organisms (Gucinski et al. 2001).

Agricultural practices, such as over-application of fertilizer and manure, can also affect streams and wetlands through phosphorous pollution. Agricultural runoff containing high concentrations of phosphorous can enter streams, leading to the increased growth of algae and aquatic weeds and subsequent oxygen shortages. Mortality of fish and aquatic macroinvertebrates may occur as a result (Sharpley et al. 2003).

Seepage and runoff from older nearby phosphate mines have increased selenium and other metal concentrations in groundwater and surface water in the area watersheds including the Blackfoot River. In 2014, the USGS released a report summarizing more than a decade of data on selenium levels in streams across the Upper Blackfoot River Watershed (Mebane et al. 2015). This study reported selenium concentrations across the watershed that exceeded the State of Idaho CCC concentration of 5 μg/L, especially during spring runoff (however, data from more recent years [2013 and 2014] suggest a lower level of impact [USGS 2015]).

In general, reproductive effects may be observed in fish if selenium concentrations in fish eggs exceed the recommended toxicity threshold of 10 mg/kg in egg tissue (Lemly 1997). The Lemly (1997) threshold was developed using data for bass, sunfish, and minnows, though it likely can be applied to a degree to all species. Hamilton and Buhl (2003) extrapolated fish egg selenium concentrations from fish whole-body selenium concentrations and found values exceeding 10 mg/kg at several sites in and around the CEA.

Rudolph et al. (2008) studied cutthroat trout and determined the no-effect threshold selenium concentration in eggs to be >20.6 mg/kg dry weight. This threshold has likely been exceeded in the CEA based on the relationship that they observed between fish muscle tissue concentration and fish egg concentration. If the Rudolph et al. (2008) relationship between percent fry mortality and egg selenium concentration holds true for the Blackfoot River, then fry mortality in the river is 19.6 percent (based on an average fish tissue selenium concentration of 16 mg/kg).

NewFields (2009) investigated selenium toxicity in wild brown trout collected from impacted waters downstream of the Smoky Canyon Phosphate Mine. The results of this study confirm the results of the Rudolph et al. (2008) study. There were positive correlations observed between egg selenium concentration and mortality, and between egg selenium concentration and incidence of deformities. The NewFields (2009) study also provides further evidence that selenium-related mortalities and deformities are likely already occurring in the CEA. In contrast, Hardy et al. (2009) did not observe toxicity and reproductive impairment to growing cutthroat trout exposed to up to 10 μg/g of dietary selenium.

Van Kirk and Hill (2007) modeled population-level responses of Yellowstone cutthroat trout to selenium toxicity. The authors' model predicted a rapid decline in the trout population at elevated selenium levels, with a 90 percent decrease from carrying capacity at a whole-body selenium concentration of 17 μg/g. After the rapid initial decline, the model predicted that the population would stabilize at a much lower number of individuals (Van Kirk and Hill 2007). The results of this study suggest that past and present activities in the CEA may have reduced fish populations to below carrying capacity. Natural history factors, such as migration, immigration or emigration of fish, competition between fish species, and food sources, are also important when determining whether patterns observed in fish populations are selenium-related (Canton and Baker 2008).

Many species of amphibians and reptiles are potentially found within the fisheries and aquatics CEA. As a whole, they use every habitat type, from wetland to dry sagebrush to forest. Amphibians and reptiles are small and fairly immobile, and habitat fragmentation and mortality have occurred as a result of road-building and other construction projects, grazing, mining, vegetation management, conversion of land to agriculture, and wildfire.

Amphibians and reptiles residing in aquatic habitats are vulnerable to degradation of water quality and aquatic prey; these species have likely been affected by activities in the CEA causing sedimentation or contamination of streams and wetlands. Effects to amphibians and reptiles from elevated selenium concentrations have not been evaluated within the CEA, but studies have found elevated selenium levels in water, sediment, aquatic plants, and aquatic insects downstream of reclaimed phosphate mines (Hamilton and Buhl 2003). Also, selenium poisoning has been confirmed in many salamanders at the nearby Gay Mine and the Smoky Canyon Mine. Concentrations in some individuals were 10 to 100 times the normal level in animal tissue (BLM 2003b). It seems likely, therefore, that amphibians and semi-aquatic reptiles have been affected by elevated selenium levels within the CEA.

5.7.4 Foreseeable Future Activities

Reasonably foreseeable actions, including maximum acres of potential future phosphate mines in the CEA, are described in **Section 5.5**. Enforcement of water quality standards and the incorporation of BMPs into future projects would be expected to lessen impacts on aquatic resources in comparison to past projects that were implemented with less regard for impacts to aquatic resources (IDEQ 2006). Remediation of inactive or abandoned mine properties is ongoing or planned to reduce existing and future selenium and COPC release to groundwater and surface water resources in the Blackfoot River basin, thereby reducing the load and impacts from COPCs to the river. Remedial actions are currently underway at the South Maybe Canyon, Conda/Woodall, and Smoky Canyon Mines, and only two of 17 historical mines in the region remain to initiate remedial investigation and possible cleanup activities. These two are the FMC Dry Valley and Rhodia Wooley Valley Mines.

5.7.5 Cumulative Activities

The Proposed Action would add the direct loss of 20.5 acres of wetland and riparian habitat and 80 acres of AIZ to the amount of overall disturbance to aquatic habitats in the CEA. Mitigation measures would be implemented to offset the lost functions and values of the impacted wetlands, per the requirements of the CWA. Implementation of BMPs and a Water Management Plan would control discharges of sediment to surrounding waters; therefore, the Proposed Action would not be expected to substantially add to the effects of sedimentation in the CEA.

The RCA would result in no direct loss of wetlands and non-wetland WOUS and a loss of 10 acres of AIZ, which would contribute a negligible amount of disturbance to aquatic habitat in the CEA. Similar to the Proposed Action, the RCA would also incorporate BMPs and a Water Management Plan to minimize impacts.

Under the Proposed Action, cumulative effects of COPCs on macroinvertebrates, fish, and amphibians are possible, as there would be measurable loading of selenium, zinc, manganese, and nickel to Angus Creek and the Blackfoot River. Although, as discussed in **Section 4.7.1.1.3**, population-level effects on macroinvertebrate, fish, or amphibian populations are unlikely under the Proposed Action, the exact degree to which effects would occur is uncertain, and minor cumulative effects on the aquatic food web are possible. Potential cumulative effects include an increase in the prevalence of fish deformities and mortalities, as well as toxicity to some macroinvertebrates and amphibians, even though the average overall fish body burden may remain below the USEPA draft freshwater chronic criterion of 8.0 µg/g (USEPA 2015a). Given the wide array of past, present, and foreseeable future projects, including other mines, affecting aquatic resources in the CEA, and the widespread nature of those projects, it is difficult to predict with certainty the extent to which the additive effects of the Proposed Action would raise water or tissue concentrations of selenium above established protective criteria. As part of its EMP (**Appendix B**), Agrium would monitor surface water quality downgradient of the mine and, if adverse mining-related impacts to water quality were detected, the regulatory agencies would require Agrium to conduct sampling (which may include further macroinvertebrate and fish sampling) as necessary to assess impacts and consider adaptive management measures.

Because the RCA would eliminate all impacts to wetlands, would not mine below the water table, and would not place overburden piles downslope of the mine, the RCA would not result in measurable loading of COPCs to surface waters. Therefore, these cumulative effects would not occur under the RCA.

5.7.6 Cumulative Effects

Under the Proposed Action, cumulative effects to aquatic habitat resulting from direct disturbance to 20.5 acres of wetlands and 80 acres of AIZ would be short-term (for the life of the project) and minor, totaling only 0.05 percent of the CEA. Cumulative effects to aquatic resources resulting from increased concentrations of selenium and other COPCs downgradient of the Study Area would also be long-term and minor. Direct loss of aquatic habitat and sedimentation would be controlled and mitigated as described in **Section 4.7.4**, and COPC releases would be detected through implementation of the EMP (**Appendix B**). Overall, the Proposed Action would have minor cumulative effects on aquatic resources, including aquatic habitat, macroinvertebrates, fish, and amphibians and reptiles, when combined with other past, present, and reasonably foreseeable activities in the CEA.

The RCA was designed to avoid direct impacts to aquatic habitat, except for 10 acres of direct disturbance to the AIZ. Reclamation of the 10 acres would reduce the cumulative impact and in the context of the overall CEA, this impact would be negligible, totaling less than 0.01 percent of the area in the CEA. Because the RCA would directly impact less aquatic habitat and AIZ, cumulative impacts on macroinvertebrates, fish, and amphibians and reptiles would also be lower in magnitude than under the Proposed Action.

The RCA would also not directly impact fish-bearing streams or result in measureable loading of selenium or other COPCs to surface waters. For these reasons, cumulative effects to aquatic resources, including aquatic habitat, macroinvertebrates, fish, and amphibians and reptiles, would be negligible.

Under the No Action Alternative, the Rasmussen Valley Mine would not be constructed, and there would be no cumulative effects to fisheries and aquatic species.

5.8 THREATENED, ENDANGERED, OR SENSITIVE SPECIES

5.8.1 CEA Boundary

The CEA for threatened, endangered, or sensitive species encompasses that area affected by past, present, and reasonably foreseeable future development activities at the Rasmussen Valley Mine and includes suitable habitat for species of concern within a 15-mile radius of the Study Area (**Figure 5.6-1**).

Most impacts to threatened, endangered, or sensitive species would occur within or immediately adjacent to the Study Area and would affect individuals with home ranges overlapping or immediately adjacent to the Study Area. An area with a 15-mile radius is large enough to encompass the home ranges of the most mobile wildlife individuals in the Study Area. It is unknown to what extent wildlife individuals would be displaced and what the impacts of displacement on resident populations would be; however, given the scale of the Proposed Action or the RCA, it is unlikely that any short- or long-term adverse impacts to BLM and USFS special status species would occur beyond the identified CEA.

5.8.2 Introduction

The Canada lynx and greater sage-grouse are the only federally listed species or candidates to potentially occur in or near the Study Area and therefore are the only federally listed or candidate species that could be subject to cumulative effects analysis. Several USFS management indicator species and BLM sensitive species potentially occur within the Study Area and are listed in **Table 3.8-1**. A variety of habitats for these special status species occur in the CEA (**Table 5.6-1**).

5.8.3 Past and Present Activities

The primary past and present activities affecting Canada lynx in the CEA are long, linear anthropogenic structures and large areas of human-altered land cover that have created barriers to lynx movement through the linkage area. The primary anthropogenic barriers to lynx movement in the CEA include the Union Pacific Railroad, U.S. Highway 30, cultivated farmland, and urban areas.

The primary past and present activities affecting greater sage-grouse in the CEA include habitat alteration associated with livestock grazing; invasion of non-native plant species such as cheatgrass; wildfires; and anthropogenic structures in sagebrush habitat, including roads, fences, and power lines.

BLM and USFS sensitive species have been affected by habitat fragmentation and habitat disturbance throughout the CEA. Within the CEA, quantified past and present disturbances to wildlife habitats based on the GAP landcover data (USGS 2001) have resulted from agriculture (cropland and pasture; 33,097 acres); roads, buildings, and other development (4,777 acres);

timber harvests (2,504 acres); and quarries, mines, gravel pits, and oil wells (1,348 acres) (**Table 5.6-1**). A different dataset for mining activity in the CEA indicates that 9,943 acres have been disturbed by mining (primarily from historical phosphate mining activity shown on **Figure 5.1-1;** Causey and Moyle 2001). There are an additional 6,775 acres of agency-approved mining disturbance in the wildlife CEA (**Table 5.1-2**) for a total of 16,718 acres of historical and present phosphate mine disturbance in the CEA. However, much of this area has been reclaimed and supports grassland and shrubland wildlife habitat.

Wildfires have also disturbed more than 3,800 acres of wildlife habitat in the CEA since 1980 (WFDSS 2013). Range allotments, which have affected vegetation through grazing, occur on more than 91,000 acres (16 percent) of the CEA, although the exact extent to which grazing has altered wildlife habitat (including greater sage-grouse habitat) cannot be quantified.

Additional unquantified past and present activities in the CEA that may affect special status species include residential and commercial development; vegetation management activities on private lands; roads; power lines; and recreational uses such as hunting, fishing, ATV and snowmobile use, camping, and picnicking.

5.8.4 Foreseeable Future Activities

Specific future impacts on private lands in the CEA are difficult to quantify as a result of lack of data, but would be an area smaller than the private land ownership area. Past and present actions on private land within the CEA have mainly included agriculture and grazing activities. These are anticipated to continue to impact special status species, including greater sage-grouse, in the future. Limited housing development has also occurred on the large ranches within the CEA, and this is also anticipated to continue.

Phosphate mining and the Hooper Springs Transmission Line are the only quantified reasonably foreseeable disturbances in the CEA. Most phosphate mining occurs at higher elevations above the big sagebrush ecotone; therefore, most phosphate mines are not anticipated to have substantial impacts on greater sage-grouse. Also, phosphate mines generally do not involve construction of linear features long enough to create barriers to lynx movement through the linkage area. However, future phosphate mining could contribute to loss of habitat for BLM and USFS sensitive species that use forest habitats, including forest raptors such as the northern goshawk.

The future construction of the Hooper Springs Transmission Line and other power lines has the potential to impact greater sage-grouse in the CEA where these features pass through big sagebrush habitat. Several studies suggest that sage-grouse and related species instinctively avoid areas where power lines or other vertical structures are visible in order to avoid predation (Schroeder 2010). One study found that sage-grouse tend to avoid habitat located within 600 meters (1,968 feet) of power lines (Gillan et al. 2013; Braun 1998); therefore, these features may fragment otherwise suitable sage-grouse habitat.

Table 5.1-2 lists foreseeable future mining activities; the only quantified proposed activities on public land that could impact special status species habitat throughout the CEA. These quantified foreseeable future disturbances total 8,242 acres (**Table 5.1-2**). The Hooper Springs Power Line will impact an additional 112 to 188 acres in the foreseeable future (Bonneville Power Administration 2013), for a total of up to 8,430 acres of quantified reasonably foreseeable disturbance to special status species habitat.

5.8.5 Cumulative Activities

The foremost features on the landscape affecting Canada lynx movement through the linkage area include long, linear features such as the Bear River, Union Pacific Railroad, and U.S. Highway 30, as well as large blocks of cultivated farmland and urban areas. These features likely affect the movements of other large special status species (gray wolf and wolverine) also.

The foremost activities affecting greater sage-grouse include habitat alteration associated with past, present, and future livestock grazing; invasion of non-native plant species such as cheatgrass; wildfires; and anthropogenic structures in sagebrush habitat, including roads, fences, and power lines. These cumulative activities also affect other sensitive species that are dependent upon big sagebrush habitats, such as Brewer’s sparrow and sage sparrow.

The foremost activities affecting many forest-dependent and riparian-dependent sensitive species within the CEA have been and will continue to be habitat changes associated with development, mining, agriculture, grazing, and timber harvest; however, not all of these activities are quantifiable. In particular, the extent to which habitat changes have occurred from livestock grazing are not possible to quantify.

Based on GAP landcover data (USGS 2001), quantified past disturbance to special status species habitat totals 41,726 acres or 7 percent of the CEA. A different dataset for mining activity in the CEA indicates that 9,943 acres have been disturbed by historical mining (primarily from phosphate mining activity shown on **Figure 5.1-1**; Causey and Moyle 2001). There are an additional 6,775 acres of agency-approved mining disturbance in the CEA (**Table 5.1-2**) for a total of 16,718 acres of historical and present phosphate mine disturbance in the CEA. Including these acres raises the past disturbance in the CEA to 58,444 acres or 10 percent of the CEA.

The reasonably foreseeable future disturbances quantified in **Table 5.1-2**, with the addition of the Hooper Springs Power Line, total 8,430 acres. When added to the past and present disturbances, these future disturbances would increase the disturbance of lands in the CEA to 12 percent (66,874 acres disturbed out of 563,385 total acres). Adding the potential new vegetation disturbance of the Proposed Action (468 acres) or the RCA (541 acres) to that total increases the overall percent of disturbance by less than 0.1 percent, a negligible amount relative to the size of the CEA.

5.8.6 Cumulative Effects

Because the area is used as linkage habitat, the primary cumulative effect of the Proposed Action or RCA on the Canada lynx would be disruption of lynx movement through the linkage area. The Proposed Action or the RCA would potentially create a barrier to movement that would add to the effects of other barriers in the CEA such as roads, railroads, agriculture, and urban development. However, neither the Proposed Action nor the RCA would involve the construction of a highway or other long, linear feature that would preclude lynx from moving through the linkage area. It is likely that lynx and other sensitive carnivores, such as gray wolves and wolverines, would navigate around the periphery of the mine during active mining. In addition, most mine features would be reclaimed, so there would be no long-term blockage of movement through the linkage area.

Cumulative effects to the greater sage-grouse and other shrubland-dependent sensitive species within the CEA include the continued loss and degradation of big sagebrush habitat through alteration of vegetation composition and structure related to livestock grazing, invasion of non-native plant species, and changes in fire cycles. Wildfires in sagebrush may result in the establishment of cheatgrass, which establishes quickly after fire and excludes native perennials, reducing habitat for sagebrush-dependent species such as the greater sage-grouse (Zouhar 2003). The Proposed Action or RCA would contribute to the long-term loss of sagebrush habitats and increase the potential for noxious weed invasion in the Study Area. However, BMPs would be implemented to minimize the potential for cumulative effects of noxious weeds (BMPs that would minimize noxious weed impacts include keeping mining disturbances to a minimum for as short a timeframe as possible, with overburden areas and pit backfill advancing in concert with the active pit; monitoring and controlling noxious weed infestations; using certified weed-free seed, mulch, and straw bales; and developing an annual noxious weed treatment plan).

Anthropogenic structures, such as roads, fences, and power lines, add to degradation of sagebrush habitat by directly removing and fragmenting contiguous blocks of sagebrush. However, the Proposed Action or RCA would only have a minor contribution to the loss and degradation of sagebrush in the CEA because the footprint of disturbance is comparatively small, most disturbed areas would be reclaimed and eventually return to shrubland, and the area that would be affected is not pristine sagebrush habitat to begin with (habitats in the Study Area are naturally patchy and already affected by livestock grazing). Under the RCA, mine disturbance would impact more forest, sagebrush, and high-elevation rangeland habitat. Therefore, cumulative effects on greater sage-grouse and other big sagebrush shrubland species would be greater under the Proposed Action than the RCA.

Cumulative effects to forest and riparian-dependent sensitive species within the CEA would occur from loss, fragmentation, and alteration of habitat associated with a variety of activities including agriculture, construction of roads and buildings, phosphate mining, timber harvest, and livestock grazing. Implementation of the Proposed Action or the RCA would disturb additional suitable forest and riparian habitat for special status species. Special status species may also be displaced into adjacent habitats, which could decrease survival rates of affected individuals to some degree and increase competition. Contribution to the cumulative impacts of habitat loss and displacement are expected to continue and increase in the future for the CEA and the southeastern Idaho region. The future trend would be the increasing displacement and disappearance of species from the region that require large tracts of relatively undisturbed forest and riparian habitat, such as the northern goshawk, boreal owl, and willow flycatcher. Other impacts to BLM and USFS special status species that might cause mortalities or large-scale avoidance of the region's high-activity areas include vehicle and power line collisions, increased noise, increased human activity, and degradation of water quality.

Past and present disturbances from roads and mining activities have resulted in fragmentation of special status species populations and their habitats in the CEA. Habitat fragmentation is of particular concern for special status species that are relatively immobile and unable to disperse between habitat patches (such as reptiles and amphibians). Fragmentation effects within the CEA have not been quantified by the land management agencies. Implementing the Proposed Action or RCA would result in additional fragmentation to wildlife habitat and could isolate populations of small, immobile wildlife, such as amphibians and reptiles. Habitat fragmentation effects would be lower under the RCA, which would consolidate some of the disturbance in an existing disturbed area.

Timber harvests, livestock grazing, and wildfires in the CEA are sources of habitat changes that affect forest and riparian-dependent special status species. The majority of habitat conversion from timber harvest is in the form of forest removal followed by reforestation with a short period of early seral conditions. This habitat conversion would cause mature forest-dependent special status species, such as the boreal owl, to disperse in search of new areas until the habitats once again became suitable through succession. The Proposed Action or RCA would incrementally add to disturbance of forest and riparian habitat in the CEA, and while most disturbed areas would be re-seeded, it is anticipated that upland shrubland communities would establish on reclaimed areas and that forest and riparian vegetation would not return. Of the two alternatives, the Proposed Action would have greater cumulative effects to riparian-dependent special status species (such as the willow flycatcher and calliope hummingbird) whereas the RCA would have greater cumulative effects to forest-dependent special status species (such as the northern goshawk, great gray owl, boreal owl, and flammulated owl).

Human presence tends to disturb many species of wildlife. Special status raptors residing in the CEA are particularly sensitive to human disturbance during the nesting season. Where possible, land management agencies have used seasonal closures and nest buffers to minimize disturbance to special status species. Mine construction and operation could cause special status species such as Canada lynx, wolverine, gray wolf, and raptors, which generally prefer areas free from anthropogenic noise and activity, to avoid the area of active mining. Special status carnivores would likely shift their travel corridors to route around the edge of the mine rather than directly through the mine. If individuals did move through the mine, they could be at risk of vehicle collision during times of heavy traffic along the haul road. Under the Proposed Action, special status raptors could be at further risk of mortality by colliding with the overhead power line. This risk would not be present under the RCA.

Other nearby phosphate mines exhibit increased concentrations of selenium and other metals in water, aquatic plants, aquatic invertebrates, and fish near the Study Area (Hamilton and Buhl 2003). Increasing concentrations of selenium in surface water and groundwater seeps and springs may lead to reduced reproductive success in the terrestrial and aquatic wildlife of the region including special status species. Selenium contamination from operating and reclaimed phosphate mines is expected to continue in the foreseeable future. New phosphate mines are likely to incorporate BMPs that limit the potential for selenium contamination of the environment, unlike past mines that were constructed without regard for selenium contamination (IDEQ 2006).

The Proposed Action is predicted to introduce measureable amounts of selenium, manganese, zinc, and nickel into surface waters fed by groundwater downgradient of the Study Area, where it could become available to special status wildlife species either by direct exposure or accumulation through the food chain. Under the Proposed Action, the direct effects of selenium exposure on special status species within the Study Area would be long-term and minor and within the CEA would be long-term and negligible. Cumulative effects from selenium and other COPCs would likely be greatest to relatively immobile species that directly depend on aquatic habitats and spend a large portion of their life cycle in the aquatic habitats downgradient of the Study Area, including the boreal toad, northern leopard frog, common garter snake, and Yellowstone cutthroat trout. The cumulative effects on aquatic habitats for the Proposed Action within the CEA would be long-term and minor.

The RCA, in comparison to the Proposed Action, would eliminate permanent external overburden piles downslope of the pit, which would eliminate the release of COPCs to surface water. There would be no cumulative effects to special status species from COPC exposure in surface waters under the RCA.

Overall, the Proposed Action would have greater cumulative effects to more special status species compared with the RCA because it would impact more species that depend on wetland and riparian habitats. These species include the bald eagle, willow flycatcher, calliope hummingbird, trumpeter swan, American white pelican, white-faced ibis, black tern, boreal toad, northern leopard frog, common garter snake, Yellowstone cutthroat trout, and northern leatherside chub. The RCA would avoid impacts to wetland and riparian habitats and would therefore have no cumulative effects to these species. However, the RCA would have greater cumulative effects to forest-dependent species including the flammulated owl, great gray owl, boreal owl, and northern goshawk. When combined with other disturbances in the CEA, both alternatives would have minor cumulative effects on species that use shrubland habitats, such as the Townsend's big-eared bat, peregrine falcon, prairie falcon, Columbian sharp-tailed grouse, and loggerhead shrike, and negligible cumulative effects to large carnivores including the Canada lynx, gray wolf, and wolverine. As discussed above, the Proposed Action would have relatively greater cumulative effects to species that are specifically dependent on big sagebrush, such as the greater sage-grouse, Brewer's sparrow, and sage sparrow.

Under the Proposed Action, reduction of impacts to threatened, endangered, and sensitive species habitat would include compensatory mitigation for impacts to wetlands under the CWA as well as mitigation for impacts quantified under the HEA. The CWA provides for compensatory mitigation for disturbances to wetlands. This mitigation typically dictates that disturbed wetlands are returned to pre-disturbance condition or replaced. Disturbances to upland (non-wetland) wildlife habitat within the Study Area have been quantified through the HEA process. Mitigation for upland wildlife habitat disturbances identified through the HEA analysis is not compulsory. Agrium has volunteered to mitigate some or all of these impacts identified in the HEA analysis. Agrium would mitigate the upland wildlife habitat through funding of project(s) that will improve wildlife habitat beyond its baseline condition. COPC impacts to surface water, and the associated threatened, endangered, and sensitive species habitat impacts, would not be mitigated in the Proposed Action.

Due to no anticipated wetland and non-wetland WOUS impacts, the RCA would not require compensatory mitigation under the CWA. Disturbances to upland (non-wetland) wildlife habitat within the Study Area have been quantified through the HEA process. Agrium has agreed to mitigate those impacts identified in the HEA analysis. In lieu of performing a mitigation project, Agrium has chosen to provide a fee to a third party such as a state natural resource management agency, foundation, or other appropriate organization. The amount of the in-lieu fee will be based on the estimated cost of a project to mitigate for wildlife habitat. The third party will use the fee to implement off-site wildlife habitat mitigation project(s), thus reducing the cumulative impact of the project.

Impacts to surface water and the associated threatened, endangered, and sensitive species habitat have been mitigated in development of the RCA by the elimination of the external overburden piles that were the source of impact under the Proposed Action. Removal of these piles has resulted in fully mitigating this impact.

Under the No Action Alternative, the Rasmussen Valley Mine would not be constructed, and there would be no cumulative effects to threatened, endangered, or sensitive species.

5.9 VISUAL RESOURCES

5.9.1 CEA Boundary

Cumulative effects were analyzed in the areas affected by past, present, and reasonably foreseeable future development activities. The CEA for visual resources is roughly equivalent to the CEA for geology, minerals, and paleontology (**Figure 5.1-1**). It encompasses a topographically discrete cluster of anticlines and synclines in the upper Blackfoot River and Bear

Lake watersheds. This area comprises the majority of the Southeast Idaho Phosphate District, including KPLAs in Bear Lake and Caribou Counties.

The CEA includes sensitive viewpoints from which the Proposed Action; the RCA; and other past, present, and foreseeable disturbances would potentially be observed. Sensitive viewpoints include public roads, recreation areas, and residential areas. Visual resources would not be affected beyond the CEA because of the topographic features and forested area that restrict line of sight of the KPLA.

5.9.2 Introduction

The CEA is within a region of generally north- to northwest-trending mountain ranges and broad valleys. The area is generally undeveloped other than for mining; however, man-made features that have resulted in visual modifications to the landscape include mining and exploration activities, oil and gas activities, roads, power lines, pipelines, range improvements, and rural residences. Although scenic variety exists in the densities, arrangements, and colors of vegetation, the landscapes are typical of those found in the CEA.

Cumulative effects to visual resources from other planned or foreseeable development activities near the Study Area would result from historical, existing, and future phosphate mining in the Rasmussen Valley area. Often, phosphate mining does not result in major impacts to visual resources because the disturbance areas are not readily visible to the general public. Most of the past, present, and foreseeable future phosphate mining activities in the KPLA are located within relatively remote areas, and are not readily visible from sensitive viewing areas, such as roads, recreation sites, or rural residences.

5.9.3 Past and Present Activities

Past and present developments in the CEA are primarily from rural land uses and management activities on USFS and BLM lands. The CEA is generally undeveloped other than for mining; visual modifications to the federal lands in the area have been in the form of timber cuts, roads, mining operations, range improvements, fence lines, power lines, recreation sites (campgrounds), and pipelines. Other visible modifications to the existing characteristic landscape on private lands include road construction, vegetation management and fuels treatments, power line and utility corridors (water and gas lines), communication sites, campgrounds, day use facilities, trailheads, hiking trails, fuel wood gathering, agricultural use, and private residences. Current management and private activities, which are taking place at the present time, are a continuation of existing uses.

Most of the land surface in the CEA, including the majority of the previously approved and existing mine areas, is federal land managed for the visual objectives for the USFS Visual Quality Objective (VQO) Modification and the BLM Visual Resource Management (VRM) Class III. BLM lands constitute a relatively small portion of the land within the CEA. Areas designated as VQO Modification or VRM Class III areas allow for considerable modification of the characteristic landscapes and typically are compatible with phosphate mining activities. With mitigation, mining activities can generally meet the VQOs for VQO Modification and VRM Class III areas.

5.9.4 Foreseeable Future Activities

Reasonably foreseeable disturbances (including the Proposed Action or the RCA) expected from agency-approved phosphate mining in the CEA are summarized in **Table 5.1-2** and shown on

Figure 5.1-1. Development of approved areas would result in effects to visual resources similar to past and present disturbances, but would include a larger area of affected landscape. Foreseeable future effects to the visual resources of the CEA are also likely to occur as a result of non-mining activities on public land administered by the USFS and BLM and recreational lands within the Blackfoot River WMA, including roads, power lines, pipelines, timber cuts, range improvements, and development of recreation sites (campgrounds). There would also be cumulative effects to visual resources from other types of planned or foreseeable activities, including development of rural residences or various other improvements on private lands. These types of activities would likely occur as a consequence of population and economic growth in the CEA, which would result in a proportionate increase in the public use of federal lands.

5.9.5 Cumulative Activities

A total of 13,454 acres of phosphate mining-related surface disturbance have been recognized for the Southeast Idaho Phosphate District (**Table 5.1-1**). The CEA includes five active phosphate mines (Blackfoot Bridge, Rasmussen Ridge Mines, Enoch Valley Mine, Lanes Creek Mine, and Smoky Canyon) and 23 previously approved phosphate mines.

The potential new disturbance from the Proposed Action (468 acres) or the RCA (541 acres) would increase the total phosphate mining-related surface disturbance within the CEA by 1.1 to 1.2 percent. The new mining activities would comply with the objectives of the USFS VQOs and the BLM VRMs.

5.9.6 Cumulative Effects

Under the Proposed Action or the RCA, phosphate mining activities would contribute to the cumulative visual effects associated with previously approved and existing phosphate mines in the CEA. These visual effects include roads, pit walls, landform changes from mining, and noticeable vegetation transition from native habitats. Under implementation of the Proposed Action or the RCA, effects to scenic quality would occur over a larger area as a result of additional industrial components and activities. The Proposed Action would extend the duration of visible mining-related disturbance in the CEA for an additional 5.8 years relative to the existing Rasmussen Ridge Mines. The RCA would extend the duration of visible mining-related disturbance an additional 7.1 years. It is likely that reclamation activities would occur at active mines throughout the CEA during the active mine life of the Rasmussen Valley Mine; therefore, there would be little or no net increase in the visibility of mining components and activities despite an increase in total surface disturbance within the CEA.

Future mining projects would likely impose the same types of adverse visual impacts as those described for the Proposed Action or the RCA, although, in response to public expectations and land use plan requirements, mine operators typically make a strong effort to design reclamation to reduce visual impacts, e.g., maximizing pit backfill and reducing residual pit walls, recontouring overburden piles and backfill, and maximizing revegetation. Economic and population growth would increase recreational uses of public lands in the CEA and would also increase the number of residents and recreationists who have a concern for scenic resources. An increase in viewers and increased phosphate mining disturbance in the CEA would increase opportunities for the public and local residents to view phosphate mining facilities and activities, including the Proposed Action or the RCA, from sensitive viewing areas. Under the Proposed Action or the RCA, the 1.2-percent increase in surface disturbance would result in a long-term and negligible increase in the extent of the visibility of phosphate mining components within the analysis area.

Under the No Action Alternative, the Rasmussen Valley Mine would not be constructed, and there would be no project-related cumulative effects to visual resources.

5.10 LAND USE, ACCESS, AND TRANSPORTATION

5.10.1 CEA Boundary

The analysis areas for transportation and access and for recreation are linked to the roads that provide access to the Study Area. The analysis area for transportation and access includes all areas where access to lands could be impacted by the Proposed Action or the RCA at the Rasmussen Valley Mine. Effects to transportation, access, and recreation can be more than the impacts related to maintenance or closure of roads and can include increased mine-related traffic that impedes access, increased need for road maintenance, or increased traffic noise that degrades the quality of recreation areas. The CEA for transportation and access includes those portions of Lanes Creek County Road and Blackfoot River Road from State Highway 34 near Wayan to the north to State Highway 34 near China Cap to the west and all minor roads branching from these (**Figure 5.10-1**). The CEA for recreation is all public lands in eastern Caribou County, but primarily those recreation opportunities that are accessed by the same roads that provide access to the Study Area.

The analysis area for grazing includes all grazing directly under the influence of the Rasmussen Valley Mine and potentially other allotments if grazing is displaced. The CEA for grazing includes the Rasmussen Valley Cattle Allotment (RVCA) that extends across large portions of the Study Area and the adjacent Henry Olsen Sheep and Goat Allotment (HOSGA) to the northeast.

5.10.2 Introduction

Impacts to uses of the land, including grazing, recreation, and access and transportation, are innately tied to a given location, and except in the cases of physically overlapping activities, do not present site-specific cumulative effects.

Impacts to land use and access in the CEA consist of loss of resources or loss of access to resources. Loss of a resource can be total because of destruction of the resource by mining, or partial because of alteration of the resource or its distribution because of changes in vegetation, drainage, or the locations of roads. Mining in the CEA is expected to be a finite activity that would be followed by reclamation; impacts to the use of lands would be temporary, with the majority of impacted lands returning to a pre-disturbance condition or productive land use potential in the long term.

Cumulative effects to grazing in the CEA occur primarily from mining and, to a lesser extent, from timber harvesting. In general, grazing is not allowed on active mine areas, livestock trailing is limited, and no watering is allowed in water control ponds or water flowing from mine overburden seeps. Depending on the reclamation methods, renewed grazing may not be allowed on a reclaimed mine site for several years after closure.

The principal recreation activity in the Study Area is hunting, primarily big game hunting, and to a lesser extent, upland game bird hunting. Cumulative effects to hunting occur from alteration of the habitat by mining or timber harvesting and from interruption of migration routes by new roads.

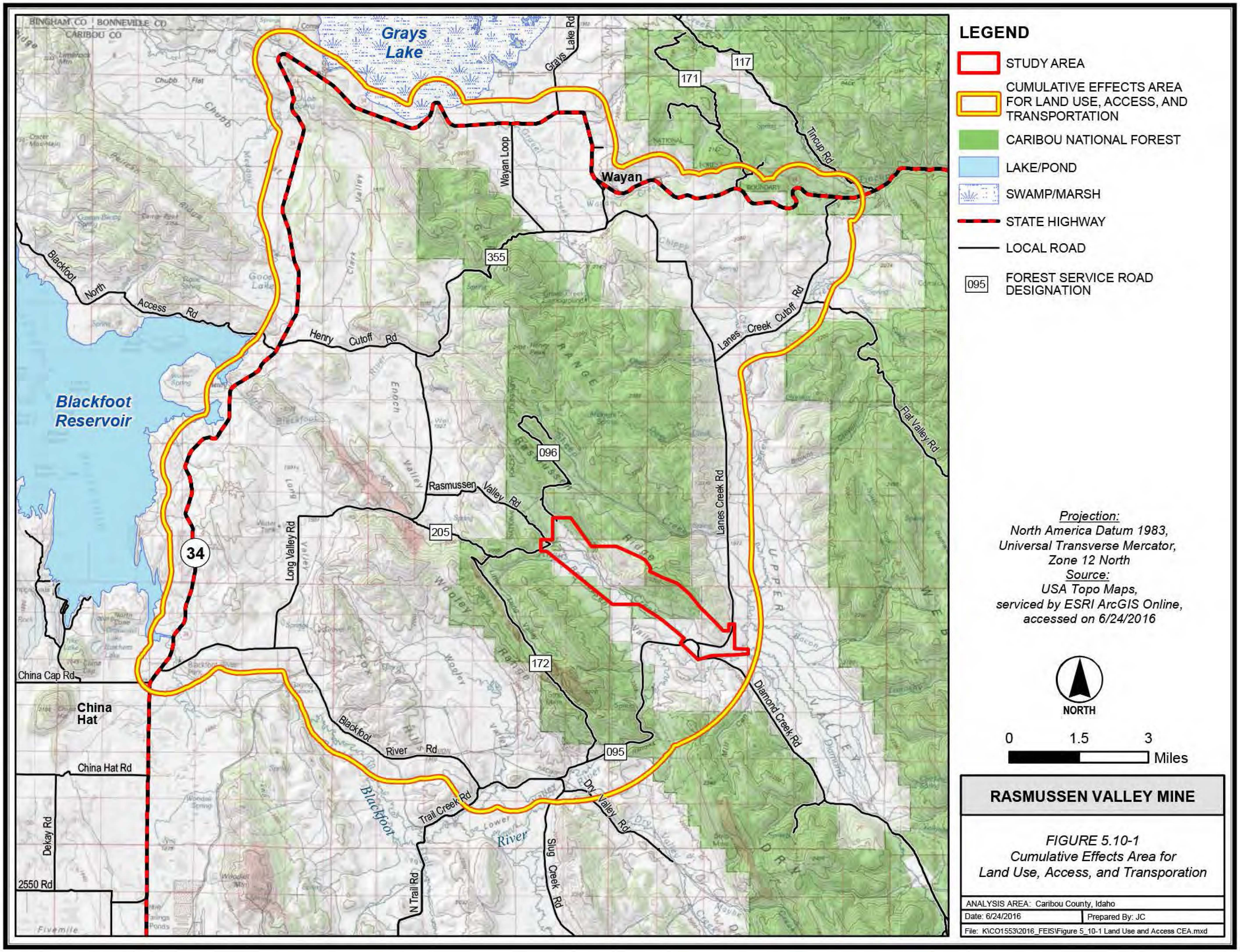

FIGURE 5.10-1
Cumulative Effects Area for Land Use, Access, and Transporation

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Other land uses in the general area of the CEA are mining and timber harvesting. The operation of this mine would dominate the land use during its operation and displace the opportunity for future mining because of the redistribution of mined minerals and overburden. The cumulative effect to timber harvesting would depend on the extent to which re-establishment of forest is inhibited by reclamation methods.

Cumulative effects to access and transportation would be influenced by the roads built and maintained for mining and those left in place after closure and reclamation. During mining and reclamation, these roads may be closed to public access, but some may be opened by surface owners or government agencies over time.

5.10.3 Past and Present Activities

The past and present activities in the vicinity of the Proposed Action or the RCA that could potentially have a cumulative effect are those described in **Section 3.10**. These activities, including grazing, recreation, phosphate mining, and the construction and use of roads and trails in the area, have shaped the land use seen in the CEA today.

5.10.4 Foreseeable Future Activities

The majority of foreseeable future activities as discussed above, like the Proposed Action or the RCA, would be continuations of activities that are currently taking place in the CEA, but would be in new locations. Of these foreseeable future activities, only the Lanes Creek Mine is located wholly or in large part within the CEA. The very northern portion of the Husky 1 North Dry Ridge Mine may extend into the very southeastern portion of the CEA. It is presumed that grazing would continue on usable public and private land in the CEA. This also represents a continuation of current activities in the CEA.

5.10.5 Cumulative Activities

Cumulative activities include all activities currently being conducted in the CEA, all activities conducted in the recent past whose effects may still be realized, and all foreseeable future activities as described above.

5.10.6 Cumulative Effects

Cumulative effects on the pattern of land use within the CEA (including grazing, recreation, and means of access) have occurred and would occur from past, present, and reasonably foreseeable future development activities. The cumulative effects that could occur would be the result of activities that are currently taking place in the CEA, but would be in new locations. As a result of the sequential nature of phosphate mining in the region, each new mine represents a continuation of existing mining activities and a continuation of existing effects.

Cumulative effects on transportation in the CEA may or may not be realized depending on the timing of the opening of future mines located wholly or in part in the CEA. If the Proposed Action or the RCA and the Lanes Creek Mine are in operation at the same time, traffic on roads in the CEA may increase. However, given the rural nature of the area and few residents, any increase in traffic would be a cumulatively short-term and minor effect.

Cumulative effects to the amount of land available for grazing could be realized within the CEA as lands affected by the Proposed Action or the RCA may not be reclaimed and made usable again for grazing before the start of future mining projects in the CEA. To partially mitigate the temporary displacement of grazing head-months (HMs) due to mining activity in the Angus Creek pasture of the RVCA, Agrium is proposing to provide water on the southwest side of the Little Long Valley pasture of the RVCA. The proposal is for Agrium to drill a water well, and the water would be pumped to water troughs. If a suitable place is not found for a well, Agrium would propose to place a pipeline from a well on Agrium's property and pump it to water troughs to be located on the southwest side of Little Long Valley pasture. The southwest side of the Little Long Valley pasture has limited grazing from livestock because of the lack of water and the Blackfoot River being fenced out. Some of the HMs temporarily lost in the Angus Creek pasture would be moved to the Little Long Valley pasture. This would decrease the economic impacts and affects to local ranchers. The Little Long Valley pasture would not be grazed beyond the capacity of the suitable rangeland within the pasture. The USFS grazing permits associated with the RVCA would not have a net increase in HMs. Agrium is also proposing to build a boundary fence on the south end of the Little Long Valley pasture in order to facilitate livestock using the southwest side of this pasture. No other specific mitigation measures for land use, access, and transportation have been proposed at this time. These effects would be long-term and minor given the small footprint of reasonably foreseeable projects in the CEA and the ongoing reclamation of past projects in the CEA.

Similarly, cumulative effects to the amount of land available for recreation could be realized within the CEA, as lands affected by the Proposed Action or the RCA may not be reclaimed and made available again for recreation before the start of future mining projects in the CEA. These effects would be long-term and negligible given the small footprint of the single reasonably foreseeable project located on public land in the CEA and the ongoing reclamation of past projects in the CEA.

In summary, the Proposed Action or the RCA, in addition to other existing and reasonably foreseeable projects in the CEA, would result in a continuation of existing land use- and traffic-related effects, often in new locations. These effects would be long-term and minor.

Under the No Action Alternative, the Rasmussen Valley Mine would not be constructed, and there would be no effects to land use, access, or transportation.

5.11 CULTURAL RESOURCES

5.11.1 CEA Boundary

Private and public lands within and near the Proposed Action have been assessed for the presence of historic properties that could be affected. The CEA for cultural resources includes that area affected by past, present, and reasonably foreseeable future development activities within the Survey Area and a 1-mile radius around it. A 1-mile radius is a conventional buffer to provide a more complete context for cultural resource sites in the vicinity. Cumulative effects are addressed in terms of adverse effect to historic properties within the Survey Area added to those in adjacent areas of the CEA.

5.11.2 Introduction

Twenty-nine previous cultural resource investigations that have included portions of the cultural resources CEA have reported 26 cultural resource sites and 13 isolated finds within the CEA. These are summarized in **Section 3.11.3**. All of these resources have been evaluated as not eligible for the National Register of Historic Places (NRHP). No historic properties have been identified by intensive cultural resource surveys conducted in the CEA (Späth 2012). Therefore, there would be no effect to historic properties and no need for protection or mitigation.

5.11.3 Past and Present Activities

There are known past and present ground disturbances in the CEA, including portions of the existing South Rasmussen Mine to the north and the recently reopened Lanes Creek Mine to the east, that have potentially affected historic properties. Within the general area, there are other past and present phosphate mines, including the Wooley Valley Mine to the west, and Rasmussen Ridge Mines, South Rasmussen Mine, and nearby Enoch Valley Mine to the north that may also have affected cultural resources. However, no adverse effects to historic properties have been documented. The areas that have been extensively disturbed are primarily located on rugged hillsides that are unattractive for sustained historic or prehistoric occupation and are marginal for ranching. The areas also do not hold precious metal deposits that could have attracted early metal mining. Historic and prehistoric sites in the region, including emigrant trails, occur along the river valleys and in lower, more open terrain with access to reliable sources of water. Historic disturbances have been more extensive to the south along natural travel corridors, through Soda Springs, and to the north in the Caribou Mountains area associated with periodic mining booms from the 1860s to 1920.

5.11.4 Foreseeable Future Activities

Reasonably foreseeable future disturbances in the Study Area are the Proposed Action or the RCA and associated activities. There are undeveloped phosphate leases to the south at North Dry Ridge and others east and west of Diamond Creek. There are plans for developing the Husky 1 lease, which may be associated with activities at North Dry Ridge. There are no proposed or anticipated changes in recreational activities in the area or any expectation of residential developments that would affect historic properties.

5.11.5 Cumulative Activities

Past, present, and reasonably foreseeable disturbance to cultural resources in the Study Area have been and would be associated with mining. There has been no known disturbance to historic properties. The Proposed Action or the RCA, if developed to the maximum extent of disturbance, would not affect any historic properties and would not contribute cumulatively to adverse effects to historic properties. If any undocumented historic properties are discovered during development, operation, or reclamation of the mine, these resources would be avoided and protected. If the site cannot be avoided and protected, a treatment plan would be developed in consultation with CTNF and the State Historic Preservation Office (SHPO) to mitigate adverse impacts to the site.

5.11.6 Cumulative Effects

Section 106 of the National Historic Preservation Act (NHPA) requires consideration of the effects of federal actions to historic properties. No historic properties have been identified within the CEA of the Proposed Action or the RCA. Neither the Proposed Action nor the RCA would have adverse effects to historic properties. Therefore, neither the Proposed Action nor the RCA would contribute to cumulative impacts to historic properties in combination with past, present, and reasonably foreseeable future activities in the CEA.

Under the No Action Alternative, the Rasmussen Valley Mine would not be constructed, and there would be no project-related cumulative effects to cultural or historic properties in the Study Area.

5.12 TRIBAL TREATY RIGHTS AND INTERESTS

5.12.1 CEA Boundary

The Tribes retain and exercise treaty rights on unoccupied public lands. Private and public lands within the cultural resource Survey Area were assessed for traditional tribal interests.

The CEA for tribal treaty rights and interests includes that portion of the Southeast Idaho Phosphate District on public lands in Caribou and Bear Lake Counties. These areas are almost entirely within the upper Blackfoot River and upper Bear River drainage basins. The area extends into a small portion of the Salt River drainage near the Wyoming state line. This CEA does not include all areas of tribal treaty rights and interests in southeast Idaho, but only those areas that have been or may be affected by past, present, or reasonably foreseeable future phosphate mining and associated activities. To the extent that data are available on effects to tribal treaty rights and interests, the past, present, and reasonably foreseeable future actions would include those identified by the Agencies from the expansion of phosphate mining in the 1970s to currently planned and validated future activities. In general, documentation of effects to Native American interests and concerns has been more consistent and complete since the passage of the Native American Graves Protection and Repatriation Act (NAGPRA) in 1990, and much of the earlier information may not be comparable.

5.12.2 Introduction

Federal land managers have a responsibility to consider effects on resources essential for the Tribes to exercise their treaty rights on public lands and a responsibility to manage and maintain the habitat of traditionally utilized natural resources in a viable and sustainable condition. Over the years, the ability of the Tribes to practice their traditional culture on these lands has been reduced by loss of unoccupied lands through loss or conversion of vegetation and wildlife habitat from phosphate mining and degradation of the resources valued by the Tribes. The Study Area includes a relatively small area of unoccupied public land in comparison to the extent of National Forests and BLM lands in the region. Nevertheless, the incremental loss of lands constitutes a cumulative impact.

5.12.3 Past and Present Activities

Past and present impacts to traditional resources include access restrictions and land disposals or exchanges that have reduced the availability of unoccupied lands for exercising tribal treaty rights. Fire suppression, mining, grazing, and timber harvest have altered or restricted access to areas of unoccupied public lands, have changed the vegetation, and in some areas, have affected water quality. In southeast Idaho, past mining alone has disturbed 17,875 acres since 1947. A large portion of these lands has been revegetated by reclamation activities. However, habitats have been altered or otherwise changed, affecting tribal hunting and gathering activities. The full impact to natural resources utilized by Indian Tribes is not known at this time.

5.12.4 Foreseeable Future Activities

Reasonably foreseeable future disturbances in the CEA would result from the Proposed Action or the RCA and associated activities. Mining plans currently being processed could result in more than 5,800 acres of additional disturbance in southeast Idaho. During mining, many traditional natural resources would be destroyed, and access to others would be impeded by the mine. Mining would continue until the approved ore reserves are depleted, and reclamation of the mined areas would take many years. Unique or non-renewable traditional resources have not been identified in the Study Area. The mined areas would be reclaimed, and there would not be a permanent loss of access to resources and the ability to exercise treaty rights.

5.12.5 Cumulative Activities

In recent years, the cumulative impacts to natural resources on unoccupied federal lands have slowed, and more coordinated efforts have been directed to reclamation and restoration of the resources. Federal and state agencies are enhancing native fish and wildlife habitat, and these collective efforts to improve the condition of natural resources contribute to the protection and restoration of tribal treaty rights. Appropriate mitigation measures and environmental protection measures (such as reclamation, stormwater and sediment control, groundwater and surface water sampling, or monitoring), which are protective of natural resources, are required and implemented for ongoing and future mining projects. These would continue.

5.12.6 Cumulative Effects

As outlined in **Section 3.12**, the federal government has a unique trust relationship with federally recognized American Indian tribes including the Shoshone and Bannock Tribes. The BLM and the CTNF have a responsibility and obligation to consider and consult on potential effects to natural resources related to the Tribes' treaty rights, uses, and interests under the federal laws, EOs, and the 1868 Fort Bridger Treaty between the U.S. and the Shoshone and Bannock Tribes (U.S. Congress 1868). In addition, the NHPA and its implementing regulations (36 CFR 800), the American Indian Religious Freedom Act (AIRFA), EO 13175: Consultation and Coordination with Indian Tribal Governments, and EO No. 13007: "Indian Sacred Sites" contain requirements for consulting with tribes on the potential effects of federal actions on tribal interests. The NAGPRA requires that concerned tribes be consulted if human remains that may be Native American or objects of cultural patrimony are discovered. Resources or issues of interest to the Tribes that could involve their traditional use or treaty rights include tribal historic and archaeological sites, sacred sites and traditional cultural properties (TCPs), traditional use sites, fisheries, traditional use plants (including culturally significant plant species) and animal species, vegetation (including noxious and invasive, non-native species), air and water quality, wildlife, access to lands and continued availability of traditional resources, land status, and the visual quality of the environment.

There are currently no generally accepted measures to address the temporary and long-term loss of the exercise of tribal treaty rights. The inability to exercise treaty rights is important to the Shoshone and Bannock Tribes and potentially affects all Tribal members. Consultation is ongoing between the Tribes and federal land managing agencies to address the most effective and practical ways to protect and restore traditional resources and assure the continued exercise of tribal treaty rights.

The EIS can generally assign a quantification (context, duration, and intensity), as required by the CEQ, to the impacts to resources such as wildlife or water quality. However, it is difficult to quantify the impact of a temporary loss of a right. Consultation that has occurred to date with the Shoshone and Bannock Tribes is described in **Section 1.6.2**. During consultations for this EIS, the Shoshone and Bannock Tribes stated that any loss of Tribal treaty rights is significant to them and could potentially affect all Tribal members.

Both the Proposed Action and the RCA would result in long-term partial or complete loss of access to some traditional resources on public lands where treaty rights exist as a result of mining and during initial reclamation. This loss of access to traditional resources on public lands would contribute to the cumulative loss of Tribal access to these traditional resources. Over time, access to unoccupied public lands and many resources would be restored. Many valued and traditional resources including culturally significant plant species and wildlife habitat would be reclaimed or replaced. However, the spiritual values of "sogobia" (Mother Earth) are non-renewable.

Under the No Action Alternative, the Rasmussen Valley Mine would not be constructed, and there would be no project-related cumulative effects on traditional resources in the Study Area.

5.13 SOCIAL AND ECONOMIC CONDITIONS

5.13.1 CEA Boundary

The CEA for social and economic conditions encompasses Caribou, Bear Lake, and Bannock Counties in Idaho, and Lincoln County (Star Valley area) in Wyoming (**Figure 5.13-1**). The two phosphate processing facilities (P4 Monsanto Plant and Agrium Conda Phosphate Operations) and the majority of the phosphate mines in the Southeast Idaho Phosphate District are in Caribou and Bear Lake Counties, Idaho. Because of the concentration of activity and employment in Caribou County, cumulative effects would be most strongly realized in Caribou County, with lesser effects felt in Bear Lake, Bannock, and Lincoln Counties.

5.13.2 Introduction

The types of cumulative effects that could occur to social and economic conditions in the CEA would primarily be from a loss of economic activity under the No Action Alternative. Because the Proposed Action or the RCA constitute continuation of activities that are currently taking place in the CEA, but would be in new locations, it is not anticipated that there would be any increases in the populations of the CEA counties as a result of the Proposed Action or the RCA; therefore, there would be no additive, cumulative effect to housing, community services, and infrastructure from the Proposed Action or the RCA.

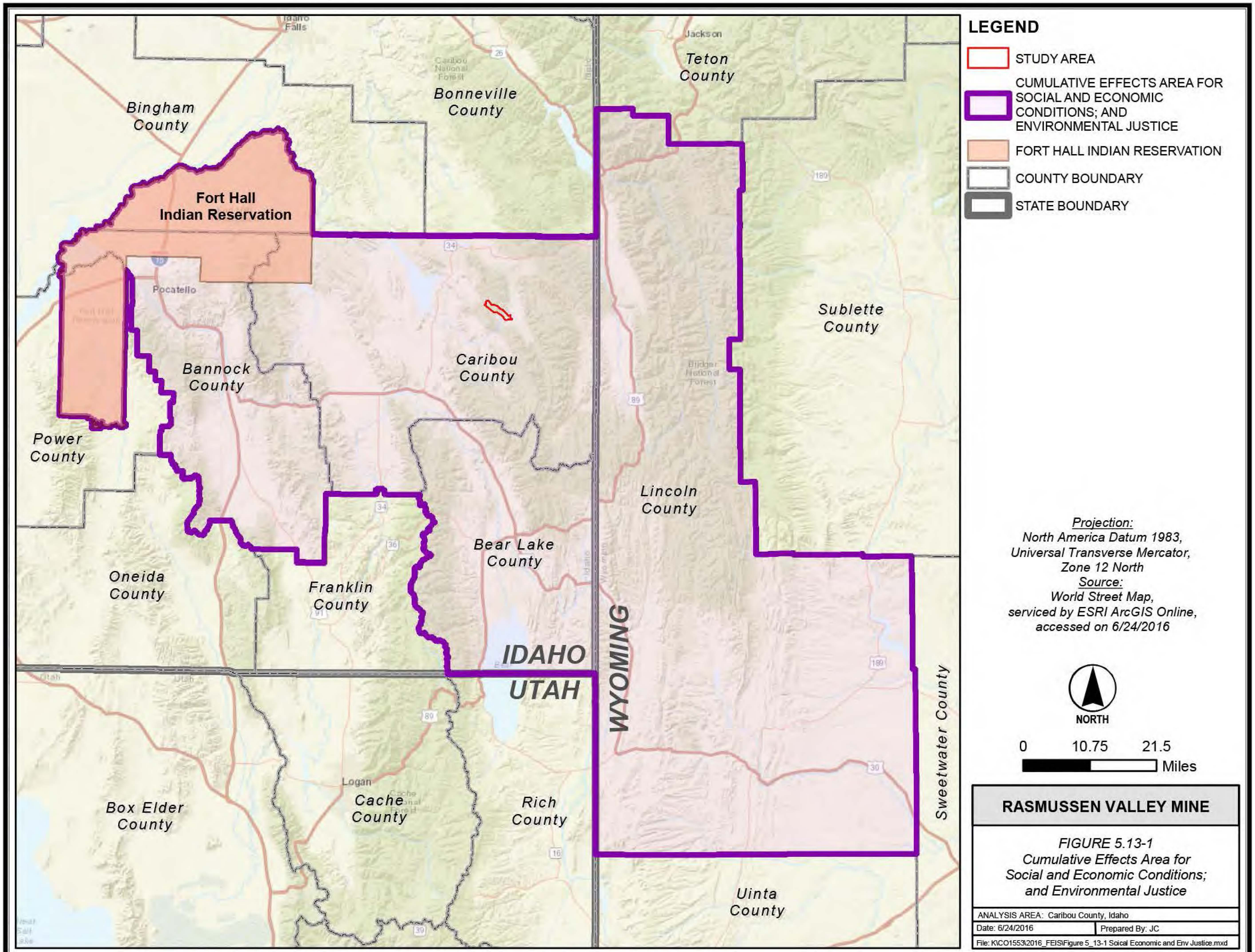
Local economic activity has increased and diversified in recent years, and such diversification may continue into the future. However, phosphate mining and ore processing will likely continue to anchor the economies of Caribou and Lincoln Counties.

5.13.3 Past and Present Activities

The contribution of past and present phosphate mining and related processing plants to local economies within the CEA has been major in terms of employment and revenues earned from tax collections, purchasing, and value-added phosphorus products. The active phosphate mines, as well as previously approved mines, are part of the economic base of the CEA that stimulates the growth of other economic sectors through a multiplier effect as described in **Chapter 4**. Contributions to local economies from increased employment and addition of workforce payroll to local economies have benefitted Bannock and Lincoln Counties; however, no phosphate mines are located in these counties. Therefore, revenues earned from tax collections and equipment purchases have occurred primarily in Caribou and Bear Lake Counties.

5.13.4 Foreseeable Future Activities

The majority of foreseeable future activities as discussed above, like the Proposed Action or the RCA, would be continuations of activities that are currently taking place in the CEA, but would be in new locations. The only identified non-phosphate mining-related foreseeable future activity (a proposed power line) would be short-term in nature, and would have no long-term socioeconomic impact in the CEA.



RASMUSSEN VALLEY MINE

FIGURE 5.13-1
Cumulative Effects Area for Social and Economic Conditions; and Environmental Justice

ANALYSIS AREA: Caribou County, Idaho
Date: 6/24/2016 | Prepared By: JC
File: K\CO1553\2016_FEIS\Figure 5_13-1 Soical Economic and Env Justice.mxd

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5.13.5 Cumulative Activities

Cumulative activities include all activities currently being conducted in the CEA, all activities conducted in the recent past whose effects may still be realized, and all foreseeable future activities as described above.

5.13.6 Cumulative Effects

Cumulative effects on the social and economic structure within the CEA have occurred and would occur from past, present, and reasonably foreseeable development activities. These effects have occurred primarily in Caribou County in terms of tax revenues and purchases of equipment and other services; however, all CEA counties have and may continue to benefit from employment. The cumulative effects (both negative and positive) have been substantial and have the potential to continue.

The Proposed Action or the RCA, in addition to other existing and reasonably foreseeable phosphate mining projects, would prolong the economic benefits associated with phosphate mining and ore processing as described in **Chapter 4**. There is a trend to the development of low-density residential areas, sometimes on privately owned agricultural lands. This has a cumulative effect on the lands outside population centers. However, this land use change is not related to the Proposed Action or the RCA. It is not anticipated that there would be any increases in the populations of the CEA counties as a result of the Proposed Action or the RCA; therefore, there would be no additive, cumulative effect to housing, community services, and infrastructure from the Proposed Action or the RCA. The cumulative effects on social and economic conditions would be positive, short-term, and major.

Under the No Action Alternative, the Rasmussen Valley Mine would not be constructed, and there would be no economic benefit from extending mining operation from the Rasmussen Ridge Mines to the Rasmussen Valley Mine. Overall impacts of the No Action Alternative to social and economic conditions would be adverse, long-term, and major.

5.14 ENVIRONMENTAL JUSTICE

5.14.1 CEA Boundary

The analysis area for the potential health risks of the Proposed Action or the RCA for minority and low-income populations would be limited to the mining-influenced area in the vicinity of the Rasmussen Valley Mine. The analysis area for disproportionate social and economic effects will be based on the U.S. Census Block (USCB) Group that contains the mine area. The smallest census unit for which both ethnic and poverty data are available is the Block Group. Therefore, the Block Group is the basic geographic unit of comparison for social and economic factors considered in environmental justice. Census data from the Block Group are compared to equivalent quantitative data for Caribou County to assess whether there are concentrations of minority or low-income populations in the Block Group relative to the county. This analysis is based on impacts to minority and low-income populations compared to the No Action Alternative.

The CEA for environmental justice encompasses Caribou, Bear Lake, and Bannock Counties in Idaho, and Lincoln County (Star Valley area) in Wyoming (**Figure 5.13-1**). Most of the phosphate mines and processing facilities in the Southeast Idaho Phosphate District are in Caribou County, Idaho, with one mine in Bear Lake County; however, employees are located within the four-county area.

5.14.2 Introduction

The types of effects that could occur to minority and low-income populations in the CEA would primarily be from potential adverse environmental impacts of phosphate and other mineral resource exploration and development.

5.14.3 Past and Present Activities

As presented in **Section 4.14**, there are no communities in the vicinity of the Rasmussen Valley Mine that are minority as a whole or that are low-income as a whole. Therefore, none have been exposed to high and adverse environmental impacts as a result of the Proposed Action.

5.14.4 Foreseeable Future Activities

As presented in **Section 4.14**, there are no communities in the vicinity of the Rasmussen Valley Mine that are minority as a whole or are low-income as a whole. Therefore, none would be exposed to high and adverse environmental impacts as a result of foreseeable future actions.

5.14.5 Cumulative Activities

As presented in **Section 4.14**, there are no communities in the vicinity of the Proposed Action that are minority as a whole or that are low-income as a whole. Therefore, none have been, are, or would be exposed to high and adverse environmental impacts as a result of cumulative activities.

5.14.6 Cumulative Effects

As presented in **Section 4.14**, there are no communities in the vicinity of the Rasmussen Valley Mine that are minority as a whole or that are low-income as a whole. Therefore, none would be exposed to high and adverse environmental impacts as a result of implementation of the Proposed Action or the RCA. Therefore, the Proposed Action or the RCA would not contribute to any potential cumulative effect on these populations.

Under the No Action Alternative, the Rasmussen Valley Mine would not be constructed, and there would be no cumulative effects to minority populations in the area.

5.15 HAZARDOUS MATERIALS AND SOLID WASTE

5.15.1 CEA Boundary

The analysis area for the Proposed Action and alternatives includes the Study Area and those potentially affected areas downstream or downgradient of the project. The CEA for cumulative effects associated with hazardous and solid waste is the Southeast Idaho Phosphate District, including KPLAs, in Bear Lake and Caribou Counties, Idaho. Caribou and Bear Lake Counties contain most of the southeastern Idaho phosphate mines and processing facilities.

5.15.2 Introduction

Cumulative effects associated with hazardous materials and wastes from other planned or foreseeable development activities near the Study Area would result from historical, existing, and future phosphate mining in the Rasmussen Valley area. Hazardous and solid waste generated by the mine would be transported by contractors to agency-approved landfill facilities. Under the Proposed Action or RCA, the transport, storage, use, and disposal hazardous materials and wastes would be required to comply with existing local, state, and federal regulations.

5.15.3 Past and Present Activities

Phosphate mining and exploration have been ongoing in the region since 1912. Numerous active, abandoned, idled, or reclaimed phosphate mines are found in the region. Ongoing BLM-approved mining and exploration activities within the Study Area require the use of hazardous materials and result in the generation of industrial, non-hazardous solid wastes, as well as hazardous wastes. The Resource Conservation and Recovery Act (RCRA) and solid waste laws and regulations apply to these wastes. However, overburden produced from mine operations is exempted from hazardous and solid waste regulations. Mining and exploration activities also typically use diesel fuel, gasoline, and lubricating grease; solvents; and other chemicals and materials. Hazardous materials and solid wastes are managed and controlled under current regulations and BMPs.

In addition to mining, major past and present land uses occurring in parts of the CEA include agriculture and residential development. Agricultural activities and residential development on private lands have also generated hazardous and solid wastes. Private landowners typically contract with private waste management specialists for waste transport and disposal.

5.15.4 Foreseeable Future Activities

Twenty-six previously approved and active phosphate mine sites are within the CEA (**Table 5.1-1**). In addition to wastes directly related to the production of phosphate rock, such as overburden (not considered a hazardous waste), mining activities in the CEA would generate other maintenance wastes that may include used petroleum products, other hazardous wastes from equipment maintenance, trash, and debris. These wastes would be recycled or hauled to appropriate landfills and other disposal sites.

5.15.5 Cumulative Activities

Past, present, and reasonably foreseeable future phosphate mining projects in the CEA require the use of hazardous materials and generation of hazardous and solid waste on federal lands. Development on private lands has also generated hazardous and solid wastes. Under the Proposed Action or the RCA, hazardous materials would continue to be used and wastes generated at rates similar to those at the existing Rasmussen Ridge Mines. Management practices for hazardous materials and wastes would continue in the same manner as currently implemented at Rasmussen Ridge Mines.

Under the Proposed Action or the RCA, the primary routes for transporting hazardous materials from Soda Springs to the Study Area are State Highway 34, Blackfoot River Road, and Rasmussen Valley Road. These are the same transport routes as those used by the existing Rasmussen Ridge Mines.

5.15.6 Cumulative Effects

Any past chemical or petroleum spills have been managed. Present and reasonably foreseeable future activities carry the potential for chemical and petroleum spills. Under the Proposed Action or the RCA, fuels, hazardous materials, and wastes would be transported, stored, and managed in accordance with federal, state, and local regulations. An accidental spill or release of hazardous materials or wastes is unlikely to pose environmental or public health and safety risks.

Under the Proposed Action or the RCA, there would be little or no net increase in the quantities of materials used or wastes generated relative to what is currently managed at the Rasmussen Ridge Mines. The Caribou County Landfill is located in Soda Springs; however, within an eight-county district in southeastern Idaho, there are 22 landfills comprising seven municipal landfills and 15 non-municipal landfills (Southeastern District Health Department 2009). Therefore, the disposal of solid waste from phosphate mines in southeast Idaho would not consume the capacity of any single landfill. Given the existing regulatory framework for transporters, hazardous material and waste storage facilities, and waste disposal, storage capacity for disposal at the Proposed Action or RCA, in combination with the other projects, is readily available and would have negligible effects on hazardous materials and wastes generation and management.

Under the No Action Alternative, the Rasmussen Valley Mine would not be constructed, and no new materials would be used or wastes generated.

CHAPTER 6
CONSULTATION AND COORDINATION

6.1 PUBLIC PARTICIPATION

Initial issues and indicators to be considered in the environmental impact assessment are identified through public and agency scoping.

6.1.1 Public Scoping Process

Public scoping for the Rasmussen Valley Mine Project was conducted in March 2011 to identify issues and concerns with the Proposed Action to be analyzed in the Draft Environmental Impact Statement (Draft EIS). The 30-day public scoping period for the Draft EIS formally began on March 1, 2011. On that date, the U.S. Bureau of Land Management (BLM) published a Notice of Intent (NOI) to prepare an EIS in the *Federal Register* (Vol. 76, No. 40, page 11259). The public scoping period was initiated by the publication of the NOI announcing that the BLM and the U.S. Forest Service (USFS) were soliciting public comments on the Proposed Action. The NOI announced the Agencies' intent to conduct an environmental analysis of Agrium's proposal to mine phosphate on their Rasmussen Valley Federal Phosphate Lease.

On March 4, 2011, the BLM and the USFS published a public notice in the *Caribou County Sun* and the *Idaho State Journal*. The public notice announced the BLM and USFS intent to conduct an environmental analysis of the proposed Rasmussen Valley Mine (the Proposed Action) and the dates and locations of three scheduled public meetings to solicit and receive comments. The dates, locations, and results of these scheduled public meetings are discussed in **Section 6.2**. It was also announced that the period for submitting written comments for public scoping would end on March 31, 2011. In addition, a Scoping Notice was prepared and mailed to all persons and organizations on the project mailing list. The project mailing list is included as Appendix D of the Scoping Summary (Arcadis 2011). A total of 523 notices were mailed. Recipients included 152 individuals and 371 companies, agencies, offices, organizations, or their representatives. In many cases, several individuals within a company, agency, office, or organization received separate notices.

6.1.2 Agency Scoping Process

In July 2011, agency scoping was conducted that included the BLM, the USFS, the Idaho Department of Environmental Quality (IDEQ), the U.S. Army Corps of Engineers (USACE), the Idaho Department of Fish and Game (IDFG), and the U.S. Fish and Wildlife Service (USFWS) to discuss issues identified through public scoping in March 2011 and to discuss agency issues and indicators that should be considered for the Rasmussen Valley Mine Project. Following this meeting, the Interdisciplinary Team (IDT) and the third-party contractor (Arcadis) provided additional issues and indicators, which were presented to Agency Management in November 2011. These issues and indicators were then presented to Agrium and Brown and Caldwell (BC) in December 2011.

6.2 PUBLIC INPUT

Three public meetings were held on consecutive evenings (March 21, 22, and 23, 2011) in Soda Springs, Pocatello, and Fort Hall (respectively) to discuss the Proposed Action and receive comments from the public. The meetings were held from 7:00 p.m. to 9:00 p.m. each evening at the Soda Springs City Hall in Soda Springs, the BLM Pocatello Field Office (PFO) in Pocatello, and the Council Chambers in Fort Hall. The meetings were conducted in an open house style, with representatives of the Agencies, Agrium, and the third-party EIS contractor (Arcadis) in attendance. Attendees could arrive at each public meeting between specified hours; view informational display boards; and at different stations throughout the room, speak one-on-one with Project representatives. A total of 40 individuals in addition to representatives of Agrium, the agencies, and Arcadis signed in at those three meetings. During the 30-day public comment period following the NOI, 1,509 letters and emails were received. These included 144 unique responses and 1,365 form letter responses. Public comments ranged from simple expressions of opposition or support to extensive discussions of multiple potential issues. The issues identified in public comments and derived from initial agency scoping are listed in the Scoping Summary (Arcadis 2011) and in **Section 1.6.1** of this document. The comment letters, form letters, and e-mails are tabulated and discussed in more detail in the Scoping Summary (Arcadis 2011).

6.2.1 Distribution of Draft EIS and Public Comments

On September 18, 2015, notifications that the Draft EIS was available were distributed to government offices, tribes, educational institutions, public media, organizations, businesses, and interested individuals listed in **Section 6.5**. A notice of availability (NOA) was also published in the *Federal Register*. Those groups and individuals that had previously indicated that they wanted copies of the Draft EIS were sent electronic or hard copies of the Draft EIS. The public was allowed 45 days to respond with their comments on the Draft EIS. The 45-day comment period was scheduled to end November 2, 2015. In addition, public meetings were held on October 6 and 7, 2015 at the BLM PFO in Pocatello and at the USFS Soda Springs Ranger District in Soda Springs, Idaho.

6.2.2 Response to Public Comments

A total of 1,010 comment letters were received. Many of the 1,010 comment letters contained more than one comment, resulting in a total of 1,295 comments on the Draft EIS. A list of these comments and associated letters, emails, and handwritten comments received at the public meetings was distributed to Agrium, the Agencies, and subject matter experts for responses. Responses to those comments are compiled in **Appendix A**. All of the comments on the Draft EIS received by the close of the comment period were processed on behalf of the BLM by the Content Analysis Team at Arcadis. Public input on the Draft EIS was documented and analyzed using a process called “content analysis”, which is a systematic method of compiling and categorizing the full range of public viewpoints and concerns regarding a plan or project. This process is discussed in more detail in **Appendix A**. In addition, in response to public comments, portions of the EIS were revised to clarify issues or add important details. These are incorporated into the current Final EIS.

6.3 GOVERNMENT-TO-GOVERNMENT CONSULTATION

Tribal concerns and interests for specific projects revolve around impacts to their tribal treaty rights and trust resources. The 1868 Fort Bridger Treaty, between the United States and the Shoshone and Bannock Tribes, reserves the Tribes right to hunt, fish, gather, and exercise other traditional uses and practices on unoccupied federal lands. In addition to these rights, the Shoshone-Bannock Tribes have the right to graze tribal livestock and cut timber for tribal use on those lands of the original Fort Hall Reservation that were ceded to the federal government under the Agreement of February 5, 1898, ratified by the Act of June 6, 1900.

Under this treaty and those agreements, the federal government has a unique trust relationship with the Shoshone-Bannock Tribes. BLM has a responsibility and obligation to protect Tribal treaty rights and trust resources, and to consider and consult on potential effects to natural resources related to the Tribes' treaty rights or cultural use.

The National Historic Preservation Act (NHPA) and its implementing regulations (36 Code of Federal Regulations [CFR] 800) require consultation with federally recognized Indian tribes to identify traditional cultural properties (TCPs) and consider potential effects on such properties resulting from a federal undertaking. TCPs are cultural sites of religious or cultural importance that may also be eligible for the NRHP because of their importance in the traditions and cultural identity of a cultural group. In addition, the American Indian Religious Freedom Act (AIRFA), Executive Order (EO) 13175: Consultation and Coordination with Indian Tribal Governments, and E.O. No. 13007: "Indian Sacred Sites" contain requirements for consulting with tribes on the potential effects of federal undertakings on tribal interests. Areas of traditional use may include areas used to gather plants, animals, or fish for subsistence or for ceremonial or medicinal purposes. National Register Bulletin No. 38 provides guidance for identification and evaluation of such TCPs and traditional use areas.

Consultation with the Fort Hall Business Council of the Shoshone-Bannock Tribes is required on land management activities and land allocations that could affect public land uses and access to the land by Tribal members. The goal of this consultation and coordination is to ensure that tribal governments, Native American communities, and individuals whose interests may be affected have a sufficient opportunity for productive participation in BLM resources management decision-making. To ensure a thorough assessment of issues and potential impacts to Native American Indians and their treaty rights, numerous contacts were made with the Shoshone-Bannock Tribes at various levels with the Tribal technical staff. Coordination with the Tribes continued throughout the EIS process.

The BLM met with Tribal staff on January 10, 2011 to present an overview of this Proposed Action and the EIS process. At that time, the Tribal staff expressed interest in following the Proposed Action and being kept updated on its progress. Another meeting was held with Tribal staff at the BLM PFO on February 9, 2012. The BLM presented an overview and status of the Rasmussen Valley Mine EIS. The Tribal participants did not identify any issues or provide substantive comments at that meeting. The status of other ongoing mining activity and exploration applications was also reviewed at the meeting. Subsequent meetings of the BLM and Tribal staff have taken place on February 20, 2013, January 15, 2014, November 18, 2014, October 9, 2015, February 26, 2016, and March 3, 2016. Consultation has continued throughout the decision-making process.

6.4 LIST OF PREPARERS AND REVIEWERS

This Final EIS was prepared jointly by the BLM, PFO, and the USFS Caribou-Targhee National Forest (CTNF), in cooperation with the IDEQ and the Walla Walla District of the USACE. Cooperating agencies have other permitting authorities for the Proposed Action. Participating agencies include the Idaho Department of Lands (IDL), IDFG, U.S. Environmental Protection Agency (USEPA), Idaho Department of Water Resources (IDWR), and USFWS. Participating agencies have the opportunity to comment during the development of the document to ensure that their interests in resources are addressed.

Lead Agency: BLM, Pocatello Field Office

Joint Lead Agency: USFS, Caribou-Targhee National Forest

Cooperating Agencies: IDEQ, USACE

Participating Agencies: IDL, IDWR, IDFG, USFWS, USEPA

Interdisciplinary Team and Technical Specialists:

Table 6.4-1 Bureau of Land Management, Pocatello Field Office

Name	Project Responsibility	Education/Experience
William Volk, P.G.	Project Lead	B.S. Geology 41 years of experience
Jeff Cundick	Technical Oversight – Minerals Branch Chief	B.S. Mining Engineering M.B.A. Business/Economics 27 years of experience
James Kumm	Wildlife	B.S. Wildlife Biology M.S. Wildlife Sciences 27 years of experience
Amy Lapp	Archaeologist - Cultural Resources Specialist	B.A. Anthropology M.S. Anthropology 9 years of experience
Blaine Newman	Visual Resources Recreation	B.S Wildland Recreation Management 26 years of experience
Michael Kuyper	Range Management	B.S. Natural Resource Management (Range Management) 16 years of experience
Joshua Stout	Geologist/Mine Inspector	B.S. Secondary Education M. NS. Geology 24 years of experience

Table 6.4-2 U.S. Forest Service, Caribou-Targhee National Forest

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Ali Abusaidi	Archaeologist – Cultural Resources Specialist	M.S. Archaeology 34 years of experience
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Rose Lehman	Botany (Vegetation)	B.S. Biology/Botanical Science 21 years of experience
Louis Wasniewski	Hydrology	M.S. Forest Hydrology 24 years of experience
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Table 6.4-4 Idaho Department of Lands

Name	Project Responsibility	Education/Experience
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Table 6.4-5 United States Army Corps of Engineers

Name	Project Responsibility	Education/Experience
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Table 6.4-6 Idaho Department of Fish and Game

Name	Project Responsibility	Education/Experience
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Table 6.4-7 United States Fish and Wildlife Service

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Carrie Womack Dixon	Document Control, Database Management, Word Processing, Project Record	B.S. Animal Science 27 years of experience

Table 6.4-9 Whetstone & Associates

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CHAPTER 7
REFERENCES, ACRONYMS, GLOSSARY AND INDEX

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7.2 ACRONYMS AND ABBREVIATIONS

°C	Degrees Celsius
°F	Degrees Fahrenheit
µg/g dw	Micrograms per gram dry weight
µg/L	Micrograms per liter
$\mu g/m^3$	Micrograms per cubic meter
AA	Assessment Areas
AADT	Annual average daily traffic
ABA	Acid-based accounting
ACEC	Area of Critical Environmental Concern
AGP	Acid generating potential
Agrium	Nu-West Industries, Inc., dba Agrium Conda Phosphate Operations (the Proponent)
ags	above ground surface
AIRFA	American Indian Religious Freedom Act
AIZ	Aquatic influence zone
amsl	Above mean sea level
ANP	Acid neutralizing potential
ANFO	Ammonium nitrate fuel oil
AO	Authorized Officer
AOI	Annual Operating Instructions
APE	Area of potential effects
APLIC	Avian Power Line Interaction Committee
Arcadis	Third-party EIS Contractor
ARD	Acid rock drainage
ARMP	Approved Resource Management Plan, BLM Pocatello Field Office
ARMPA	Approved Resource Management Plan Amendment, BLM Pocatello Field Office
ATF	U.S. Bureau of Alcohol, Tobacco and Firearms
ATV	All-terrain vehicles
BA	Biological Assessment
BAT	Batch adsorption test
BC	Brown and Caldwell
BCC	Birds of Conservation Concern

BCEH	Idaho Bureau of Community and Environmental Health
BCR	Bird Conservation Regions
BE	Biological Evaluation
BEA	Bureau of Economic Analysis
BEI	Backscatter imaging
BFR	Blackfoot River
bgs	Below ground surface
BLM	Bureau of Land Management
BLS	Bureau of Labor Statistics
BMP	Best management practice
BST	Basalt
btoc	Below top of casing
$CaCO_3$	Calcium carbonate
CCC	Criteria continuous concentration
CCD	Census County Division
CDP	Census Designated Place
CEA	Cumulative effects area
CEQ	Council on Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFA	Carbonate flourapatite
CFR	Code of Federal Regulations
cfs	Cubic feet per second
CH_4	Methane
CHZ	Core Habitat Zone
cm/sec	Centimeters per second
CMC	Criteria maximum concentration
CNF	Caribou National Forest
CO	Carbon monoxide
CO_2	Carbon monoxide
CO_2e	CO_2 equivalent
COPC	Constituent of potential concern
CPO	Conda Phosphate Operations Fertilizer Manufacturing Plant
CTNF	Caribou-Targhee National Forest
CWA	Clean Water Act
CWS	Center waste shale

dB	Decibel
dBA	A-weighted decibel
dba	Doing business as
DCS	Dark cherty shale
DFC	Desired future condition
DO	Dissolved oxygen
DOI	Department of the Interior
DR	Decision Record
DSAY	Discounted Service Acre Year
EC	Electrical conductivity
EDS	Energy dispersive x-ray spectroscopy
EIS	Environmental Impact Statement
EMP	Environmental Monitoring Plan
EO	Executive Order
EPT	*Ephemeroptera-Plecoptera-Trichoptera*
ESA	Endangered Species Act
ES&R	Emergency stabilization and rehabilitation
ET	Evapotranspiration
FHWA	Federal Highway Administration
FLPMA	Federal Land Policy and Management Act
FOS	Factors of safety
FR	Forest Road *or* Final Rule
ft/day	Feet per day
ft^2/day	Square feet per day
FWM	Foot wall mud
FY	Fiscal year
GCLL	Geosynthetic clay laminate liner
GHG	Greenhouse gas
GHMA	General Habitat Management Area
GHZ	General Habitat Zone
GIS	geographic information system
GM	Growth medium
gpm	Gallons per minute
GTD	Grandeur Tongue
GWP	Global Warming Potential

HDPE	High-density polyethylene
HEA	Habitat Equivalency Analysis
HM	Head Month
HOSGA	Henry Olsen Sheep and Goat Allotment
hp	Horsepower
HR	Haul road
HRV	Historical range of variability
HUC	Hydrologic Unit Code
HWM	Hanging wall mud
ICP-AES/MS	Inductively coupled plasma atomic emission spectroscopy and mass spectrometry
IDAPA	Idaho Administrative Procedures Act
IDEQ	Idaho Department of Environmental Quality
IDFG	Idaho Department of Fish and Game
IDL	Idaho Department of Lands
IDoL	Idaho Department of Labor
IDOT	Idaho Department of Transportation
IDT	Interdisciplinary Team
IDWR	Idaho Department of Water Resources
IFWIS	Idaho Fish and Wildlife Information System
IHMA	Important Habitat Management Areas
IHZ	Important Habitat Zone
IPaC	Information for planning and Conservation
IPCC	Intergovernmental Panel on Climate Change
IPMP	Investigation of Phosphate Mine Contamination and Final Risk Management Plan
IRA	Inventoried Roadless Area
ISSS	Idaho Special Status Species
IWI	Index of Watershed Indicators
K	Hydraulic conductivity
kg	Kilograms
kHz	Kilohertz
kPa	KiloPascals
KOP	Key observation point
KPLA	Known phosphate leasing area
K_{sat}	Saturated hydraulic conductivity

LAU	Lynx analysis unit
lb/hr	Pounds per hour
LCY	Loose cubic yards
L_{dn}	Day-night average sound (noise) level
L_{eq}	Equivalent noise level
LHC	Land Health Condition
L_{max}	Maximum noise level
LO	Lower ore
LOP	Lower ore partings
M	Modification
MBCY	Million bank cubic yards
MBTA	Migratory Bird Treaty Act
MDEQ	Montana Department of Environmental Quality
MDL	Method detection limit
ME	Minerals and Energy
mg/g	Milligrams per gram
mg/kg	Milligrams per kilogram
mg/L	Milligrams per liter
MIS	Management indicator species
mL/hr	Milliliters per hour
MLCY	Million loose cubic yards
MOU	Memorandum of Understanding
mph	Miles per hour
MSGP	Multi-sector General Permit
MSHA	Mine Safety and Health Administration
MWAM	Montana Wetland Assessment Method
N_2O	Nitrous oxide
N/A	Not Applicable
NAAQS	National Ambient Air Quality Standards
NAD 83	North American Datum of 1983
NAGPRA	Native American Graves Protection and Repatriation Act
NEPA	National Environmental Policy Act
NFS	National Forest System
NHPA	National Historic Preservation Act
NNP	Net neutralization potential

NO_2	Nitrogen dioxide
NOA	Notice of Availability
NOI	Notice of Intent
NO_x	Oxides of nitrogen
NPDES	National Pollutant Discharge Elimination System
NPS	National Park Service
NRCS	National Resources Conservation Service
NRHP	National Register of Historic Places
NSPS	New Source Performance Standards
NTT	National Technical Team
NTU	Nephelometric turbidity units
NWI	National Wetlands Inventory
NWS	National Weather Service
O_3	Ozone
OHV	Off-highway vehicles
ORP	Oxidation-reduction potential
P	Preservation
P4	P4, LLC
Pb	Lead
PE	Professional Engineer
PFA	Post-fledging area
PFC	Proper functioning condition
PFO	Pocatello Field Office
PFYC	Potential Fossil Yield Classification
PGA	Peak ground acceleration
PGH	Preliminary general habitat
PHMA	Priority Habitat Management Areas
PILT	Payment In Lieu of Taxes
PLS	Percent live seed
PM_{10}	Particulate matter with a nominal diameter of 10 microns or less
$PM_{2.5}$	Particulate matter with a nominal diameter of 2.5 microns or less
POC	Point of Compliance
ppb	Parts per billion
ppm	Parts per million
PR	Partial Retention

PRISM	Parameter-elevation Regressions on Independent Slopes Manual
Proposed Action	Rasmussen Valley Mine Project
PSB	Passerines and small birds
PSD	Prevention of Significant Deterioration
PVC	Polyvinyl chloride
R	Retention
RAWS	Remote Automated Weather Station
RCA	Rasmussen Collaborative Alternative
RCRA	Resource Conservation and Recovery Act
RHCA	Riparian habitat conservation area
redox	Oxidation and reduction
REX	Rex chert
RFP	Revised Forest Plan
RICHCOVWET	Richness-cover-wetness metric
RLB	Raptor/Large Bird
RM	Roaded Modified
RMI	River Macroinvertebrate Index
RNA	Research Natural Area
ROD	Record of Decision
ROM	Run of mine
ROS	Recreation Opportunity Spectrum
RQD	Rock quality designation
RVCA	Rasmussen Valley Cattle Allotment
S	Storativity
SARA	Superfund Amendments and Reauthorization Act
Sat VWC	Saturated volumetric water content
Se	Selenium
SE	Southeast
Se^0	Elemental selenium
Se^{2-}	Selenide
Se^{4+}	Selenite
Se^{6+}	Selenate
SHI	Stream Habitat Index
SHPO	State Historic Preservation Office
SMI	Stream Macroinvertebrate Index

SNOTEL	Snow Telemetry
SO^2	Sulfur dioxide
SOPA	Schedule of proposed actions
SPCC	Spill prevention, control, and countermeasures
SPLP	Synthetic precipitation leaching procedure
SPM	Semi-Primitive Motorized
SS	Stainless steel
Study Area	Geographic area (2,567 acres) considered for NEPA analysis
s.u.	Standard units
SUA	Special Use Authorization
SWPPP	Stormwater Pollution Prevention Plan
T	Transmissivity
TCP	Traditional cultural property or place
TDS	Total dissolved solids
TEPC	Threatened, endangered, proposed, or candidate
TMDL	Total Maximum Daily Loads
TOC	Total organic carbon
tons/yr	Tons per year
TPH	Total petroleum hydrocarbon
TSS	Total suspended solids
U.S.C.	United States Code
UO	Upper ore
UOP	Upper ore partings
USACE	U.S. Army Corps of Engineers
USCB	U.S. Census Bureau
USDA	U.S. Department of Agriculture
US DOI	U.S. Department of the Interior
US DOT	U.S. Department of Transportation
USEPA	U.S. Environmental Protection Agency
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
USGCRP	U.S. Global Change Research Program
USGS	U.S. Geological Survey
UTM	Universal Transverse Mercator
VCR	Visual Contrast Rating

VMS	Visual Management System
VOC	Volatile organic compound
VQO	Visual Quality Objective
VRM	Visual Resource Management
VWC	Volumetric water content
VWP	Vibrating wire piezometer
WAA	Wetland Assessment Area
WAO	Within aspen overstory metric
WEG	Wind erodibility group
WEL	Wells Formation
WER	Water effect ratio
WMA	Wildlife Management Area
WOUS	Waters of the U.S.
WRCC	Western Regional Climate Center
WSA	World shale average
WSR	Wild and scenic river
WUI	Wildland Urban Interface
XRD	X-ray diffraction
XRF	X-ray fluorescence
yd	Yard
yd^3	Cubic yard
YOY	Young-of-year

7.3 GLOSSARY

Acre-foot - The volume of liquid or solid required to cover 1 acre to a depth of 1 foot, or 43,560 cubic feet; measure for volumes of water, reservoir rock, and other related materials.

Agencies, the - The Agencies refers jointly to the lead agencies preparing this EIS (U.S. Bureau of Land Management, Pocatello Field Office [BLM] and the U.S. Forest Service, Caribou-Targhee National Forest [USFS]) and the cooperating and participating agencies including the Idaho Department of Environmental Quality (IDEQ), the Walla Walla District of the U.S. Army Corps of Engineers (USACE), the Idaho Department of Lands (IDL), the Idaho Department of Fish and Game (IDFG), and the U.S. Fish and Wildlife Service (USFWS).

Allotment - A unit of land suitable and available for livestock grazing that is managed as one grazing unit.

Alluvium - Unconsolidated or poorly consolidated gravel, sands, and clays, deposited by streams and rivers on riverbeds, floodplains, and alluvial fans.

Alteration floor - The depth at which less weathered or unaltered ore is encountered.

Ambient - The environment as it exists at the point of measurement and against which changes or impacts are measured.

Analysis Area - Each resource defines an analysis area that includes areas of potential indirect effects to that resource from the Proposed Action or alternatives. The analysis area may also provide a context to establish baseline conditions to which potential effects can be compared. The analysis area is generally larger than the Study Area.

Animal Unit Months (AUMs) - The amount of forage consumed by a 1,000-pound cow and calf (less than 6 months of age) over a 1-month period (approximately 800 pounds of forage).

Anticline - A fold in rock, where the interior of the fold is composed of rocks that are older than the rocks on the exterior of the fold.

Aquatic Resources - Biological resources (plants, animals, and other life forms) present in or dependent on streams, lakes, and other surface water.

Aquifer - A body of rock that is sufficiently permeable to conduct groundwater and to yield economically significant quantities of water to wells and springs.

Aquitard - A leaky barrier to groundwater flow.

Attenuation - The process of becoming thinner, or diminished, in dimension, concentration, or density.

Baseline Study - A study conducted to gather data before mining, outlining conditions existing on the proposed mine site. Impacts and reclamation success are measured against baseline data.

Best Management Practices (BMPs) - Established and effective environmental protection practices. Also innovative, dynamic, and improved environmental protection practices applied to industrial projects to help ensure that development is conducted in an environmentally responsible manner.

Bioaccumulation - The accumulation of a substance, such as a toxic chemical, in various tissues of a living organism. The process typically occurs when certain chemicals are taken up by organisms from water or sediment directly or through consumption of food containing the chemicals.

Bioaccumulation factor - The ratio of the concentration of a chemical inside an organism to the concentration in the surrounding environment.

Biodiversity - The diversity of species, ecosystems, and natural processes in an area.

Biological Assessment - Information prepared by or under the direction of the federal agency concerning listed species that may be present in an area and the evaluation of potential effects of an 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 (BE) - A document describing the components of a Proposed Action or Agency Preferred Alternative in sufficient detail to determine the effects that implementation would have on USFS Sensitive Species, USFS Management Indicator Species, BLM Sensitive Species, and any other species included in the management standards and guidelines of the BLM PFO ARMP or the CNF RFP.

Chert - A hard, dense, microcrystalline sedimentary rock, consisting chiefly of interlocking crystals of quartz less than about 30 micrometers in diameter; it may contain amorphous silica (opal). It may be white or variously colored. Chert occurs primarily as nodular or concretionary segregations, or nodules in limestone or dolomite, and less commonly as layered deposits or bedded chert.

Code of Federal Regulations (CFR) - The compilation of federal regulations adopted by federal agencies through a rule-making process.

Colluvium - General term applied to loose and incoherent deposits, usually at the foot of a slope or cliff and brought there chiefly by gravity; such as talus and cliff debris.

Column Test - A laboratory leaching 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.

Concurrent Reclamation - Concurrent backfilling and reclamation of sequential mine phases or other mining disturbances.

Critical (Crucial) Habitat - Habitat that is present in minimum amounts and is a determining factor for population maintenance and growth.

Cultural Resources - The archaeological and historical remains of human occupation or use. Includes any manufactured objects, such as tools or buildings. May also include objects, sites, or geological/geographical locations significant to Native Americans.

Cumulative Effects - As defined by 40 CFR 1508.7, cumulative effects are the impacts on the environment which result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions, regardless of what agency or person undertakes such other actions. Cumulative effects can result from individually minor but collectively significant actions taking place over a period of time. Analysis addresses the contribution of the Proposed Action or alternatives to the cumulative effects to resources. If the Proposed Action or Alternatives have no direct or indirect effect to a given resource, they do not contribute to cumulative effects to that resource, regardless of the overall magnitude of cumulative effects.

Cumulative Effects Area - An area of analysis defined by resource over which incremental impacts of the Proposed Action or alternatives combined with past, present and reasonably foreseeable future actions can adversely affect the resource over a period of time.

Direct Effects - As defined by 40 CFR 1508.9, these are effects caused by the action and which occur at the same time and place as the action. Synonymous with direct impacts.

Discharge - The allowance of a release of water or liquid from a facility where it has been contained or the volume of water flowing past a point per unit time, commonly expressed as cubic feet per second (cfs), gallons per minute (gpm), or million gallons per day (mgd).

Disturbed Area - Area where natural vegetation and soils have been removed or disrupted.

Drainage Channel - Natural channel through which water flows during some time of the year. Natural and artificial means for effecting discharge of water as by a system of surface and subsurface passages.

Drawdown - The lowering of the water level in a well or aquifer as a result of water withdrawal.

Endangered Species - Any plant or animal species in danger of extinction throughout all or a significant portion of its range. Plant or animal species identified by the Secretary of the Interior as endangered in accordance with the 1973 Endangered Species Act.

Erosion - The wearing away of soil and rock by weathering, mass wasting, and the action of streams, glaciers, waves, wind, and underground water.

Evapotranspiration - The portion of precipitation returned to the air through evaporation and plant transpiration.

Exploration - The search for economic deposits of minerals, ore, and other materials through practices of geology, geochemistry, geophysics, drilling, or mapping.

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.

Fault - Surface of rock rupture along which there has been differential movement.

Fisheries - Streams and lakes used for fishing.

Floodplain - That portion of a river valley adjacent to the channel which is built of sediments deposited during the present regimen of the stream and which is covered with water when the river overflows its banks at flood stages.

Forb - Any herbaceous (not woody) plant other than a grass.

Fugitive Dust - Particulate matter that is generated or emitted by open air operations (emissions that do not pass through a stack or vent), for example, dust from blasting or explosives, drilling, screening, hauling, material handling, or wind erosion from areas such as disturbed areas, overburden piles, or GM stockpiles.

Game Species - Animals commonly hunted for food or sport.

Geotechnical - A branch of engineering concerned with the engineering design aspects of slope stability, settlement, earth pressures, bearing capacity, seepage control, and erosion.

Grade - A slope stated in terms of feet per mile or as vertical feet divided by horizontal feet (percent grade); the relative mineral ore content of a rock.

Greenhouse Gas - Greenhouse gases are gases, including but not limited to carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O), that trap heat in the atmosphere and can contribute to climate change.

Groundwater - All subsurface water, especially that as distinct from surface water in the zone of saturation.

Habitat - The place or type of site where a plant or animal naturally or normally lives and grows. Includes all biotic, climatic, and soils conditions, or other environmental influences affecting living conditions.

Haul Road - All roads typically designed for large equipment used for transport of an extracted mineral, overburden, or other earthen materials.

Hydraulic Conductivity - The permeability of a rock mass or unconsolidated deposit with respect to water.

Hydrologic Disturbance - These include changes in natural canopy cover or surface soil characteristics that may alter natural streamflow quantities and character.

Hydrologically Connected Roads - Any road segment that, during a design runoff event, has a continuous flow path beneath any part of the road prism and a natural stream channel.

Indirect Effects - As defined by 40 CFR 1508.8, these are reasonably foreseeable effects caused by the action but occur later in time or are removed in distance from the action. Synonymous with indirect impacts.

Infiltration - The movement of surface water or some other liquid into the soil or rock through pores or other openings.

Infrastructure - The basic framework or underlying foundation of a community or project including road networks, electric and gas distribution, water and sanitation services, and facilities.

Intermittent Stream - 1) A stream that flows only at certain times of the year, as when it receives water from springs or from a surface source and 2) a stream that does not flow continuously, as when water losses from evaporation or seepage exceed the available stream flow.

Irretrievable - Applies to the loss of production, harvest, or use of natural resources. For example, some or all of the timber production from an area is lost irretrievably while an area is serving as a winter sports site. The production lost is irretrievable, but the action is not irreversible. If the use changes, it is possible to resume timber production.

Irreversible - Applies primarily to the use of nonrenewable resources, such as minerals or cultural resources, or to those factors that are renewable only over long time spans such as soil productivity and aspen regeneration. Irreversible also includes loss of future options.

Jurisdictional Wetland - A wetland area identified and delineated by specific technical criteria, field indicators, and other information for purposes of public agency jurisdiction. The public agencies which administer jurisdictional wetlands are the U.S. Army Corps of Engineers, U.S. Environmental Protection Agency, U.S. Fish and Wildlife Service, and USDA-Soil Conservation Service.

Land Use - Land uses determined for a given area that establish the types of activities allowed (e.g., mining, agriculture, timber production, residences, industry) and the size of buildings and structures permitted.

Linkage Area - A habitat corridor that facilitates exploratory movements and is important for dispersal and breeding season movements.

Lithology - The description of rocks in terms of the physical character of a rock, mineral composition, grain size, color, and other physical characteristics.

Long-Term Effects - Effects are effects that would remain following completion of the project. As an example, unreclaimed pit walls would be a long-term effect. They would not be included in the crest-to-crest backfill at the end of the project and would not be revegetated.

Meade Peak - The phosphate-rich Meade Peak Member of the Permian-age Phosphoria Formation. The economic phosphate rock occurs in two zones within the Meade Peak Member. Certain layers within the Meade Peak also contain selenium and other COPCs that can be released into water when they are disturbed.

Meade Peak Overburden - Overburden that may contain Meade Peak or specific Rex Chert strata is referred to as “Meade Peak-containing material" or “Meade Peak overburden.”

Mesic - Moist habitats associated with springs, seeps, and riparian areas.

Mitigate, Mitigation - To cause an impact to become less severe or harmful. To reduce impacts. Actions to avoid, minimize, rectify, reduce, eliminate, and compensate for impacts to environmental resources.

Monitor - To systematically and repeatedly watch, observe, or measure environmental conditions in order to track changes or regulatory compliance.

National Environmental Policy Act of 1969 (NEPA) - The national charter for protection of the environment. NEPA establishes policy, sets goals, and provides means for carrying out the policy. Regulations at 40 CFR 1500-1508 implement the Act.

Non-Meade Peak Overburden - Overburden (see below) that does not include Meade Peak strata or specific Rex Chert strata and typically has a lower content of selenium and other COPCs, referred to as “non-Meade Peak-containing material” or “non-Meade Peak overburden”.

Noxious Weed - An alien, introduced, or exotic plant species that is adventive, aggressive, or overly competitive with more desirable plant species.

Ore - A deposit of rock from which a valuable mineral or minerals can be economically extracted.

Overburden - Sub-economic, non-ore material that overlies or interfingers with the ore and must be segregated and removed to allow recovery of a deposit of valuable material.

Perennial Stream - A stream or reach of a stream that flows throughout the year.

Permeable - The property or capacity of a porous rock, sediment, or soil to transmit a liquid.

Pit Backfill - Overburden (sub-economic, non-ore material) that is placed in a mined-out pit.

Point of Compliance (POC) - A location identified or agreed to by the IDEQ for a groundwater monitoring well downgradient of an undertaking to detect the presence of any contaminants released into the groundwater and evaluate whether those contaminants exceed levels allowed by the Clean Water Act.

Productivity - In reference to vegetation, productivity is the measure of live and dead accumulated plant materials.

Proposed Action - All areas of proposed surface disturbance identified in the 2011 Mine and Reclamation Plan (Agrium 2011), including the mine pits, temporary or permanent overburden and overfill piles, GM stockpiles, temporary stockpiles, access roads, new haul roads from the mine pits to the existing Wooley Valley Tipple Haul Road, and ancillary mine facilities.

Raptor - A bird of prey (e.g., eagles, hawks, falcons, and owls).

Recontouring - Reshaping an area to obtain more stable or more natural topographic contours by reclamation measures, particularly in reference to roads.

Record of Decision (ROD) - A decision document for an EIS or Supplemental EIS that publicly and officially discloses the responsible official’s decision regarding the actions proposed in the EIS and their implementation.

Reserves - Identified resources of mineral-bearing rock from which the mineral can be extracted profitably with existing technology and under present economic conditions.

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.

Runoff - That part of precipitation or snow melt that is in excess of what infiltrates or evaporates and typically flows downhill toward depressions or surface streams.

Runon - That part of precipitation or snow melt that runs onto an adjacent area. Runoff that flows onto an area.

Scoping - Procedures by which agencies determine the extent of analysis necessary for a proposed action (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; 40 CFR 1501.7).

Sediment (as in Stream Sediment) - Solid particulate material suspended in or settling to the bottom of a liquid. Sediment input comes from natural sources such as soil erosion, rock weathering, agricultural practices, or construction activities.

Seismicity - The likelihood of an area being subject to earthquakes; the phenomenon of earth movements.

Shale - A fine-grained sedimentary rock formed by the compaction of clay, silt, or mud. It has a finely laminated structure which gives it a natural plain along which the rock splits, especially on weathered surfaces.

Short-Term Effects - Those effects that would not last longer than the life of the project, including reclamation. As an example, the loss of vegetation from the construction of a haul road would be a short-term effect because the road would be reclaimed and vegetation re-established following completion of the project. Reclamation in this context includes recontouring and re-establishing vegetative cover. It does not include vegetative succession and re-establishment of communities.

Significant - As used in the context of NEPA, determination of significance 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).

Storage - A dimensionless value defined as the volume of water an aquifer releases or takes into storage per unit surface area of the aquifer for a unit change in head.

Study Area - The Study Area shown encompasses the Proposed Action and anticipated elements of the alternatives for which baseline studies were conducted. The Study Area is larger than the Proposed Action.

Threatened Species - Any species of plant or animal that is likely to become endangered within the foreseeable future throughout all or a significant portion of its range.

Tilth - The fitness of soil for cultivation, as measured by its structure, properties and composition.

Tipple Facility - Area where mined ore is hauled to and stockpiled for subsequent loading onto trucks, rail cars or other conveyance for transport to the processing plant.

Transmissivity - The rate at which water can be transmitted through a unit width of an aquifer under a unit hydraulic gradient.

Visual Sensitivity - A measure of public concern for scenic quality and existing or proposed visual change.

Waters of the U.S. (WOUS) - A jurisdictional term from Section 404 of the Clean Water Act referring to waterbodies, such as lakes, rivers, streams (including intermittent streams), mudflats, sandflats, wetlands, sloughs, prairie potholes, wet meadows, playa lakes, or natural ponds, the use, degradation, or destruction of which could affect interstate or foreign commerce.

Watershed - The geographic region from which water drains into a particular stream, river, or body of water. A watershed includes hills, lowlands, and the body of water into which the land drains. A watershed boundary is typically defined by the ridges or divides separating watersheds, but can include other areas if significant subsurface inputs derive from outside the boundaries.

Wetlands - Areas inundated by surface or groundwater with a frequency sufficient to support, and under normal circumstances does or would support, a prevalence of vegetation or aquatic life that requires saturated or seasonally saturated soil conditions for growth and reproduction.

Wilderness - Land designated by the U.S. Congress as a component of the National Wilderness Preservation System.

Wind Erodibility Group - A grouping of soils that have similar properties affecting their resistance to soil blowing in cultivated areas.

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