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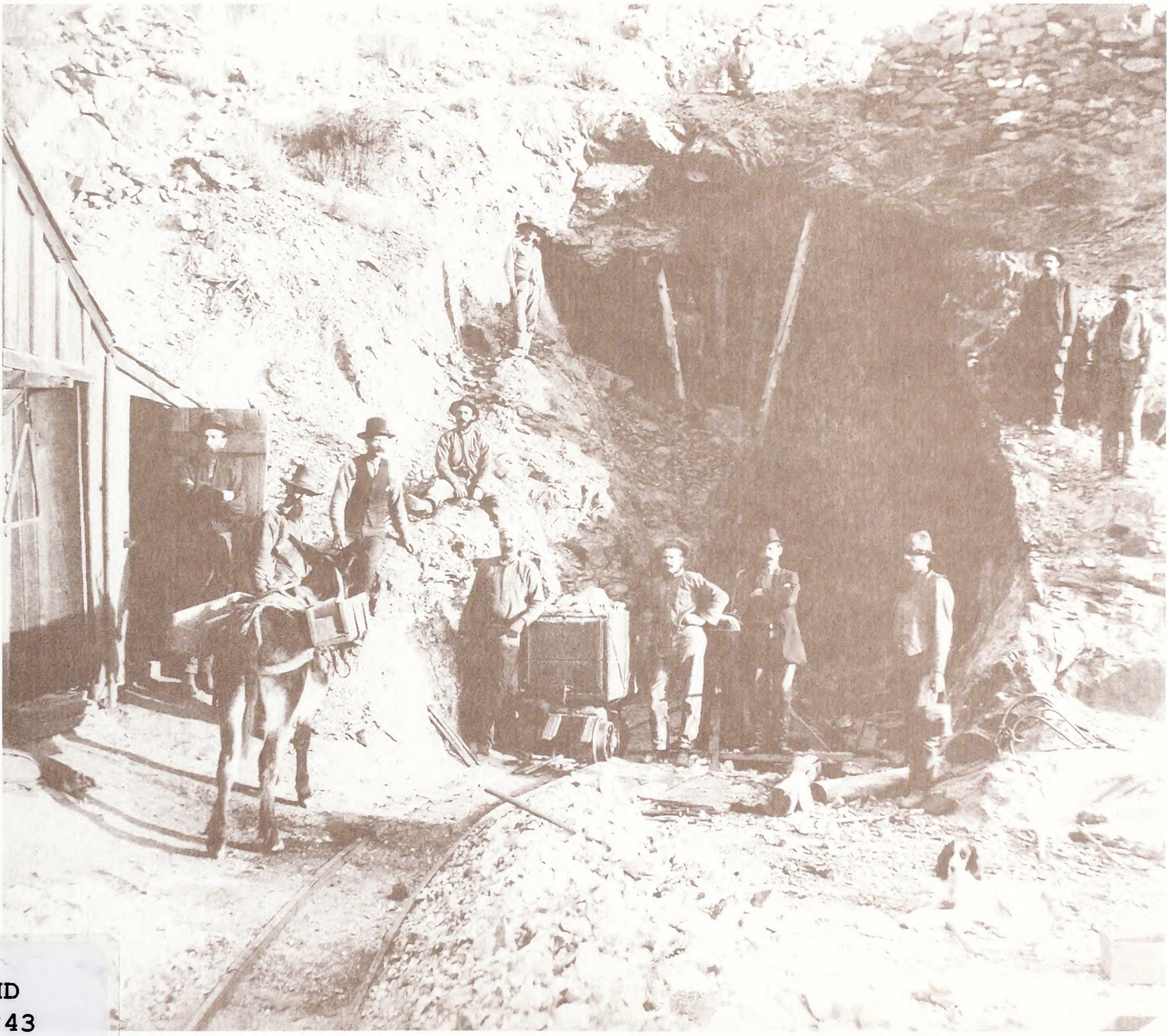
U.S. Department of the Interior

Bureau of Land Management
Carson City District Office

October 1996

Final Environmental Impact Statement Talapoosa Mining Inc.'s Talapoosa Mine Project



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MISSION STATEMENT

The Bureau of Land Management is responsible for the stewardship of our public lands. It is committed to manage, protect, and improve these lands in a manner to serve the needs of the American people for all times. Management is based upon the principle of multiple use and sustained yield of our nation's resources within a framework of environmental responsibility and scientific technology. These resources include recreation, rangelands, timber, minerals, watershed, fish and wildlife, wilderness, air and scenic, scientific and cultural values.

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United States Department of the Interior

Bureau of Land Management

Carson City District
1535 Hot Springs Road
Carson City, NV 89706
Phone: (702)885-6000

In Reply Refer to:
1793.6/3809
(NV-030)

OCT - 7 1996

Dear Reader:

Enclosed for your review is the Final Environmental Impact Statement (FEIS) for Talapoosa Mining Incorporated's Talapoosa Mine Project prepared by the Bureau of Land Management (BLM), Carson City District Office.

The FEIS has been prepared in an abbreviated format and must be used in conjunction with the Draft Environmental Impact Statement (DEIS) issued February 2, 1996. The FEIS and the DEIS constitute the complete EIS. Comments that were received during public review of the DEIS are contained in Chapter 5 of the FEIS. Responses are provided that either clarify or update the analyses, make factual revisions, or explain why a comment does not warrant further agency response. Chapter 4 contains an amended Geology and Minerals and Water Quality/Quantity sections to clarify specific public concerns regarding potential acid rock drainage and pit lake water. In addition, the Appendix contains a Monitoring and Mitigation Plan, a Waste Rock Management Plan, and a Risk Assessment for Wildlife.

Following the 30-day availability period of this Final Environmental Impact Statement, a Record of Decision will be issued. Questions or comments should be directed to: Ron Moore, Talapoosa EIS Project Manager, Bureau of Land Management, Carson City District Office, 1535 Hot Springs Road, Suite 300, Carson City, Nevada 89706.

Sincerely,

Karl L. Kipping

Karl Kipping
Acting District Manager, Carson City

Enclosure

FINAL ENVIRONMENTAL IMPACT STATEMENT
TALAPOOSA MINE PROJECT
LYON COUNTY, NEVADA

Lead Agency:	U.S. Department of the Interior Bureau of Land Management Carson City District Carson City, Nevada
Responsible Official:	John O. Singlaub, District Manager Carson City District
Project Location:	Lyon County, Nevada
Comments on this Final Environmental Impact Statement (EIS) Should Be Directed to:	Ron Moore, EIS Coordinator Carson City District Office Bureau of Land Management 1535 Hot Springs Road, Suite 300 Carson City, Nevada 89706-0638 (702) 885-6000
Cooperating Agency:	Lyon County, Nevada
Date Final EIS Was Made Available to the Environmental Protection Agency and the Public:	October 18, 1996

ABSTRACT

This Final Environmental Impact Statement (FEIS) responds to comments received during the public comment period on the Draft Environmental Impact Statement (DEIS), which analyzed impacts due to the proposed development of an open-pit gold and silver mining operation (the Talapoosa Project). The operation, with an expected mine life of seven to ten years, would include a 118-acre open-pit mine and two smaller pits (7 and 22 acres respectively), overburden and interburden disposal areas, ore stockpiles, a valley fill leach pad, process solution ponds, a processing plant, water treatment and supply facilities, administration and support facilities, and necessary ancillary facilities. Approximately 596 acres would be disturbed. Access would be provided by upgrading an existing road from U.S. Highway 95 Alternate. Two miles of new road construction are being proposed on the steeper areas and adjacent to the mine site.

The quality of the water in the post mining pit lake, the potential for acid rock drainage from the waste rock dumps, potential impacts to ground water, and potential impacts to the adjacent private lands were key issues identified from the review of the DEIS. The Proposed Action as described in the DEIS has been modified to address these issues by developing specific monitoring and mitigation requirements and a Waste Rock Management Plan designed to minimize potential impacts from acid rock drainage.

Karl L. Kipping

John O. Singlaub
Associate District Manager
Carson City District

10/7/96
Date

How to Use This Document

GUIDELINES FOR REVIEWING THIS FINAL ENVIRONMENTAL STATEMENT

This Final Environmental Impact Statement (FEIS) is designed to respond to the comments received from the public review of the Draft Environmental Impact Statement (DEIS). Although there were a number of comments received on a variety of issues, most of the concerns expressed by the responders concentrated on the water quality and quantity issues related to:

1) pit lake quality and the potential impacts of the pit lake on wildlife;
2) potential for acid rock drainage from the waste rock dumps; and
3) potential impacts on ground water resources and, more specifically, concerns about the impacts of the project on Blind Rock Spring and the Silver Springs aquifer.

Based on the comments, it was clear the reviewers needed to understand and evaluate the potential impacts associated with this project. To meet that need, the BLM has amended and supplemented the Geology and Minerals and the Water Quality and Quantity sections presented in the Affected Environment and Environmental Consequences chapters of the DEIS. These amendments are included in Chapter 4 of the FEIS.

To facilitate a detailed review of this document and to track changes made based on the public's review of the DEIS, we suggest the following:

1) For an overview of the project, review the Summary, Chapter 1, Introduction, and Chapter 2, Preferred Alternative.
2) If you are familiar with the project and wish to review the response to your comment or those of others, review Chapter 5, Comments and Responses. This section provides a copy of the public's letters and comments on the DEIS along with responses to the comments.

The responses, while addressing the specific comments, reference three documents where supporting information is found. Reviewing these documents will provide a fuller understanding of the issues, analytical process and conclusions reached by the reviewers of the project. These references are:

1) The DEIS.
2) This FEIS, including several chapters and appendices, primarily but not exclusively, Chapter 4 and Appendix E, which provide additional information and amended analyses on the Affected Environment and Environmental Consequences for the Geology and Minerals and Water Quantity and Quality issues.
3) Water Management Consultants, Inc.'s (WMC's) Talapoosa Project Evaluation of the Baseline Hydrology and Prediction of Hydrologic Conditions during Operation and Closure, July 1996.

WMC's technical report consists of five volumes of technical data that is the basis for the water quality/quantity analysis. This document is located at the BLM offices in Carson City and Reno, the Silver Springs Library, and the University of Nevada Library in Reno.

TABLE OF CONTENTS

List of Tables

List of Figures

List of Appendices

SUMMARY

PROPOSAL

Talapoosa Mining Inc. (TMI) proposes to develop a gold and silver mine in Lyon County, Nevada, approximately three miles northwest of the unincorporated area of Silver Springs.

The Talapoosa Mine site is located on private land owned or controlled by TMI and on public lands administered by the Carson City District of the Bureau of Land Management (BLM). TMI submitted a Plan of Operations, Reclamation Plan and Permit Application to the BLM in September 1994.

The proposed Talapoosa Mine would consist of a year-round, around-the-clock, open-pit gold and silver mining operation. Current ore reserves would be mined over a seven- to ten-year period. The actual life of the mine would depend on gold prices and other variables.

The proposed Talapoosa Mine would be accessed via an improved road from U.S. Highway 95 Alternate (U.S. 95 Alt.) east of the site. The proposed project area encompasses 2,673 acres, which includes 2,340 acres of public land and 333 acres of private land. The total land area that would be disturbed by the Proposed Action is approximately 596 acres. Operations would consist of an open-pit mine (three pits), overburden and interburden disposal areas, ore stockpiles, a valley fill leach pad, process solution ponds, a processing plant, water treatment and supply facilities, administration and support facilities, and necessary ancillary facilities.

The Talapoosa deposit would be mined using conventional open-pit mining methods consisting of drilling, blasting, loading and hauling. Overburden/interburden material would be hauled to designated disposal sites. Ore would be hauled to the crusher site. Run-of-mine ore, which is ore that does not need crushing, would be hauled directly to the valley fill leach pad.

Three open pits would be mined on roughly 20- to 30-foot-wide benches. Pit walls would have angles ranging from 40 degrees to 55 degrees. Under current projections, approximately 30 million to 42 million tons of ore-grade material would be recovered from these pits.

Approximately 90 million tons of overburden/interburden material would be mined over the life of the project. Two overburden/interburden disposal areas are proposed.

Final slope configurations for the disposal areas would range from 2h:1v (horizontal to vertical) to 2.5h:1v. The northeast disposal area would be constructed to a height of 380 feet. The southwest disposal area would be constructed to a height of 500 feet. Both disposal areas have been designed to be stable following completion of reclamation.

A new leach facility would be constructed to recover the gold and silver ore reserves. The leach pad would be lined with high-density polyethylene and would accommodate 42 million tons of ore. Solution ponds would be double-lined. Both the leach pad and the solution ponds would be equipped with leak detection systems. An overflow pond would be constructed downgradient of the "pregnant" solution pond. Surface water runoff would be diverted around the leach pad, processing areas and solution ponds to undisturbed surrounding areas.

Within the containment area, crushed ore would be mixed with lime, cement and dilute cyanide solution before being moved by conveyor to the leach pad. Run-of-mine ore would be trucked directly to the leach pad. Ore in the leach pad would be drip irrigated with a dilute cyanide solution to dissolve the gold, silver and other metals. This "pregnant" solution would then be transferred to the process plant for gold and silver recovery. After the gold and silver are recovered, the solution (now called barren solution) would be returned to the barren solution pond for reapplication to the heap.

Proposed reclamation activities that would be implemented after mining is completed include:

1) heap leach detoxification and closure;
2) establishment of a safety berm and warning signs around the pit perimeter;
3) removal of structures;
4) regrading and revegetation of disturbed areas; and
5) monitoring of various aspects of reclamation.

PURPOSE AND NEED

TMI's purpose in developing the Talapoosa Mine is to help meet an increasing demand for gold in the global market and to offset the anticipated decreases in production in South America and the former Soviet Union.

Gold is an established commodity with an international market. It is an important export commodity for the United States to satisfy increasing demands from the global market for jewelry, electronics and investment uses. Accordingly, the need to further develop the proposed project is to help satisfy existing and future demands for gold.

PLANNING ISSUES

Public scoping resulted in the identification of 15 issues.

1) Air Quality
2) Soils
3) Vegetation Resources
4) Wildlife and Fisheries Resources
5) Threatened, Endangered or Candidate Plant and Animal Species
6) Range Resources
7) Land Use and Access
8) Recreation
9) Aesthetics (Visual and Noise)
10) Social and Economic Values
11) Cultural Resources
12) Paleontology
13) Hazardous Materials
14) Water Quality and Quantity
15) Geology and Minerals

ALTERNATIVES

The DEIS analyzed the Proposed Action and the No Action alternatives. The Proposed Action was described in detail in Chapter 2 of the DEIS. The No Action Alternative means no further action would take place beyond the existing exploration already permitted by the BLM. Under the No Action Alternative, the BLM would not approve the proposed project or the Plan of Operations.

NO ACTION ALTERNATIVE

Under the No Action Alternative, the Proposed Plan of Operations would be denied and there would be no development of the Talapoosa Mine. The No Action Alternative provides the baseline for evaluating the potential environmental impacts of the Proposed Action.

TMI currently has an approved Plan of Operations for mineral exploration and has assumed all regulatory responsibility for the proposed project since purchase of the site. There is currently an estimated 85.7 acres of existing surface disturbance. An additional 39.4 acres of exploration-related disturbance is presently permitted within the proposed project area.

TMI is responsible for reclamation of exploration-related disturbance created under these approvals. Under the No Action Alternative, exploration would probably cease and the existing disturbance would be reclaimed.

ALTERNATIVES ELIMINATED FROM DETAILED CONSIDERATION

This DEIS section describes alternatives identified through the scoping process or previous studies that were considered by the BLM but not evaluated in detail for the reasons described below.

Each of the issues and components of the proposed mine (i.e., pits, overburden/interburden sites, leach pad site, processing facilities, administration and support facilities and access) were reviewed as the basis for possible alternatives. However, no major issues were identified in the review of the Proposed Action that would necessitate the development of an alternative.

In addition, the topography in the vicinity of the proposed mine severely limits the availability of alternative sites for the mine components within a reasonable distance to the mining operation.

ALTERNATIVE LEACH PAD SITE

An alternative leach pad site was identified by Pegasus Gold Corporation in 1993. Pegasus had considered the development of a tram system to move the ore from the pit over a ridge to a flat area north of the mine where the ore would be processed. TMI continued to keep the north leach pad as an option in the Proposed Plan of Operations submitted to the BLM in September 1994.

Recent drilling indicates that there are no significant ore reserves under the valley fill site and that the north leach site would not be economical with the existing ore reserves. Therefore, the alternative, or north leach pad site alternative, does not meet the Purpose and Need Statement objectives for the proposed project and is not considered a viable alternative for detailed evaluation.

TOTAL BACKFILLING OF MINED PITS WITH

Backfilling of the mined pits with waste rock, the overburden/interburden removed during development, was eliminated from detailed consideration for two reasons:

1) It has been determined that future additional mining of the pits could occur under higher metal prices and with new technology, and backfilling would preclude that option; and
2) Logical mining development of the pit is from the upper to lower elevation of the proposed project area, and the expense of hauling waste rock uphill to backfill the pit would be cost-prohibitive.

POTENTIAL PARTIAL PIT BACKFILLING

TMI is currently developing the optimal schedule for mining of the three proposed open pits. Therefore, it is not possible to determine at this time if any pit backfilling would be completed at the Talapoosa Project.

However, because mine plans are dynamic in nature, BLM and TMI would continuously evaluate the potential to complete partial pit backfilling of one or more of the pits during the life of the project. The implementation of any backfilling program would be dependent on the mine plan and its effect on project economics. TMI would coordinate any backfilling program with the BLM and the Nevada Division of Environmental Protection (NDEP).

PIT DRAINAGE OFF-SITE

Draining pit water off-site by means of a tunnel, which would empty to a site at a lower elevation, was eliminated from detailed consideration for the following reasons:

1) The cost of creating the underground tunnels would be prohibitive.
2) The tunnel excavation would create additional waste rock, some of which would come from the acid-bearing formations.
3) The discharged ground waters would, in their natural state, exceed relevant Nevada State Drinking Water Standards.

SUMMARY OF ENVIRONMENTAL CONSEQUENCES

Table S.1, presented on the following pages, compares the environmental impacts between the Proposed Action and the No Action alternatives.

TABLE S.1: COMPARISON OF IMPACTS OF THE PROPOSED ACTION AND NO ACTION ALTERNATIVES

RESOURCE	PROPOSED ACTION (TALAPOOSA MINE PROJECT)	NO ACTION (CURRENT EXPLORATION ONLY)
AIR	Particulate emissions would increase, primarily in the form of fugitive dust. Particulate levels would be well within national standards.	No impact.
SOILS	596 acres of native soils would be disturbed. Soil profiles in the area of disturbance would be permanently altered. 147 acres associated with the open pit would be permanently impacted. Some surface soils would be salvaged through stockpiling. Soil compaction would occur along roads and in the heap leach area.	514 acres of undisturbed land would not be impacted. 81 acres of native soils currently disturbed would be reclaimed.
VEGETATION	596 acres of native vegetation would be disturbed. 449 acres would be reclaimed to BLM/NDEP standards. No plant communities classified as sensitive or limited in extent would be impacted.	514 acres of native vegetation would not be disturbed. 81 acres of native vegetation currently disturbed would be reclaimed.
WILDLIFE / FISHERIES RESOURCES	596 acres of breeding habitat for small birds, mammals and reptiles and foraging habitat for raptors and larger mammals would no longer be available during the life of the mine. A prairie falcon nest would be disturbed. Indirect impacts would likely cause sensitive species to avoid areas of disturbance by 1/4-mile, impacting an additional 1,880 acres.	No undisturbed breeding and foraging habitat would be disturbed. 81 acres of previously unreclaimed land would be reclaimed.
THREATENED, ENDANGERED AND CANDIDATE SPECIES – PLANTS	No impact to any threatened, endangered or candidate plant species.	No impact.

TABLE S.1: COMPARISON OF IMPACTS OF THE PROPOSED ACTION AND NO ACTION ALTERNATIVE (CONTINUED)

RESOURCE	PROPOSED ACTION (TALAPOOSA MINE PROJECT)	NO ACTION (CURRENT EXPLORATION ONLY)
THREATENED, ENDANGERED AND CANDIDATE SPECIES – ANIMALS	No threatened or endangered animal species would be impacted. Sensitive bat species of Townsend's big-eared bat and small-foot myotis that roost or hibernate in old mine shafts and adits may be impacted as some shafts and adits would be destroyed.	No impact.
RANGE RESOURCES	2,340 acres of public native rangelands would be removed from range use. No actual loss to livestock operators would occur as impacted grazing allotments are not currently used or planned for use.	No impact.
ACCESS AND LAND USE	No impacts to ownership patterns and land use plans. Land uses would change for 2,673 acres of land. 2,240 acres of public land would be unavailable for public use during the life of the mine. Two residences south of the Proposed Action may be impacted by light and noise. Undeveloped residential lots in this area may be affected during the life of the mine. Vehicular ingress and egress on U.S. 95 Alt. would increase. Roadway levels of service would not be impacted.	No impact.
RECREATION	596 acres of public land would be unavailable for current low-intensity recreational use. Four-wheel-drive access through the mine site would be restricted during the life of the mine, although access above the mine would be provided by an alternative route.	No impact.
VISUAL RESOURCES	The Proposed Action would be visible from points along U.S. 95 Alt. and U.S. 50. Changes to the landscape would be minor, falling within BLM Visual Resource Management Guidelines.	No impact.

TABLE S.1: COMPARISON OF IMPACTS OF THE PROPOSED ACTION AND NO ACTION ALTERNATIVE (CONTINUED)

RESOURCE	PROPOSED ACTION (TALAPOOSA MINE PROJECT)	NO ACTION (CURRENT EXPLORATION ONLY)
NOISE	Daytime and nighttime noise would be audible to nearby residences. Noise levels fall below levels established by the EPA and HUD. Blasting during early stages of mining, once daily near the end of the shift during mine operation, would be heard and felt.	No impact.
SOCIAL AND ECONOMIC VALUES	Total employment in the area (direct and indirect) would be increased by 336 jobs. A total of 73 long-term housing units would be needed and are currently available. Local government tax revenues would be increased by $929,000 to $969,000. No significant impacts to services and facilities would occur.	No additional jobs or tax revenue would be provided; no demands on housing stock.
CULTURAL RESOURCES AND ETHNOGRAPHY	Eight documented cultural resource sites would be impacted. These eight sites are not eligible for designation on the National Register for Historic Places. There would be no impacts on eligible sites. There would be no impacts to traditional uses by Native Americans.	No impacts.
PALEONTOLOGICAL RESOURCES	No fossil content discovered; no impacts identified. Impacts to any fossils discovered during mining would be mitigated through consultation with the BLM.	No impact.
HAZARDOUS MATERIALS	Any on-site or off-site accidents related to the storage or transport of hazardous materials would be mitigated.	No impact.

TABLE S.1: COMPARISON OF IMPACTS OF THE PROPOSED ACTION AND NO ACTION ALTERNATIVE (CONTINUED)

RESOURCE	PROPOSED ACTION (TALAPOOSA MINE PROJECT)	NO ACTION (CURRENT EXPLORATION ONLY)
GEOLOGY AND MINERALS	90 million tons of waste rock would be mined. 42 million tons of ore would be relocated to the leach pad. One million ounces of gold and fourteen million ounces of silver would be extracted during the life of the mine. The following elements could potentially be mobilized from weathering of waste rock and pit walls to levels above Nevada Drinking Water Standards: sulfate, TDS, aluminum, cadmium, iron, thallium, nickel, manganese and arsenic. However, insufficient precipitation exists to transport them into the environment.	Following completion of current exploration activities, no additional mineral resource would be mined.
WATER QUALITY AND QUANTITY	Direct impacts include the formation of a pit lake which would contain mineralized waters, water supply pumping activity and resultant lowering of the water table of the volcanic bedrock aquifer system in the immediate proposed project area. Impacts are expected to be within close proximity of the proposed mine and are not expected to affect ground water conditions in the Churchill Valley aquifer. The pit lake would contain mineralized waters which would remain on the site indefinitely. 25-year projections show the following chemical analytes would remain above Nevada Drinking Water Standards: sulfate, TDS, antimony, arsenic, manganese, nickel, and thallium.	No impact.

CHAPTER 1

INTRODUCTION

This abbreviated Final Environmental Impact Statement (FEIS) has been prepared for Talapoosa Mining Inc.'s (TMI) proposed Talapoosa gold and silver mining operation in Lyon County, Nevada. The FEIS includes the Preferred Alternative, a record of written and verbal comments received on the Draft Environmental Impact Statement (DEIS), and responses to those comments.

This FEIS contains modifications and changes to the DEIS. The previously distributed DEIS and this document together constitute the FEIS for the proposed Talapoosa Mining Project. The Bureau of Land Management is the Lead or Responsible Agency. Lyon County participated as a cooperating agency in development of the DEIS and FEIS.

The Talapoosa Mining Project DEIS was distributed for public review on February 2, 1996. The Bureau of Land Management (BLM) requested written comments during the public comment period that ended April 2, 1996. Neither written comments nor verbal comments received during the public comment period required major changes or revisions in the analysis or conclusions presented in the DEIS.

The public comments did identify the need to provide additional clarification and documentation of the assumptions and supporting material used for the analysis. This additional material is provided in Chapter IV of this FEIS.

The DEIS has not been reprinted. Therefore, this document must be read in conjunction with the DEIS that was released for public review on February 2, 1996.

The Preferred Alternative is described in Chapter 2. Chapter 3 presents specific modifications and corrections to the DEIS. Chapter 4 provides additional or supporting data for the geology and water quality/quantity analysis. All comment letters and responses to substantive comments are provided in Chapter 5. Chapter 6 provides an update to the List of Agencies, Groups and Persons that will receive copies of the FEIS.

Public review of the DEIS identified concerns over water quality of the post-mining pit lake, potential for acid rock drainage and potential impacts to private lands (noise, dust, blasting vibrations and potential impacts on domestic wells) as major issues. This FEIS incorporates the requirements of the Nevada Division of Environmental Protection (NDEP) related to water quality and reclamation identified in permits issued by the NDEP. The FEIS also includes specific measures identified to respond to concerns expressed by the adjacent private land owners.

CHAPTER 2

PREFERRED ALTERNATIVE

This section of the FEIS specifies the Preferred Alternative and explains revisions made to the Proposed Action as described in the DEIS beginning on page 2-1. The revised Preferred Alternative identified in this FEIS would not result in additional impacts beyond those described in Chapter 4, Environmental Consequences, of the DEIS. This Preferred Alternative has been modified based on public comments on the DEIS.

The Preferred Alternative implements all components of the Proposed Action as described below.

IMPLEMENTATION REQUIREMENTS

The Preferred Alternative would be implemented in accordance with the Record of Decision for the Lahontan Resource Management Plan (RMP) approved September 3, 1985, as described on pages 3-17 and 3-18 of the DEIS, and would be subject to the Project Monitoring and Mitigation Measures (see Appendix A of the FEIS).

A specific Waste Rock Management Plan has been developed to minimize the potential for an acid rock drainage problem developing in the future (see Appendix B of the FEIS).

DESCRIPTION OF THE PREFERRED ALTERNATIVE

The Preferred Alternative includes the development of an open-pit mine, overburden and interburden disposal areas, ore stockpiles, a valley fill leach pad, process solution ponds, a processing plant, water treatment and supply facilities, administration and support facilities, and necessary ancillary facilities.

Figure 2.1 depicts the locations of the proposed project components. Table 2.1 lists the acreage of surface disturbance by public and private land for each mine component.

PRE-PRODUCTION DEVELOPMENT

Prior to development of the individual project components, available soils materials (growth medium) would be stripped and salvaged from the areas targeted for disturbance.

While poor quality growth medium was identified as available, the steep, rocky terrain of the proposed project area would adversely affect the efficiency of the growth medium salvage operations. Limited amounts of growth medium would be salvaged from the overburden/interburden disposal areas. In these areas, growth medium would be stripped, loaded into trucks, hauled a short distance and stockpiled for future reclamation use.

TABLE 2.1: PROPOSED PROJECT DISTURBANCE (ACRES)

COMPONENT*	PUBLIC LAND	PRIVATE LAND	TOTAL
Main Pit	88	30	118
Dyke Adit Pit	18	4	22
East Hill Pit	7	0	7
Northeast overburden/interburden disposal area	80	0	80
Southwest overburden/interburden disposal area	171	0	171
Crushing pad/ore stockpiles	13	1	14
Valley fill leach pad/growth medium stockpile	133	0	133
Office and shop/warehouse facilities	5	1	6
Process plant and lab facilities	3	0	3
Main access road	19	2	21
Haul roads	6	0	6
Utility/water line road	4	0	4
Sediment ponds	5	0	5
Fresh Water Pond	2	0	2
Pregnant Pond	1	0	1
Overflow Pond	1	0	1
Barren Pond	1	0	1
Water well/water tank	1	0	1
TOTAL	**558**	**38**	**596**

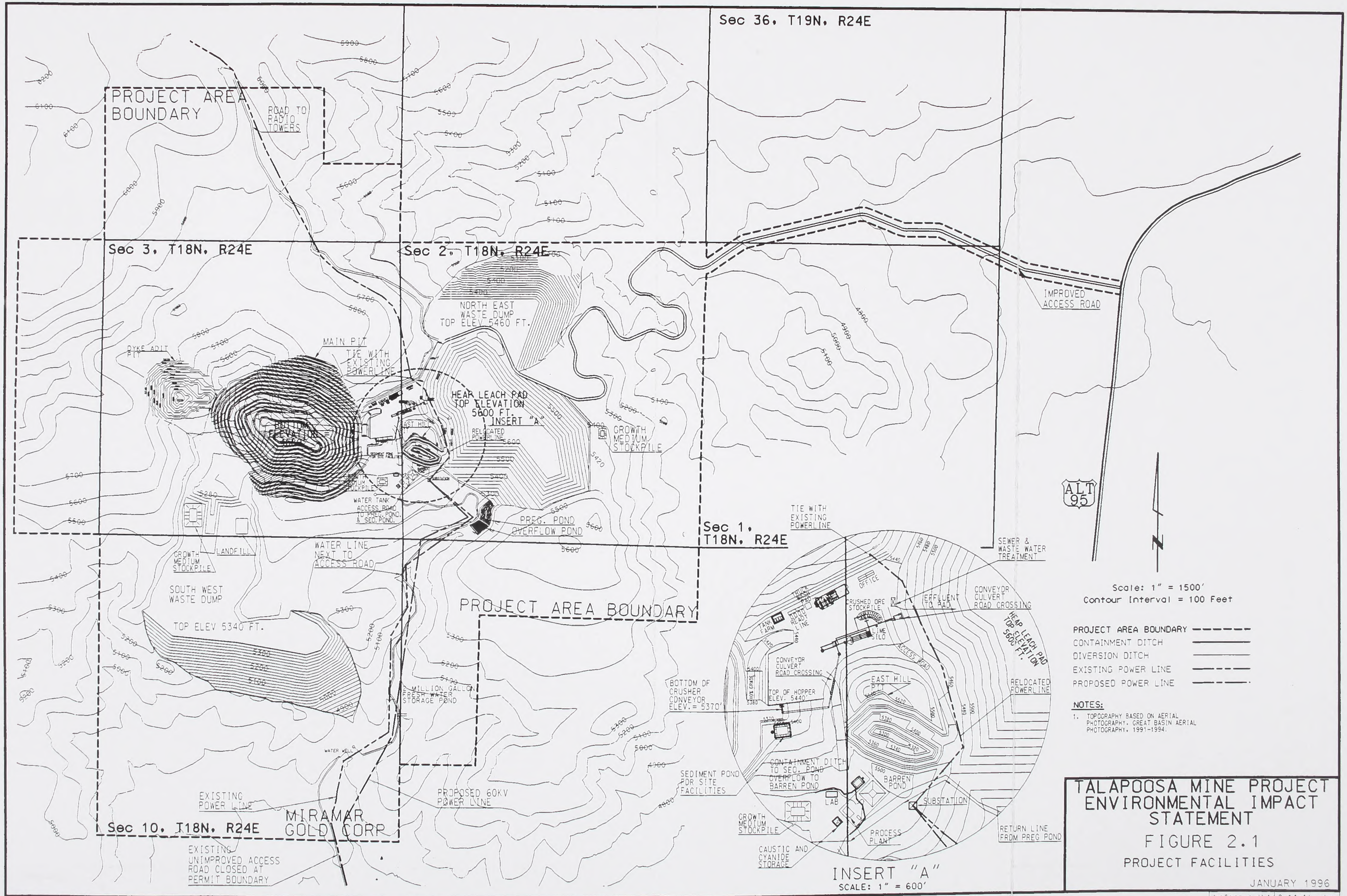
*Acreages for diversion and containment ditches are included within the total acreages for pits, disposal areas and leach pad.

Available soil materials with high clay content occurring naturally beneath the proposed leach pad and main pit would be stripped, sieved and used as liner material for the heap leach pad area.

To provide erosion control, growth medium stockpiles would be seeded with the reclamation seed mixture shown in Table 2.3, under the Proposed Reclamation section of this chapter.

OPEN-PIT DEVELOPMENT

The Talapoosa deposit would be mined using conventional open-pit mining methods consisting of drilling, blasting, loading and hauling. The ore would be processed using conventional heap leach technologies.



TALAPOOSA MINE PROJECT ENVIRONMENTAL IMPACT STATEMENT

FIGURE 2.1

PROJECT FACILITIES

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Overburden/interburden material – material taken from above and between the ore deposits – would be hauled to designated disposal sites, and the ore would be hauled to the crusher site. Run-of-mine ore would be hauled directly to the valley fill leach pad.

Mining activities would be conducted around-the-clock, on a year-round basis. However, blasting practices would normally be conducted one time daily near the end of the day shift. The current ore reserves are anticipated to be mined over a seven- to ten-year period. The three Talapoosa pits would be mined on approximately 20- to 30-foot benches with pit walls at angles ranging from 40 to 55 degrees.

The projected mining rate for overburden/interburden material and ore grade material is currently estimated at 3,000 to 4,000 tons per hour. Current projections estimate approximately 30 million to 42 million tons of ore-grade material would be recovered and processed from the open pits. Approximately 90 million tons of overburden/interburden material would also be mined.

OVERBURDEN / INTERBURDEN DISPOSAL AREAS

Approximately 90 million tons of overburden/interburden material would be mined over the life of the project. Two overburden/interburden disposal areas are proposed, the northeast and the southwest sites, as shown on Figure 2.1.

Disposal areas would be constructed by end-dumping to achieve overall final slope configurations of 2h:1v (horizontal to vertical) for the northeast disposal area, and 2.5h:1v for the southwest disposal area.

It is estimated that the northeast disposal area would be constructed to a height of 380 feet, while the southwest area would be constructed to a height of 500 feet. The northeast disposal area would hold up to 26 million tons of waste rock; the southwest disposal area would contain up to 64 million tons. The southwest disposal area will be constructed by end-dumping to maintain a slope configuration of 2.5h:1v.

The northeast disposal area will be constructed by end-dumping in lifts with benches for an overall configuration of 2h:1v. Lifts will average 50 feet in height, and benches will average 50 feet in width. For stability, structural integrity and to meet land ownership constraints, benches will be left in the slopes. Where possible, individual benches will be removed and contoured in conjunction with re-seeding.

Both disposal areas would be designed to be stable following completion and reclamation.

ORE AND WASTE ROCK

The overburden/interburden disposal areas would be constructed in lifts by end-dumping. As a part of normal operations, both the acid-neutralizing and potentially acid-generating waste rock would be mined from the pit and placed in the disposal areas in accordance with the Waste Rock Management Plan described in Appendix B. Acid-base accounting indicates there would be approximately 10 percent more acid-producing material than acid-neutralizing material in the waste rock.

VALLEY FILL LEACH PAD AND SOLUTION PONDS

A new leach facility would be constructed to recover gold and silver from the ore reserves. The leach pad would consist of a 6.0-million-square-foot, high-density polyethylene (HDPE) (60 mil thickness) lined pad that would accommodate up to 42 million tons of ore. The pad would be comprised of a composite liner system including both a clay sub-liner and the HDPE layer. The solution ponds that impound process solutions would be double-lined with 60 mil HDPE.

The compacted clay sub-liner for the leach pad would be a minimum of one-foot thick and would be obtained by sieving the clay soil materials from the native soils in the vicinity of the proposed mine facilities. Two feet of crushed gravel material (crushed to minus ¾ inch) would be used as a liner cover material. Ore to be placed on the leach pad would be crushed to minus 0.125 inch and agglomerated.

The pad and solution ponds would be equipped with leak detection systems. The leak detection system for the leach pad would consist of a wick drain placed between the primary HDPE and secondary clay liner. The leak detection systems would discharge directly to the pregnant pond, thus maintaining a closed system.

For the solution ponds, an HDPE drainage geonet would be placed between the two HDPE liners as a leak detection layer. In the event of a leak in the primary liner, the solution would be collected in the leak detection layer and transported by gravity to a sump in one corner of each pond.

The leak detection system for the solution ponds would include observation points for monitoring each sump location. Flow rates (in gallons per day) would be measured and submitted to the Nevada Division of Environmental Protection (NDEP) in quarterly reports. Solution pond systems have been designed to contain:

1) the normal working inventory of solution;
2) the fluid volume resulting from precipitation and runoff during a 25-year, 24-hour storm event (as required by State of Nevada regulations); and
3) solution accumulations resulting from an eight-hour cessation of power.

A standby diesel generator would power a pump-back system to maintain the required pond containment capacities should an extended power outage occur.

All liners, containment, leak detection systems and stormwater storage capacities would be approved by the State of Nevada prior to construction.

An overflow pond would be constructed downgradient of the pregnant solution pond, at the toe of the heap leach pad. The overflow pond would be constructed with a single HDPE liner. It would be designed to ensure that the process solution system would contain a 24-hour, 25-year storm event, as required by State of Nevada regulations.

To meet long-term operation and reclamation objectives, the leach pad would be constructed and operated in lifts to overall final slope configurations of 3h:1v. Lifts would average 25 feet in height, with a maximum heap height of 300 feet to 350 feet (12 to 14 lifts). Stability modeling indicates that the heap leach would be stable in both the static (normal) or pseudo-static (seismic) conditions.

Diversion structures above the heap leaching facilities would be designed to divert runoff resulting from the 100-year, 24-hour storm event around the leach pad, processing area and solution ponds. The diversion would channel the runoff into undisturbed drainages located east, north and south of the heap and process facility. This design would ensure that the leach system would be able to withstand the 100-year, 24-hour storm event, as required by State of Nevada regulations.

Four ground water monitoring wells would be placed to the south, east and west of the heap leach. These wells would be used to identify any potential adverse effects from the heap leach.

Layout of the leach pad would consider the following critical design parameters:

- 42 million tons heap capacity
- Adequate slope to allow positive drainage and rapid response of the solution collection system
- A shallow slope at the toe of the heap to ensure stability
- A grading plan that minimizes cut-and-fill quantities
- A system of four monitoring wells would be installed cross-gradient and downgradiated from the heap leach.

The heap leach pad would be designed to hold approximately 42 million tons of ore. Final pad elevations would match existing stripped ground surface elevations where possible. Structural fill material, where required, would be tested to ensure that materials are placed at a minimum of 95 percent maximum dry density.

ROAD CONSTRUCTION AND MAINTENANCE

The mine would be accessed in part via an existing road from U.S. Highway 95 Alternate (U.S. 95 Alt.) to the east of the proposed project (see Figure 2.1). This portion of the access road would be improved and widened to a width of 40 feet.

Because of the steepness of a portion of the existing access road, a newly engineered access road would be constructed from Section 2 to the mine site. This new section of access road would be approximately 2.02 miles in length and 40 feet in width. The new access road would be constructed to a condition equal to or better than the existing access road.

Haul roads and secondary access roads would be developed within the mine areas for accessing mine facilities. Mine roads would be surfaced, as needed, with waste rock material.

The width of mine roads would be 25 feet for access roads and 90 feet for haul roads. Haul road grades would not exceed 10 percent. Grades of 7 percent would not be exceeded for the access road from U.S. 95 Alt.

The existing access road from U.S. Highway 50 (U.S. 50) into the south portion of the proposed project area would be closed at the proposed project boundary. This access road presently serves as the primary access to the microwave sites to the north of the proposed project area. The improved access road from U.S. 95 Alt. would be maintained as the access to the microwave sites.

Access to the microwave sites north of the proposed project would be granted through the mine site by TMI for maintenance of the communication sites during the life of the mine. After mine closure, TMI will assign its rights to L.A. Water and Power for the road where it crosses through private lands.

BLM will provide right-of-way to L.A. Water and Power and other commercial uses upon application for the portion of the road on public lands.

For public safety reasons, public access through the mine site would be restricted. Public access to public lands near the mine area would be via an existing four-wheel-drive road to the north of the project site. The new access road would be available for public use after mine closure.

All mine roads would be outsloped or crowned and ditched to promote drainage. Intersecting dips or water bars and lead-offs would be installed as needed to channel drainage off the mine roads and reduce erosion potential. The majority of the mine roads would be constructed in disturbed areas, such as the crusher site and overburden/interburden disposal area sites.

Mine roads would be maintained by periodic dressing and blading, as required. Dust control measures would include watering and/or chemical controls.

PROPOSED PROCESSING FACILITIES

Ore from the pits would be crushed in a four-stage crushing system. Crushed ore would be mixed in a closed system with lime, cement and a dilute cyanide solution and moved to the leach pad by an enclosed conveyor system, all within the contained facilities area. (Runoff from the facilities area would all be captured.) The crushed-ore mixture would be placed on lifts on the leach pad. Run-of-mine ore would be trucked directly to the leach pad and would not be crushed. Crushers and conveyors would be equipped with baghouses (e.g., filters) and water sprays to reduce fugitive dust emissions.

Ore on the leach pad would be drip-irrigated with a dilute cyanide solution. The solution would percolate through the ore and dissolve the gold, silver and other metals. This "pregnant" solution (e.g., solution with dissolved metals in it) would be collected in lined ditches via a gravel-covered perforated pipe and transferred to the process plant for gold and silver recovery.

After recovery, solution without dissolved metals (barren solution) would be returned to the barren solution pond for the addition of cyanide and re-application to the heap.

Because Talapoosa ore contains significant amounts of silver, the pregnant solution would be processed in a Merrill-Crowe plant. In a Merrill-Crowe plant, the pregnant solution first passes through a series of diatomaceous earth filters to remove solids. Oxygen is then removed from the solution using a vacuum process. Metallic zinc dust is then added to the solution. This results in a gold and silver precipitate.

If mercury is a by-product, then it would also be precipitated out of the solution by this process. The resulting precipitate would be dried, the mercury removed and the gold and silver refined. Mercury, stored in secure containers, and the gold-silver product (doré) would be shipped off site for final refining and sale.

HAZARDOUS MATERIALS

Description of Hazardous Materials/Wastes

Operation and maintenance of the proposed mine would involve the use of various reagents and products. The approximate types, quantities and uses of the materials that would be stored at the property are shown in Table 2.2.

BLM policy requires those chemicals that would be present at the proposed site to be compared to the EPA's list of chemicals subject to reporting under the Superfund Amendments and Reauthorization Act (SARA).[1]

(In the lists below, RQ means reportable quantity; TPQ means threshold planning quantity. Both are measured in pounds.)

The chemicals that would be present at the proposed project site that are on the SARA list are:

- Ammonium Nitrate (Sec. 313)
- Caustic Soda (Sodium Hydroxide) RQ=1,000
- Hydrochloric Acid RQ=5,000
- Silver Nitrate RQ=1
- Sodium Hydroxide RQ=1,000
- Sodium Cyanide (EHS) TPQ=100, RQ=10
- Nitric Acid (EHS) TPQ=1,000, RQ=1,000
- Hydrogen Peroxide (EHS) TPQ=1,000, RQ=1
- Zinc Compounds
- Waste Lead Compounds RQ=10
- Waste Mercury Compounds RQ=1
- Ethylene Glycol RQ=1

Those listed as extremely hazardous are:

- Sodium Cyanide (EHS) TPQ=100, RQ=10
- Nitric Acid (EHS) TPQ=1,000, RQ=1,000
- Hydrogen Peroxide (EHS) TPQ=1,000, RQ=1

Those that are not extremely hazardous but would be used in quantities greater than 10,000 pounds annually are:

- Ammonium Nitrate (Sec. 313)
- Caustic Soda (Sodium Hydroxide) RQ=1,000

1

This comparison is required through the BLM s Interim Policy Identification of Hazardous Materials Impacts Through NEPA Process, and was made to the EPA s Consolidated List of Chemicals Subject to Reporting Under Title III of SARA, dated January 1992.

TABLE 2.2: LIST OF POTENTIAL CHEMICALS/PRODUCTS AND BY-PRODUCTS TO BE UTILIZED/STORED

CHEMICAL	MAXIMUM QUANTITY STORED ON SITE	CONTAINER	USE
Ammonium nitrate	100,000 lbs.	Magazine	Blasting
Blasting caps, primer cord & boosters		Magazine	Blasting
Gasoline	10,000 gallons	ASTs	Fuel for equipment/vehicles
Diesel	4 x 20,000 gallons	ASTs	Fuel for equipment/vehicles
Solvents	2 x 55 gallons	Drums	Cleaning
Anti-scalant	1,000 gallons	Drum	Scale inhibitor for piping
Muriatic acid	20 gallons	Drum	Clean scaling from equipment/piping
Lime (Calcium oxide) or cement	500 tons	Silo	Ore agglomerator & pH buffer
Sodium cyanide (30% Solution)	20,000 gallons	Tank	Reagent used to leach ore
Caustic soda (Sodium hydroxide) (1% Solution)	In cyanide solution	Tank	pH regulation of cyanide solution
Hydrochloric acid	5 gallons	Bottle	Analytical uses
Hydrogen peroxide	10 x 55 gallons	Drums	Neutralization of Sodium Cyanide
Silver nitrate	5 gallons	Bottle	Analytical uses
Sodium hydroxide	5 gallons	Bottle	Analytical uses
Nitric acid	5 gallons	Bottle	Analytical uses
Soda ash (Sodium carbonate)	55 gallons	Drum	Processing
Nitre (Potassium nitrate)	55 gallons	Drum	Processing
Borax (Sodium borate decahydrate)	55 gallons	Drum	Processing
Metallic zinc dust	250 (50 x 5) gallons	Pail	Processing
Slag (product)	500 lbs.	Drum	By-product*
Lead crucibles	6-14 tons	Drums or Bulk Bin	By-product
Oil	20,000 gallons	Tank	Vehicles/equipment
Mercury	est. 12 oz.	Small containers	By-product
Antifreeze (Ethylene Glycol)	220 (4 x 55) gallons	Drums	Antifreeze for equipment/vehicles
Antifreeze Waste	220 (4 x 55) gallons	Drums	Antifreeze waste from equipment/vehicles

*Covered by Bevill Amendment: slag = by-product of the beneficiation process

Description of the Uses, Storage, Transport and Disposal of Hazardous Materials/Wastes

Use

All hazardous materials use would be in accordance with pertinent local, state and federal regulations. Employees working with hazardous materials would wear personal protective equipment as specified in the Material Safety Data Sheets and on the labels for each chemical. Personal protective equipment would be available in the event of a spill or other emergency activity.

The gold recovery plant would be constructed on curbed concrete pads to contain potential spills from tanks containing cyanide solution.

Storage

All hazardous material containers would be secondarily contained by basins, tubs or specified storage buildings. Flammable materials would be kept in cabinets designed to contain a fire.

All containers of hazardous materials, by-products and wastes would be appropriately labeled. Any employees working with hazardous materials would be trained in their proper storage and labeling.

Hazardous materials required for the heap leach operation and process plant would include sodium cyanide solution, caustic soda, acids, bases and solvents. The cyanide solution would be delivered by truck. Caustic soda would be obtained in bulk as a solid. The acids and bases would be obtained in concentrated solutions from appropriate vendors. Transportation of chemicals would be handled by licensed carriers in properly marked vehicles.

Other hazardous materials that would be used and stored on site include ammonium nitrate, oil, diesel fuel, gasoline, sodium hydroxide, lime and solvents. Ammonium nitrate would be shipped in granular form in bins or 100-pound bags. Sodium hydroxide would be delivered either as a liquid or solid flake. Solvents would be purchased in 55-gallon drums.

Gasoline and diesel fuel would be stored in aboveground tanks near the main mine site. The tanks would be surrounded by earthen dikes or berms sufficient to contain 110 percent of the largest tank's contents in the event of a major spill or tank rupture. Solvents used for equipment cleaning would be purchased and stored in their original containers in the maintenance shop. Wherever possible, solvents purchased for use at the site would be those that are classified as non-hazardous waste upon disposal (40 CFR 261). Waste oil from equipment maintenance and any waste solvents would be temporarily held on site in secondary containment areas until sufficient quantities are accumulated for shipment off site for disposal or recycling. The waste oil would be sold to a properly permitted waste oil recycling facility. Transportation of the waste oils and solvents would be by licensed carrier.

Transport

The hazardous materials brought to the proposed mine site would be transported via certified hazardous material transporters, following all applicable regulations. Most materials would be transported in small quantities prior to the start-up of the mine operations. The only materials expected to be transported in larger quantities and more often would be gasoline and diesel fuels and blasting materials.

The only hazardous material by-products expected to be transported off site would be waste oil, waste antifreeze, lead crucibles and any produced mercury.

Disposal

For the most part, the proposed mine would be a zero-discharge mine during operation. A few by-products would be transported off site for recycling and reuse, such as small quantities of waste oil, waste antifreeze and lead crucibles. Lead crucibles may be disposed of as a hazardous waste if recycling is not a preferable alternative. Other waste disposal may occur after the mine closure, as described in the Proposed Reclamation section of this chapter.

Overview of TMI Safety and Contingency Plans

TMI would implement safety and contingency plans as required by local, state and federal regulations to provide for worker safety and to protect the environment. Following is a more detailed description of these plans.

Emergency Response Plan

The Emergency Response Plan would identify persons or positions responsible for responding to spills or releases of regulated materials at the facility. Names, phone numbers, chain of authority and responsibilities would be clearly identified. The plan would identify the types, quantities and locations of all regulated materials on the site, the locations of safety equipment and neutralizing chemicals and the specific actions to be taken for different types, sizes and locations of spills and releases.

The plan would also describe spill/release reporting procedures in accordance with all applicable regulations, including the Nevada Notification of Release regulations, NAC 445.238 through 445.242, and all permit conditions.

Temporary Closure Plan

The purpose of the Temporary Closure Plan is to protect the integrity of the fluid management system during temporary closures. The plan would define events that would result in planned suspension of active operations. These include seasonal conditions, planned maintenance outages and unfavorable economic conditions. It would detail the actions to be taken to maintain the stability of the process components until operations resume.

Unplanned temporary closures would not be covered under this plan and would be handled in accordance with NAC 445.24384. The Temporary Closure Plan would include:

1) a list of events that would cause temporary closure;
2) actions to be taken for each event;
3) a site inspection plan for evaluation of system integrity;
4) facility manning levels and duties;
5) process fluid quantities and pond levels to be maintained during temporary closure;
6) proposed temporary changes to the Monitoring and Mitigation Plan; and
7) estimated duration of temporary closures.

Transportation

Transportation of hazardous materials and minor amounts of waste products to and from the mine site would be primarily by truck. Certified contractors would be used for transport of hazardous materials and wastes.

TMI would use certified contractors to transport hazardous materials and hazardous wastes. TMI would have pre-arranged plans to respond to a transportation incident involving hazardous materials or wastes.

TMI would provide copies of these plans to the appropriate area agencies and local emergency response contractors. TMI would rely upon an effective response plan that depends upon a quick response from local emergency response contractors to minimize environmental effects from a transportation incident. A proactive emergency response stance would be taken.

There is always the possibility of a truck accident resulting in the release of hazardous or non-hazardous materials. However, the environmental impact of such a possibility would be minimized by:

1) avoiding sensitive areas along the transportation routes, if possible; and
2) having emergency response plans in place to mitigate such an incident.

In the event of an accident resulting in a release of hazardous materials or wastes, TMI would depend upon outside sources for emergency response cleanup. These sources would include the local emergency response agencies as well as private emergency response companies.

Arrangements with both the agencies and the private organizations would be made in advance, as part of the emergency response plan for the mine, to ensure a speedy and effective response.

If an incident involving a release of hazardous materials and wastes occurs, a complete investigation of the incident would be conducted. This would include mitigation of the problem and monitoring of potentially affected resources.

Mitigation of a problem would consist of different procedures depending upon the type and extent of the problem. This could range from turning off a valve and cleaning out the secondary containment areas to cleaning up contaminated soils and waters.

Immediate response may include the evacuation of the mine site and the immediate surrounding area or other affected areas in the event of an off-site spill.

Once the problem is under control, an assessment of the problem area would be conducted. This assessment would determine what further mitigation procedures may be required and what monitoring is required to determine the extent, if any, of contamination.

Monitoring to ensure proper remediation would also be conducted. After the cleanup has been completed, an incident review would be conducted. This would consist of a thorough investigation that would include a determination of the incident's cause and identification of measures to prevent it from happening again.

ANCILLARY FACILITIES

Water Wells

TMI would maintain one to three production water wells on the proposed mine site for ore production and processing, and for monitoring water quality. Additionally, five wells would be maintained exclusively for monitoring purposes.

Water Supply

During mine operations, water usage is expected to be up to, but no greater than, 1,500 acre feet per year. However, the on-site production wells probably would be not meet this requirement. Therefore, additional water would need to be obtained from an off-site source. TMI is in the process of reviewing alternate available water sources.

At present, TMI proposes to pump water from a well located within Section 26, T18N, R24E, MDB&M (see Figure 2.2). However, because of limited water rights in the area, TMI must secure existing water appropriations and transfer them to the proposed well at the point of diversion. This will require approval by the State Engineer.

From the proposed well location in Section 26, approximately two miles of 6- to 10-inch steel or HDPE water line would be installed to the project site. The pipeline would be buried to a minimum depth of three to six inches with an average trench width of 12 to 18 inches. A rubber-tired backhoe would be used for construction and the pipeline would be placed on existing disturbed areas as much as possible. New disturbance would be about ½ acre and limited to the extent necessary to bury the water line. The new disturbance resulting from the construction of the water line would be seeded with a seed mixture approved by the BLM.

The route of the pipeline is described as follows: from the well, north to the northern fence boundary of the Silver Springs airstrip, thence west along the fence line to the projected intersection of Ruby Avenue; thence north across U.S. 50 to the east side of Ruby Avenue, within the 60-foot Lyon County dedicated road right-of-way; thence north and west along the east side of Ruby Avenue to the west line of Section 14; thence north along the west line of Section 14 to the project site.

Future use of the water line would be determined at mine closure. The line would be removed if not needed for other uses. TMI would secure appropriate permits from the Nevada Department of Transportation and the Lahontan Airport Development Association for crossing U.S. 50 and the airstrip with the water line.

Power Supply

Power would be supplied to the proposed mine by Sierra Pacific Power Company (SPPCo). SPPCo proposes to provide power to the site by extending two existing separate power lines and merging them onto a single pole as follows: The 12kV line that exists north of U.S. 50, running north-south along Opal Avenue, would remain intact to the point where it intersects the east-west 60kV line that exists along the southern ¼ section line of Section 14. From this intersection, the 60kV and 12kV power lines would run north along the west line of Section 14 to the project site.

The existing 12kV line in Sections 10 and 15 would be removed and a 60kV line would be installed on single wood-pole structures with an average span of 400 feet between poles (see Figure 2.2). Approximately ¾ mile of new line would be constructed and ¾ mile of existing power line removed. Access for installation and maintenance of the power line would be provided by cross-country travel or by development of a minimal two-wheel track where necessary.

The project would include a substation within the proposed project facilities area. The impact associated with the power line and proposed substation within the project boundary were evaluated as part of the proposed action in the DEIS.

Right-of-way permitting and compliance with Section 106 of the National Historic Preservation Act associated with the power supply would be addressed by SPPCo during their permitting process.

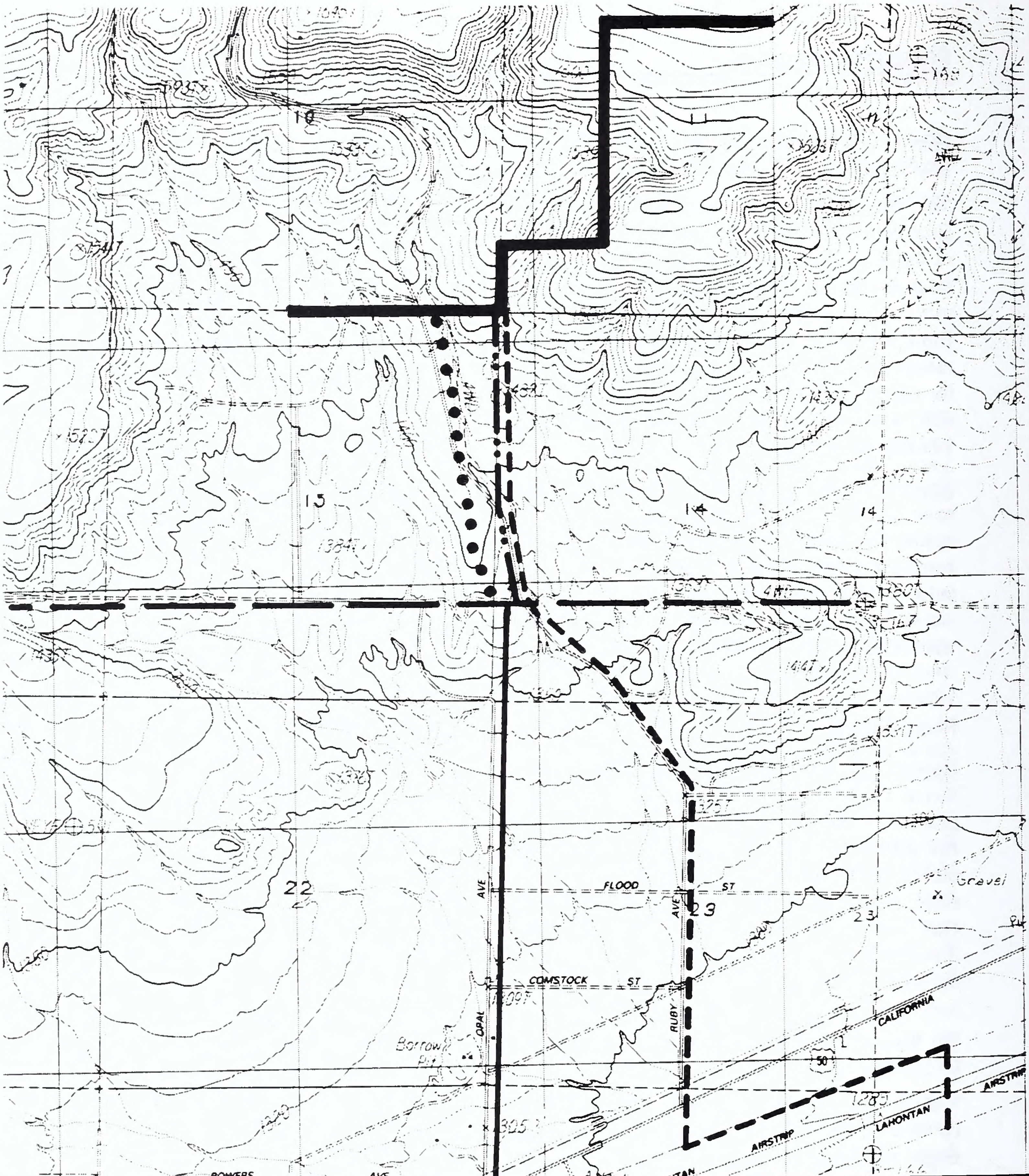
EXPLORATION ACTIVITIES

Through its exploration group, TMI would continue to conduct mineral exploration activities within the proposed project boundary. Exact drill targets and drill hole locations have not been finalized at this time. In order to facilitate future permitting, TMI's exploration group would coordinate any future exploration activity within the proposed project area with the BLM and NDEP.

Ongoing exploration activities within the proposed project area are projected to occur during the life of the mine. The proposed exploration would consist of construction of temporary roads, pads and trenches and drilling of exploration drill holes.

Site-specific operation/reclamation plans would be submitted to the BLM and NDEP prior to the beginning of each drilling season. Areas of proposed exploration and reclamation costs would be included in the exploration plans.

Since the proposed project area has been subjected to previous exploration and mining activity, existing roads and trails would be used to the extent possible. The drilling would be conducted within the proposed project area on potential extensions of favorable geologic formations. Rock samples would be collected, studied and analyzed, when appropriate, to determine the extent and nature of the gold mineralization discovered during earlier drilling programs.



EXPLANATION

- MINE PROPERTY BOUNDARY
- PROPOSED WATERLINE
- 12 kV LINE TO BE REMOVED
- NEW 12 kV AND 60 kV LINE
- EXISTING 60 kV LINE
- EXISTING 12 kV LINE TO BE RETAINED

2000 0 2000 FEET

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TALAPOOSA MINE PROJECT ENVIRONMENTAL IMPACT STATEMENT

FIGURE 2.2

PROPOSED WATERLINE AND POWERLINE

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Drilling Equipment and Crews

The drilling equipment would consist of a variety of truck- or track-mounted drills, including reverse-circulation air-rotary and diamond-core equipment. Other support equipment would include a water truck, a pipe truck, mobile tool houses, a crane truck and a mobile air compressor. Pickups and other general access vehicles would also be used.

It is anticipated that the number of drill rigs at work on the proposed project at any given time would be one or two, and that the maximum number of rigs would be six.

The typical drill crew for the reverse-circulation rigs would consist of a drill rig operator and two helpers. These rigs may operate two shifts per day. Therefore, up to six crew members may be required to operate each drill rig.

The core units operate at a slower drilling rate and require only two-person crews, consisting of a drill rig operator and helper. These rigs may also operate two shifts per day. Therefore, up to four crew members would be required to handle each core rig. These workers are currently employed or would be contracted by TMI.

A reverse-circulation type of air-rig uses conventional rotary or down-the-hole hammer bits to advance the drill hole. Compressed air is used to remove cuttings from the bit face and move them to the top of the hole where samples are collected and split.

Waste from Drilling

The excess cuttings from the drilling are discharged into adjacent sumps along with any ground water encountered in the drill hole. Water is often used along with the air to aid in bit lubrication and cooling. Biodegradable detergent additives may also be added to the water to enhance the ability of the return air to lift cuttings and water from the drill hole.

Diamond core drilling uses a hollow, diamond-faced bit to cut a core as the bore hole is advanced. Drilling fluids, usually polymer additives mixed with water, are used to clean the cutting surface, lubricate the bit face and return the very fine drill cuttings to the surface. Drilling fluid additives are biodegradable and are contained in zero-discharge sumps.

Aquifers

Aquifers encountered during drilling would be protected with appropriate mud programs or casing, as necessary, and in compliance with Nevada Division of Water Resources requirements.

Roads, Drill Pads and Erosion Control

Construction of exploration roads, drill pads and reclamation activities would be performed by a bulldozer and/or a large track-mounted backhoe.

A number of existing roads are currently located in the proposed project area. Access to the proposed exploration sites would be via existing roads to the extent possible. Some existing roads, overland travel (with track-mounted rigs) and newly proposed roads would be used for access to drill pad locations.

Most new exploration roads would be constructed with a bulldozer using standard balanced cut-and-fill methods. On shallower side slopes, cut-only methods would be utilized to reduce construction time.

Where road construction for exploration is necessary, any available growth medium would be graded and stockpiled to the uphill margin of the road cut. On steeper slopes where maneuvering heavy equipment is difficult, growth medium would be stored as side-cast along the exploration roads and pads where feasible.

Although this method often results in combining a greater proportion of deeper soils with topsoil, experience has shown that the regraded surface soils can support vegetation. The alternative of pushing topsoil uphill prior to cutting exploration road on steep slopes results in additional work for bulldozers and significantly increases surface disturbance.

The majority of the exploration roads would be constructed to an average roadbed width of approximately 15 feet. Exploration roads constructed on slopes would typically be in-sloped at a grade of 1 to 2 percent. The final extent of in-sloping would be dictated by the geologic conditions encountered and by the planned use of the exploration road.

Exploration roads would be constructed at grades of less than 8 percent and would be upgraded and maintained as necessary to allow efficient use and to minimize adverse impacts to soil and water resources. Upgrading and maintenance procedures for exploration roads would include:

1) periodic dressing or blading of frequently used road surfaces;
2) installation of drainage controls, such as water bars and ditches, to control road damage, soil loss and sediment impacts from erosion;
3) road maintenance, such as the removal of snow and accumulating water in mudholes, to allow access during wet seasons;
4) surfacing some road segments with gravel to control muddy conditions to assure continued travel along proposed access routes;
5) installation of culverts, if required, at main drainage crossings, although it is not anticipated that culverts would be required for proper maintenance of drainages in the proposed action; and
6) watering of roads during dry conditions for dust control.

To avoid erosion during construction, straw or hay bales would be used as silt traps to control sediment runoff to the extent required.

Sediment ponds, settling basins or silt traps would be constructed as barriers to sediment transport at drill sites located adjacent to major drainages that may be impacted by the drilling program. The barriers would be designed to capture sediment resulting from the release of drill cuttings and drilling fluids, and from soil eroded from exploration roads and drill pads during rainfall or during discharge of ground water encountered during drilling.

Post-Exploration Restoration

At the completion of the drilling and subsequent data interpretation, drill holes would be plugged in accordance with NAC 534.425 through 534.428. All drill holes would be plugged concurrent with operations. Areas of exploration road construction which result in berms would be recontoured to approximate the pre-disturbance slope by pulling berm and side-cast material back onto the road. This contour restoration would be performed by backhoes or bulldozers, depending on local site conditions, including slope gradient, the desire to minimize further disturbance and the availability of the equipment.

Overland travel would occur resulting in "jeep trails" that require even less reclamation. These "jeep trails" would be reclaimed by ripping and seeding.

Culverts or other drainage devices installed during construction of access roads would be removed during final reclamation, and natural drainages would be re-established by grading. When necessary, water bars would be reconstructed on scarified roads that exhibit a potential for accelerated soil erosion through channelization. On lesser slopes, the regrading and ripping of exploration roadbeds would be sufficient to prevent sediment transport.

Topsoil would be redistributed after completing the regrading/scarifying of exploration roads and drill pads. Recontouring and scarifying of exploration roads and drill pads would be the primary means of seedbed preparation.

Soil surfaces abraded during the final stages of earthwork would provide an enhanced seed germination environment by allowing the seed to be trapped and held. Additional benefits would include slower runoff, increased infiltration and generally more favorable microclimates conducive to sprouting.

PROPOSED RECLAMATION

Reclamation after the proposed mining activities cease include the following:

- Test plots
- Growth medium placement
- Revegetation
- Establishment of a safety berm and warning signs around the pit perimeter
- Heap leach detoxification and closure
- Re-grading of disturbed areas
- Road reclamation
- Removal of structures
- Closure of wells not required following mine closure
- Reclamation monitoring
- Drainage control

Each of these activities is detailed in this section.

Test Plots

Concurrent with development, a test-plot program will be developed for use in refining the reclamation plan and developing site-specific reclamation treatments for the proposed mine facilities. This will include determining the suitability for replacing the growth medium stripped during development and the revegetation of disturbed areas.

Different seed mixes, site preparation techniques, growth medium depths and soil amendments would be used in the test plots. Consideration would be given to using wastewater treatment plant biosolids based on test plot results. The test plot program would be developed in consultation with the BLM, the NDEP and the U.S. Department of Agriculture Natural Resources Conservation Service (NRCS).

Based on the results of the test plot program, BLM's Authorized Officer would select the specific seed mixtures and cultivation techniques to be used in reclaiming site-specific disturbed areas.

Growth Medium Placement

The results of the revegetation test plot program will be used to determine if placement of growth medium on the heap will be necessary to enhance establishment of the reclaimed disturbed plant community.

In order to optimize the available resource, growth medium would first be placed on the top of the heap leach. Additional growth medium, if available, would then be placed on the heap slopes. The amount and depth of the placed growth medium will be determined by the results of additional test plots.

The overburden/interburden disposal areas will be revegetated without the addition of growth medium. If there is growth medium remaining following reclamation of the heap leach, this material would be placed to a uniform depth on the tops of the disposal areas.

During development of the mine, the solution/sediment ponds would be constructed by excavation. The sites would be stripped of growth medium that would be stored as part of the dike structure. The excavated soil material would be stored in the pond berms.

During reclamation, the pond sites will be backfilled with the excavated material. Liners may be buried under the backfilled material (see page 2-19). The sites will be graded for drainage, scarified and revegetated.

Roads will not require a growth medium cap for revegetation. Roadways would not be stripped of growth medium before they are constructed. During construction, excavated roadbed material will be stockpiled in berms along the road where blading and widening is used, or used as roadbed fill in cut-and-fill construction.

TABLE 2.3: PROPOSED RECLAMATION SEED MIX

COMMON NAME	VARIETY	POUNDS/ACRE (PLS)*
Crested wheatgrass	Highcrest	3.06
Thickspike wheatgrass	Critana	3.06
Streambank wheatgrass	Sodar	3.06
Needle & thread grass		2.34
Indian ricegrass	Nezpar or Paloma	1.08
Palmer penstemon		0.50
Yellow sweet clover		1.12
Ladak alfalfa	Lahontan	1.12
Lewis flax		0.18
Cicer milkvetch	Lutana	0.50
Fourwing saltbush	Rincon	1.98
TOTAL		**18.00**

*PLS - pure live seed.
Note: Proposed seed mix would be refined based on results of test plot program. Application rate is for broadcast or hydro-seeding. The rate would be reduced by one-half for drill seeding.

During reclamation of roads that were bladed or widened, the driving surface will be ripped and stockpiled soil material will be bladed on to the road to form the final soil surface for revegetation.

For roads that were built using cut-and-fill construction, the roadbed fill material will be pulled back onto that portion of the roadway to be reclaimed by a track-mounted backhoe. The soil fill material will then be recontoured and revegetated.

Revegetation

Growth medium, in-place soils and waste rock would be sampled prior to revegetation. If determined to be necessary based on the test plot program, fertilizer may be used, if beneficial. Seed would be applied by broadcast methods, hydro-seeding or rangeland drill, depending on the steepness of slopes.

The proposed seed mix in Table 2.3 consists of a combination of woody shrubs, forbs and grasses. This would result in a self-sustaining, reclaimed disturbed plant community. The seed mix will be refined based on the results of the test plot program, as detailed below.

Open-Pit Reclamation

A safety berm four to six feet in height would be constructed around the perimeter of the open-pits to limit access into them. Construction of the berm would be accomplished during the establishment of the maximum pit boundary. Overburden material would be scraped from the surface and pushed to form the safety berms. Safety berm slopes would be angle-of-repose (1.5h:1v).

In addition, warning signs would be posted around the pit. Access roads into the pit would be reclaimed to deter access. The pit berm would be revegetated in order to control erosion.

Overburden/Interburden Disposal Area Reclamation

The crests of each lift in the two overburden/interburden disposal areas would be rounded off by a bulldozer to achieve a smooth appearance and improve the final overall slope stability.

As shown on Figure 2.1, upgradient diversion ditches would be constructed as necessary to prevent run-on of precipitation.

The disposal areas would be revegetated to reduce the potential for accelerated erosion. If available, growth medium would be placed on the tops of the disposal areas. Where accessible by equipment, surfaces would be scarified along the contour, instead of up and down the slopes, to prepare a suitable seed bed and reduce erosion potential.

The final surfaces would be contour-scarified to prepare a suitable seed bed. The seed would be applied during the optimum "seed window." Depending on the steepness of the slope, seed would be applied either by broadcasting, hydro-seeding or with a rangeland drill. Wherever possible, a rangeland drill would be used.

Heap Leach and Solution Ponds/Ditches Detoxification and Closure

The valley fill leach pad would be closed by first allowing the heap to drain freely. Solutions would be collected and reduced via evaporation in the solution ponds. Fresh water would then be added to the remaining pond solutions.

This rinsate solution would be circulated through the heap leach until the levels for weak acid dissociable (WAD) cyanide and pH meet acceptable levels, and also until the levels for other constituents would not have the potential to degrade waters of the state.

A preliminary closure plan for the leach pad would be included in the Water Pollution Control Permit Application to be filed with the Nevada Division of Environmental Protection, Bureau of Mining Regulation and Reclamation. A detailed closure plan would be submitted two years prior to the anticipated closure, as required by Nevada state regulations.

Solutions in process ponds would be allowed to evaporate. The remaining residues would be analyzed and disposed of based on the analytical results and in accordance with appropriate regulations.

If the residues are neutral and do not exhibit any hazardous characteristics, the liners would be perforated, folded into the ponds over the residues and buried in place.

If the residues are not neutral, the liners and residues would be removed to an appropriate disposal area and handled according to federal and state regulations. Pond sites would be backfilled and regraded for free drainage and to blend with the surrounding topography.

Heap Leach and Solution Ponds/Ditches Reclamation

Following detoxification, the top of the leach pad would be graded to prevent ponding. Pond sites would be backfilled and regraded for free drainage and to blend with the surrounding topography.

Solution collection ditches would be backfilled and regraded to promote free drainage. Run-on would be diverted around the facilities by ditches designed to carry the 100-year, 24-hour storm event. Figure 2.1 shows the location of the proposed diversion ditches.

The leach pad would be revegetated in accordance with the above revegetation guidelines to reduce erosion potential and infiltration of precipitation. Available growth medium would be placed on the tops of the heap leach pad and benches. Depending on the steepness of the slope (final continuous slope of 3h:1v), seed would be applied either by broadcasting, hydro-seeding or with a rangeland drill. Wherever possible, a rangeland drill would be used.

Three ground water monitoring wells would be placed downgradient and cross-gradient from the heap leach pad. MW-1 would be located east of the heap leach, MW-3 would be located immediately south of the heap pad, and MW-4 would be located south and west of MW-3. These wells would be monitored during mine operation until final closure is accepted by the State of Nevada and the BLM. This system of wells would serve to identify any unexpected impacts to the ground water from the southwest disposal area and the heap leach pad.

Road Reclamation

All roads, except the access road from U.S. 95 Alt. to the microwave facility, would be regraded to blend with the surrounding topography to the extent possible. Berms, sidecast material and drainage ditches would also be regraded when the roads are regraded. Culverts would be removed as roads are no longer needed. Water bars would be installed at suitable locations in the reclaimed roadways to minimize erosion potential. Regraded roads would be scarified to prepare a suitable seed bed.

Depending on the steepness of the slope, seed would be applied either by broadcasting, hydro-seeding or with a rangeland drill. Wherever possible, a rangeland drill would be used. Drainages affected by road construction would be stabilized to prevent erosion by reconstruction, placement of rip-rap in erosion-prone areas of drainages and/or revegetation.

Removal of Structures

All buildings, structural materials and equipment *will* be removed from the mine site at the close of operations. Any non-hazardous or non-toxic materials such as scrap lumber or metal would be recycled when possible or disposed of in the state-approved on-site landfill. Hazardous or toxic materials would be disposed of according to federal and state regulations.

All equipment used for process solutions would be neutralized and either used for salvage or disposed of (or recycled when possible) in accordance with federal and state regulations. The sewer and wastewater treatment system would be managed and closed according to state regulations. Concrete foundations, pads and sumps would be broken up and either hauled to the on-site landfill or flattened and buried in place.

Well and Drill Hole Closure

All water wells and drill holes remaining at mine closure would be plugged in accordance with state regulations and standards. Any disturbed areas around well sites or drill holes would be revegetated.

PROJECT DESIGN FEATURES AND REQUIREMENTS

The proposed project incorporates environmental protection measures to prevent unnecessary and undue degradation of lands on which the project would be located. All activities would be conducted in accordance with applicable BLM, other federal, state and local environmental permit requirements and facility siting requirements.

EMISSION / POLLUTION CONTROL

The proposed project would be designed and would be operated as a "zero discharge" facility with respect to releases to surface and ground waters. The leach pad, solution ponds and solution collection ditches would be lined with impermeable synthetic liners and equipped with leak detection and recovery systems.

Collection ponds have been designed to contain runoff from the leaching facility from a 25-year, 24-hour storm event. Process pipelines would be equipped with automatic shutoff devices and a compacted ditch for secondary containment. A standby diesel generator would power a pump-back system to maintain the required pond containment capacities should an extended power outage occur.

The Merrill-Crowe processing plant would be equipped with secondary containment sufficient to contain 110 percent of the largest tank in the facility. All reagent and fuel storage tanks outside the process plant would be bermed to create secondary containment capacity greater than 110 percent of the largest tank.

A regular program of inspection of all portions of the fluid management system and monitoring of the leach detection and recovery systems would be incorporated into operation of the leaching facility.

Fugitive dust from road traffic would be controlled by application of water and/or a dust suppressant on roads within the proposed mine area. Particulate emissions from crushing of ore would be controlled by baghouses and water sprays. Emissions of particulates from the conveyor would be controlled by fogging and water sprays. Potential emissions of lime from the lime storage silo would be controlled by use of a baghouse on the silo and water spray bars on the discharge conveyor.

RUNOFF AND SEDIMENT CONTROL

Since the open-pit and overburden/interburden disposal areas would be constructed in the uppermost reaches of the watersheds, natural runoff from the areas above these facilities would be minimal.

Sediment ponds would be constructed at the bases of the disposal areas as shown on Figure 2.1. Runoff from precipitation above the proposed project area would be diverted by a ditch diversion system capable of conveying runoff from a 100-year, 24-hour storm event. Diversion ditches and outlets would be riprapped as necessary to reduce erosion and sediment loss.

All roads would be constructed with water bars at appropriate intervals to channel runoff away from the road and minimize erosion. Culverts would be constructed at drainage crossings. Berms along roads would be revegetated during the project life to reduce potential erosion and sediment loss.

WILDLIFE PROTECTION MEASURES

Solution ponds would be enclosed by an eight-foot-high chain link fence that meets Nevada Division of Wildlife (NDOW) requirements to keep wildlife out of the area. Solution ponds and open collection ditches would either use netting or high-density polyethylene balls to exclude birds and other wildlife. The heap irrigation system would be operated to eliminate any ponding of solution on the heap.

BLM-SPECIFIC REQUIREMENTS

The BLM would be notified if there is a significant variance from the approved action with respect to hazardous materials and wastes and any aspect of their use, storage and disposal. (Interim Policy on Identification of Hazardous Materials Impacts Through the National Environmental Policy Act Review Process, 11/12/93)

There would be no disposal of hazardous materials on public lands. As required, when hazardous materials are located on public lands, the following sequence of actions would occur: reporting, site security, coordination of procedural clean-up and monitoring results of clean-up. All necessary permits from the State of Nevada and the Environmental Protection Agency would be obtained.

All applicable requirements of the Toxic Substances Control Act would be complied with. Additionally, any release of toxic substances in excess of the reportable quantity established by 40 CFR, Part 117, would be reported as required by the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) of 1980, Section 102b.

A copy of any report required or requested by any federal or state agency as a result of a reportable release or spill of any toxic substances would be furnished to the BLM Authorized Officer concurrent with the filing of the reports to the involved federal or state agency. (Lahontan Resource Management Plan, Update: Standard Operating Procedures, April 1994)

CHAPTER 3

ERRATA

This chapter presents specific modifications and corrections to the Talapoosa Project DEIS. These corrections and modifications were made in response to comments received during the public comment period. Changes are shown in italics.

Page S-6 states that "The lake is expected to be high in sulfate and dissolved solids resulting in a neutral chemistry." This is misstated. The statement should read:

"The lake is expected to be high in sulfates and dissolved solids and be near neutral to alkaline in pH."

DEIS Page 2-9, Valley Fill Leach Pad and Solutions Ponds, has been revised. Add the following paragraph following the first paragraph of the section. It is included in the FEIS on pages 2-5 and 2-6 of the Preferred Alternative:

"The compacted clay sub-liner for the leach pad would be a minimum of one-foot thick and would be obtained by screening the clay soil materials from the native soils in the vicinity of the heap leach pad, ponds and overburden/interburden disposal areas. Two feet of crushed ore material (crushed to minus ¾ inch) would be used as a liner cover material. Ore to be placed on the leach pad would be crushed to minus 0.125 inch and agglomerated."

Page 2-9, replace the sentence in paragraph 9 that begins "Stability modeling indicates . . ." with the following sentence:

"Stability modeling indicates that the heap leach pad would be stable in both the static (normal) and pseudo-static (seismic) conditions."

Page 2-32, in Table 2.4 under the Water resource the description of the Proposed Action, the first sentence is modified as follows:

"Direct impacts include the formation of a pit lake which would contain mineralized waters, water supply pumping activity and resultant lowering of the water table of the *volcanic bedrock* aquifer system in the immediate proposed project area."

Page 3-7, a new paragraph is added after paragraph 6:

"Soils along the proposed water line and power line are generally shallow and usually stony to bouldery on the surface. Grade of the water line would generally be less than 5%, although there would be pitches of 10% to 15% on the north end of the mine property. Overall, the erosion potential for the area is considered low to moderately low based on the type of soil material and grade of the water line. The water line and power line would be seeded after construction."

Page 3-13, a new paragraph is added after paragraph 3:

"A survey for threatened, endangered and sensitive plants was conducted along the proposed water line and power line. There were no threatened, endangered or sensitive species identified."

Page 3-25, paragraph 13, is modified as follows:

"This observation point is located on *Ruby* Avenue, approximately one mile south of the proposed project boundary. It is . . . ."

Page 3-35, paragraph 9 is modified as follows:

"Four archaeological Class III surveys have been conducted within the proposed project area *and along the proposed water line and power line.*"

Page 3-46, paragraph 2 as been modified as follows:

"Most rock are mixtures of both acid-generating and acid-neutralizing minerals. The ratio of the ANP to the AGP, [delete *"known as the Net Neutralization Potential (NNP)*], indicates the potential of the rock to produce acid over the long term."

Page 3-57, the Section Heading titled "Project Area Ground Water Quantity and Quality" has been changed as follows:

"Project Area Aquifer"

Page 3-57, source for values of transmissivity, porosity, and existence of barrier faults have been added as follows:

"Water Management Consultants (WMC), 1996."

Figure 3.7, Geologic Cross Section A map has been corrected. See FEIS Figure 4.2 for the corrected map. Cross Section A-A' referenced on Figure 3.7 is found on DEIS Figure 3.8 and FEIS Figure 4.3.

Page 4-3, Paragraph 10 is modified as follows:

"Using a sediment delivery ratio of 0.3, the anticipated soil loss from the reclaimed heap leach is 1.46 tons/acre/year (T/A/Y) from a 1,000-foot slope and 1.05 T/A/Y from a 500-foot slope."

Page 4-3, a new paragraph is added after Paragraph 10:

"Potential soil loss would be limited to the tops of the overburden/interburden disposal area and post reclamation soil loss for the overburden/interburden disposal area is estimated as follows:

Northeast Overburden/Interburden Disposal Area:

Long Slope	*.0024 T/A/Y*
Short Slope	*.0015 T/A/Y*

Southwest Overburden/Interburden Disposal Area:

Long Slope	*.0021 T/A/Y*
Short Slope	*.0015 T/A/Y"*

Page 4-6, under the heading "Wildlife and Fisheries Resources," paragraph 10 beginning "Water supply pumping could . . ." has been replaced with the following paragraph:

"All available information indicates that water supply pumping from the proposed mining operation would not impact Rock Blind Spring, the sole source of water in the immediate area of the proposed project. In the improbable event that the mine's operations do impact this spring, loss of this water source could diminish or eliminate populations of those species that require free water, including chukar and mourning doves."

Page 4-7, second column, paragraphs 4 and 5 have been modified as follows:

Paragraph 4: Replace the first sentence with: "*Five guzzlers will be installed in the area.*"

Paragraph 5: "The water level at Rock Blind Spring *will* be monitored on a regular basis. Should monitoring indicate the spring is being significantly impacted by mining activity, a solar-powered well *will* be installed to maintain this water source."

Page 4-8, Paragraph 1 is modified as follows:

"No threatened, endangered *or sensitive* plant species would be affected by the proposed Talapoosa project, *including the water line and power line*."

Page 4-9, paragraph 4, the second sentence is modified as follows:

"Alternative sites *will* be *bat-gated* to prevent human entrance and minimize disturbance to bats."

Page 4-13, paragraph 12 is modified as follows:

"The power line and *water line* serving the site would be visible from U.S. 50. This line would appear similar to the existing power lines in this area. *The water line would be buried along existing disturbed areas for most of its run.* The overall impact would be minor."

Page 4.31, Cultural Resources, Direct and Indirect Impacts of the Proposed Action, paragraph 1, has been revised as follows:

"In total, 21 sites and 71 isolated artifacts *(92 cultural resources)* were located in the proposed project area. All *but one* of these *cultural resources properties* have been determined to be Not Eligible to the National Register of Historic Places. *The single eligible site is well outside the project boundaries and would not be impacted by the mining activities. There were no sites identified along the proposed routes for the water and power lines.* Therefore, there would be no effects on historic properties as a result of the Proposed Action."

The following entries are added to Chapter 7, Biblography:

"American Society of Agricultural Engineers, 1992.

Hydrologic Modeling of Small Watersheds. C.T. Hann, Ed., ASAE Monograph No. 5., p. 210.

Miller, Glenn C., Lyons, W. Berry, Davis, Andy.

Understanding the Water Quality of Pit Lakes, Environmental Science and Technology, Vol. 30, No. 3, 1995.

McDonald & Harbaugh

A Modular 3-D Finite-Difference Ground Water Flow Model, Chapter A-1, USGS Open File Report 83-875.

Water Management Consultants, Inc., 1996.

Evaluation of Baseline Hydrology and Prediction of Hydrologic Conditions During Operation and Closure; Talapoosa Project. Prepared for Miramar Gold Corporation, Reno, Nevada.

Water Management Consultants, Inc. 1996.

Use of the HELP Model to predict Seepage from the Reclaimed Waste Rock Disposal Areas."

Page E-3, Paragraph 5 has been modified as follows:

"Most types of rock are mixtures of both acid-generating and acid-neutralizing minerals. The ratio of the ANP to the AGP, [delete *"known as the Net Neutralization Potential (NNP)*], indicates the potential of the rock to produce acid over the long term".

CHAPTER 4

AMENDED ANALYSIS: AFFECTED ENVIRONMENT; ENVIRONMENTAL CONSEQUENCES

This section amends the Geology and Minerals sections and Water Quality & Quantity sections of Chapter 3, Affected Environment, and Chapter 4, Environmental Consequences, of the Draft Environmental Impact Statement (DEIS). It stands as a complete analysis of these two resource issues.

AMENDED ANALYSIS: AFFECTED ENVIRONMENT

GEOLOGY AND MINERALS

REGIONAL GEOLOGY

The proposed project is located in the northern portion of the Virginia Range. The range consists of volcanic rocks that rest at depth on older igneous and metamorphic rocks.

Other gold/silver occurrences located near Talapoosa include the Gooseberry Mine and the Ramsey District, both of which are aligned along the east-west trending Talapoosa-Gooseberry Lineament.

In addition to these mineralized areas, the historic Virginia City Mining District is also in the Virginia Range, but along a separate mineralized trend 20 miles to the southwest of the proposed Talapoosa project.

GENERAL MINE GEOLOGY / LOCAL GEOLOGY

Local geology at the Talapoosa site consists predominantly of three relatively horizontal volcanic rock units. From oldest to youngest these rocks are known as the Kate Peak Formation (predominantly andesite), the Coal Valley Formation (predominantly volcanic-derived sedimentary rocks) and the Lousetown Formation basalt (See Figure 4.1). A veneer of alluvial gravel exists in some low-lying areas.

A fourth rock type consists of a body of igneous intrusive rock or stock, which intrudes portions of the Lower Kate Peak Formation below or near the ore zone. The stock may have acted as a heat source for the hydrothermal (hot water) system that produced the ore body. However, the stock itself does not contain significant ore.

MINERAL RESOURCES

Gold and silver are the only commodities known to have a potential economic value at the Talapoosa site. Historic production from the site is estimated at 22,000 tons of ore, which yielded approximately 5,000 ounces of gold (Van Nieuwenhuyse, 1991).

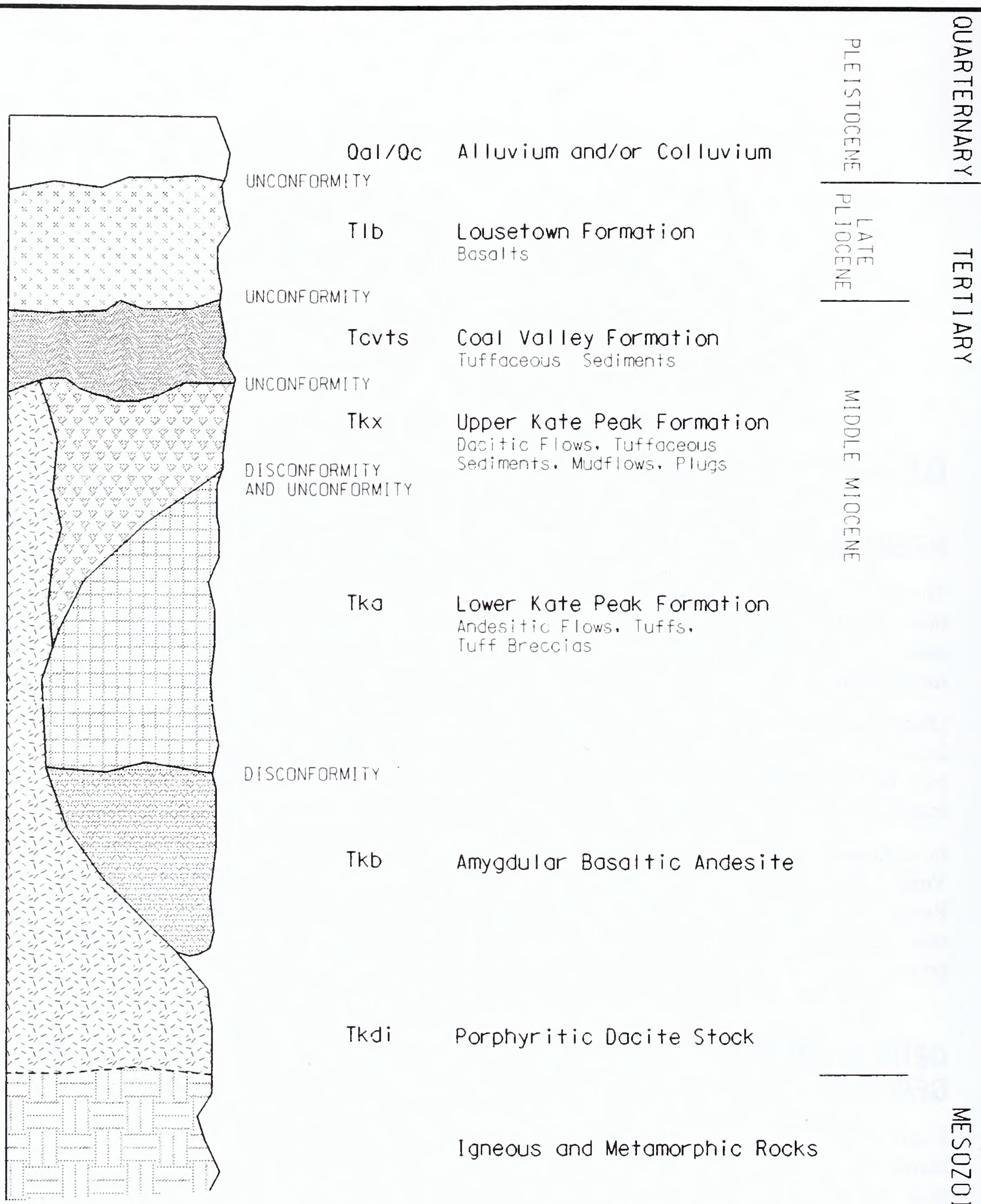
The Talapoosa ore body is comprised of two adjacent ore zones in the Kate Peak Formation, known as the Main Zone and the Bear Creek Zone. The Bear Creek Zone is further subdivided into Upper and Lower Zones.

Current estimates of mineral resources in all three zones are approximately 42 million tons of ore grade materials containing approximately 1 million ounces of gold and 14 million ounces of silver.

ALTERATION / MINERALIZATION

The Talapoosa deposit is classified as a quartz-adularia (an aluminum silicate mineral containing potassium), low-sulfur system (Carpenter, 1993).

During emplacement of ore minerals, hydrothermal fluids altered the rocks in and adjacent to the ore bodies. The alteration in the district includes quartz-veining or silicification, clays (argillic alteration), bleaching (sericitic alteration) and weakly-altered rock (propylitic alteration).



STRATIGRAPHIC SECTION OF THE TALAPOOSA MAIN DISTRICT (AFTER CARPENTER, 1992)

TALAPOOSA MINE PROJECT
ENVIRONMENTAL IMPACT
STATEMENT

FIGURE 4.1

STRATIGRAPHIC SECTION

JANUARY 1996

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Some of the near-surface rocks have been weathered and are oxidized. A north-south schematic cross-section through the center of the district, showing general alteration and oxidation patterns, is provided in Figure 4.2.

Eighty percent of the Talapoosa ore is located within the Lower Bear Creek Zone and consists of silicified or quartz-veined rocks containing small quantities of pyrite (an iron sulfide).

The Main Zone and portions of the Upper Bear Creek Zone have been partially oxidized by exposure to surface conditions (Van Nieuwenhuyse, 1991).

The Upper Bear Creek Zone lies both above and below the present water table and consists of quartz veins in clay-altered rocks.

The Lower Bear Creek Zone is a harder silicified rock. The Main Zone is similar to the Lower Bear Creek Zone, but faults have offset the ore and exposed it to erosion and weathering, resulting in near-surface oxidation.

Sulfide minerals in the unoxidized ore include very small quantities of zinc, copper, mercury, antimony, arsenic and silver sulfides. Waste minerals are typically quartz, clays and calcite.

STRUCTURE OR MINERALIZATION CONTROLS

Talapoosa ore was deposited from hydrothermal fluids (hot ground water with dissolved minerals and metals) along faulted and sheared rocks. After mineralization was complete, additional movement on some faults offset portions of the ore.

All measurable faults are high-angle normal type formations (i.e., the block of ground on the upper side of the fault moved down the dip of the fault plane). From north to south across the deposit, important structures include the northwest-trending BJ fault, the N75 west-trending Talapoosa fault and the northwest-trending Road Fault (Figure 4.2 and Figure 4.3).

The Main Zone and the Bear Creek Zones may have formed adjacent to each other, but they have been separated into two zones by post-mineral normal faults.

The largest block of ore lies within the Lower Bear Creek Zone. Faults associated with the zone include the BJ and Talapoosa faults. The northwest trending Road Fault may have been a feeder for localizing gold in the Bear Creek Zones, but it also appears to have offset a portion of the ore body to the south.

Most of the remaining faults shown on Figure 4.3 were formed after the ore was deposited.

Figure 4.4 shows the location of the two satellite pits. Figure 4.5 and Figure 4.6 show the geologic cross sections through the two satellite pits that will be mined as part of the proposal.

AREA SEISMICITY

The proposed project site is in the Great Basin, which is generally seismically active. Slemmons (1983) mapped approximately 1,000 large-scale, geologically recent faults across the State of Nevada. The abundance of faults indicates that earthquakes can occur within tens of miles of almost any point in the state.

In addition, the proposed project site is located near the junction of three major fault zones. These are:

1) the Walker Lane (including the Pyramid Lake Fault Zone), a regional northwest-trending structural zone located five miles east of the proposed project site;
2) the Carson Lineament, an east-northeast trending structural zone that extends from Carson City to Fallon, passing five miles south of the project site; and
3) the Olinghouse Zone, an east-northeast zone located approximately 20 miles northwest of the proposed project site (Bell, 1981 and Figure 4.7).

TABLE 4.1: MAXIMUM EARTHQUAKE POTENTIAL FOR NEARBY ACTIVE FAULT[1]

FAULT	CHARACTERISTIC EARTHQUAKE MAGNITUDE (M)	MAXIMUM CREDIBLE EARTHQUAKE MAGNITUDE (M)	EVENTS/YEAR
Olinghouse	6.9	7.2	3.57E-5
Pyramid Lake	7.3	7.6	5.56E-4
Carson Lineament	6.8	7.1	9.09E-6

PEAK BEDROCK ACCELERATION FOR THE TALAPOOSA PROJECT SITE

Probability of Exceedance	Bedrock Acceleration (g)
10% in 10 years	0.17
10% in 50 years	0.33
10% in 100 years	0.41
Maximum Credible Earthquake	0.7

[1] Siddharthan, et al. 1993

Although the faults listed above are relatively close to the proposed project site, the project site itself does not contain any known active faults. The Talapoosa-Gooseberry lineament and other faults that affect the ore are not considered active and have not experienced any known historic or Pleistocene fault movement (Bell, 1984).

Table 4.1 presents the seismic characterization for the proposed project site. The table includes the major faults in the vicinity of the proposed project on which an earthquake could potentially occur, their possible maximum magnitude, their likelihood of occurring in any given year, and the maximum probable peak acceleration (ground shaking).

The data indicates that a significant earthquake, with a magnitude greater than 7.0, could occur along any of the three faults. The maximum credible earthquake would have a peak acceleration (ground shaking) of approximately 0.7 gravity.

ACID ROCK DRAINAGE

BACKGROUND

Acid rock drainage (ARD) is a potential environmental problem at some mineralized areas. This condition generally results from the exposure of rocks containing sulfides (typically iron sulfides such as pyrite, pyrrhotite or marcasite) to oxygen and water. Formation of ARD depends mostly on the amount of sulfide in the rock, the local climate and the amount of sulfide rock mined and exposed to the atmosphere.

TABLE 4.2: GENERAL DESCRIPTION OF THE LITHOLOGY OF SAMPLED GEOLOGIC UNITS

UNIT	LABEL	LITHOLOGY
Quaternary alluvium	Qc/Qal	Colluvium/alluvium undifferentiated
Lousetown basalt	Tlb	Very finely crystalline vesicular basalt
Coal Valley sediments	Tcvts	White ash clasts in matrix of medium grain mainly quartz sand and fine ash
Upper Kate Peak	Tkx	Dacite flows, tuffs
Upper Kate Peak	Tkseds	Tan to medium brown tuffaceous sediments
Upper Kate Peak	Tklahar	Medium brown andesitic to dacitic lahars
Upper Kate Peak Dacite	Tkdi	Gray porphyritic dacite intrusive
Lower Kate Peak	Tka	Andesitic flows, tuffs, and welded tuffs
Chlorapagus formation	Tkb	Amygdaloidal basaltic andesite

Source: WMC, 1995

Rocks which do not generate acid are generally more environmentally benign because metals in the rock are not readily leached out in the absence of acid solutions. In these settings, metals do not disperse into the surrounding environment, unless they are placed in direct contact with surface waters.

The near-surface portions of many ore deposits have been oxidized (e.g., sulfides have been converted to oxide minerals) by gradual exposure to the atmosphere. However, as mining progresses deeper into ore deposits, near-surface oxidized rocks are often removed, and unoxidized sulfide-bearing rock may be mined and exposed to the atmosphere. The exposed sulfides may generate acidic fluids if rain and/or snowmelt are allowed to infiltrate through waste rock and ore piles.

The amount of acid a particular rock is capable of producing under "ideal" conditions can be estimated in a laboratory and is termed its Acid Generation Potential (AGP).

Not all ores generate acid, and many rock minerals are capable of neutralizing acids. The ability of a rock to neutralize acid can also be estimated in a laboratory and is termed the Acid Neutralization Potential (ANP). Generally, rock with a high ANP contains acid-neutralizing minerals such as calcium carbonate (calcite).

Most rocks are mixtures of both acid-generating and acid-neutralizing minerals. The ratio of the ANP to the AGP indicates the potential of the rock to produce acid over the long term. The amount of net acid neutralizing potential (NNP) is the difference between the ANP and AGP.

Harmful environmental effects from acid rock drainage may occur because most heavy metals are especially soluble in acid solutions. Acid may leach metals from the rock and transport them into surface or ground waters where they may impact aquatic life or ground water users.

Nine different geologic units would be encountered by the proposed mine. Table 4.2 lists the names, abbreviated names and brief descriptions of these rock units and gives the description of each of these rock units.

ACID-BASE ACCOUNTING

The nine rock types were analyzed in the laboratory to determine their acid-generating or acid-neutralizing potential. The laboratory results were used in performing the acid-base accounting of the data.

In the acid-base accounting (ABA) procedure, values of ANP and AGP are converted to units of equivalent tons of $CaCO_3$/1,000 tons of rock and compared to determine if a rock will produce a net acid leachate. Presumably, if AGP exceeds ANP, water in contact with the rock will become acid.

To be conservative, however, given the semi-quantitative nature of these tests, the Nevada Division of Environmental Protection (NDEP) defines as acid generating any rock with an ANP/AGP ratio of less than 1.20. In other words, the rock is assumed non-acid generating only if ANP exceeds AGP by more than +20 percent. If the difference between the ANP and AGP is -20 to +20 percent, the rock is described as possibly acid generating. If the difference is less than -20% the rock is considered acid generating.

The overall ANP/AGP ratio for the Talapoosa block model is 0.9 exceeds NDEP's minimum standard of 1.2 and, therefore, requires a waste rock management plan. The Waste Rock Management Plan is included in Appendix B of this FEIS.

The results of the acid-base accounting are given in Table 4.3. Only samples from the Upper and Lower Bear Creek horizons of the ore body are likely to produce acid leachates. Additional discussions of the results are in Appendix E.

Additional tests were run on the rock types that will be encountered by the proposed mine. These tests, known as the Humidity Cell Test (HCT) and the Meteroric Water Mobility Procedure (MWMP) help to determine whether weathering of waste rock or ore piles will produce acid or metals. The specifics of these tests are detailed in Appendix E.

In 1993, three samples from the ore zone were studied in 80-week-long HCTs. The results are generalized in Appendix E, Table E.4. Specific data on the 1993 HCTs are found in Appendix S of v.4, WMC, 1996, including time plot behavior of the tested analytes. The table shows that most chemical analytes increase their concentration in the leachate as the test progresses. These concentrations reach maximum values after about 15-35 weeks but decrease to background or level of detection values, except for chromium, iron and sulfate. These analytes remain at elevated concentrations after 80 weeks.

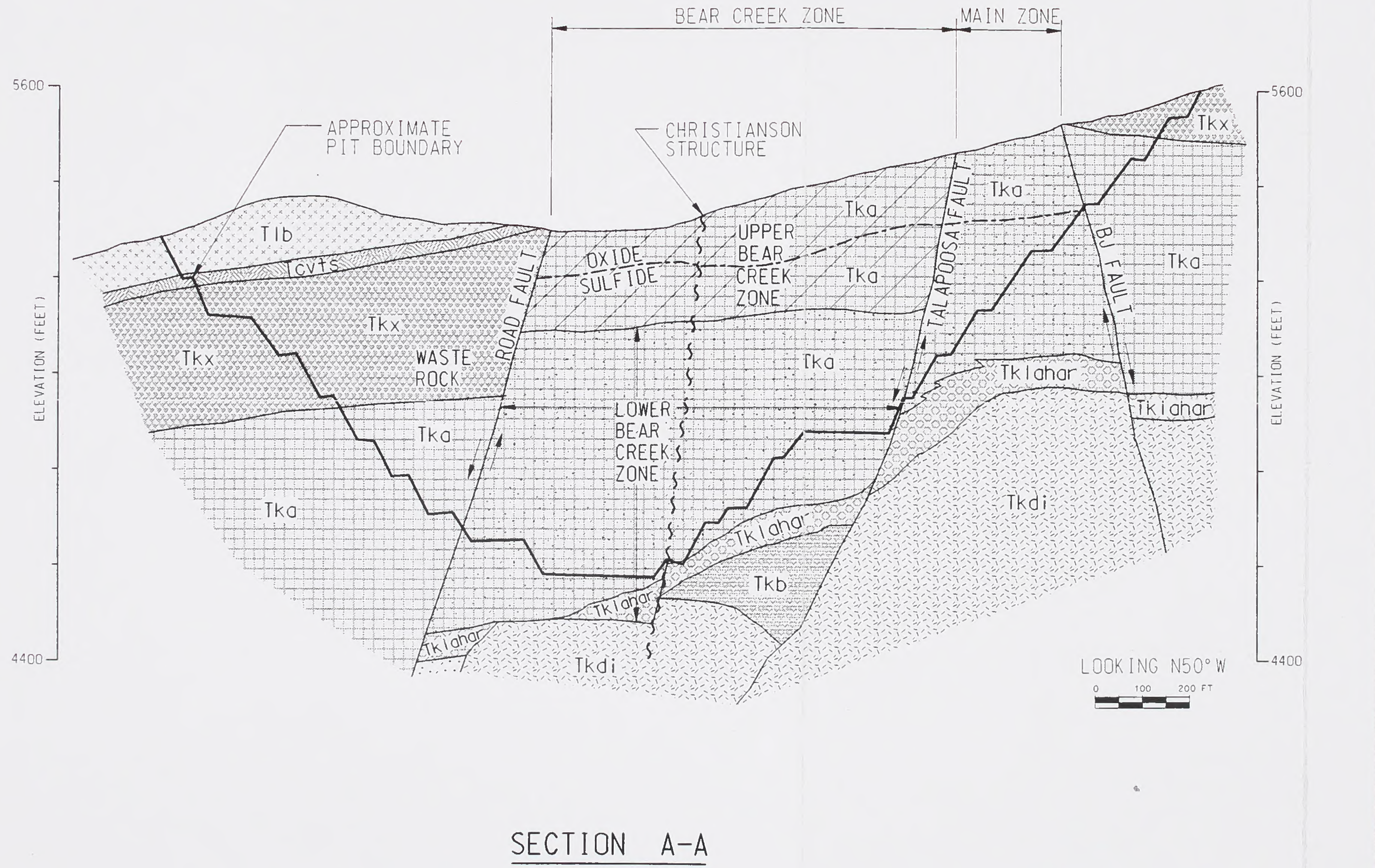
TABLE 4.3: AVERAGE ACID-BASE ACCOUNTING RESULTS *

GEOLOGIC UNIT	ANP/AGP	NNP+
Qal/Qc	12.6	19.6
Tlb	73.6	18.2
Tcvts	11.2	10.0
Tkx	4.17	12.1
Tka(UBC)	0.14	-19.7
Tka(LBC)	0.50	-14.0
Tkdi	33.4	42.4
Tksed	324	16.2
Tklahar	63.3	11.2
Tkb	2,180	109

*using AGP PyriticS.
+ tons of $CaCO_3$ / 1000 tons rock

Six additional rock samples from the sulfide-bearing strata of the ore zone were studied in 1995. Although the tests are ongoing at week 40, sulfate, aluminum, arsenic, manganese and nickel can be expected to be present in the leachate from weathered waste rock and pit walls. Appendix Q of v.4, WMC, 1996, gives the results of the 1995 humidity cell testing including time plot behavior through week 50 of the tests.

On-site weathering tests would be also being conducted on wall rock samples from the ore zone at the proposed mine site as rocks are produced from the mine.



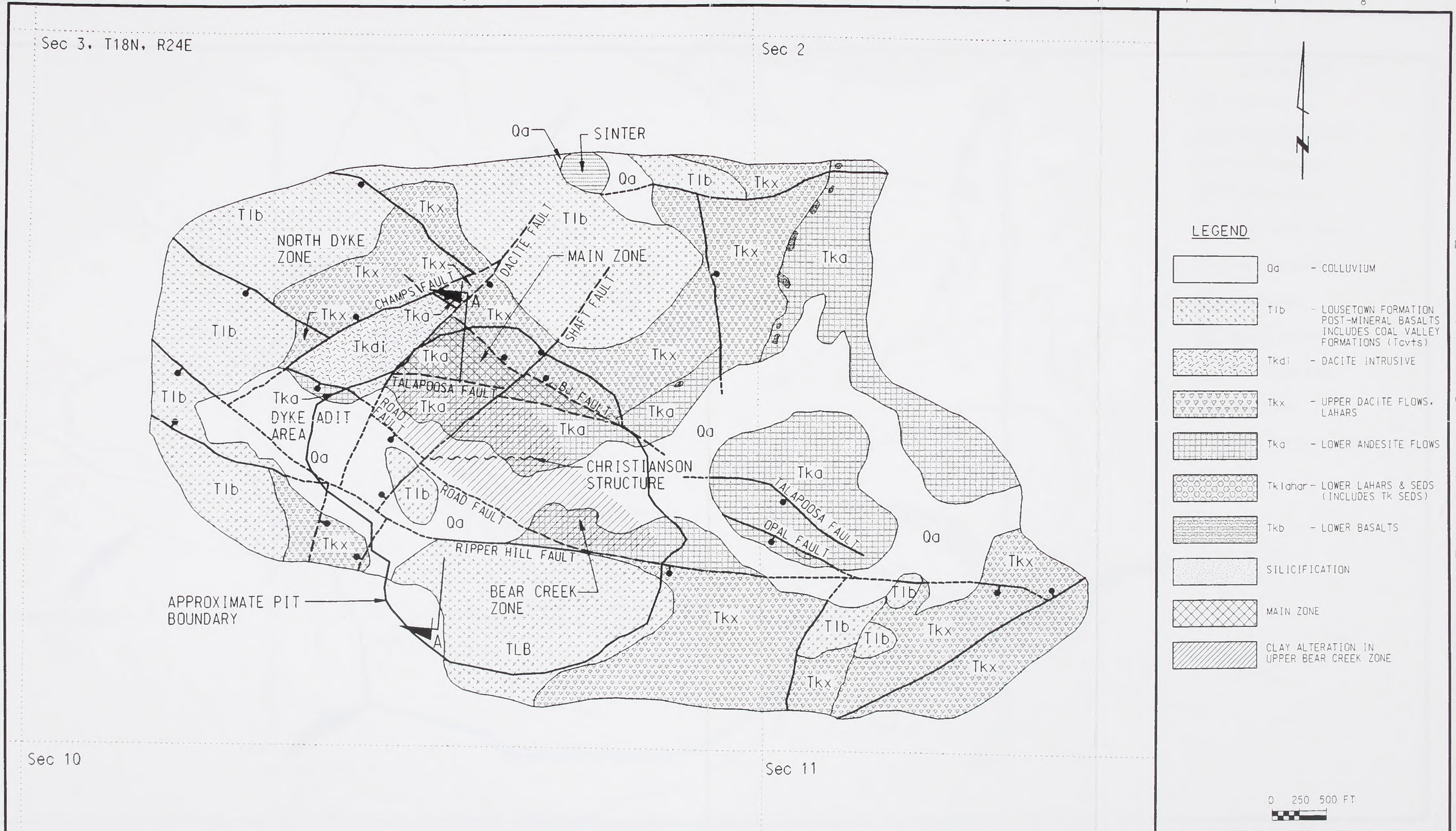
TALAPOOSA MINE PROJECT
ENVIRONMENTAL IMPACT STATEMENT

FIGURE 4.2

GEOLOGIC CROSS SECTION A

JANUARY 1996

hafcascr.tbl | 32secta.dgn



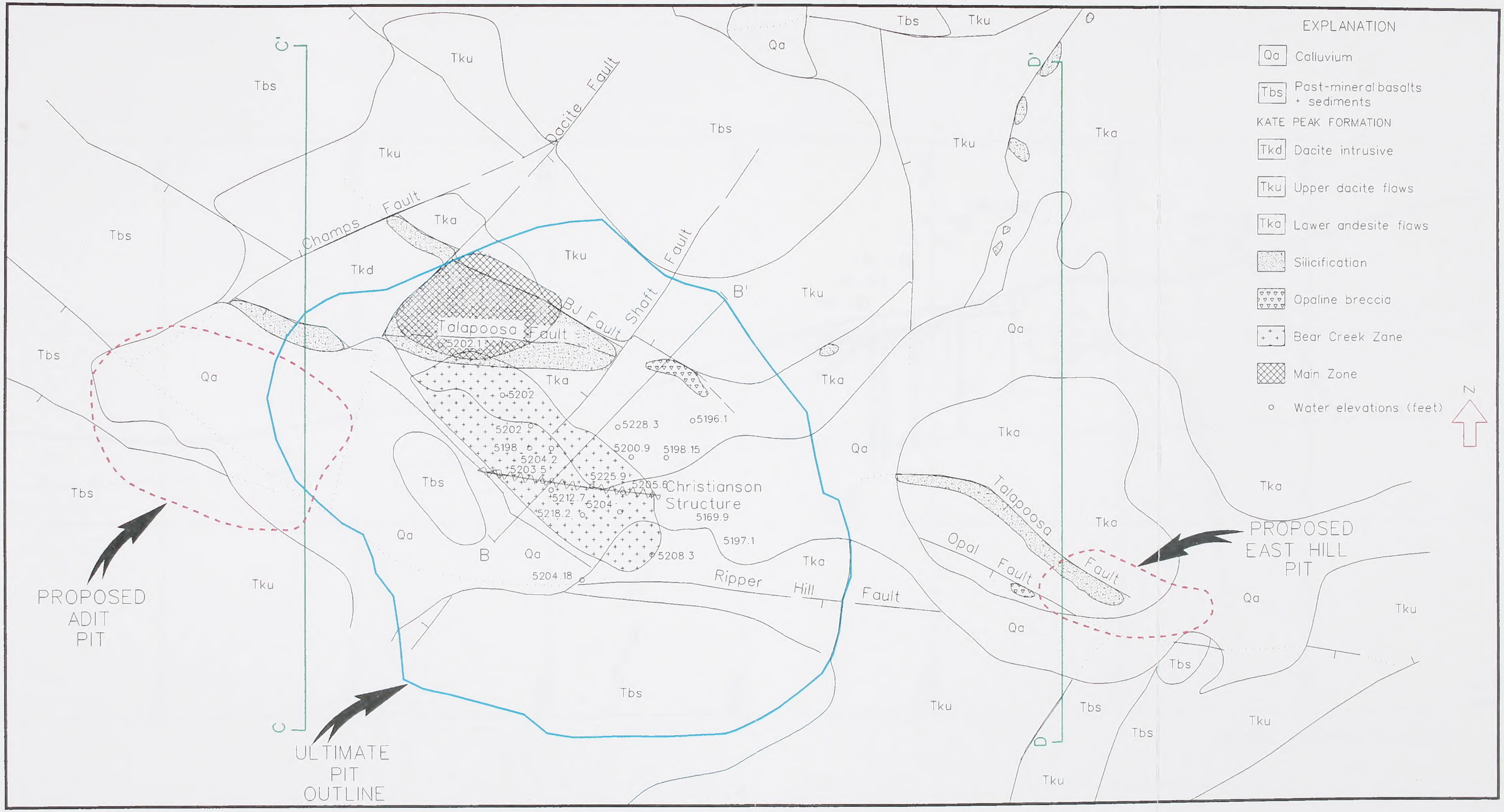
TALAPOOSA MINE PROJECT
ENVIRONMENTAL IMPACT STATEMENT

FIGURE 4.3

GENERALIZED GEOLOGY

JANUARY 1996

hafcoscr.tbl | 32gengeo.dgn



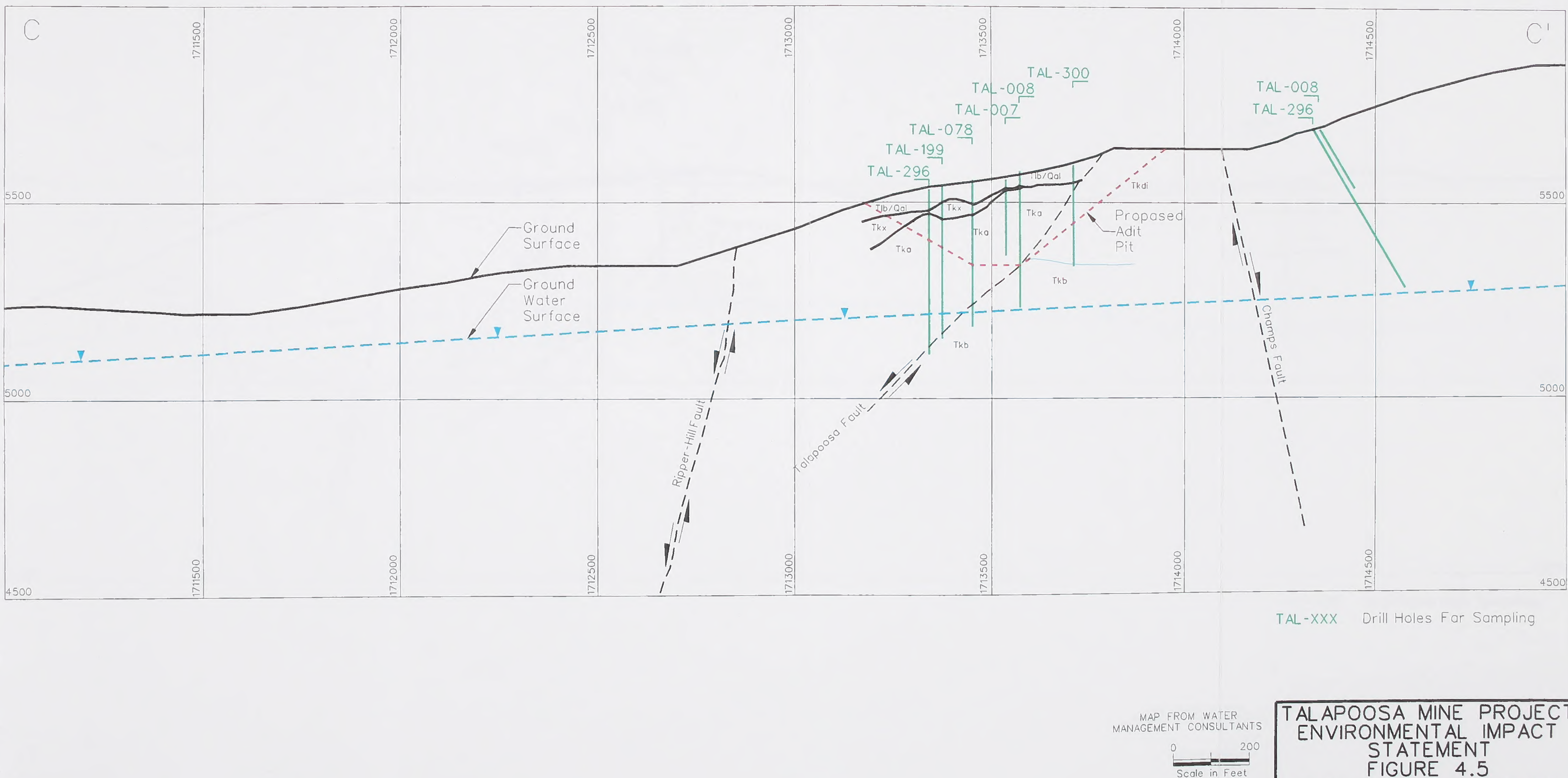
MAP FROM WATER MANAGEMENT CONSULTANTS

0 250 500
Scale in Feet

TALAPOOSA MINE PROJECT
ENVIRONMENTAL IMPACT STATEMENT
FIGURE 4.4
HYDROGEOLOGIC PLAN

JULY 1996

loc-geol.dgn



TALAPOOSA MINE PROJECT
ENVIRONMENTAL IMPACT STATEMENT
FIGURE 4.5
HYDROGEOLOGIC CROSS SECTION THROUGH DYKE ADIT

JULY 1996

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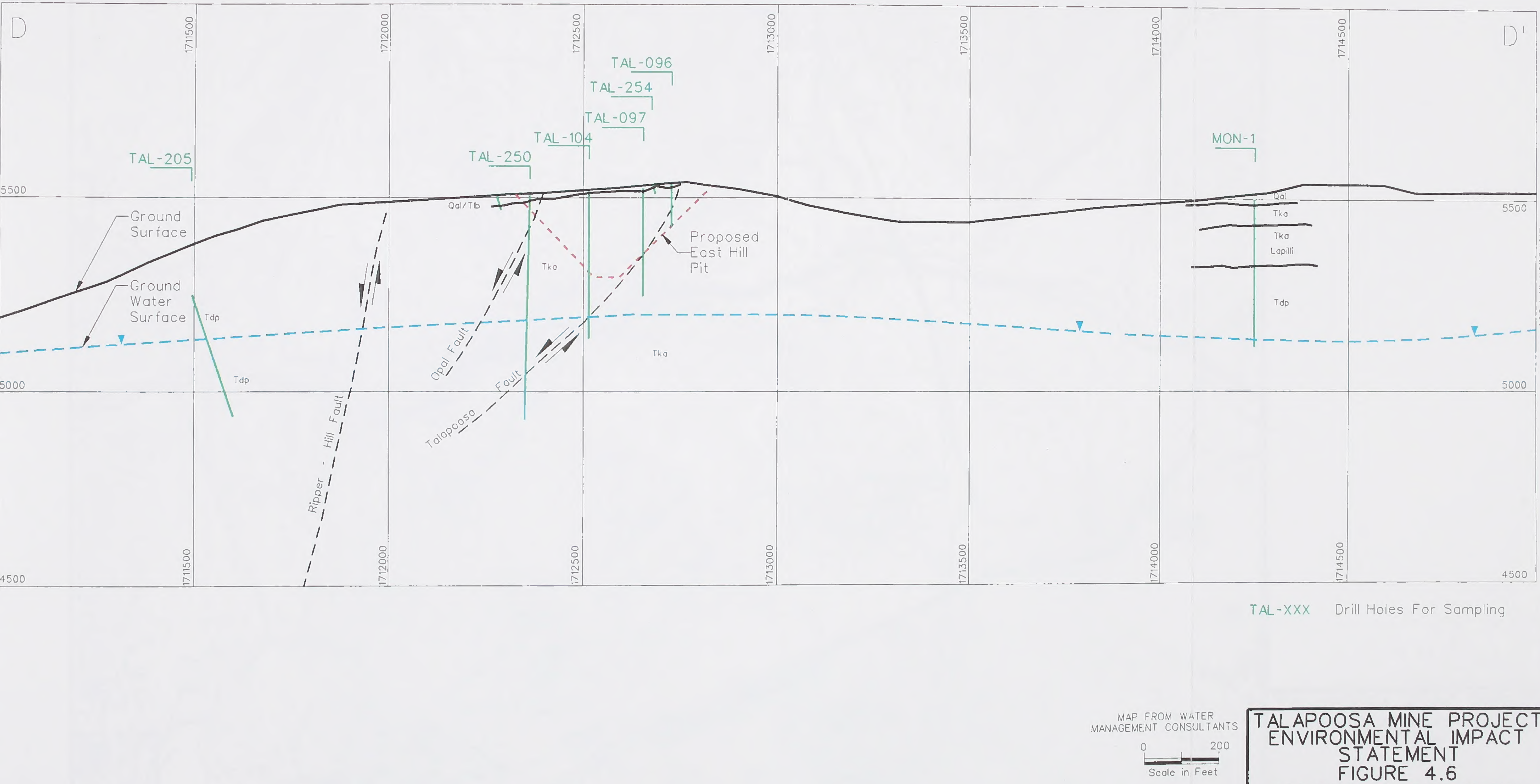
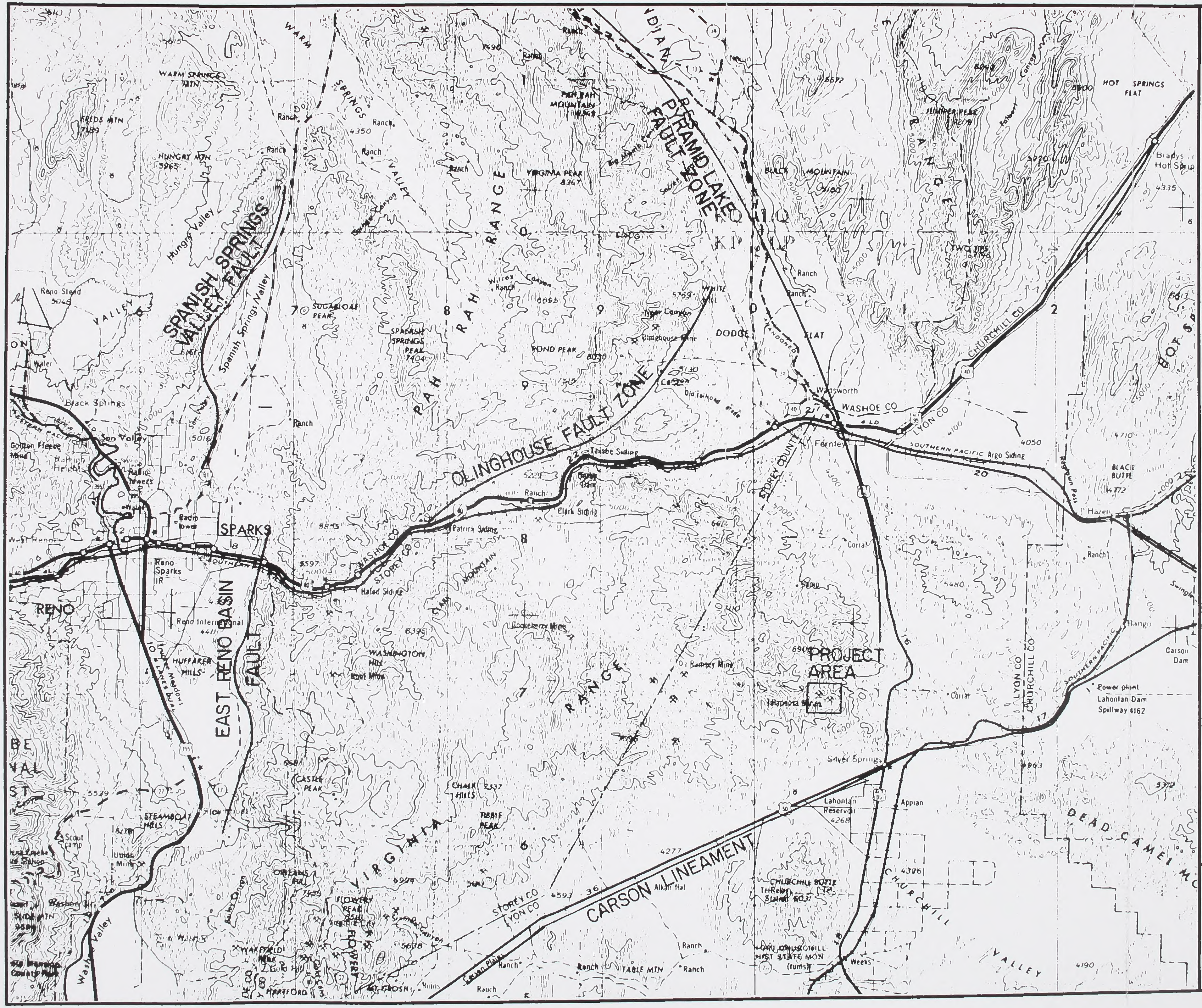


TALAPOOSA MINE PROJECT
ENVIRONMENTAL IMPACT STATEMENT
FIGURE 4.6
HYDROGEOLOGIC CROSS SECTION THROUGH EAST HILL PIT

JULY 1996

xsec-d.dgn



TALAPOOSA MINE PROJECT
ENVIRONMENTAL IMPACT
STATEMENT

FIGURE 4.7

EARTHQUAKE FAULTS (REGIONAL)

JANUARY 1996

hafcoscr.tbl | 32fault.dgn

TABLE 4.4: METEORIC MOBILITY TEST RESULTS OF INDIVIDUAL GEOLOGIC UNITS

	Tka-UBC		Tka-LBC		Tlb		Tkx		Tkdi		MISC	
	max	avg	max	avg	max	avg	max	avg	max	avg	max	avg
Nitrate											X	
Sulfate	X	X									X	
TDS	X	X									X	
Aluminum	XY	XY	XY	XY	XY	XY	X	X	XY	XY	XY	XY
Arsenic							XY	X			X	
Cadmium	XY	XY										
Iron	XY	XY	X	X	XY	X					X	X
Lead	XY	XY										
Manganese	XY	XY			XY	X					X	
Zinc	X											

X designates those elements and properties that exceed 2 times NDEP drinking water standards.
Y designates those elements and properties that exceed 10 times NDEP drinking water standards.
Source: WMC, 1996

The Meteroric Water Mobility Procedure analysis results are summarized in Table 4.4 and Table E.8 in Appendix E of the DEIS. The results of the analyses are compared to two and 10 times the drinking water standard. With the exception of rock unit Tkx, aluminum exceeds two and 10 times the drinking water standard for all rock types analyzed. Rocks from the Upper Bear Creek Zone of the Lower Kate Peak Formation yielded acid leachates that exceeded the 10 times drinking water criterion for aluminum, cadmium, iron, lead and manganese.

The Lower Kate Peak Formation makes up approximately 54 percent of the waste rock that would be produced by the proposed mine. Arsenic exceeded 10 times the drinking water standard for rocks from the upper Kate Peak Formation, which comprises approximately 16 percent of the waste rock that would be produced by the proposed mine.

Based on the results of the Meteroric Water Mobility Procedure testing, aluminum, arsenic, cadmium, iron, lead and manganese may potentially be dissolved into water that comes into contact with the waste rock or pit walls, particularly under acidic conditions.

ACID ROCK DRAINAGE FROM THE HEAP

Heap leach ore produced at the proposed Talapoosa Mine would primarily consist of material from the Lower Kate Peak geologic unit (98 percent). Although static acid-base accounting data indicate that the mineralized Lower Kate Peak materials exhibit a substantial potential to generate acid, acid rock drainage from the heap is not expected to occur. This potential is discussed below.

Leaching Process

Valley Fill Leach Pad

The proposed valley fill leach pad would be constructed in three phases and would encompass approximately six million square feet of area at completion. Lifts approximately 15 feet to 20 feet thick would be placed on the leach pad to maximum heap height of 300 feet to 350 feet. Side slopes would be constructed at a ratio of three feet horizontal to 1 foot vertical (3h:1v).

The pad would be equipped with a composite liner consisting of the 60 mil HDPE primary liner placed over compacted soil taken from the project area that would be high in clay content. The soil would have a permeability to 1×10^{-6} cm/sec and would have a minimum thickness of one foot.

Five wick drains would be placed between the primary and secondary liner to facilitate leak detection. The wick drains would discharge to lined gravel filled sumps which would drain into the lined pregnant solution pond.

Solution Pond

The pregnant (metals-laden) and barren solution ponds would be double lined with 60 mil HDPE separated by geonet. Leak detection equipment would also be placed on these process solution ponds.

An emergency overflow pond would be placed downgradient of the process ponds and heap. The overflow pond would be lined with a single sheet of 60 mil HDPE and would have with a capacity to hold the runoff from a 24-hour, 25-year storm event.

Ore Crushing Activities

Prior to placement on the pad, the ore would be crushed to minus 0.125 inch. Crushing would increase the surface area of the ore and thereby increase the reactivity of the material to the process solution. Following crushing, the ore would be agglomerated in a rotary mixer with lime, cement and water. Lime and cement would be mixed with the ore at a rate of approximately seven pounds per ton of ore.

A drum agglomerator would be used to maximize the coating of lime and cement onto the crushed ore. The agglomeration process would pelletize the crushed ore, improving the contact between the process solution and the ore and help maintain an alkaline environment in the heap.

Heap Leach

Ore would be leached by irrigation with a dilute alkaline cyanide solution (pH between 10 and 11). The solution would be applied at the rate of 0.0025 to 0.004 gallon per minute per square foot to saturate the heap and recover precious metals. Pregnant solution collected from the heap would be processed in a Merrill-Crowe plant to recover precious metals.

The pH and cyanide concentration of the barren solution leaving the plant would be adjusted and the solution would then be recycled back to the heap. It is imperative that an alkaline processing solution (pH 10 to 11) be used in the leaching circuit. If the pH of the solution drops below about 8.5, the cyanide would not remain in solution and precious metals would not be recovered.

The heap is not expected to produce acid rock drainage for a number of reasons. Ore will be agglomerated with lime and cement. The alkaline nature of the lime and cement would help neutralize acid leached from the ore. Furthermore, the ore would be continuously leached with an alkaline cyanide solution (pH 10 to 11) for the life of the mine. Heap irrigation with an alkaline processing solution would recover precious metals and would also serve to neutralize any acid leached from the ore.

Precipitation at the site is about eight inches annually. The area also has extremely low water infiltration rates. A clay soil cover will be placed on the top and on the benches of the heap. This cover will be revegetated with the species shown in the reclamation plan as detailed on page 2-17 of the FEIS. Runoff will be permanently diverted around the heap through division channels designed for the 100-year, 24-hour storm event.

A monitoring well system consisting of three wells located cross-gradient and downgradient from the heap will be installed to detect any unpredicted effects to ground water.

It is also important to note that the entire heap would be located on a clay and synthetically lined pad that is equipped with a leak detection system. The heap would remain on the pad throughout the operating life of the facility as well as during and following closure. At the time of closure, the heap would be rinsed with repeated applications of fresh water to reduce cyanide levels and stabilize the rinsate to a pH of between 6 and 9. Prior to abandonment, the heap effluent and, if necessary, the heap solids, would be tested and characterized. Specific heap closure techniques would be developed based on the test results. The goal of closure would be to reduce potential impacts to the waters of the State.

Placement of Waste Rock into Disposal Areas

Ore, overburden and waste rock would be blasted and mined on approximate 20- to 30-foot benches in the pit. As mining of ore proceeds across and around the pit, a range of differing waste rock types would be removed from the pit. The blasted waste rock would be loaded into 150-ton haul trucks by hydraulic shovels or front-end loaders and transported to one of the two waste rock disposal areas.

The waste rock disposal areas would be constructed in a manner such that materials would be well mixed throughout the disposal areas. The disposal areas would be constructed by end dumping in 50-foot lifts. Each lift would be separated by a bench approximately 15 to 50 feet in width. Each load of material hauled to the waste rock disposal areas is likely to contain a different distribution of rock units. The placement of waste rock by end dumping in thin lifts would enhance the blending and mixing of materials in the disposal areas.

Potential for Waste Rock Disposal Areas to Degrade Waters of the State

Although characterization data indicate that some of the waste rock materials (the Lower Kate Peak formation comprises 54% of the waste rock) exhibit the potential to generate acid and leach certain metals, degradation of the waters of the State are not anticipated for the following reasons:

1) The waste rock disposal areas would be constructed in valley fills with existing surface materials consisting of alluvium/colluvium, Upper Kate Peak volcanic rocks and Tertiary Lousetown basalts. Acid-base accounting results indicate that these materials, which would be beneath and on the sides of the disposal areas, exhibit an overall neutralization potential.

2) The depth to ground water in the vicinity of the southwest waste rock disposal area is approximately 150 to 400 feet. The depth to ground water in the vicinity of the northeast waste rock disposal area is approximately 200 to 400 feet (Water Management Consultants [WMC], 1996).

3) Available data suggest that ground water recharge is limited in the mine area (WMC, 1996).

4) There are no perennial surface water bodies, springs or seeps in the immediate project area.

5) The disposal areas would be located in the upper portions of the watershed and would receive minimal run on. Furthermore, TMI proposes to construct stormwater diversion structures, sized to accommodate flows from the 100-year, 24-hour storm event, up gradient from the disposal areas. Diversion structures would also be constructed along the sides of each disposal area.

6) Sediment ponds would be constructed at the bases of the disposal areas.

7) The ratio of evaporation to precipitation is approximately 5.5:1 in the proposed Talapoosa project area.

8) Results of HELP modeling conducted for the Talapoosa waste rock disposal areas indicate that seepage rates of 0.012 to 0.062 gpm per acre could be expected under the worst-case scenario. Given the very low infiltration rates that exist at the site, there is very little likelihood that leachate would be produced from the waste rock disposal areas.

9) A waste rock management plan would be implemented to minimize the likelihood of exposure of acid-generating materials to meteoric waters.

In summary, although available waste rock characterization data suggest that the disposal areas have a potential to release constituents under meteoric conditions, a mechanism for the transport of constituents from the disposal areas to the waters of the State, such as surface water leaching through the disposal areas, does not exist at the site due to the low precipitation and design of the disposal areas.

WATER QUALITY & QUANTITY

SURFACE WATER

Regional Surface Water Systems

The proposed Talapoosa Mine lies within the Carson River Basin of west central Nevada. Major regional surface water features are the Carson River, Lahontan Reservoir and the Carson Sink. The Carson River flows into Lahontan Reservoir near the proposed project site, then continues to the Carson Sink, where its flow terminates.

Average annual flow through the Carson River at Fort Churchill was 259,900 acre feet for the period between 1919 and 1979. Average annual flow in the Carson River below Lahontan Dam was 377,000 acre feet for the period between 1919 and 1969.

Precipitation

The proposed project area has an arid climate with an estimated annual precipitation of 8.05 inches (WMC, 1996). Snowfall accounts for about one-third of the total precipitation in the area.

Annual evaporation for the proposed project site has been calculated at 71.38 inches per year (WMC, 1996).

The meteorological information for the vicinity of the proposed project is included in Appendix A of the DEIS.

Local Surface Water Systems

There are no perennial streams or surface water occurrences within the proposed project site. Ephemeral stream channels (which contain water for only a short period) drain the area to the south and east.

Four of these ephemeral drainages were determined to be eligible as jurisdictional waters of the United States (WESTEC, 1995). Figure 4.8 shows these drainages.

No records of flow or water quality are known to exist for the ephemeral channels draining the proposed project area. Runoff, when it occurs, is expected to have a high turbidity, elevated total dissolved solids, and high suspended-sediment loads typical of Great Basin ephemeral drainages.

Pre-Mining Flow Estimates

The mine area, facilities and south waste rock disposal area are drained by two of these drainages (see Figure 4.8). The NRCS-TR20 model was run on the contributing watershed area, which drains the southern portion of the proposed project. The contributing drainage area was measured at 1.8 square miles. A

TABLE 4.5 RESULTS OF RUNOFF MODELING FOR SOUTH AREA

STORM EVENT	PRECIPITATION (INCHES)	PEAK RUNOFF (CFS)	TOTAL RUNOFF (INCHES)	TOTAL RUNOFF (ACRE-FEET)
100 yr 24 hr	2.7	702	0.94	95.6
25 yr 24 hr	2.1	440	0.60	60.3
10 yr 24 hr	1.8	319	0.44	44.3
2 yr 24 hr	1.2	111	0.17	17.2

curve number of 86 for fair to poor range and hydrologic soil group D (clayey soils) were used as model inputs. Modeling was performed for the 10-, 25- and 100-year return periods and 24-hour storm duration. Table 4.5 shows the results of the modeling. As can be seen from the table, runoff ranges between .17 and .94 areal inches, depending on return period. Peak runoff flow rates range from 111 cfs to 702 cfs at the lower portion of the drainage as it leaves the permit boundary. Diversion of runoff around the disposal areas is planned. Diversion channels will be designed for the 100-year, 24-hour storm event.

Runoff from the Waste Rock Disposal Areas

The amount of total runoff and the peak runoff rate from the two waste rock disposal areas were predicted using the NRCS TR-20 program for hydrologic analysis of watersheds.

The time of concentration, defined as the time required for water to travel from the most remote part of the disposal area to the outlet, was calculated using the equations proposed by Ramser and Kerby (ASAE, 1982). A Manning's roughness coefficient value of 0.10 was used for sheet flow off of the tops of the disposal areas. Channelized flow was assumed for the sideslopes because of the steepness of the slopes and the likelihood that rills will form during larger runoff events.

A curve number of 90 was used for the top of the disposal areas, and a curve number of 85 was used for the sideslopes. The overall curve number for the watershed was weighted using the respective areas of the tops and the slopes. The larger disposal area, the southwest disposal area, had a total area of 171 acres, a top area of 89.2 acres, and a slope area of 81.6 acres. The smaller northeast disposal area had a total area of 73 acres, a top area of 28.4 acres, and a slope area of 44.6 acres. Weighted curve numbers of 88 and 87 were used for the southwest and northeast disposal areas, respectively. The southwest disposal area had a higher weighted curve number because it had a higher percentage of top area to overall area.

Modeling was performed for 24-hour storm events with return periods of 2, 10, 25, and 100 years. Modeling results are presented in Table 4.6

The modeling shows that most of the precipitation falling on the disposal areas would result in runoff and not infiltration. Best management practices would be used to reduce the off-site impacts from erosion, including the placement of sedimentation basins downstream of the disposal areas. (ASAE, 1992)

The proposed southwest waste rock disposal area would be located over approximately 6,000 feet of ephemeral drainage channel classed as waters of the U.S. The waste rock disposal area would be a valley fill disposal area, therefore covering of the ephemeral

TABLE 4.6: RESULTS OF RUNOFF MODELING FOR WASTE ROCK DISPOSAL AREAS

DISPOSAL AREA	STORM EVENT	PRECIPITATION (INCHES)	PEAK RUNOFF (CFS)	TOTAL RUNOFF (INCHES)	TOTAL RUNOFF (ACRE-FEET)
Southwest	100 yr 24 hr	2.7	109.1	1.06	15.2
Southwest	25 yr 24 hr	2.1	71.1	0.69	9.9
Southwest	10 yr 24 hr	1.8	53.2	0.52	7.4
Southwest	2 yr 24 hr	1.2	21.3	0.22	3.2
Northeast	100 yr 24 hr	2.7	43.9	1.0	6.1
Northeast	25 yr 24 hr	2.1	28.1	0.64	3.9
Northeast	10 yr 24 hr	1.8	20.7	0.48	2.9
Northeast	2 yr 24 hr	1.2	7.86	0.19	1.2

drainage cannot be avoided. These two drainage channels are located in mixed desert shrub habitat type and areas of previous disturbance. Figure 3.3 of the DEIS shows the location of the channels and the habitat types involved.

SPRINGS, SEEPS AND WELLS

Springs and Seeps

Only one spring, called Rock Blind Spring, is located in the proposed project vicinity. The spring is located approximately 5,500 feet north of the proposed mine pit in Section 35, T19N, R24E (See Figure 4.8). No discharge has been observed from the small pool formed by the spring (WMC, 1996).

Rock Blind Spring is a perched ground water system that occurs at the intersection of two major high-angle faults. It is not fed by the deeper ground water system of the volcanic bedrock aquifer. Rock Blind Spring is located in sinter underlain by the rocks of the Upper Kate Peak formation which are much lower in vertical hydraulic conductivity (See Figure E.1 of the FEIS and Figure 7.1 of v.1 of WMC, 1996).

The precipitation falling over the outcrop of basalt and sinter in the location of the spring infiltrates and moves along shallow joints and fractures. This water is prevented from moving downward by the low hydraulic conductivity of the Upper Kate Peak rocks. As the accumulated water moves down the topographic slope by gravity, it is blocked by the northeast trending fault, which causes it to pool water at the surface as dictated by the local topography.

A 42-day pump test of Well PW-1, located in the ore body, produced no measurable drawdown in the Rock Blind Spring. More than 80 feet of drawdown was produced in the area of the ore body with no drawdown occurring north of the pit in the area of the spring. The closest observed drawdown was observed about 5,000 feet south of the spring (See Section 7.4.4 and Plan 5.2, v.1 of WMC, 1996.)

Wells

Two wells exist within a two-mile radius of the proposed project area. In addition, TMI would maintain five ground water monitoring wells within the project area.

GROUND WATER

Two principal ground water units exist in the northern part of Churchill Valley in the vicinity of the proposed project area. These are the volcanic bedrock aquifer and the basin fill alluvial aquifer.

Volcanic Bedrock Aquifer

The volcanics of the Kate Peak Formation form the main bedrock aquifer unit of the southern flanks of the Virginia Range. The aquifer is a fractured rock system, and available water supplies depend on the degree of fracturing.

The elevation of the water table in the proposed project area ranges from 5,150 to 5,270 feet, while ground elevations range from 5,300 to 5,500 feet in the center of the proposed project area. The elevation of the volcanic bedrock aquifer is typically more than 1,000 feet above the elevation of the basin fill alluvial aquifer. The rocks within the volcanic bedrock aquifer exhibit very low porosity and low ground water storage within the proposed project area.

Basin Fill Alluvial Aquifer

The basin fill alluvial aquifer forms the major aquifer system in the Churchill Valley/Silver Springs area. The northern boundary of this system occurs at the range front at the contact with the volcanic bedrock system approximately three miles from the proposed project area (Figure 4.9).

In the Silver Springs area, saturated alluvium occurs at an elevation below 4,145 feet, with the thickness of the alluvial aquifer becoming greater southward towards the center of the valley floor. Elevation of the basin fill alluvial aquifer is approximately 4,200 feet near the contact with the volcanic bedrock aquifer and approximately 4,120 feet near Silver Springs. The aquifer supplies essentially all of the domestic and municipal water used within Churchill Valley.

Numerous domestic and agricultural wells have been completed within the alluvial aquifer near Silver Springs. Several wells have also been completed in the alluvial aquifer that supplies Silver Springs with municipal water.

Ground Water Recharge and Discharge

Volcanic Bedrock Aquifer

Recharge to the bedrock ground water system occurs through infiltration from precipitation events and snow melt. Annual recharge is estimated at approximately 0.02 to 0.17 inches or about 2 percent of mean annual precipitation (WMC, 1996, Section 5.2.1). Recharge rates were estimated based on measured seasonal ground water level rises of between 0.4 and 2.4 feet in 1994 and 1995. Multiplying the rise in water level by a representative porosity of 0.006 gave the annual recharge rate of 0.02 to 0.17 inches.

The ground water gradient, comprising both regional and local flow systems, moves from higher elevations to lower elevations. The more regional systems flow through the fractured rock to the valley floor, discharging to the alluvial aquifer systems.

The bedrock flow systems are quite complex, with much faulting and fracturing of the host rock. The Kate Peak Formation in the proposed project area exhibits very low localized hydraulic conductivities (WMC, 1996).

Ground water elevations in the bedrock aquifer near the ore body ranged from 5,163 feet on July 8, 1993, to 5,240 feet on June 6, 1995. Nearly all of the ground water within the aquifer located beneath the southern flanks of the Virginia Mountains discharges to the alluvium at the northern margins of Churchill

Valley at a rate of 2.6 gpm to 22 gpm per lineal mile of range front.

Ground water in the bedrock aquifer flows slowly south at a gradient of 0.03 to 0.05 and discharges into the basin fill deposits below the alluvial contact.

Basin Fill Alluvial Aquifer

Recharge to the alluvial aquifer occurs from several sources. The major source is through channelized flow infiltration from higher elevations. Recharge occurs as these flows reach the slopes of the alluvial material along the range front. A minor amount of recharge occurs as underflow from the bedrock aquifer, as described previously. A significant portion of recharge occurs from the Carson River and the Lahontan Reservoir.

Lahontan Reservoir is a major recharge for the alluvial aquifer. The average annual recharge to ground water from the reservoir was estimated at about 6,500 acre feet between 1919 and 1969 (WMC, 1996). Recharge from precipitation is estimated at 20 million to 30 million gallons per year per mile of range front.

Ground water flow in the Silver Springs area is to the southeast toward the Carson River and Lahontan Reservoir (See Figure 4.9).

The Carson Sink area is the regional ground water discharge for the basin fill alluvial aquifer.

Summary of Existing Studies

Previous hydraulic work in the Talapoosa area consisted of drilling, completion and pump testing of wells. A complete listing of previous hydrologic study work is found in "Evaluation of the Baseline Hydrology and Prediction of Hydrologic Conditions During Operation and Closure" prepared by Water Management Consultants, Inc., July 1996. This study report is part of the BLM Project File and is hereby incorporated by reference.

Aquifer Properties of the Project Area

Characteristics of the Project Area

The ground water flow system in the proposed project area is totally contained within the fractured bedrock aquifer and appears to be controlled by faults.

Several major high-angle faults occur within the proposed project site and border the site to the north and south (Figure 4.3 and Figure 4.10). These faults appear to act as hydraulic barriers to ground water flow.

For Churchill Valley ground waters, only average Fe and Mn concentrations exceed secondary drinking water standards. However, secondary water standards are exceeded by maximum measured values of TDS, Fe and Mn, and equaled by the maximum reported Cr concentration.

Ground water depths in the area of the proposed pit are typically between 40 feet and 450 feet below the ground surface. Depth to ground water in the vicinity of the plant and maintenance areas is typically 350 feet to 400 feet, while depth to ground water in the vicinity of the northeast waste rock disposal area is 200 feet to 300 feet below the land surface.

Transmissivities measured in Water Well No. 6, located south of the central fracture zone of the ore body, were 3,500 to 3,750 ft^2 per day (see v.1 Section 5, WMC, 1996). Long-term pumping of Well PW-1 shows that geologic structures control the volcanic bedrock aquifer and thereby control the water supply within the proposed project area.

Calculated porosities of 0.005 to 0.009 have been determined from the pump test data. The range was calculated by dividing the amount of water that was removed from the volcanic rocks during the period of pumping (1.42 million cubic feet) by the volume of rock that was drained (10-15 feet of drawdown over an area of 15-20 million square feet, or 150-200 million cubic feet). Approximately 335 to 450 million gallons of water are stored in the 500 feet of volcanic rocks in the area influenced by the proposed water supply pumping. The volume of water is based on results of the pump testing, using a total area of 15-20 million square feet, an aquifer depth of 500 feet, and a representative porosity of 0.006 (See v.1, Section 5, WMC, 1996).

High-angle faulting and shearing create hydraulic barriers to flow outside of the ore zone. The ground water system of the proposed mine area is thus compartmentalized.

Ground Water Flow Models

Two ground water flow models were developed. The first model, a two-dimensional, cross-sectional ground water flow model, was developed to evaluate the effect of mining on the ground water levels downgradient of the mine. The MODFLOW model was used for this purpose. The second model, consisting of the analytical model TWODAN, was used to estimate the lateral inflow of water into the pit after closure. Results and discussion of the models are fully described in Appendix E.

The MODFLOW modeling results indicate that certain "open" faults (faults that provide a high-conductivity path for ground water flow) exert little influence on water table elevations, except in the immediate vicinity of the pumping well. Closed or barrier faults exhibit a large influence on ground water flow. Based on the MODFLOW model, mine development would have a very small effect on ground water level in Churchill Valley (less than 0.1 feet of drawdown would be expected near Silver Springs).

The TWODAN modeling results were used with a water balance approach to determine the water level in the pit corresponding to different lateral inflows. A ground water inflow of 10 gpm was determined to be the base case, at which a steady-state water level elevation in the pit of 4,843 feet is predicted. The model predicts that more than 90 percent of the ground water flowing into the pit originates from the area north of the pit.

Ground Water Quality

Thirty-five ground water samples were collected and chemically analyzed, including two from Rock Blind Spring. Chemical analyses of 11 wells and one spring in Churchill Valley were also available from the U.S. Geological Survey (USGS). Locations of these sampling points are shown on Figure 4.11.

Table 4.7 and Table 4.8 compare the average chemical composition of the ground water from the Talapoosa ore body and the ground water from Churchill Valley.

The background ground water from the ore body is predominantly a sodium-sulfate type water, whereas ground water in the Churchill Valley is chiefly a calcium-bicarbonate type water of about one-third the TDS content. The ore body waters are notably higher in total dissolved solids, sulfate, aluminum, iron, manganese, arsenic and nickel.

Compliance with Nevada Water Quality Criteria and Standards

The background or baseline water quality of the bedrock aquifer exceeds drinking water standards for several constituents or properties. Water quality criteria and Nevada drinking water standards are listed in Appendix G. Considering the drinking water standards, mean concentrations of TDS, sulfate, antimony, arsenic, cadmium, lead, iron and manganese in the ground water in the area of the ore body exceed drinking standards.

Maximum concentrations of arsenic, cadmium, chromium and lead equal or exceed primary drinking water standards. Those wells with concentrations of arsenic, cadmium and lead above maximum contaminant levels (MCLs) are listed in Table 4.9.

WATER USES

Surface water in the area of the proposed project is used primarily for agricultural irrigation, recreation, wildlife habitat and sport fishing. These uses are confined to the Carson River and Lahontan Reservoir. Rock Blind Spring is also an important water source for wildlife.

Ground water uses within Churchill Valley are for domestic water, municipal water and irrigation. Several ground water appropriations have been filed for mining, milling, water removal and domestic purposes for the proposed Talapoosa project. Appendix E, Figure E.7, shows the location of water rights in the project area. A detailed description of the water uses in the area is included in Appendix E.

TABLE 4.7: STATISTICAL SUMMARY OF GROUND WATER HYDROCHEMISTRY DATA FROM THE VOLCANIC BEDROCK WITHIN THE PROJECT AREA

CONSTITUENT	UNITS	PROJECT AREA GROUND WATER				
		Minimum	Average[1]	Maximum	No. of Samples	No. of Detections
Aluminum	mg/l	<0.5	0.10	0.29	17	14
Antimony	mg/l	<0.002	0.021	0.079	17	13
Arsenic	mg/l	<0.05	0.2	1.5	25	19
Barium	mg/l	<0.005	0.020	0.074	25	13
Beryllium	mg/l	<0.0002	0.012	0.12	25	10
Bicarbonate	mg/l	27	123	347	15	15
Boron	mg/l	0.08	0.40	0.72	17	17
Cadmium	mg/l	<0.0002	0.012	0.12	25	10
Calcium	mg/l	5.4	139	390	25	25
Carbonate	mg/l	2	7	14	4	4
Chloride	mg/l	12.1	41	130	25	25
Chromium	mg/l	<0.01	NA	<0.05	25	1[2]
Copper	mg/l	<0.01	NA	<0.02	25	0
Cyanide (free)	mg/l	<0.02	NA	<0.02	4	0
Cyanide (WAD)	mg/l	<0.005	NA	<0.005	21	0
Elec. Cond. (field)	micro mhos	320	1593	3200	17	17
Fluoride	mg/l	<0.02	0.37	0.85	25	18
Iron	mg/l	<0.02	1.18	8.07	25	12
Lead	mg/l	<0.002	0.015	0.131	25	2
M Alkalinity	mg/l	56	224	504	4	4

1 Averages were calculated for parameters with two or more detections. For calculating averages, detection limits were used for samples listed as below the detection limit. For locations with multiple samples, the parameters were first averaged for that location to derive a number to use for the project average.

2 One detection of chromium at 0.012 mg/l.

TABLE 4.7: STATISTICAL SUMMARY OF GROUND WATER HYDROCHEMISTRY DATA FROM THE VOLCANIC BEDROCK WITHIN THE PROJECT AREA (CONTINUED)

CONSTITUENT	UNITS	PROJECT AREA GROUND WATER				
		Minimum	Average[1]	Maximum	No. of Samples	No. of Detections
Magnesium	mg/l	0.08	53	120	25	25
Manganese	mg/l	<0.01	1.01	2.61	25	22
Mercury	mg/l	<0.0002	0.0006	0.0012	25	3
Molybdenum	mg/l	<0.04	NA	<0.5	7	0
Nickel	mg/l	<0.01	NA	<0.04	9	0
Nitrate	mg/l	<0.02	0.6	7.9	25	11
Nitrite	mg/l	<0.02	0.02	0.11	17	2
pH - lab	SU	6.3	7.22	8.77	25	25
Potassium	mg/l	1.7	11	20	25	25
Selenium	mg/l	<0.001	NA	<0.002	25	0
Silver	mg/l	<0.0005	0.003	0.01[3]	25	5
Sodium	mg/l	23	206	640	25	25
Sulfate	mg/l	26	776	1780	25	25
TDS	mg/l	208	1466	2610	25	25
Thallium	mg/l	<0.0005	NA	<0.001	17	0
Tin	mg/l	<0.01	NA	<0.5	17	1[4]
Total Alkalinity	mg/l	27	115	347	21	21
Vanadium	mg/l	<0.1	NA	<0.1	7	0
Zinc	mg/l	<0.02	0.18	1.05	25	9

1 Averages were calculated for parameters with two or more detections. For calculating averages, detection limits were used for samples listed as below the detection limit. For locations with multiple samples, the parameters were first averaged for that location to derive a number to use for the project area average.

3 Maximum detected value for silver; ore sample location had a higher detection limit of 0.025 mg/l.

4 One detection of tin at 0.03 mg/l.

TABLE 4.8: STATISTICAL SUMMARY OF BASIN FILL ALLUVIAL GROUND WATER HYDROCHEMISTRY

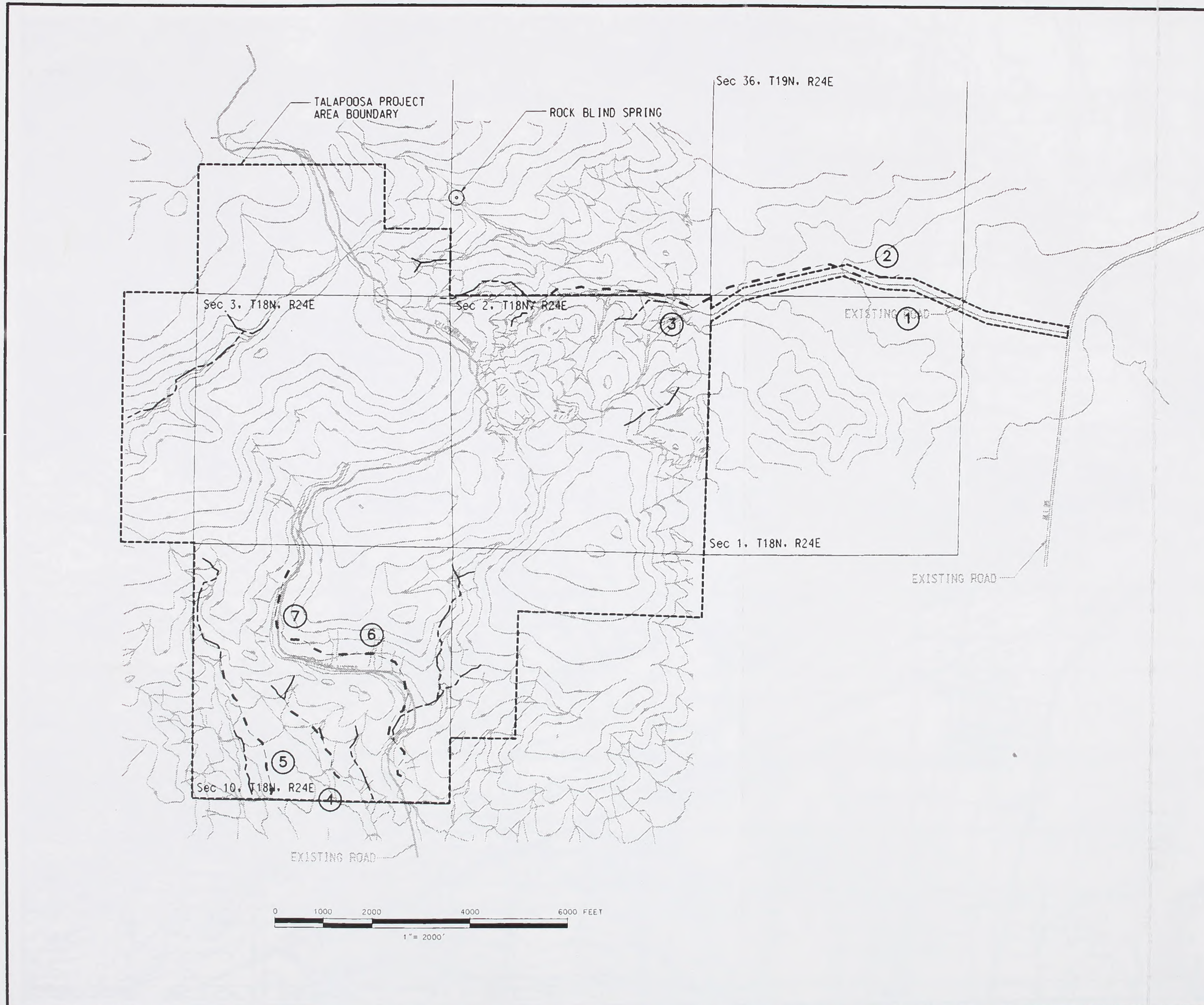
CONSTITUENT	UNITS	CHURCHILL VALLEY GROUND WATER				
		Minimum	Average[1]	Maximum	No. of Samples	No. of Detections
Conductivity field	micro mhos		NA	613	1	1
TDS field	mg/l		NA	306	1	1
Temperature	ºC	5.5	14	22.5	2	2
pH lab	SU	6.6	7.7	8	12	12
Conductivity lab	micro mhos		NA	650	1	1
Bicarbonate	mg/l	109.8	198.2	561.2	11	11
Carbonate	mg/l	0	0	0	11	0
Hardness	mg/l	108	159	210	2	2
TDS	mg/l	193	411	860	12	12
Calcium	mg/l	21	53	157	12	12
Magnesium	mg/l	1.6	13	23	12	12
Sodium	mg/l	15	47	76	12	12
Potassium	mg/l	7.5	7.9	8.3	2	2
Silica	mg/l		NA	73	1	1
Alkalinity, Total	mg/l	90	166	460	12	12
Chloride	mg/l	7	17	32	12	12
Sulfate	mg/l	4.8	94	227	12	12
Nitrate	mg/l	0.000	4.5	14	12	12
Nitrite	mg/l	<0.01	0.46	0.9	2	1
Fluoride	mg/l	0.4	0.4	0.4	2	2
Aluminum	mg/l		Na	<0.05	1	0
Iron	mg/l	0.00	0.44	2.40	12	12
Manganese	mg/l	0.26	0.36	0.45	2	2
Arsenic	mg/l	0.008	0.008	0.008	2	2

1 Averages were calculated for parameters with two or more detections. For calculating averages, detection limits were used for samples listed as below the detection limit. For locations with multiple samples, the parameters were first averaged for that location to derive a number to use for the project average.

TABLE 4.8: STATISTICAL SUMMARY OF BASIN FILL ALLUVIAL GROUND WATER HYDROCHEMISTRY (CONTINUED)

CONSTITUENT	UNITS	CHURCHILL VALLEY GROUND WATER				
		Minimum	Average[1]	Maximum	No. of Samples	No. of Detections
Boron	mg/l		NA	<0.1	1	0
Barium	mg/l	0.02	0.02	0.027	2	1
Cadmium	mg/l	<0.0002	0.001	0.001	2	1
Chromium	mg/l	<0.005	0.03	0.05	2	1
Copper	mg/l	<0.01	0.02	0.02	2	1
Cyanide (WAD)	mg/l		NA	<0.005	1	0
Cyanide (Total)	mg/l		NA	<0.005	1	0
Cyanide (Free)	mg/l				0	-
Lead	mg/l	<0.002	NA	<0.01	2	0
Selenium	mg/l	<0.001	NA	<0.001	2	0
Silver	mg/l	<0.0005	NA	<0.001	2	0
Zinc	mg/l	<0.01	0.9	1.8	2	1
Mercury	mg/l		NA	<0.0005	1	0
Molybdenum	mg/l		NA	<0.5	1	0
Nickel	mg/l		NA	<0.05	1	0
Tin	mg/l		0.05	0.05	1	0
Vanadium	mg/l		NA	<0.1	1	0
Thallium	mg/l		NA	<0.003	1	0
Beryllium	mg/l		NA	<0.0002	1	0
Antimony	mg/l		0.007	0.007	1	1
Radon	mg/l		0.160	0.160	1	1
Lithium	mg/l		0.27	0.27	1	1

1 Averages were calculated for parameters with two or more detections. For calculating averages, detection limits were used for samples listed as below the detection limit. For locations with multiple samples, the parameters were first averaged for that location to derive a number to use for the project average.



LEGEND

WATERS OF THE UNITED STATES

IDENTIFIED IN THE FIELD NOT TO BE WATERS OF THE UNITED STATES

(5) SAMPLE NUMBER

PROJECT AREA BOUNDARY

NOTES:

1. TOPOGRAPHY BASED ON AERIAL PHOTOGRAPHY, GREAT BASIN AERIAL PHOTOGRAPHY, 1991-1994.

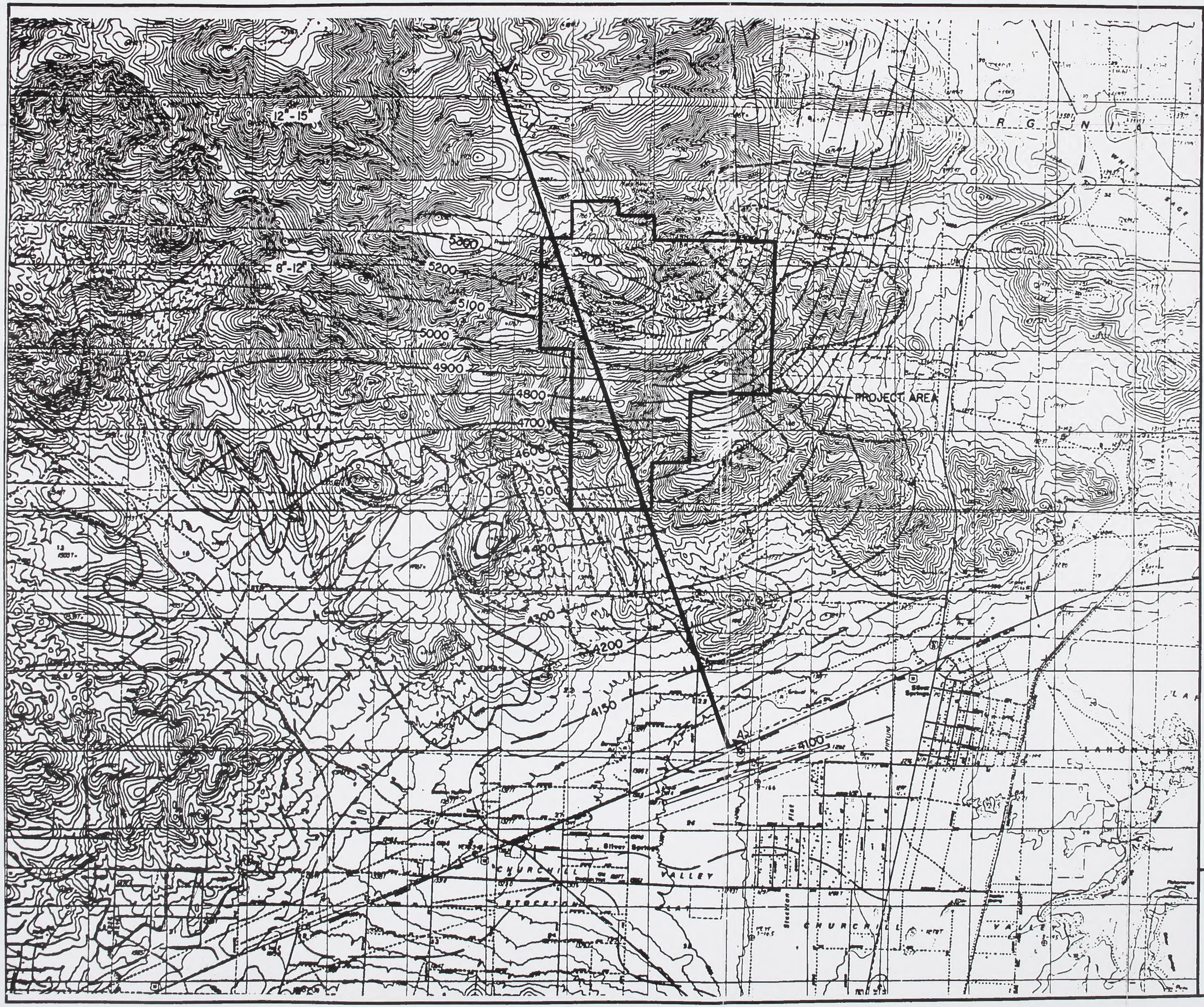
TALAPOOSA MINE PROJECT ENVIRONMENTAL IMPACT STATEMENT

FIGURE 4.8

WATERS OF THE US

JANUARY 1996

$$$$SYTIME$$$$$$$ | hafcoscr.tbl | 32fig2.dgn



LEGEND

WATER ELEVATION CONTOURS

TALAPOOSA PROJECT AREA

ESTIMATED PRECIPITATION INTERVAL

ALLUVIUM - BEDROCK CONTACT

A A'
REGIONAL GEOLOGIC CROSS SECTION SEE FIGURE 3.12

NOTES:

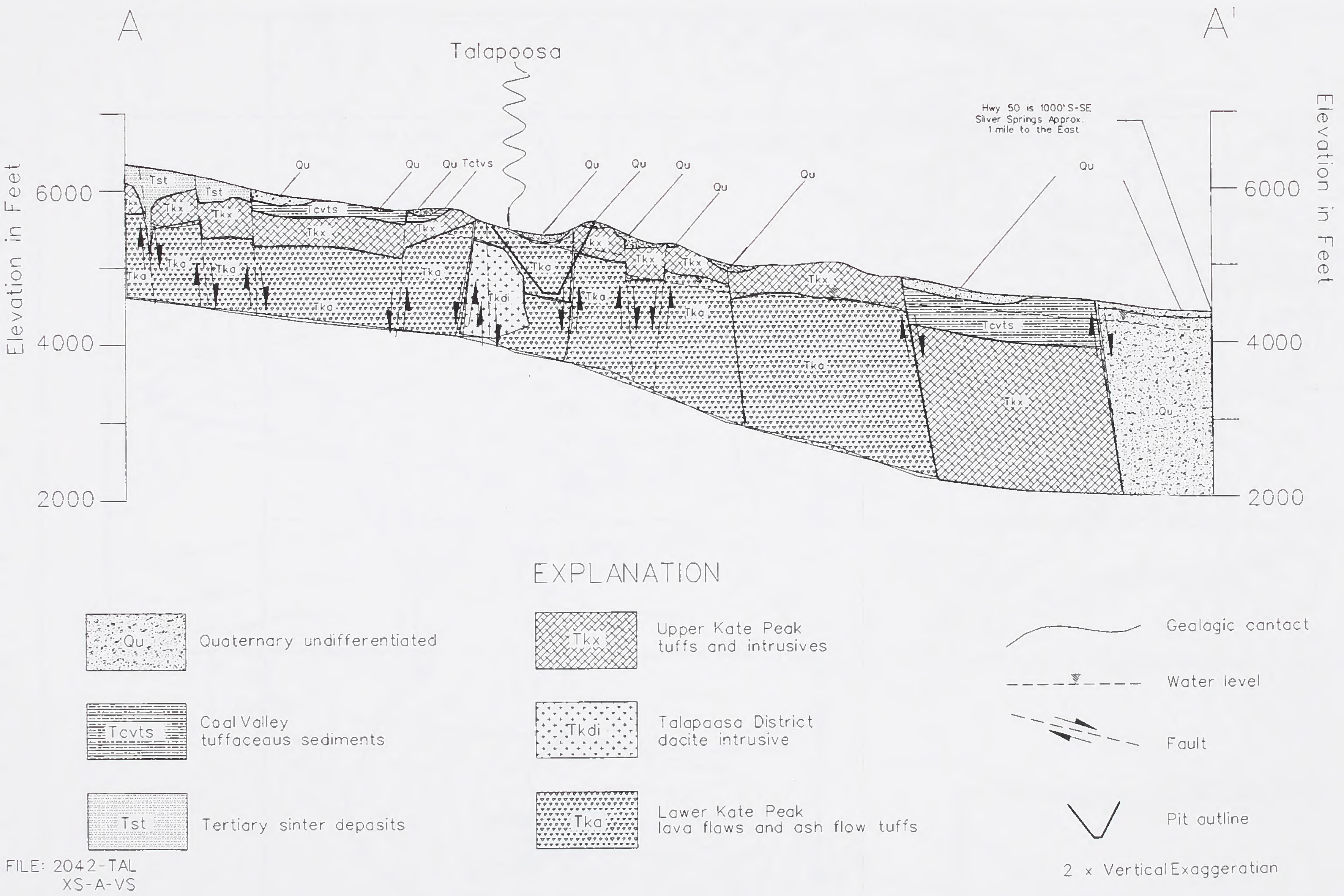
1. BASE MAP INFORMATION ACQUIRED FROM SILVER SPRINGS NORTH QUADRANGLE AND STOCKTON WELL QUADRANGLE, 7.5 MINUTE SERIES.

TALAPOOSA MINE PROJECT
ENVIRONMENTAL IMPACT
STATEMENT

FIGURE 4.9
GROUND WATER
CONTOURS (REGIONAL)

JANUARY 1996

hafcoscr.tbl | 32water.dgn



TALAPOOSA MINE PROJECT
ENVIRONMENTAL IMPACT STATEMENT

FIGURE 4.10

REGIONAL GEOLOGIC CROSS SECTION

JANUARY 1996

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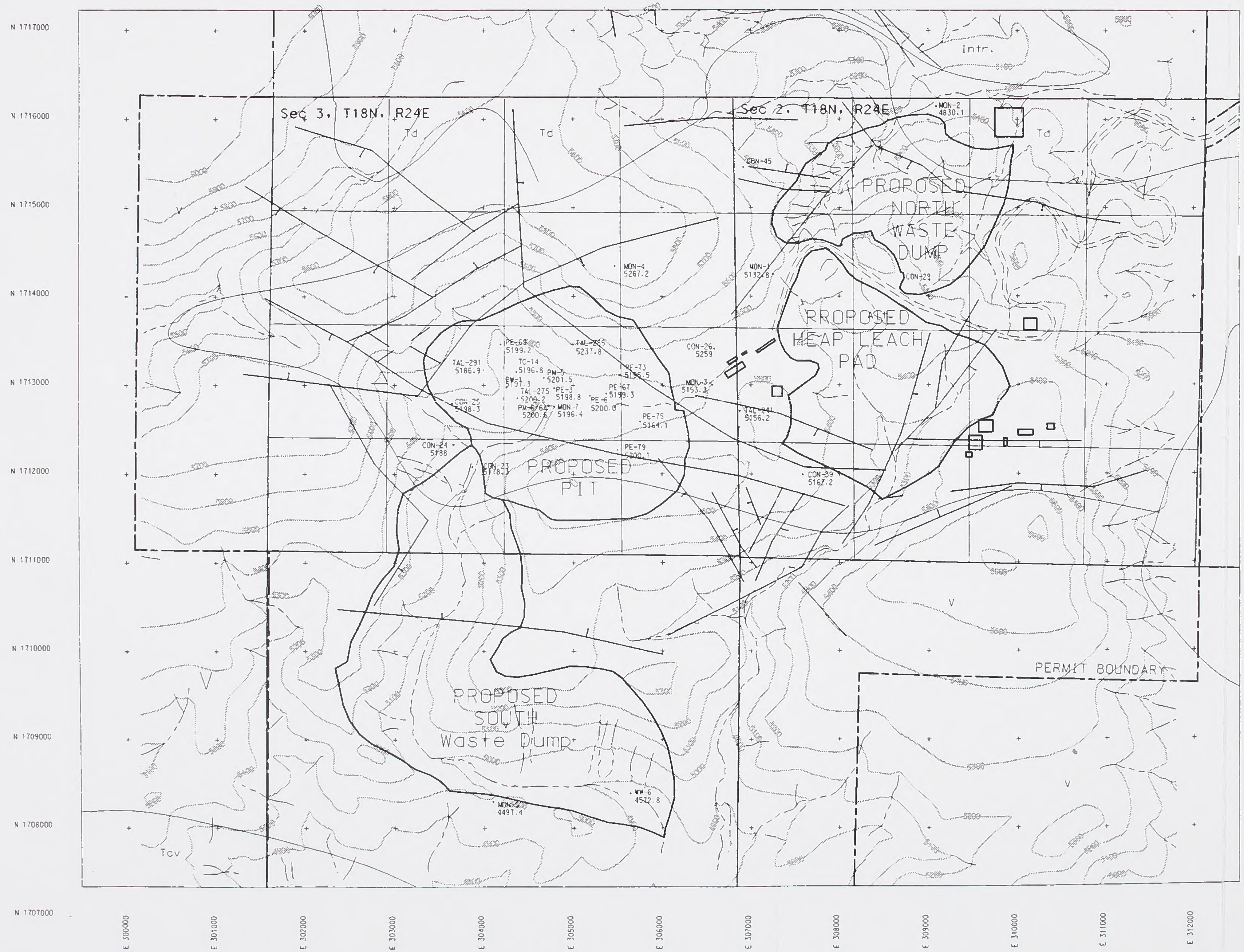

GEOLOGIC LEGEND

Q	ALLUVIUM
Tcv	COAL VALLEY Fm TUFFACEOUS SANDSTONE DIAT. SHALE AND RHY. TUFF
Tk	KATE PEAK Fm INT.-FELSIC FLOWS AND BRECCIAS ALT = SILIC. ARGILLIZED PORPY
Td	DESERT PEAK Fm TUFF SANDSTONE DIATOMITE, DIAT. SHALE, MISC. TUFFS. SANDSTONE LOCALLY SILICIFIED
Tc	CHLOROGAPTUS Fm MAFIC LAVAS
Jms	METASEDIMENTARY ROCKS
Intr	GRANITE, DACITE, RHYOLITE, etc.

FAULT WITH BAR ON DOWNTHROWN SIDE

PROJECT BOUNDARY

. PM-5 5201.5 STATIC WATER ELEVATIONS MAY 28, 1995

0 500 1000
Scale in Feet

TALAPOOSA MINE PROJECT ENVIRONMENTAL IMPACT STATEMENT

FIGURE 4.11
GEOLOGY AND BASELINE ELEVATIONS SOUTHERN PART OF VIRGINIA RANGE

JANUARY 1996

hafcoscr.tbl | taladh.dgn

TABLE 4.9: WELLS EXHIBITING CHEMICAL ANALYTES EQUAL TO OR GREATER THAN ESTABLISHED MCLS FOR THE STATE OF NEVADA WATER QUALITY STANDARDS

WELL	ARSENIC (As) (0.05)	WELL	CADMIUM (Cd) (0.01)	WELL	LEAD (Pb) (0.05)
PE-61	(0.206)	PE-61	(0.008)	PE-61	
PW-1	(0.094)	PE-75	(0.02)	PE-75	
MON-1	(0.26)	PE-81	(0.01)	PE-81	(0.131)
MON-3	(0.23)	PW-1	(0.016)	WW-6	
MON-4	(1.5)	WW-6	(0.008)		
Rock Blind Spring	(0.077)	MON-7	(0.12)		

AMENDED ANALYSIS: ENVIRONMENTAL CONSEQUENCES

GEOLOGY AND MINERALS

Direct impacts of the Proposed Action on geologic and mineral resources would be limited to excavation and relocation of waste rock and processed ore and the removal of gold and silver. These direct impacts would not be mitigated.

Indirect impacts would involve potential discharge of acidic water and metals from waste disposal areas and sulfide ore stockpiles. Proposed waste rock management and monitoring programs would be expected to adequately detect and mitigate these potential indirect impacts. Potential instability of waste disposal areas, heap leach piles and pit slopes would be mitigated through proper design and construction.

DIRECT AND INDIRECT IMPACTS OF THE PROPOSED ACTION

Direct impacts would include relocation of approximately 42 million tons of ore to the leach pad. Approximately one million ounces of gold and 14 million ounces of silver would be extracted from the geologic resource.

In order to produce this ore from an open-pit mine, an additional 90 million tons of waste rock (rock not containing economic quantities of gold or silver) would also be mined and placed in waste rock disposal areas.

Indirect impacts of the Proposed Action could arise from placement of potentially acid-generating material in waste rock disposal areas and ore stockpiles. Rain and snowmelt infiltrating through waste rock and ore piles could potentially cause an acidic or metal bearing discharge through contact with these materials.

Seismicity and Slope Stability

Stability modeling for the waste rock disposal areas, heap leach pad and mine pit show that the design slopes would be stable during operations and following reclamation (WESTEC, 1995).

Acid Rock Drainage

The Upper and Lower Bear Creek horizons of the Lower Kate Peak Formation are acid-forming rock strata. These two horizons comprise 54 percent of the waste rock and pit walls. These horizons must be considered as an important potential source of acid generation.

Humidity cell test data from these two horizons indicate that aluminum, arsenic, iron, manganese, nickel, sulfate, thallium and TDS could be produced in leachate. However, background water quality also currently exceeds some of these parameters.

Results of the Meteoric Water Mobility Procedure testing validate the humidity cell testing and indicate that aluminum, arsenic, cadmium, lead, iron, manganese, sulfate, total dissolved solids and zinc could be mobilized from waste rock and the pit walls.

Seepage from Reclaimed Waste Disposal Areas

Waste rock material stored in the disposal areas could be a source for leachate production. The chemistry of the waste rock has been discussed in previous sections.

The Hydrologic Evaluation of Landfill Performance (HELP) model was used to predict seepage rates from the waste rock disposal areas. A description of the model and its inputs can be found in Volumes 1 and 2 of the report titled "Use of the HELP Model to Predict Seepage from the Reclaimed Waste Rock Disposal Areas," WMC, 1996. This report is hereby adopted as part of the FEIS by reference.

A total of 30 simulations were performed to assess the sensitivity of input parameters in the model. The individual soil layers used in the model were constructed to simulate the actual waste rock disposal area design. The waste rock disposal areas are designed so that the upper two to three feet of waste rock will be compacted with 150-ton loaded haul-truck traffic. The HELP model was also run assuming the disposal area was saturated.

The preferred and most realistic simulation (WMC, 1996, HELP Model Section 6) consisted of a three-layer soil system for the top of the disposal area, and a two-layer system for the slopes. An eight-inch-thick growth medium layer was used for the tops, but not on the sidewalls because of limited availability of the growth medium. Because of compaction from the haul-truck traffic, the middle layer of argillized rock was modeled as clay with a thickness of 24 inches (on the sidewalls, the argillized rock [clay] was modeled as the top layer).

The lower layer beneath the argillized rock (clay) layer was modeled as volcanic rock. In addition to the preferred three-layer system, modeling was also performed using a two-layer system for the top and one-layer system for the sidewalls, where the argillized rock (clay) layer was removed from both the slope and top. While this model was not deemed realistic by WMC, it was performed to evaluate the sensitivity of the model to input parameters.

The results of the model show that seepage rates of 0 to 0.012 gpm per acre could be expected if the argillized rock (clay) layer was used, and 0.006 to 0.062 gpm per acre if the argillized rock (clay) layer was not used. Using the largest disposal area of 171 acres in area, worst case seepage is estimated at 2 gpm from the entire disposal area site if the argillized rock (clay) layer is used, and 11 gpm from the entire disposal area site if the argillized rock (clay) layer is not used. Even using the worst case seepage of 11 gpm, it is unlikely the disposal area site will produce a point-source leachate.

Instead, given the very low average infiltration rate through the waste rock (0.003 inch/day at the highest) the water that infiltrates the waste rock disposal area would probably infiltrate into the original ground surface at the interface with the bottom of the waste disposal area.

Since the upper 200 feet of the native soil and rock in the area of the southwest waste rock disposal area is composed of alkaline materials (Tkx, Upper Kate Peak tuffs and intrusives) (WMC, 1996, Figure 2.4, Evaluation of Baseline Hydrology), and since the ground water depth beneath the waste rock disposal areas is about 150 to 400 feet below the ground surface, it is probable that acid drainage, if any, from beneath the southwest waste rock disposal area would be neutralized before reaching the ground water.

The northeast disposal area would be located above Tka material (Lower Kate Peak lava flows and ash flow tuffs), which has been shown to be neutral to acid producing. Acid-base accounting data for the rock types present under the northeast disposal area was performed.

The representative rock types were weighted according to their occurrence in the area of the disposal area and the ANP:AGP ratio calculated. The average ANP:AGP ratio based upon pyritic sulfur is 6.61, while the average NNP is 6.42 tons $CaCO_3$/1000 tons of rock. Therefore, the rocks under northeast disposal area also have a significant neutralizing capability. Water depth under the northeast disposal area is expected to be between 200 and 400 feet.

Given the conservative nature of the model and the very low infiltration rate, little if any leachate production is expected. Little if any percolation of water would exist within the disposal areas. Thus, no transport mechanism would exist for mobilization of metals or acids. The low annual rainfall of the site and high evapotranspiration rates would not allow significant seepage rates from the reclaimed waste rock piles. Neutralizing rocks and soils exist under the disposal areas.

NO ACTION ALTERNATIVE

The No Action alternative eliminates the proposed project development and avoids the potential direct and indirect impacts of the Proposed Action. It also eliminates the recovery of the precious metal resource.

POTENTIAL MITIGATION AND MONITORING OF RESOURCES

Because tests show the unoxidized ore to be potentially acid-producing, waste rock and ore stockpiles may be sources of acid drainage over the life of the operation. The Waste Rock Management Plan in Appendix B of this document would be implemented as mitigation to this potential impact.

UNAVOIDABLE ADVERSE EFFECTS

No unmitigated residual adverse impacts to the geologic resource would be expected.

WATER QUALITY & QUANTITY

The direct impacts of the Proposed Action on water resources would be:

- the water supply pumping activity;
- resultant lowering of the water table of the bedrock aquifer system in the immediate project area; and
- formation of a pit lake that would contain mineralized waters.

Due to the presence of fault-controlled flow barriers and low hydraulic conductivities of the volcanic bedrock ground water system, the water supply pumping impacts are expected to occur within close proximity of the proposed mine. Thus, water supply pumping is not expected to affect ground water conditions in the alluvial aquifer in Churchill Valley.

Rock Blind Spring is not expected to be impacted by water supply pumping.

Pumping of the water from the pit area is not expected to produce water in excess of that used in the mining and leaching operation. Although ground water in the pit area exceeds drinking water standards for some constituents, all ground water produced would be used in ore processing, and no discharge of water to the environment would occur.

Surface drainage would be diverted around pits, the disposal areas and the heap leach pad. Surface water runoff from these areas can be expected to be affected by increased sediment load until vegetation becomes established. Impacts to jurisdictional waters of the U.S. would involve placement of the southwest overburden disposal area over portions of two segments of ephemeral drainages.

Any proposed purchase of processing water is not anticipated to have any impacts to the potable water supply in the vicinity of the proposed mine. Water purchased by TMI for the proposed mine would be within an existing appropriation. There would be no net increase to the amount of water appropriated.

A pit lake would be formed in which mineralized water would accumulate. The water is expected to exceed drinking water quality standards for certain chemical parameters. However, surrounding ground water would not be impacted because the pit would act as a sink with water flowing toward it.

DIRECT AND INDIRECT IMPACTS OF THE PROPOSED ACTION

Water supply pumping to allow mining to progress below the existing ground water levels would result in direct impacts on water quantity. The water supply pumping is expected to decrease the ground water level from a pre-mining elevation of 5,200 feet to approximately 4,600 feet. Approximately 335 to 450 million gallons of water would be removed from ground water storage within the volcanic bedrock aquifer and used in the mining operation.

Due to the structural boundaries of the ground water system, the cone of depression created by water supply pumping is expected to be insignificant outside of the pit area. No effects on any existing wells or water supplies, including those of Churchill Valley, are expected.

Water quality of the ground water system would not be impacted by the Proposed Action, since the post-mining pit would act as a sink with ground water flow moving towards the pit.

Surface water impacts would involve sediment loading during spring run-off and during high-intensity storms. Two ephemeral drainages designated as jurisdictional waters of the U.S. would be covered by the southwest overburden disposal area, for which a Section 404 permit will be required for this action. Approximately 6,000 feet of ephemeral drainage would be covered by the disposal area.

The Risk of Contamination of Churchill Valley Ground Waters

Geologic and hydrogeologic evidence suggests that historic ground water flow from the Talapoosa site towards the valley has been severely limited by a barrier fault or other low-conductivity structure between the ore body and Churchill Valley. Carbon 14 dating and wells completed downgradient of the ore zone verify this conclusion.

The creation of the proposed pit lake, which would become the ground water discharge zone for the Talapoosa site, would further ensure that any contaminated ground water created by the mining operations would remain on site indefinitely.

No impacts to Churchill Valley ground water are expected.

Water Budget of the Pit Lake

Water Management Consultants (WMC) has undertaken modeling to predict the future pit lake water levels and chemistry. There are three inflow components to the final pit (WMC, 1996). These are:

1) Precipitation falling onto the open water surface within the base of the pit;

2) Runoff due to precipitation falling onto the pit walls above the open water surface; and

3) Ground water seepage into the final pit.

The relative importance of these inflows would change as the pit fills after mining. Thus, the amount of precipitation on the lake surface would increase from zero as the area of that surface increases, up to about 6 gallons per minute (gpm) when the water level has recovered to a steady-state elevation of 4,843 feet. The maximum area of the lake is estimated to be about 14.2 acres. Runoff from pit walls would decrease as the area of those walls decreases as the pit lake fills.

Studies by WMC predict the pit wall runoff decreasing from 19 gpm into the empty pit to 17 gpm when the pit lake level stabilizes. Ground water seepage into the pit is expected to be fairly constant at 10 gpm, although it could range between 3 and 24 gpm. Evaporation would increase from zero initially to 33 gpm when steady-state conditions occur. The lake level would rise very slowly, from 4,680 feet to 4,817 feet in 50 years. The lake would reach near its maximum surface area in about 200 years. Table 4.10 details the expected pit lake water balance.

Modeling of Pit Lake Chemistry

Section 8.6 of v.1, WMC, 1996 gives a complete description of the geochemical modeling approach to predict pit lake chemistry and is adopted by reference to define the complete modeling approach. Following is a summary of the modeling approach.

The water balance was established first using the observed and measured results of the long-term pump test and hydrological modeling explained in

Sections 6 and 7 of v.1, WMC, 1996. Direct precipitation, ground water inflow and runoff from the pit walls are the water inputs of the model. Evaporation is the only output as the pit will act as a ground water sink. Precipitation onto the pit lake surface contains little if any of the leachate components of concern and evaporation only removes solvent water. Thus, neither of these two water balance components involves mass flux of any dissolved chemical analytes of interest and their influence on water chemistry is addressed through mass balance.

Prediction for the runoff from the pit walls was obtained by applying the expected precipitation to the proportions of each rock type that will exist in the final pit wall. The areas of each rock type were measured from geologic map of the final pit. Leachate chemistry was derived from weeks 32 through 48 of the latest humidity cell tests.

The hydrochemistry of the ground water inflow was derived from the ground water sampling and analysis program defined in Section 5.9 v.1 of WMC, 1996.

Mixing ratios of ground water and pit wall leachate are derived from their inflow rates. Evaporation acts as an enrichment factor, concentrating chemical analytes present in the lake. The PHREEQC model was used to mix waters and the model MINTEQA2 was used to compute chemical equilibria of the resultant analytes and precipitates.

Pit Lake Chemistry

The lake that would form in the open pit following mining operations would have a chemistry that changes with time as the lake fills.

The pit lake is expected to have a surface area of approximately 14 acres and a water surface elevation of 4,843 feet after steady-state conditions are reached.

The chemistry of the pit lake will be strongly influenced by the balance of the hydrologic system. The major source of acidity to the lake would be from runoff that flows into the pit after interacting with sulfide-bearing rocks in the pit walls. The high alkalinity of the ground water inflow (135 mg/l $CaCO_3$) would control the pH of the final pit lake. Sufficient alkalinity and buffering capacity exist to neutralize any generated acidity. Consequently, modeling shows that pit waters would not be acidic.

The natural ground water flowing into the pit exceeds drinking water standards, as described in Chapter 3 of the DEIS.

Due to the large evaporation component of the lake's water budget, some metals and chemicals present in the natural ground water of the site would be concentrated in the lake's waters. Table 4.11 shows modeling results that predict pit lake chemistry and compares it with baseline values and Nevada drinking water standards.

The model is based on eight inches of precipitation, 10 gpm of ground water inflow and 45 inches of evaporation as the base case. Chemical analytes that are expected to equal or exceed drinking water standards after 25 years of recovery are TDS, antimony, arsenic, manganese, nickel, sulfate and thallium.

Nickel is projected to exceeded the drinking water standards, however, two of the three average leachate analyses exhibit non-detectable values for nickel. Therefore, in the model, half of the detection limit has been used. As a result, there is uncertainty, as to whether nickel will actually exceed the drinking water standard.

The pit lake is projected to have a pH of 7.45. The pH of the water in the lake will be controlled by the alkalinity of the ground water inflow. The results of the humidity cell testing and the ABA reveal that the leachate of the Tka will be acid generating and will have an alkalinity near zero.

Different mixing ratios were analyzed based on varying precipitation, evaporation and ground water flow rate to see the effect on pH. In the cases studied, the pH of the pit lake is projected to be above 7.0 due to the high alkalinity (135 mg/l) of the ground water (Refer to Table 8.18, v.1, WMC, 1996).

TABLE 4.10: LONG-TERM WATER BALANCE FOR THE FINAL PIT (BASE CASE)

BENCH ELEVATION (FT)	TOTAL VOLUME (FT^3)	BENCH VOLUME (FT^3)	LAKE SURFACE (FT^2)	PIT WALL ABOVE LAKE (FT^2)	RECHARGE FROM PIT WALL (GPM)	CUMULATIVE PIT WALL RECHARGE (GPM)	CUMULATIVE GROUND WATER INFLOW (FT^3)	CONC. FACTOR	PRECIPITATION ON LAKE (GPM)	EVAPORATION FROM LAKE (GPM)	BALANCE (GPM)	FILLING TIME (YR)	LAKE (ACRES)
4,900	8.75E+07	5.65E+06	8.76E+05	4.24E+06									
4,893.4	8.38E+07	2.91E+06	8.50E+05	4.27E+06									
4,890	8.19E+07	8.17E+06	8.37E+05	4.28E+06									
4,880	7.37E+07	7.77E+06	7.98E+05	4.32E+06									
4,870	6.59E+07	7.35E+06	7.56E+05	4.36E+06									
4,860	5.86E+07	6.85E+06	7.14E+05	4.40E+06									
4,850	5.17E+07	6.28E+06	6.57E+05	4.46E+06									
4,843.05	4.74E+07	1.92E+06	6.17E+05	4.46E+06	17.1	9.54E+09	5.58E+09	319.4	5.9	33	0.00	7946	14
4,840	4.54E+07	5.80E+06	6.00E+05	4.52E+06	17.1	2.42E+08	1.39E+08	8.4	5.7	32	0.83	198	14
4,834.8	4.24E+07	2.78E+06	5.79E+05	4.54E+06	17.2	1.22E+08	6.96E+07	4.5	5.5	31	1.82	99	13
4,830	3.96E+07	1.35E+06	5.60E+05	4.56E+06	17.3	9.60E+07	5.44E+07	3.8	5.3	30	2.74	77	13
4,827.5	3.83E+07	4.05E+06	5.50E+05	4.57E+06	17.3	8.75E+07	4.94E+07	3.6	5.2	29	3.22	70	13
4,820	3.42E+07	1.47E+06	5.20E+05	4.60E+06	17.5	6.57E+07	3.69E+07	3.0	4.9	28	4.65	52	12
4,817.1	3.28E+07	3.59E+06	5.11E+05	4.61E+06	17.5	6.02E+07	3.37E+07	2.9	4.9	27	5.05	48	12
4,810	2.92E+07	4.72E+06	4.91E+05	4.63E+06	17.6	4.78E+07	2.66E+07	2.5	4.7	26	6.02	38	11
4,800.1	2.45E+07	4.76E+04	4.62E+05	4.66E+06	17.7	3.40E+07	1.88E+07	2.2	4.4	25	7.39	27	11
4,800	2.44E+07	1.41E+06	4.62E+05	4.66E+06	17.7	3.39E+07	1.87E+07	2.2	4.4	25	7.40	27	11

TABLE 4.10: LONG-TERM WATER BALANCE FOR THE FINAL PIT (BASE CASE) (CONTINUED)

BENCH ELEVATION (FT)	TOTAL VOLUME (FT^3)	BENCH VOLUME (FT^3)	LAKE SURFACE (FT^2)	PIT WALL ABOVE LAKE (FT^2)	RECHARGE FROM PIT WALL (GPM)	CUMULATIVE PIT WALL RECHARGE (GPM)	CUMULATIVE GROUND WATER INFLOW (FT^3)	CONC. FACTOR	PRECIPITATION ON LAKE (GPM)	EVAPORATION FROM LAKE (GPM)	BALANCE (GPM)	FILLING TIME (YR)	LAKE (ACRES)
4,796.78	2.30E+07	2.97E+06	4.46E+05	4.67E+06	17.7	3.05E+07	1.68E+07	2.1	4.2	24	8.14	24	10
4,790	2.01E+07	3.72E+06	4.14E+05	4.70E+06	17.9	2.41E+07	1.32E+07	1.9	3.9	22	9.71	19	9
4,780.45	1.63E+07	1.75E+05	3.67E+05	4.75E+06	18.0	1.72E+07	9.33E+06	1.6	3.5	20	11.91	13.3	8
4,780	1.62E+07	2.71E+05	3.65E+05	4.75E+06	18.0	1.70E+07	9.18E+06	1.6	3.5	19	12.02	13.1	8
4,779.178	1.59E+07	3.03E+06	3.59E+05	4.76E+06	18.1	1.66E+07	8.96E+06	1.6	3.4	19	12.29	12.8	8
4,770	1.29E+07	2.60E+06	2.95E+05	4.82E+06	18.3	1.21E+07	6.49E+06	1.4	2.8	16	15.35	9.2	7
4,760	1.03E+07	2.15E+06	2.25E+05	4.89E+06	18.6	9.01E+06	4.80E+06	1.3	2.1	12	18.68	6.8	5
4,750	8.11E+06	1.95E+06	2.05E+05	4.91E+06	18.6	6.87E+06	3.65E+06	1.3	1.9	11	19.65	5.2	5
4,740	6.16E+06	1.68E+06	1.85E+05	4.93E+06	18.7	5.02E+06	2.65E+06	1.2	1.8	10	20.61	3.8	4
4,730	4.48E+06	1.33E+06	1.50E+05	4.97E+06	18.9	3.50E+06	1.84E+06	1.2	1.4	8	22.26	2.6	3
4,720	3.15E+06	1.04E+06	1.16E+05	5.00E+06	19.0	2.38E+06	1.24E+06	1.1	1.1	6	23.92	1.8	3
4,710	2.12E+06	8.02E+05	9.20E+04	5.03E+06	19.1	1.55E+06	8.11E+05	1.1	0.9	5	25.04	1.2`	2
4,700	1.31E+06	5.97E+05	6.84E+04	5.05E+06	19.2	9.42E+05	4.91E+05	1.1	0.6	4	26.16	0.7	2
4,690	7.17E+05	4.23E+05	5.10E+04	5.07E+06	19.2	5.05E+05	2.62E+05	1.1	0.5	3	26.99	0.4	1
4,680	2.93E+05	2.93E+05	3.36E+04	5.08E+06	19.3	2.03E+05	1.05E+05	1.1	0.3	2	27.82	0.1	1
4,870			2.50E+04										

Groundwater inflow 10 gpm 702674 cu ft/yr; Precipitation 8 in/yr 0.67 ft^3/yr; Open water evaporation 45 in/yr 3.75 ft/yr

Sensitivity of the Model Inputs

Several chemical analytes were found to be below the detection limit in the pit wall leachates or the ground water inflow. The base case presented in Table 4.11 assumes half the detection limit is present for those analytes that were below the detection limit. The actual value for these analytes, although unknown, will range from zero to the detection limit value.

In order to bracket the uncertainty associated with these analytes, a sensitivity analysis was conducted in which the geochemical model was run for the base case using zero and the full-detection limit for analytes that were below the detection limit. (Tables 8.22 and 8.23 of v.1, of the WMC, 1996, show the chemical inputs of the ground water used for these sensitivity runs.)

Table 4.12 and Table 4.13 show the results of this sensitivity modeling. The modeling is run through year 25 after the close of mining. When the maximum detection limit is used, antimony, arsenic, cadmium, chromium, manganese, nickel, sulfate, thallium and TDS are projected to exceed drinking water standards. When 0 is used for the analytes with non-detect values, antimony, arsenic, manganese, sulfate, thallium and TDS are projected to exceed drinking water standards.

A comparison of these base case sensitivity runs indicates that cadmium, chromium and nickel exceed the drinking water standards as a result of the assigned concentration. It is inconclusive whether these elements will actually exceed ground water standards.

Sensitivity runs were also prepared for variations in the pit water balance. Cases in which six inches of precipitation and 50 inches of evaporation (dry case), a wetter case in which 10 inches of precipitation and 40 inches of evaporation, and a high ground water flow rate (24 gpm) were run by the geochemical model. In the drier case antimony, arsenic, manganese, nickel, sulfate, thallium and TDS are projected to exceed ground water standards. In the wetter case antimony, arsenic, manganese, nickel, sulfate, thallium and TDS are predicted to exceed drinking water standards. The high ground water case results in the best pit lake chemistry, with antimony, arsenic, manganese, sulfate, thallium and TDS exceeding the drinking water standards. Table 4.14, Table 4.15 and Table 4.16 show the results of these sensitivity runs.

Table 4.17 shows the results of the analytes that would exceed drinking water standards under each of the sensitivity analysis scenarios. Antimony, arsenic, manganese, sulfate, thallium and TDS are projected to exceed the drinking water criteria in all of the sensitivity runs conducted. Chromium, cadmium and nickel are below the detection limit for at least two of the four sources of input chemistry (Tka leachate, Tkx leachate, Tlb leachate and ground water inflow). Thus, the exceedances predicted by the model are probably the result of the assigned value chosen for the concentration of each of these analytes. Since the actual concentration of these elements is unknown, the prediction that they will exceed the drinking water standards is questionable.

Impacts to wildlife from the waters of the pit lake are detailed in the Wildlife and Fisheries Resources section of Chapter 4 of the DEIS and Appendix D of this document.

NO ACTION ALTERNATIVE

Under the No Action Alternative, no dewatering of the basalt aquifer would occur, and the current hydrogeologic system would remain undisturbed. No pit lake would be created.

POTENTIAL MITIGATION AND MONITORING OF RESOURCES

The State of Nevada has primary responsibility on water quality issues. Mitigation would be part of the Nevada Water Pollution Control permit granted to the proposed project. Monitoring of water as detailed below would be a key part of the mitigation plan for water resources.

Monitoring of the water supply pumping activities would allow for the detection of potential impacts. Monitoring activities need to be scheduled on Rock Blind Spring to detect any potential impacts. Ground water quality and quantity would be monitored through a network of seven wells.

Sampling of runoff (should it occur) from the waste rock disposal areas should be conducted to verify that metals mobilization and acid rock drainage are not occurring.

The pit lake in-flow (if available) should be sampled and analyzed for water quality parameters for a period of years during and following reclamation. Monitoring results should be compared to modeling predictions. Should conditions warrant, actions could be undertaken to alleviate problems at the time.

Toxicological and risk analysis of the accumulated pit lake water could be conducted to determine effects on wildlife. Appropriate measures could be taken if toxicologic problems are predicted to occur. These measures could include pumping additional fresh water and diverting the limited surface runoff to fill the pit lake above the steady-state level.

Pumping would be initiated at the close of mining if risks to wildlife were projected. Pumping would be conducted on a one-time basis to fill the pit above the steady-state level predicted by modeling. Modeling would be used to determine the amount of water required to sufficiently dilute problem constituents well into the future by offsetting the effects of evaporation over time.

Diversion of surface water into the pit would also have an additional diluting effect, although not a large one. The pit would be located near the top of the watershed with little contributing area. Other mitigating measures include the exclusion of wildlife or water treatment.

A case-by-case analysis of the economic feasibility and impacts of any mitigation plan would need to be developed prior to implementation.

UNAVOIDABLE ADVERSE EFFECTS

The final pit lake elevation is estimated to be 4,843 feet. This is approximately 325 to 450 feet below the pre-mining water table. Due to low inflow rates and high evaporation rates, the water levels within the pit would remain at a level below the original baseline, creating a water discharge area within the pit. No impact is expected in the basin fill alluvial aquifer due to the lowering of the water table in the pit area.

A pit lake would be formed whose hydrochemistry would exceed some pre-mining baseline conditions and Nevada drinking water standards for sulfate, TDS, arsenic, antimony, manganese, nickel and thallium. Exceeding these standards could potentially affect wildlife that use the pit lake either for habitat or drinking water (see Appendix D).

TABLE 4.11: CHEMICAL INPUT DATA AND RESULTS OF FINAL PIT MODELING (BASE CASE*)

CONSTITUENT	CHEMICAL INPUT DATA				MODELING RESULTS				NEVADA MCL (SMCL)
	ROCK LAYER UNITS				25 YEAR		100 YEAR		
	Tka	Tkx	Tlb	Influent Ground Water	I	II	I	II	
Alkalinity ($CaCO_3$) (mg/l)	0.0+	3.83	7.60	135.47	24.3	33.6	54.0	68.25	
Aluminum (mg/l)	9.5	3.1	0.9	0.1	8.6	0.009	13.8	0.016	(0.05)
Arsenic (mg/l)	0.010	0.004	0.003	0.515	0.402	0.277	0.799	0.595	0.05
Barium (mg/l)	0.05	0.05	0.05	0.01	0.08	0.01	0.13	0.007	2
Cadmium (mg/l)	0.0059	0.0004#	0.0004#	0.0004	0.0049	0.0044	0.010	0.0024	0.005
Calcium (mg/l)	20.8	0.6	1.1	69.2	68.7	67.7	147.7	95.4	
Chloride (mg/l)	0.7	0.3	0.9	35.5	27.9	27.9	60.2	60.3	(250)
Iron (mg/l)	1.9	0.6	0.5	0.9	2.4	0.0004	3.9	0.0004	(0.3)
Lead (mg/l)	0.003	0.001#	0.001#	0.011	0.011	0.0001	0.018	0.0003	0.015
Magnesium (mg/l)	28.5	0.5	0.3	31.5	45.5	45.5	98.1	97.9	(150)
Manganese (mg/l)	1.6	0.1	0.1	0.6	1.7	1.7	3.7	1.4	(0.05)
pH (s.u.)	3.50	5.66	6.13	7.37	7.45	7.60	7.81	7.89	(6.5-8.5)
Phosphorous (mg/l)	0.02	0.11	0.21	0.35①	0.37	0.0001	0.59	0.00003	
Sulfate (mg/l)	254.6	1.2	2.2	409.4	504.8	505.2	1091.2	1095.1	(250)

* Base Case assumes ground water inflows of 10 gpm, precipitation of 8 inches/year, and open water evaporation of 45 inches/year

I MINTEQA2 results before precipitation

II MINTEQA2 results following expected precipitation and adsorption

( ) Secondary Nevada drinking water standards (SMCL)

\+ The actual average alkalinity from the 32-48 week HCT data is 0.711 mg/$CaCO_3$, however at a pH of 3.5, the alkalinity would have to be near zero.

① Values from Tkx analyses from 32-40 week average were used as input parameters for influent ground water chemistry for these analytes. Water analysis did not include these parameters.

\# Indicates values were below detection limit. Half of detection limit was used in base case.

TABLE 4.11: CHEMICAL INPUT DATA AND RESULTS OF FINAL PIT MODELING (BASE CASE*) (CONTINUED)

CONSTITUENT	CHEMICAL INPUT DATA				MODELING RESULTS				NEVADA MCL
	ROCK LAYER UNITS				25 YEAR		100 YEAR		
	Tka	Tkx	Tlb	Influent Ground Water	I	II	I	II	(SMCL)
Antimony	0.004	0.002	0.001#	0.026	0.024	0.024	0.051	0.051	0.006
Beryllium (aa)	0.0041	0.0004#	0.0004#	0.0001	0.0034	0.0006	0.0057	0.0001	0.004
Bismuth	0.05#	0.05#	0.05#	0.05①	0.11	0.11	0.23	0.23	
Chromium	0.05#	0.05#	0.05#	0.02	0.08	0.08	0.18	0.18	0.1
Cobalt	0.11	0.05#	0.05#	0.05①	0.15	0.15	0.32	0.32	
Copper	0.06	0.05#	0.05#	0.01#	0.08	0.004	0.13	0.005	1.3
Fluoride	0.3	1.5	0.1#	0.3	1.1	0.99	2.3	2.1	2
Gallium	0.05#	0.05#	0.05#	0.05①	0.11	0.11	0.023	0.23	
Log P_{CO2}					-3.00	-3.00	-3.00	-3.00	
Mercury (mg/l)	0.00025	0.00025#	.00034	.00029	0.00057	0.00057	0.00124	0.00124	0.002
Nickel (mg/l)	0.14	0.02#	0.02#	0.02#	0.13	0.123	0.28	0.26	0.1
Potassium (mg/l)	3.1	1.2	0.5	7.4	8.5	8.5	18.4	18.4	
Silver (mg/l)	0.001	0.001#	0.001#	0.001	0.002	0.002	0.005	0.005	(0.1)
Sodium (mg/l)	2.0	4.6	3.1	137.7	109.0	109.0	235.4	234.5	
Zinc (mg/l)	1.71	0.05	0.06	0.12	1.39	0.0001	3.23	0.00002	(5)

* Base Case assumes ground water inflows of 10 gpm, precipitation of 8 inches/year, and open water evaporation of 45 inches/year

I MINTEQA2 results before precipitation

II MINTEQA2 results following expected precipitation and adsorption

( ) Secondary Nevada drinking water standards (SMCL)

\+ The actual average alkalinity from the 32-48 week HCT data is 0.711 mg/$CaCO_3$, however at a pH of 3.5, the alkalinity would have to be near zero.

① Values from Tkx analyses from 32-40 week average were used as input parameters for influent ground water chemistry for these analytes. Water analysis did not include these parameters.

\# Indicates values were below detection limit. Half of detection limit was used in base case.

TABLE 4.11: CHEMICAL INPUT DATA AND RESULTS OF FINAL PIT MODELING (BASE CASE*) (CONTINUED)

CONSTITUENT	CHEMICAL INPUT DATA				MODELING RESULTS				NEVADA MCL
	ROCK LAYER UNITS				25 YEAR		100 YEAR		
	Tka	Tkx	Tlb	Influent Ground Water	I	II	I	II	(SMCL)
Lanthanium	0.05#	0.05#	0.05#	0.05①	0.11	0.11	0.23	0.23	
Lithium	0.11	0.05#	0.05#	0.05①	0.15	0.15	0.32	0.32	
Molybdenum	0.18#	0.18#	0.18#	0.25#	0.43	0.43	0.94	0.94	
Nitrate (N)	0.06	0.05#	0.08	0.72	0.63	0.63	1.36	1.36	10
Scandium	0.05#	0.05#	0.05#	0.05①	0.11	0.11	0.23	0.23	
Selenium	0.0005#	0.0005#	0.0005#	0.0006#	0.0011	0.0011	0.0024	0.0024	0.05
Silicon	4.6	9.3	13.4	18.0①	23.6	23.0	50.6	49.6	
Strontium	0.14	0.05#	0.05#	0.05	0.17	0.17	0.37	0.37	
Sulfate	254.8	1.2	2.2	409.4	504.8	505.2	1091.2	1095.1	250
TDS						826.3		1730.1	500
Thallium (aa)	0.0044	0.0007	0.0003#	0.0003	0.0038	0.0038	0.0083	0.0083	0.002
Tin	0.4#	0.4#	0.4#	0.1	0.6	0.6	1.3	1.3	
Titanium	0.05#	0.05	0.08	0.05①	0.11	0.11	0.24	0.24	
Vanadium	0.05#	0.05#	0.05	0.05#	0.11	0.11	0.23	0.23	

* Base Case assumes ground water inflows of 10 gpm, precipitation of 8 inches/year, and open water evaporation of 50 inches/year

I MINTEQA2 results before precipitation

II MINTEQA2 results following expected precipitation and adsorption

( ) Secondary Nevada drinking water standards (SMCL)

\+ The actual average alkalinity from the 32-48 week HCT data is 0.711 mg/$CaCO_3$, however at a pH of 3.5, the alkalinity would have to be near zero.

① Values from Tkx analyses from 32-40 week average were used as input parameters for influent ground water chemistry for these analytes. Water analysis did not include these parameters.

\# Indicates values were below detection limit. Half of detection limit was used in base case.

TABLE 4.12 CHEMICAL INPUT DATA AND RESULTS OF FINAL PIT MODELING (BASE CASE DETECTION LIMIT EQUALS MAXIMUM DETECTION LIMIT)

	CHEMICAL INPUT DATA				MODELING RESULTS		
	Tka	Tkx	Tlb	Influent Ground Water	Lake Year 25 Evaporation	Lake Year 25 Sorption	NDEP STDS 9/29/95
CONSTITUENT					I	II	
pH (s.u.)	3.50	5.66	6.13	7.37	7.45	7.60	
Alkalinity ($CaCO_3$) (mg/l)	0.0	3.8	7.6	135.5	24.4	33.6	
Log P_{CO2}					-3.00	-3.00	
Aluminum (mg/l)	9.5	3.1	0.9	0.1	8.6	0.009	0.05
Antimony (mg/l)	0.005	0.004	0.004	0.028	0.027	0.027	0.006
Arsenic (mg/l)	0.011	0.005	0.005	0.519	0.407	0.268	0.05
Barium (mg/l)	0.10	0.10	0.10	0.01	0.14	0.01	2
Beryllium (mg/l)	0.0048	0.0014	0.0020	0.0002	0.0047	0.0003	0.004
Bismuth (mg/l)	0.10	0.10	0.10	0.10	0.21	0.21	
Cadmium (mg/l)	0.0062	0.0020	0.0020	0.0010	0.0066	0.0054	0.005
Calcium (mg/l)	20.8	0.6	1.1	69.2	68.7	68.1	
Chloride (mg/l)	0.7	0.3	0.9	35.5	27.9	27.9	250
Chromium (mg/l)	0.10	0.10	0.10	0.05	0.17	0.17	0.1
Cobalt (mg/l)	0.13	0.10	0.10	0.10	0.23	0.23	
Copper (mg/l)	0.10	0.10	0.10	0.02	0.15	0.009	1.3
Fluoride (mg/l)	0.3	1.5	0.10	0.3	1.1	1.03	2
Gallium (mg/l)	0.10	0.10	0.10	0.10	0.21	0.21	
Iron (mg/l)	2.0	0.6	0.6	0.9	2.5	0.0004	0.3
Lanthanum (mg/l)	0.10	0.10	0.10	0.10	0.21	0.21	
Lead (mg/l)	0.020	0.040	0.040	0.031	0.063	0.0019	0.015
Lithium (mg/l)	0.13	0.10	0.10	0.10	0.23	0.23	
Magnesium (mg/l)	28.5	0.5	0.3	31.5	45.4	45.5	125

I MINTEQA2 results before precipitation
II MINTEQA2 results following expected precipitation and adsorption

TABLE 4.12 CHEMICAL INPUT DATA AND RESULTS OF FINAL PIT MODELING (BASE CASE DETECTION LIMIT EQUALS MAXIMUM DETECTION LIMIT) (CONTINUED)

	CHEMICAL INPUT DATA				MODELING RESULTS		
	Tka	Tkx	Tlb	Influent Ground Water	Lake Year 25 Evaporation	Lake Year 25 Sorption	NDEP STDS 9/29/95
CONSTITUENT					I	II	
Manganese (mg/l)	1.6	0.10	0.1	0.6	1.7	1.7	0.05
Mercury (mg/l)	0.00050	0.00050	0.00055	0.00054	0.00109	0.00109	0.002
Molybdenum (mg/l)	0.50	0.50	0.50	0.51	1.06	1.06	
Nickel (mg/l)	0.15	0.04	0.04	0.04	0.17	0.158	0.1
Nitrate (mg/l)	0.10	0.10	0.12	0.75	0.71	0.71	10
Phosphorus (mg/l)	0.02	0.11	0.21	0.12	0.19	0.0001	
Potassium (mg/l)	3.1	1.2	0.5	7.4	8.5	8.5	
Scandium (mg/l)	0.10	0.10	0.10	0.10	0.21	0.21	
Selenium (mg/l)	0.0010	0.0010	0.0010	0.0020	0.0029	0.0029	0.05
Silicon (mg/l)	4.7	9.5	13.4	18.0	23.7	23.1	
Silver (mg/l)	0.005	0.005	0.005	0.019	0.021	0.021	0.1
Sodium (mg/l)	2.0	4.6	3.1	137.7	109.0	108.9	
Strontium (mg/l)	0.39	0.50	0.50	0.50	0.97	0.97	
Sulfate (mg/l)	254.6	1.2	2.2	409.4	505.0	501.3	250
Thallium (mg/l)	0.0048	0.0012	0.0010	0.0030	0.0065	0.0065	0.002
Tin (mg/l)	1.0	1.0	1.0	0.5	1.7	1.7	
Titanium (mg/l)	0.10	0.10	0.12	0.10	0.21	0.21	
Vanadium (mg/l)	0.10	0.10	0.10	0.10	0.21	0.21	
Zinc (mg/l)	1.72	0.10	0.10	0.12	1.43	0.0001	5
TDS (mg/l)						826.5	500

I MINTEQA2 results before precipitation
II MINTEQA2 results following expected precipitation and adsorption

TABLE 4.13: CHEMICAL INPUT DATA AND RESULTS OF FINAL PIT MODELING (BASE CASE DETECTION LIMIT EQUAL TO ZERO)

	CHEMICAL INPUT DATA				MODELING RESULTS		
	Tka	Tkx	Tlb	Influent Ground Water	Lake Year 25 Evaporation	Lake Year 25 Sorption	NDEP STDS 9/29/95
CONSTITUENT					I	II	
pH (s.u.)	3.50	5.66	6.13	7.37	7.46	7.60	
Alkalinity ($CaCO_3$) (mg/l)	0.7	3.8	7.6	135.5	24.5	33.6	
Log P_{CO2}					-3.00	-3.00	
Aluminum (mg/l)	9.5	3.1	0.9	0.1	8.6	0.009	0.05
Antimony (mg/l)	0.003	0.001	0.000	0.026	0.022	0.022	0.006
Arsenic (mg/l)	0.008	0.002	0.001	0.514	0.399	0.280	0.05
Barium (mg/l)	0.00	0.00	0.00	0.01	0.01	0.01	2
Beryllium (mg/l)	0.0039	0.0001	0.0000	0.0001	0.0030	0.0001	0.004
Bismuth (mg/l)	0.00	0.00	0.00	0.00	0.00	0.00	
Cadmium (mg/l)	0.0057	0.0000	0.0000	0.0004	0.0045	0.0039	0.005
Calcium (mg/l)	20.8	0.6	1.1	69.2	68.7	68.0	
Chloride (mg/l)	0.6	0.3	0.9	35.5	27.8	27.8	250
Chromium (mg/l)	0.00	0.00	0.00	0.001	0.00	0.00	0.1
Cobalt (mg/l)	0.08	0.00	0.00	0.00	0.06	0.06	
Copper (mg/l)	0.02	0.00	0.00	0.00	0.015	0.001	1.3
Fluoride (mg/l)	0.2	1.5	0.02	0.2	0.97	0.91	2
Gallium (mg/l)	0.00	0.00	0.00	0.00	0.00	0.00	
Iron (mg/l)	1.9	0.6	0.5	0.9	2.4	0.0004	0.3
Lanthanum (mg/l)	0.00	0.00	0.00	0.00	0.00	0.00	
Lead (mg/l)	0.003	0.000	0.000	0.011	0.011	0.0001	0.015
Lithium (mg/l)	0.08	0.00	0.00	0.00	0.06	0.06	

I MINTEQA2 results before precipitation

II MINTEQA2 results following expected precipitation and adsorption

TABLE 4.13: CHEMICAL INPUT DATA AND RESULTS OF FINAL PIT MODELING (BASE CASE DETECTION LIMIT EQUAL TO ZERO) (CONTINUED)

	CHEMICAL INPUT DATA				MODELING RESULTS		
	Tka	Tkx	Tlb	Influent Ground Water	Lake Year 25 Evaporation	Lake Year 25 Sorption	NDEP STDS 9/29/95
CONSTITUENT					I	II	
Magnesium (mg/l)	28.5	0.5	0.3	31.5	45.4	45.5	150
Manganese (mg/l)	1.6	0.03	0.0	0.6	1.7	1.7	0.05
Mercury (mg/l)	0.00000	0.00000	0.00013	0.00007	0.00008	0.00008	0.002
Molybdenum (mg/l)	0.00	0.00	0.00	0.00	0.00	0.00	
Nickel (mg/l)	0.13	0.00	0.00	0.00	0.10	0.089	0.1
Nitrate (mg/l)	0.01	0.00	0.03	0.69	0.54	0.54	10
Phosphorus (mg/l)	0.02	0.11	0.21	0.12	0.19	0.0001	
Potassium (mg/l)	3.1	1.2	0.5	7.4	8.5	8.5	
Scandium (mg/l)	0.00	0.00	0.00	0.00	0.00	0.00	
Selenium (mg/l)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.05
Silicon (mg/l)	4.5	9.0	13.4	18.0	23.4	22.8	
Silver (mg/l)	0.0002	0.000	0.000	0.0004	0.000	0.000	0.1
Sodium (mg/l)	2.0	4.6	3.1	137.7	109.0	109.0	
Strontium (mg/l)	0.11	0.00	0.00	0.05	0.1	0.120	
Sulfate (mg/l)	254.6	1.2	2.2	409.4	505.6	501.4	250
Thallium (mg/l)	0.0042	0.0005	0.0000	0.000004	0.0033	0.0033	0.002
Tin (mg/l)	0.0	0.0	0.0	0.0	0.0	0.0	
Titanium (mg/l)	0.00	0.00	0.03	0.00	0.01	0.006	
Vanadium (mg/l)	0.00	0.00	0.00	0.00	0.00	0.00	
Zinc (mg/l)	1.69	0.00	0.02	0.11	1.34	0.0001	5
TDS (mg/l)						820.5	500

I MINTEQA2 results before precipitation
II MINTEQA2 results following expected precipitation and adsorption

TABLE 4.14: CHEMICAL INPUT DATA AND RESULTS OF FINAL PIT MODELING (DRIER CASE)

CONSTITUENT	CHEMICAL INPUT DATA				MODELING RESULTS		
	Tka	Tkx	Tlb	Influent Ground Water	Lake Year 25 Evaporation	Lake Year 25 Sorption	NDEP STDS 2/29/95
					I	II	
pH (s.u.)	3.50	5.66	6.13	7.37	7.81	7.90	
Alkalinity ($CaCO_3$) (mg/l)	0.0+	3.833	7.600	135.472	59.1	67.95	
Log P_{CO2}					-3.00	-3.00	
Aluminum (mg/l)	9.5	3.1	0.9	0.1	9.3	0.02	0.05
Antimony (mg/l)	0.004	0.002	0.001	0.026	0.032	0.032	0.006
Arsenic (mg/l)	0.010	0.004	0.003	0.515	0.566	0.421	0.05
Barium (mg/l)	0.05	0.05	0.05	0.01	0.08	0.01	2
Beryllium (mg/l)	0.0041	0.0004	0.0004	0.0001	0.0036	0.0001	0.004
Bismuth (mg/l)	0.05	0.05	0.05	0.05*	0.13	0.127	
Cadmium (mg/l)	0.0059	0.0004	0.0004	0.0004	0.005	0.0019	0.005
Calcium (mg/l)	20.8	0.6	1.1	69.2	91.9	75.9	
Chloride (mg/l)	0.7	0.3	0.9	35.5	39.2	39.3	250
Chromium (mg/l)	0.05	0.05	0.05	0.02	0.09	0.094	0.1
Cobalt (mg/l)	0.11	0.05	0.05	0.05*	0.17	0.174	
Copper (mg/l)	0.06	0.05	0.05	0.01	0.09	0.005	1.3
Fluoride (mg/l)	0.3	1.5	0.1	0.3	1.3	1.1	2
Gallium (mg/l)	0.05	0.05	0.05	0.05*	0.13	0.127	
Iron (mg/l)	1.9	0.6	0.5	0.9	2.9	0.0003	0.3
Lanthanum (mg/l)	0.05	0.05	0.05	0.05*	0.13	0.127	
Lead (mg/l)	0.003	0.001	0.001	0.011	0.015	0.0003	0.015
Lithium (mg/l)	0.11	0.05	0.05	0.05*	0.17	0.174	

* Values from old Tkx analyses from the 32-40 week average are input into the ground water chemistry for these analytes.

I MINTEQA2 results before precipitation

II MINTEQA2 results following expected precipitation and adsorption

TABLE 4.14: CHEMICAL INPUT DATA AND RESULTS OF FINAL PIT MODELING (DRIER CASE) (CONTINUED)

	CHEMICAL INPUT DATA				MODELING RESULTS		
	Tka	Tkx	Tlb	Influent Ground Water	Lake Year 25 Evaporation	Lake Year 25 Sorption	NDEP STDS 9/29/95
CONSTITUENT					I	II	
Magnesium (mg/l)	28.5	0.5	0.3	31.5	57.1	57.1	150
Manganese (mg/l)	1.6	0.1	0.1	0.6	2.0	1.1	0.05
Mercury (mg/l)	0.00025	0.00025	0.00034	0.00029	0.00069	0.00069	0.002
Molybdenum (mg/l)	0.18	0.18	0.18	0.25	0.53	0.531	
Nickel (mg/l)	0.14	0.02	0.02	0.02	0.15	0.14	0.1
Nitrate (mg/l)	0.06	0.05	0.08	0.72	0.86	0.86	10
Phosphorus (mg/l)	0.02	0.11	0.21	0.35*	0.49	0.00004	
Potassium (mg/l)	3.1	1.2	0.5	7.4	11.1	11.1	
Scandium (mg/l)	0.05	0.05	0.05	0.05*	0.13	0.127	
Selenium (mg/l)	0.0005	0.0005	0.0005	0.0006	0.0014	0.001	0.05
Silicon (mg/l)	4.6	9.3	13.4	18.0*	30.1	29.4	
Silver (mg/l)	0.001	0.001	0.001	0.001	0.003	0.003	0.1
Sodium (mg/l)	2.0	4.6	3.1	137.7	53.09	153.1	
Strontium (mg/l)	0.14	0.05	0.05	0.05	0.2	0.198	
Sulfate (mg/l)	254.6	1.2	2.2	409.4	649.5	649.3	250
Thallium (mg/l)	0.0044	0.0007	0.0003	0.0003	0.004	0.004	0.002
Tin (mg/l)	0.4	0.4	0.4	0.1	0.69	0.689	
Titanium (mg/l)	0.05	0.05	0.08	0.05	0.13	0.133	
Vanadium (mg/l)	0.05	0.05	0.05	0.05	0.13	0.127	
Zinc (mg/l)	1.71	0.05	0.06	0.12	1.53	0.00003	5
TDS (mg/l)						1089.1	500

* Values from old Tkx analyses from the 32-40 week average are input into the ground water chemistry for these analytes.
I MINTEQA2 results before precipitation
II MINTEQA2 results following expected precipitation and adsorption

TABLE 4.15: CHEMICAL INPUT DATA AND RESULTS OF FINAL PIT MODELING (WETTER CASE)

	CHEMICAL INPUT DATA				MODELING RESULTS		
	Tka	Tkx	Tlb	Influent Ground Water	Lake Year 25 Evaporation	Lake Year 25 Sorption	NDEP STDS 9/29/95
CONSTITUENT					I	II	
pH (s.u.)	3.50	5.66	6.13	7.37	6.98	7.10	
Alkalinity ($CaCO_3$) (mg/l)	0.0+	3.833	7.600	135.472	8.10	10.6	
Log P_{CO2}					-3.00	-3	
Aluminum (mg/l)	9.5	3.1	0.9	0.1	7.5	0.004	0.05
Antimony (mg/l)	0.004	0.002	0.001	0.026	0.017	0.017	0.006
Arsenic (mg/l)	0.010	0.004	0.003	0.515	0.286	0.174	0.05
Barium (mg/l)	0.05	0.05	0.05	0.01	0.06	0.01	2
Beryllium (mg/l)	0.0041	0.0004	0.0004	0.0001	0.0029	0.0009	0.004
Bismuth (mg/l)	0.05	0.05	0.05	0.05*	0.09	0.086	
Cadmium (mg/l)	0.0059	0.0004	0.0004	0.0004	0.0043	0.0042	0.005
Calcium (mg/l)	20.8	0.6	1.1	69.2	51.3	50.6	
Chloride (mg/l)	0.7	0.3	0.9	35.5	19.9	19.9	250
Chromium (mg/l)	0.05	0.05	0.05	0.02	0.07	0.07	0.1
Cobalt (mg/l)	0.11	0.05	0.05	0.05*	0.12	0.12	
Copper (mg/l)	0.06	0.05	0.05	0.01	0.07	0.004	1.3
Fluoride (mg/l)	0.3	1.5	0.1	0.3	0.9	0.08	2
Gallium (mg/l)	0.05	0.05	0.05	0.05*	0.09	0.09	
Iron (mg/l)	1.9	0.6	0.5	0.9	2.0	0.001	0.3
Lanthanum (mg/l)	0.05	0.05	0.05	0.05*	0.09	0.09	
Lead (mg/l)	0.003	0.001	0.001	0.011	0.008	0.0001	0.015
Lithium (mg/l)	0.11	0.05	0.05	0.05*	0.12	0.12	

* Values from old Tkx analyses from the 32-40 week average are input into the ground water chemistry for these analytes.

\+ The actual average alkalinity from the 32-48 humidity cell data is 0.711 mg/l $CaCO_3$, however, at a pH of 3.5 the expected alkalinity is 0.0.

I MINTEQA2 results before precipitation

II MINTEQA2 results following expected precipitation and adsorption

TABLE 4.15: CHEMICAL INPUT DATA AND RESULTS OF FINAL PIT MODELING (WETTER CASE) (CONTINUED)

	CHEMICAL INPUT DATA				MODELING RESULTS		
	Tka	Tkx	Tlb	Influent Ground Water	Lake Year 25 Evaporation	Lake Year 25 Sorption	NDEP STDS 9/29/95
CONSTITUENT					I	II	
Magnesium (mg/l)	28.5	0.5	0.3	31.5	35.8	35.7	150
Manganese (mg/l)	1.6	0.1	0.1	0.6	1.4	1.4	0.05
Mercury (mg/l)	0.00025	0.00025	0.00034	0.00029	0.00047	0.00047	0.002
Molybdenum (mg/l)	0.18	0.18	0.18	0.25	0.35	0.35	
Nickel (mg/l)	0.14	0.02	0.02	0.02	0.11	0.11	0.1
Nitrate (mg/l)	0.06	0.05	0.08	0.72	0.46	0.46	10
Phosphorus (mg/l)	0.02	0.11	0.21	0.35*	0.28	0.001	
Potassium (mg/l)	3.1	1.2	0.5	7.4	6.5	6.5	
Scandium (mg/l)	0.05	0.05	0.05	0.05*	0.09	0.09	
Selenium (mg/l)	0.0005	0.0005	0.0005	0.0006	0.0009	0.0009	0.05
Silicon (mg/l)	4.6	9.3	13.4	18.0*	18.3	17.8	
Silver (mg/l)	0.001	0.001	0.001	0.001	0.002	0.002	0.1
Sodium (mg/l)	2.0	4.6	3.1	137.7	77.8	77.9	
Strontium (mg/l)	0.14	0.05	0.05	0.05	0.14	0.14	
Sulfate (mg/l)	254.6	1.2	2.2	409.4	390.2	390.0	250
Thallium (mg/l)	0.0044	0.0007	0.0003	0.0003	0.003	0.003	0.002
Tin (mg/l)	0.4	0.4	0.4	0.1	0.5	0.5	
Titanium (mg/l)	0.05	0.05	0.08	0.05	0.09	0.09	
Vanadium (mg/l)	0.05	0.05	0.05	0.05	0.09	0.09	
Zinc (mg/l)	1.71	0.05	0.06	0.12	1.20	0.001	5
TDS (mg/l)						614.0	500

* Values from old Tkx analyses from the 32-40 week average are input into the ground water chemistry for these analytes.

+ The actual average alkalinity from the 32-48 humidity cell data is 0.711 mg/l $CaCO_3$, however, at a pH of 3.5 the expected alkalinity is 0.0.

I MINTEQA2 results before precipitation

II MINTEQA2 results following expected precipitation and adsorption

TABLE 4.16: CHEMICAL INPUT DATA AND RESULTS OF FINAL PIT MODELING (HIGH GROUND WATER FLOW)

	CHEMICAL INPUT DATA				MODELING RESULTS		
	Tka	Tkx	Tlb	Influent Ground Water	Lake Year 25 Evaporation	Lake Year 25 Sorption	NDEP STDS 9/29/95
CONSTITUENT					I	II	
pH (s.u.)	3.50	5.66	6.13	7.37	8.01	8.04	
Alkalinity ($CaCO_3$) (mg/l)	0.0+	3.833	7.600	135.472	87.8	93.6	
Log P_{CO2}		3.1			-3.00	-3.00	
Aluminum (mg/l)	9.5	0.002	0.9	0.1	4.8	0.022	0.05
Antimony (mg/l)	0.004	0.004	0.001	0.026	0.029	0.029	0.006
Arsenic (mg/l)	0.010.010	0.05	0.003	0.515	0.535	0.445	0.05
Barium (mg/l)	0.05	0.0004	0.05	0.01	0.05	0.01	2
Beryllium (mg/l)	0.0041	0.05	0.0004	0.0001	0.0019	0.00002	0.004
Bismuth (mg/l)	0.05	0.0004	0.05	0.05*	0.09	0.089	
Cadmium (mg/l)	0.0059	0.6	0.0004	0.0004	0.0029	0.0028	0.005
Calcium (mg/l)	20.8	0.3	1.1	69.2	80.0	36.7	
Chloride (mg/l)	0.7	0.05	0.9	35.5	37.0	36.9	250
Chromium (mg/l)	0.05	0.05	0.05	0.02	0.06	0.06	0.1
Cobalt (mg/l)	0.11	0.05	0.05	0.05*	0.11	0.11	
Copper (mg/l)	0.06	1.5	0.05	0.01	0.05	0.004	1.3
Fluoride (mg/l)	0.3	0.05	0.1	0.3	0.8	0.66	2
Gallium (mg/l)	0.05	0.6	0.05	0.05*	0.09	0.09	
Iron (mg/l)	1.9	0.05	0.5	0.9	1.9	0.0003	0.3
Lanthanum (mg/l)	0.05	0.001	0.05	0.05*	0.09	0.09	
Lead (mg/l)	0.003	0.05	0.001	0.011	0.013	0.0003	0.015
Lithium (mg/l)	0.11	0.5	0.05	0.05*	0.11	0.11	

* Values from old Tkx analyses from the 32-40 week average are input into the ground water chemistry for these analytes.

+ The actual average alkalinity from the 32-48 humidity cell data is 0.711 mg/l $CaCO_3$, however, at a pH of 3.5 the expected alkalinity is 0.0.

I MINTEQA2 results before precipitation

II MINTEQA2 results following expected precipitation and adsorption

TABLE 4.16: CHEMICAL INPUT DATA AND RESULTS OF FINAL PIT MODELING (HIGH GROUND WATER FLOW) (CONTINUED)

	CHEMICAL INPUT DATA				MODELING RESULTS		
	Tka	Tkx	Tlb	Influent Ground Water	Lake Year 25 Evaporation	Lake Year 25 Sorption	NDEP STDS 9/29/95
CONSTITUENT					I	II	
Magnesium (mg/l)	28.5	0.1	0.3	31.5	44.2	44.2	150
Manganese (mg/l)	1.6	0.00025	0.1	0.6	1.3	0.6	0.05
Mercury (mg/l)	0.00025	0.18	0.00034	0.00029	0.00049	0.00049	0.002
Molybdenum (mg/l)	0.18	0.02	0.18	0.25	0.39	0.39	
Nickel (mg/l)	0.14	0.05	0.02	0.02	0.08	0.08	0.1
Nitrate (mg/l)	0.06	0.11	0.08	0.72	0.79	0.79	10
Phosphorus (mg/l)	0.02	1.2	0.21	0.35*	0.42	0.0001	
Potassium (mg/l)	3.1	0.05	0.5	7.4	9.2	9.2	
Scandium (mg/l)	0.05	0.0005	0.05	0.05*	0.09	0.09	
Selenium (mg/l)	0.0005	9.3	0.0005	0.0006	0.0010	0.0010	0.05
Silicon (mg/l)	4.6	0.001	13.4	18.0*	24.0	23.6	
Silver (mg/l)	0.001	4.6	0.001	0.001	0.002	0.002	0.1
Sodium (mg/l)	2.0	0.05	3.1	137.7	144.1	144.15	
Strontium (mg/l)	0.14	1.2	0.05	0.05	0.13	0.13	
Sulfate (mg/l)	254.6	0.0007	2.2	409.4	526.7	526.4	250
Thallium (mg/l)	0.0044	0.4	0.0003	0.0003	0.002	0.002	0.002
Tin (mg/l)	0.4	0.05	0.4	0.1	0.4	0.40	
Titanium (mg/l)	0.05	0.05	0.08	0.05	0.09	0.09	
Vanadium (mg/l)	0.05	0.05	0.05	0.05	0.09	0.09	
Zinc (mg/l)	1.71		0.06	0.12	0.84	0.00003	5
TDS (mg/l)						919.1	500

* Values from old Tkx analyses from the 32-40 week average are input into the ground water chemistry for these analytes.

\+ The actual average alkalinity from the 32-48 humidity cell data is 0.711 mg/l $CaCO_3$, however, at a pH of 3.5 the expected alkalinity is 0.0.

I MINTEQA2 results before precipitation

II MINTEQA2 results following expected precipitation and adsorption

TABLE 4.17: SUMMARY OF ELEMENTS EXCEEDING NDEP MCL AND SMCL STANDARDS (STANDARDS AS OF 9/29/95) WITH VARYING SENSITIVITY PARAMETERS

CASES	BASE YEAR 25			BASE YEAR 100	WET CASE YEAR 25	DRY CASE YEAR 25	HIGH GROUND WATER YEAR 25
ASSIGNED DETECTION LIMITS	Max. Detection Limit	1/2 Detection Limit	Zero	1/2 Detection Limit	1/2 Detection Limit	1/2 Detection Limit	1/2 Detection Limit
ELEMENTS	Antimony	Antimony	Antimony	Antimony	Antimony	Antimony	Antimony
	Arsenic	Arsenic	Arsenic	Arsenic	Arsenic	Arsenic	Arsenic
	Cadmium	Manganese	Manganese	Chromium	Manganese	Fluoride	Manganese
	Chromium	Nickel	Sulfate	Fluoride	Nickel	Manganese	Sulfate
	Manganese	Sulfate	Thallium	Manganese	Sulfate	Nickel	Thallium
	Nickel	Thallium	TDS	Nickel	Thallium	Sulfate	TDS
	Sulfate	TDS		Sulfate	TDS	Thallium	
	Thallium			Thallium		TDS	
	TDS			TDS			

CHAPTER 5

COMMENTS AND RESPONSES

This chapter includes copies of all public comments received in response to the Talapoosa Project DEIS. The BLM's responses to substantive comments are provided adjacent to the reproduced comment letters. A total of 18 letters were received in response to the DEIS.

Letter No. 1

AIRTOUCH™ Cellular

February 15, 1996

AirTouch Cellular
5000 Smithridge Drive, Suite A-1
Reno, NV 89502
Telephone: 702 829 1800

Mr. Ron Moore
EIS Project Manager
Bureau of Land Management
Carson City District Office
1535 Hot Springs Road
Carson City NV 89706

Your Reference: N36-94-002P
1793/3809
(NV-932.8)
(NV-030/034)

Ron,

It was good meeting you again the evening of January 22nd at the public open house for the Talapoosa Mine Project. Thank you for introducing me to Edward L. Devenyns, Mineral Land Consultant, representing Talapoosa Mining Inc.,(TMI). My conversation with him and subsequent conversations have been quite positive.

I appreciated being able to express verbally the concerns of AirTouch Cellular regarding access to the Eagle Ridge Communication Site. Your consideration of my following written comments and requests is appreciated.

AirTouch Cellular, successor to PacTel Cellular, holds a Right-of-Way Grant, Serial Number N-55067, for communication facilities within Section 28, T. 19N., R. 24E., MDB&M.

My understanding is that AirTouch Cellular along with numerous other telecommunication users do not hold a Right-of-Way grant for access to their facilities. Although there has been "physical" access to the communication site, for many years, this does not necessarily imply "legal" access.

[1] Page 3-21 of the Draft Environmental Impact Statement for the Talapoosa Mine project states: "The Lyon County Board of Commissioners approved a Special Use Permit for TMI ... subject to ... Road Easement for maintenance of the Eagle Ridge translator". I would like to see written indication in the EIS, or wherever appropriate, that AirTouch Cellular would have "physical" as well as "legal" access across private property where necessary.

[2] Page 3-22 of the EIS mentions certain right-of-way users that exist in the Talapoosa Mine Project area; AirTouch Cellular being one of many. Page 4-11 states: "The Proposed Action would allow continued public access to public lands in the vicinity, including the telecommunications facility north of the Talapoosa site." Based on my conversations with Ed Devenyns and maps within the EIS, the "public access" would be from Highway 95 Alternate as opposed to the "public access" from US 50. I would

Response No. 1

During construction and mine operation, TMI would provide access for those companies/groups that have facilities located at the Eagle Ridge Translator site through the mine property. Once the mine is closed, the BLM right-of-way would include L.A. Water and Power and AirTouch Cellular as users for continued access to the translator site. TMI would relinquish its rights to the right-of-way upon mine closure. Other companies using the road to access the Eagle Ridge Translator site would need to work directly with the private land owners to use that section of road that crosses private land. The BLM does not have the authority to guarantee access through private lands. The mining claims predate the existing BLM right-of-way issued to L.A. Water and Power.

Response No. 2

Public access to the area north of the mine during mine operation would be provided by a four-wheel-drive road north of the project during the life of the mine. After mine closure, the public may use either the new access road through the mine as discussed in Response No. 1 or continue the use of the four-wheel-drive road. AirTouch Cellular and other companies requiring access to the Eagle Ridge translator site can be added, upon request, to the BLM right-of-way for the section of the road that crosses through public lands.

[2] cont. request a statement be made to the effect that AirTouch Cellular would be granted a Right-of-Way for access pursuant to Title V of the Federal Land Policy and Management Act of October 21, 1976 (90 Stat. 2776; 43 U.S.C. 1761). This would insure legal access to the AirTouch Cellular facility.

The aforementioned has been discussed with Ed Devenyns and I am confident that TMI and he will assist in our endeavor to secure legal rights of access to Eagle Ridge.

Thank you for the opportunity to express my views and requests on behalf of AirTouch Cellular. Please include me on any mailing list pertaining to the Talapoosa Mine Project. My address is: 120 Riverhaven Place, Reno, NV 89509. I can be reached at 702-747-7334 if you would like.

Sincerely,

Rand L. Lewman
Property Acquisition Consultant

cc: AirTouch Cellular
Ronald C. Waddell
Real Estate & Const. Mgr.
Rand Cantrell
Real Estate Project Mgr.
Lisa A. Howell
Property Coordinator

Talapoosa Mining, Inc.
Edward L. Devenyns
Mineral Land Consultant

Power Engineers, Inc
D. Lynn Askew
Project Manager
Frank Rowland
Project Manager

Advanced Communications, Inc.
Jim Boyer

Letter No. 2

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
75 Hawthorne Street
San Francisco, CA 94105-3901

BUR OF LAND ... DIS...
APR 22 3 02 PM '96

April 16, 1996

Ron Moore
Carson City District Office
Bureau of Land Management
1535 Hot Springs Road, Suite 300
Carson City, NV 89706-0638

Dear Mr. Moore:

The U.S. Environmental Protection Agency (EPA) has reviewed the Draft Environmental Impact Statement (DEIS) for the **Talapoosa Mine Project, Lyon County, Nevada.** Our comments are provided pursuant to the National Environmental Policy Act (NEPA), the Council on Environmental Quality's NEPA Implementation Regulations, and Clean Air Act Section 309. We appreciate your granting us a two-week extension on the comment period. As you know, a mishap in mailing resulted in our receiving the DEIS almost a month after it was mailed.

The DEIS analyzes the impacts of alternatives to construct and operate an open-pit gold and silver mine, a heap leach pad, waste rock piles, ore stockpiles, processing and ancillary facilities. The proposed project would disturb approximately 596 acres over a period of seven to ten years.

EPA has rated this project as Environmental Objections-Insufficient Information -- EO-2 (see enclosed "Rating Summary and Follow-Up Action"). Our objections to the proposed project are based on its potential to adversely affect the quality of groundwater and the post-mining pit lake due to the high acid-generation potential of the waste rock and pit walls at this site. We believe that the project's potential impacts to water quality and quantity are seriously underestimated in the DEIS and that additional information is needed in the Final Environmental Impact Statement (FEIS). The FEIS should provide additional information regarding groundwater and HELP modeling, pit water quality, ecological risk assessment, geochemical characterization and waste rock disposal, seepage rates from the waste rock dumps, facilities design and reclamation, and mitigation measures. Our specific comments are enclosed.

We appreciate the opportunity to review this DEIS. Please send a copy of the FEIS to this office when it is officially filed with our Washington, D.C., office. If you have any questions, please call David Farrel at (415) 744-1584 or Jeanne Geselbracht at (415) 744-1576.

Sincerely,

Deanna M. Wieman, Director
Office of External Affairs

002426/96-072

Enclosures

cc: Doug Zimmerman, NDEP
John Miesner, Fish and Wildlife Service, Reno
Rory Lamp, NDOW

SUMMARY OF RATING DEFINITIONS AND FOLLOW-UP ACTION

Environmental Impact of the Action

LO-Lack of Objections

The EPA review has not identified any potential environmental impacts requiring substantive changes to the proposal. The review may have disclosed opportunities for application of mitigation measures that could be accomplished with no more than minor changes to the proposal.

EC-Environmental Concerns

The EPA review has identified environmental impacts that should be avoided in order to fully protect the environment. Corrective measures may require changes to the preferred alternative or application of mitigation measures that can reduce the environmental impact. EPA would like to work with the lead agency to reduce these impacts.

EO-Environmental Objections

The EPA review has identified significant environmental impacts that must be avoided in order to provide adequate protection for the environment. Corrective measures may require substantial changes to the preferred alternative or consideration of some other project alternative (including the no action alternative or a new alternative). EPA intends to work with the lead agency to reduce these impacts.

EU-Environmentally Unsatisfactory

The EPA review has identified adverse environmental impacts that are of sufficient magnitude that they are unsatisfactory from the standpoint of environmental quality, public health or welfare. EPA intends to work with the lead agency to reduce these impacts. If the potential unsatisfactory impacts are not corrected at the final EIS stage, this proposal will be recommend for referral to the Council on Environmental Quality (CEQ).

Adequacy of the Impact Statement

Category 1-Adequate

EPA believes the draft EIS adequately sets forth the environmental impact(s) of the preferred alternative and those of the alternatives reasonably available to the project or action. No further analysis or data collection is necessary, but the reviewer may suggest the addition of clarifying language or information.

Category 2-Insufficient Information

The draft EIS does not contain sufficient information for EPA to fully assess environmental impacts that should be avoided in order to fully protect the environment, or the EPA reviewer has identified new reasonably available alternatives that are within the spectrum of alternatives analyzed in the draft EIS, which could reduce the environmental impacts of the action. The identified additional information, data, analyses, or discussion should be included in the final EIS.

Category 3-Inadequate

EPA does not believe that the draft EIS adequately assesses potentially significant environmental impacts of the action, or the EPA reviewer has identified new, reasonably available alternatives that are outside of the spectrum of alternatives analyzed in the draft EIS, which should be analyzed in order to reduce the potentially significant environmental impacts. EPA believes that the identified additional information, data, analyses, or discussions are of such a magnitude that they should have full public review at a draft stage. EPA does not believe that the draft EIS is adequate for the purposes of the NEPA and/or Section 309 review, and thus should be formally revised and made available for public comment in a supplemental or revised draft EIS. On the basis of the potential significant impacts involved, this proposal could be a candidate for referral to the CEQ.

*From: EPA Manual 1640, "Policy and Procedures for the Review of Federal Actions Impacting the Environment."

Water Quality

EPA is concerned about the potential for acid generation at the proposed mine site. According to the DEIS, the majority of waste rock and pit walls would be acid generating. However, the rock is composed of andesite flows and tuffaceous sediments, neither of which are significantly neutralizing in nature.

[3] According to the hydrologic report ("Talapoosa Project, Evaluation of the Baseline Hydrology and Prediction of Hydrologic Conditions During Operation and Closure," Water Management Consultants, 1995), the prediction of pit lake chemistry is based on the block model that was developed for the waste rock at the Talapoosa site. However, the Lousetown Basalt (Tlb), which was represented as 27 percent of the waste rock in the block model, may not even be present in the pit will at closure (p. 117, Hydrologic Report, vol. 1). In addition, according to the Hydrologic Report, the model shows that the projected buffering capacities of the Lousetown Basalt and Upper Kate Peak formation control the overall pH of the pit lake water. Therefore, if these two formations have little or no presence in the pit walls, this block model appears inappropriate to predict pit geochemistry.

[3A] In light of the Lower Kate Peak formation's high acid-generating potential and the questionable buffering capacity of the pit wall rock, it appears that the pit lake could have a much lower pH than predicted. This would also affect the projected concentrations of contaminants in the pit lake. The modeling for pit geochemistry should be conducted using more realistic assumptions, and the FEIS should present the results and conclusions of this modeling. If the pit lake chemistry predictions are revised, the potential ecological impacts and options for mitigation measures would also need to be reassessed in the FEIS.

[4] According to the DEIS, concentrations of several parameters in the Main Pit lake would exceed standards for drinking water, and at least one (arsenic) would also exceed standards for aquatic life and stock water as well. However, no ecological risk assessment has been conducted for the proposed project, and mitigation measures are vague in the DEIS. The DEIS (p. 4-45) states that the Lahontan Reservoir, Carson River, and Carson Sink would present a "more available water source" to wildlife; however, this statement is unclear. The FEIS should identify the anticipated beneficial uses of the post-mining pit lake and provide a more thorough assessment of the risks that it would pose to wildlife. This assessment should also be based on more

Response No. 3

The block model that listed percent amounts of rocks exposed in the pit walls (e.g. 27% Lousetown Basalt) was used in first modeling attempts to determine relative amounts of leachates from the different rock types that would contribute to pit lake chemistry. However, recent work has taken a more rigorous approach and involves measuring the areas of rocks of each unit exposed in the pit at the time of mine closure, based on a geologic map of the proposed final pit. This approach indicates that 13.8% of the exposed rock in the pit will be Lousetown Basalt (Tlb) and 31.3% will be Upper Kate Peak Formation (Tkx) (See Section 8.6.3 and Table 8.17, v. 1, WMC, 1996).

The model uses these percentages to predict the chemistry of the leachate from the pit walls. Net neutralization potentials (NNP values) for these formations average 18.2 tons and 12.1 tons of $CaCO_3$ per 1,000 tons of rock, respectively, versus about a minus 17 tons of $CaCO_3$ per 1,000 tons of rock for the Lower Kate Peak, which is exposed in about 55% of the pit wall. The Tlb and Tkx formations will contribute significant amounts of NNP to neutralize acidities produced by the leaching of Tka in the pit walls. The Tlb and Tkx will be present in the pit walls in significant portions as shown above. The model counts both pit wall neutralization and acid generation potential of the rock types based upon the proportion of rock present in the final pit.

Response No. 3A

The geochemical model of the pit lake presented in the DEIS estimated the chemistry of pit wall rock leachate from 16 weeks of humidity cell test (HCT) data. The revised model uses average HCT data from 32-48 weeks of tests. This average test data indicates that Tka, which occupies about 55% of the pit walls, has an average pH of 3.50 and contributes about 9.4 gpm into the pit lake. This is effectively neutralized by 10 gpm of ground water inflow to the pit lake that has a $CaCO_3$ alkalinity of 135 mg/L. The other pit wall leachates of 5.4 gpm from Tkx and 2.4 gpm from Tlb have pH values of 5.66 and 6.13, respectively, and do not contribute significantly to the acidity of the pit lake. Model calculations predict that evaporation will result in respective pit lake pH and carbonate alkalinity values of 7.60 and 33.6 mg/L after 25 years, and 7.89 and 68.25 mg/L after 100 years (Table 8.21, p. 143, v. 1, WMC, 1996). Ground water inflows with significant residual alkalinity will serve as the control for acid generation in the pit lake. The results for the revised pit lake water chemistry modeling are presented in Chapter 4 of the FEIS, Pit Lake Chemistry section, beginning on page 4–47.

Response No. 4

A screening level risk assessment has been prepared for the proposed pit lake and is included in Appendix D of the FEIS. The assessment is based upon the

[4] cont. realistic pit water modeling conclusions, which we have discussed in our previous comment.

[5] It appears from the DEIS and the hydrogeologic report that the Dyke Adit Pit and East Hill Pit were not included in the original mining plans. The hydrogeologic report does not mention them, and the DEIS does not describe their pre- and post-mining geology and geochemistry or their positions with respect to the projected groundwater contours. It is unclear from the DEIS whether groundwater below these pits would move toward the Main Pit. If not, contaminated meteoric water percolating through the bottom of the pits could degrade groundwater. The FEIS should provide this additional information regarding these two pits.

[6] EPA objects to the project if groundwater would be degraded by subsurface flow of pit water out of any of the pits. This also would appear to conflict with BLM's Nevada Cyanide Management Plan and Nevada Division of Environmental Protection's (NDEP) Regulations Governing Design, Construction, Operation and Closure of Mining Operations (445.24342), which prohibit degradation of groundwater by mining facilities. The FEIS should discuss whether the proposed project would conflict with BLM and NDEP policies and/or regulations and how it would be mitigated to ensure against degradation of groundwater.

Waste Rock Dumps

[7] The DEIS (p. 2-7) states that there is sufficient acid-neutralizing waste rock to buffer any acid generation potential. This statement, however, is unfounded in the DEIS and hydrogeologic report. Elsewhere (p. 4-34), the DEIS states that humidity cell test data from the Upper and Lower Bear Creek horizons of the Lower Kate Peak Formation indicate that aluminum, arsenic, iron, manganese, nickel, sulfate, and total dissolved solids could be produced in leachate. In addition, results of the Meteoric Water Mobility Procedure indicate that most of these parameters, plus lead and zinc, could be mobilized from the waste rock and pit walls. EPA has serious concerns that leachate from the waste rock piles could pose significant threats to groundwater and surface water under acid and non-acid conditions. The majority of waste rock is acid generating, and we believe that the neutralizing capacity of the rock would not be sufficient to prevent acid generation from the waste rock piles.

[8] EPA is extremely concerned that disposal of waste rock would be conducted without any special handling procedures (DEIS, p. 2-7). According to the DEIS (p. 4-35), monitoring of the waste rock pile would be conducted to determine if acid generation is occurring; and, if it is, the waste rock management plan would be

Response No. 4 (continued)
latest modeling and results as described in the response to Comment No. 3, above. No irrigation or other human uses of the pit lake water are planned. However, wildlife could use the pit lake as a water source. The risk assessment discusses potential users of the lake, the chemical parameters that are predicted to exceed the drinking water standards and mitigation that could be employed.

Response No. 5
Figures 4.5 and 4.6 of the FEIS show cross-sections of the two satellite pits, which are both above the water table. Figure 2.3 of v. 1, WMC, 1996, shows the main, Dyke Adit and East Hill pits. The Dyke Adit and East Hill pits are approximately 111 feet and 93 feet above the water table, respectively. Chemical analyses of rocks that will occur in the walls of these pits indicate that they have pyritic sulfur contents equal to or less than 0.003% and rock paste pH values that range from 6.87 to 8.72. Further, NNP values based on pyritic sulfur for satellite pit wall rocks range from 0.4 to 64.7. ANP:AGP ratios for pyritic sulfur for the rock types of the satellite pits range from 1.67 to 648. The satellite pits are, therefore, not expected to contribute leachates that will degrade ground water. (See Appendix P, v.4, WMC, 1996).

Response No. 6
Cyanide would be contained within the processing facilities and would not be present in the pits. Thus, there would be no conflict with the BLM's Nevada Cyanide Management Plan.

NAC 445.24342 discusses exemptions and limitations on degradation of water. As discussed in the DEIS, ground water in the pit area has TDS, SO_4, Fe and Mn, which exceed the secondary standards for public water systems, while some wells in the pit area exceed the maximum contaminant levels for As, Cd, Cr, and Pb. As described in the DEIS, the ground water has a high alkalinity and buffering capacity, and modeling indicates that the pit will act as a ground water sink. Because of this, it is not anticipated that the quality of those waters of the state that already exceed the criteria established by NAC 445.24342, subsection (2), would be lowered to a level that the NDEP would find the mine operations would render those waters unsuitable for the existing or potential municipal, industrial, domestic or agricultural use, as required by 445.24342 subsection 1.c

Response No. 7
An evaluation of the most recent acid-base accounting (ABA) data that includes ABA data for rocks from the small pits indicates that the acid-neutralization potential (ANP) of rocks in the waste rock pile is about 10% less than the acid-generating potential (AGP) of those rocks (see revised Table F.1 of the FEIS).

Response No. 7 (continued)

However, ground waters sampled from sulfide-rich rocks in the ore zone (Tka) have pH values above 7 and carbonate alkalinities greater than 100 mg/L. Separately, the 80-week HCT results that used sulfide-rich rock from Tka showed that after 80 weeks of leaching, Al, As, Mn, Ni, and Pb concentrations were at or below detection limits, and Zn was at background levels. High Fe concentrations in the tests after 80 weeks can be expected to precipitate as ferrrihydrite as pH values increase above three because of neutralization by rocks with a positive NNP in the waste rock pile. Such neutralization should further reduce concentrations of most metals in leachates that might be produced by oxidation of pyrite in the waste rock pile.

We do not consider results of the meteoric water tests (MWMP) meaningful or applicable for predicting the long-term chemistry of waters associated with the waste rock pile or the proposed pit lake. The MWMP leaches out readily soluble salts but does not provide information on long-term behavior of the geological materials at the mine site. HCT data are a much better indicator of the long-term behavior of the rocks at the mine site.

Other commenters on the DEIS share our view of the usefulness of the MWMP test data (see Response to Comment No. 51).

The MWMP testing is required by the State of Nevada, and the results were presented in the DEIS to document the required testing and to act as a gross screening level indicator of the chemical constituents that could be leached from the waste rocks. None of the MWMP results or data were used in the geochemical modeling of the pit lake. Forty-eight weeks of HCT testing has been completed for rocks that would be produced from the pit. This information indicates that sodium, potassium and arsenic show initial high concentrations that decline toward minimum values (background or non-detect) by week 48. Strontium, manganese, zinc, cadmium, copper, cobalt, lithium and nickel show analyses whose overall behavior through time is at or below the detection limit. The exceptions to this are Samples PE-3 (from Tka), which exhibits a maximum value sometime during the 48 week test and declining by week 48, and sample TC-13 (from Tka), which shows an increase in concentration after week 32, probably due to decreasing pH. Magnesium, calcium, iron and aluminum behave similarly to strontium in that five of the six samples have low dissolved concentrations. Sample PE-3 is the exception to this. Magnesium and calcium show increasing concentrations in Sample TC-13 after week 32, which is probably related to a declining pH. Barium shows spikes in all samples between weeks 7 and 16 but returns to at or below the detection limit after week 20. Mercury shows spikes throughout the testing but is at or below the detection limit at week 40. Lead shows maximum concentrations implemented. However, acid generation would not necessarily occur as soon as the waste rock is disposed, and monitoring could, therefore, be misleading. Given the strong potential for acid generation at this site, an appropriate waste rock management plan is essential and should be implemented **as soon as** disposal begins. Neutralizing material should be admixed with acid-generating waste rock in an appropriate ratio during disposal. If sufficient neutralizing potential does not exist in the waste rock, lime or some other neutralizing material should be imported and admixed with the acid-generating rock. The DEIS states that dumping waste rock (which is primarily acid-generating) into the dumps without any special handling "would essentially blend the waste rock to attain the neutralization potential indicated by the mass balance analysis." This conclusion is completely unfounded. Indeed, the lack of waste management at old mine sites throughout North America, which are now generating acid drainage, attests to this.

Significantly more detail is needed in the Waste Rock Characterization and Management (WRCM) Plan and should be included in the FEIS. We have the following recommendations regarding the WRCM Plan:

[8] cont.

- The DEIS (p. 4-35) indicates that random samples of dumped rock would be collected and analyzed quarterly to determine acid-generating and acid-neutralizing potentials. The waste rock should be sampled at adequate densities and frequencies for each geologic unit and be characterized chemically and/or visually prior to placement in the dumps. In order to verify visual characterization methods, rock that is classified visually should be tested to confirm its geochemical properties.

- The plan should identify the tests that would be used to characterize the rock and the threshold values that would be used to determine whether rock would be acid-generating and require special handling.

- The DEIS (p. 4-35) states that if acid-generating rock constitutes a significant portion of the dump material, the dump would be situated and designed to reduce infiltration to the extent possible. The DEIS indicates that the majority of the waste rock would be acid-generating, which is indeed significant. The dumps should be designed to reduce infiltration **prior to** commencement of waste rock disposal there so that it is constructed properly from the beginning.

[9]

- The DEIS (p. 4-35) generally describes isolation of acid-generating rock within the dumps as well as construction of the dump base and cover. The WRCM Plan and FEIS should include

Response No. 7 (continued)

early in the testing but declines to at or below detection limits by week 40 with the exception of sample TC-14, which shows concentration increasing from the detection limit in week 48.

Antimony, beryllium, bismuth, chromium, copper, gallium, lanathium, molybdenum, scandium, selenium, tin, thallium, titanium, and vanadium are at or below detection limits throughout the testing. Silver peaks in weeks 4 through 40, but an increase in the detection limit in week 48 masks variation after week 40. The trend for silver appears to have been declining prior to the change in the detection limit.

See Section 8.5.4, page 122, v. 1 and Appendix R of the WMC, 1996, report for the data and additional interpretative comments.

Response No. 8

The Lower Kate Peak formation (Tka), which comprises approximately 54% of the waste rock, has acid-generating potential. The remaining 46% of the waste rock has net neutralizing potential. The net amount of acid-generating material was calculated using the average NNP for all the rock types based on the proportions in which they exist in the block model. Table F.1 of the FEIS shows the results of these calculations.

Approximately 79,000 tons of net acidity as $CaCO_3$ (Table F.1) would result from the 90,000,000 tons of waste rock produced from the mine. Significant mixing of the rock types will take place during mining and placement in the waste rock disposal areas, although the disposal areas will not be homogeneously mixed. The disposal areas would be placed on top of soils and rock types that have significant acid-buffering capabilities. The disposal areas would also be located so that runoff is diverted from them. The extremely dry climate of the proposed project site provides a very limited amount of available water to infiltrate into the waste disposal areas. The majority of the waste rock would also come from areas of the pit that are high in clay alteration. Because each lift of the waste disposal areas would receive extensive truck traffic from the haul trucks during disposal area construction, compaction would result that limits permeability and thus limits infiltration. The disposal area surface would be expected to have a permeability in the range of 10^{-5} cm/sec to 10^{-6} cm/sec.

Response No. 9

The Waste Rock Management Plan has been revised to provide additional information and is included in FEIS Appendix B. Mitigating measures are proposed in order to handle the potential for acid generation. The EIS is meant to predict impacts and propose potential mitigation that may be used to alleviate

[9] cont. considerably more detail on construction of the dumps, including thickness and permeability of the base and cover, and the criteria that would be used to determine adequate material for these portions of the dumps.

[10] - The proposed reclamation of the waste rock dumps does not appear to be adequate to preclude meteoric water in order to reduce the potential for acid drainage from the dumps. Rainfall and snow melt will occur in pulses in which evapotranspiration will not be very effective. For example, "most of the infiltration occurs in February and March when the ground is saturated following snow melt, and mean daily temperatures are below 45° F, reducing evapotranspiration" (DEIS, p. E-17). Furthermore, the statement that fines that tend to remain near the top of the dumps would facilitate sealing of each lift surface is misleading. As proposed, the dumps would not be "sealed" to preclude meteoric water. We recommend that the WRCM Plan include specifications for a cap of adequate thickness (at least 18 to 24 inches) with a permeability of no greater 1 x 10^{-6} cm/sec. An adequate thickness of growth medium would then be placed on top of the cap to promote vegetation.

[11] EPA has reviewed the report, "Talapoosa Project, Use of the HELP Model to Predict Seepage from the Reclaimed Waste Rock Dumps," Water Management Consultants (1995). In general, the most significant error in the HELP model evaluation appears to be the selection of "clay" (soil type #11 in the HELP model) to describe the argillized waste rock. The inappropriate selection of soil type affects several parameters used in the model, including porosity, field capacity, and hydraulic conductivity. The HELP model soil characteristics are based in part on particle size. Therefore, "argillized waste rock" which consists of gravel- to boulder- size rock, regardless of the clay (mineral) content, cannot be considered a clay for purposes of the HELP model. The distinction is clay as hydrous alumino-silicate mineral, or clay as a particle size (<0.0039mm). More specifically:

[11A] - The hydrologic report indicates that the degree of argillization increases with depth, but there is no indication of what percentage of the rock is clay. Using a term such as "high clay content" is inappropriate without a quantification of the actual clay content. The information on clay content could be derived from boring logs and soil cores.

[11B] - According to Table 4.6 in the HELP model report, the K-value for the waste rock is 0.011 cm/sec, but the K-value for the "argillized waste rock" is 0.000064 cm/sec; a difference of approximately three orders of magnitude.

Response No. 9 (continued)

impacts. The Record of Decision will stipulate the mitigating measures required based upon the analysis of the EIS. Appendix B of the FEIS shows a revised Waste Rock Management Plan. Details on disposal area construction lift thickness and permeabilities are provided. See response to Comment No. 8.

Response No. 10

Infiltration into the waste rock disposal areas was simulated using the HELP model. The HELP model does a daily water balance, meaning that infiltration, runoff and evapotranspiration are calculated on a daily basis. Thus, the HELP model does simulate the "pulses" of precipitation. The model actually predicts less runoff from a 24-hour storm than would occur from a 1-hour storm. Therefore, for the shorter duration storms, there is actually less infiltration than as predicted by the model, which is a conservative estimate (i.e. the model over-predicts the volume of infiltration).

The amounts of precipitation and evaporation expected for the months of highest precipitation are as follows:

MONTH	PRECIPITATION	PAN EVAPORATION	CALCULATED LAKE EVAPORATION
January	1.03	1.48	.93
February	1.00	2.51	1.58
March	.88	5.07	3.19
November	.81	2.6	1.64
December	1.04	1.24	0.78
Total	**4.76**	**12.90**	**8.12**

Pan evaporation rates exceed precipitation for each of the maximum precipitation months. When the projected lake evaporation rate is used in the comparison, January and December precipitation values slightly exceed the evaporation rate. Little precipitation is available for infiltration into the waste disposal areas. Percolation into the waste rock disposal areas by any precipitation would be limited by the amount of water available.

It was not intended to insinuate that the top of the waste disposal areas would be tightly sealed by fines. However, compaction by heavy haul truck traffic is

Response No. 10 (continued)
expected to compact the top of the disposal areas to a depth of two to three feet with permeability ranging between 10^{-5} to 10^{-6} cm/sec. Growth medium at the site is limited and will be used to reclaim the heap pad first. Any leftover material will be applied to the tops of the waste disposal areas. The texture of the available soil material is generally a clay to sandy clay loam.

Response No. 11
The WMC HELP model report, page 6, first paragraph, states additional runs of the HELP model were run without the argillized waste rock (clay) in Layer 2 and are included in the sensitivity analysis, although they are not considered representative of actual conditions as described in Section 3, pages 3 and 4. This section describes the alteration away from the silicified "core." Also, on Page 10, Sections 4.3 and 4.31, soil type II was described as compacted layers with density of 12 ft^3/ton or 118 lb/ft^3. The modeling was conducted for a range of porosities from 0.398 (sandy clay loam) to 0.437 (compacted clay). (See Section 4.35, Page 12). Additional information on the interpretation of the HELP modeling results is included in the FEIS, pages 4—43 and 4—44, in the Seepage from Reclaimed Water Disposal Areas section, and Appendicies E and F.

Response No. 11A and 11B
Compaction and kneading of the waste rock from the dump trucks and caterpillars will break down the waste rock. Since the waste rock is montmorillonitic, the resulting soil will have a low hydraulic conductivity, much lower than the undisturbed waste rock.

- The HELP model report (section 4.3.6) indicates that the HELP model predicts a runoff rate of 80-90 percent, with only 10-20 percent infiltration. Again, this is strongly biased by the input soil type. The HELP model should be re-run substituting the input values for the volcanic waste rock rather than the clay description used to identify the argillized waste rock. [11C]

[11D] In addition, the HELP model report indicates that the "argillized waste rock" would be deposited last on the waste rock dumps and, therefore, comprise a low-permeability cover. However, the DEIS does not mention this, and no description of the available amount or specifications for its placement over the top and side slopes of the dumps (to preclude meteoric water) are provided.

We are concerned regarding the 2:1 slope of the Northeast Waste Rock Dump. According to the DEIS (p. 4-5), reclamation of the steep slopes of the disposal areas is expected to be successful, based on the literature regarding slopes with steepness ratios of less than 3h:1v. It is unclear how successful revegetation would be on the proposed Northeast Waste Rock Dump with a slope of 2:1. The FEIS should provide the success criteria that would be used and contingency measures should success of the original plan fail. We suggest that reducing the volume of this dump be considered so that a final slope of 2.5:1 or shallower can be achieved to improve reclamation.

[12] According to the HELP model report, sandy clay loam would only be used on top of the waste rock dumps, and the slopes would have no cover other than the "argillaceous waste rock." On the Southwest dump, only 53 percent of the dump surface would be covered by sandy clay loam, and on the Northeast dump, only 39 percent of the dump surface would be covered by sandy clay loam. If the "argillaceous waste rock" or any other material used to cap the dump had a low permeability (as assumed in the HELP model), it is unclear that revegetation would be very successful on the side slopes, as the DEIS claims. The FEIS should clarify this discrepancy.

[12A] The DEIS (p. 4-3) refers to soil loss on the heap leach facility, which would have slopes of 3h:1v. However, erosion and soil loss for the waste rock piles with slopes of 2.5:1 and 2:1 are not addressed. The FEIS should describe these impacts.

Heap Leach Pad

[13] The FEIS should include additional information regarding the heap leach pad. For example, where will the clay for the sub-base come from and how thick will it be? What are the size and thickness of the gravel that will be placed directly on the

Response No. 11C
With the argillized rock (clay) layer, the HELP model predicts a maximum of 3.4% infiltration (WMC, Table 5.3). Without the argillized rock (clay) layer, the HELP model predicts a maximum of 17.9% infiltration (WMC, Table 5.6). The "correct" infiltration is probably a balance between the two, since the top of the waste disposal area is compacted, but the slopes are not as compacted. Additional information on the interpretation of the HELP modeling results is included in the FEIS, pages 4–43 and 4–44, in the Seepage from Reclaimed Waste Disposal Areas Section and Appendicies E and F

Response No. 11D
A description of the waste rock material and mode of compaction is contained in Section 3.1, Page 3 of the Help Model Report of WMC, 1996. The discussion of the HELP model and interpretation has been modified in the FEIS, page 4–44. See responses to Comment No. 11C.

Response No. 12
The northeast disposal area would be sited on a natural steep slope and constructed in lifts. The terraces created by the lifts would provide more ideal sites for plant growth than the existing slope. Plant growth on the terraces often colonizes the adjoining slopes. The use of a steep slope for the disposal area allows for a broader flat top to the disposal area, which in turn increases the acreage for optimal plant growth given the arid environment. Also the steep slope has a northeast aspect where evaporation would be minimized.

The northeast disposal area would be constructed as described in FEIS, page 2-5.

The southwest disposal area would be constructed and reclaimed, including pushing down benches and then revegetating as described in FEIS pages 2-5, 2-18 and 2-19. This will increase the acres requiring revegetation.

The success of establishing vegetation on steep disposal area slopes is often dependent upon the nature of the resultant surface material. Natural colonizing or seeded species can only germinate on non-top-soiled steep slopes if sufficient fine-grained soil materials exist in pockets and basins to capture and hold moisture for germination and growth.

The surface of disposal areas cannot be accurately predicted due to variations in over- and inter-burden, the vagaries of the dumping operations, and operational changes in disposal area designs based on changes in mine plans. Most likely the surfaces of the completed disposal area slopes at Talapoosa would be

[13] cont. liner? Describe the wick drain. The leach pad will be in a valley and the liner will act as a slide plane. Has a geotechnical stability analysis been conducted, including a seismic analysis? What is the threshold leakage rate that would trigger replacement of a pond liner?

Water Quantity

[14] The estimated pit water volume to be dewatered for the Main Pit, if based only on porosity, appears rather low. It is unclear whether the estimates include fracture flow and how porosity was determined from a pump test (DEIS, p. 3-57). The FEIS should discuss the basis of the assumption that faults will reduce the water flow and, therefore, act as barriers to outside water flow. Some fault or fracture systems create enormous quantities of unexpected water that would not be picked up in a pump test. In addition, the steep topography and potentially high permeability of volcanic rock suggest that there could be flow out of the pit. The FEIS should identify how many pump tests were conducted and where they were conducted, and include a map of locations, pump test results and other parameters associated with test wells. Figure E.3 in the DEIS should include the actual water table in order to make comparisons with the calculated one. The FEIS should also discuss, according to the sensitivity analysis, what permeability for the barrier fault would allow flow out of the pit.

EPA believes that the volume of water that this mine will generate will probably far exceed the conservative estimates provided in the DEIS. The results of the pump test, as discussed in the hydrologic report, indicate potentially extremely variable hydraulic conductivity, which could reflect different recharge conditions in the pit than those predicted. If the pit water volume exceeds the DEIS estimates, several other issues need to be addressed:

[14A] - If permeability is higher than projected, the water table around the pit would have a different shape, the pit lake surface elevation would be higher, and the pit would contain a greater volume of water. Mitigation of impacts to water quality and wildlife could be extremely difficult and costly under such conditions.

[14B] - If, under steady-state conditions, the pit does not remain a groundwater sink, contaminated pit water would degrade groundwater downgradient of the pit.

[14C] - If goundwater pumped during excavation exceeds water needs for mining operations, a National Pollutant Discharge Elimination

Response No. 12 (continued)
a variety of material from clays to large rock. The revegetation test plot program would help adjust the revegetation program to increase success on the disposal area slopes.

The goal is to establish a self-sustaining reclaimed disturbed plant community (RDPC) on the tops and slopes of the disposal areas.

Response No. 12A
The placement of growth medium will be limited to the tops of the disposal areas, and potential soil loss from the tops of disposal areas would be minimal. Estimated soil loss for the northeast and southwest disposal areas are described in the Errata changes for the DEIS in FEIS Chapter 3. Sediment control structures will be installed below the waste rock disposal areas.

Response No. 13
The text on DEIS pages 2-5, 2-6 and 2-9 has been revised in response to the comment. See page 2-5 of the FEIS for the appropriate wording. Also see Appendix B of the FEIS.

Small tears in pond liners would be repaired by patching. Past experience shows that pond liners would not be required to be entirely replaced. No threshold leakage rate has been established that would trigger replacement of a pond liner. Only in the event of a catastrophic failure would pond liners be replaced instead of repaired.

A Stability Analysis was completed for the overburden/interburden disposal areas and heap leach pad as a component of the Revised Plan of Operations, dated March 1996.

Response No. 14
Calculated porosities of 0.005 to 0.009 have been determined from the pump test data. The range was calculated by dividing the amount of water that was removed from the volcanic rocks during the period of pumping (1.42 million cubic feet) by the volume of rock that was drained (10-15 feet of drawdown over an area of 15-20 million square feet, or 150-200 million cubic feet).

The pump test results are presented in WMC's discussion in Section 5.6.2, page 51 of v.1 of the Hydrology report, and the data plot on Figure 5.4 indicates the existence of low to impermeable boundaries at 1,000 and 9,000 minutes into the test. The slow recovery as presented and shown in Figure 5.5, indicate the fractures are not connected and have essentially been dewatered during the pumping test. The non-uniform nature of drawdown in observation

Response No. 14 (continued)
wells in and surrounding the pit area indicate a fracture system with poor hydraulic connection.

Drainable porosity estimates are discussed in Section 5.6.2 on page 53, fifth paragraph, and are based on calculations of the dewatered portion of rock during the pumping test. The value ranged from 0.005 to 0.009 with a value of 0.006 used in the calculations. Other data derived from the pump test, including specific capacity, transmissivity, and hydraulic conductivity, are discussed in Sections 5.6.2 and 5.7.1 for both the long-term pump test and short-term drill item tests.

Flow across the faults is greatly reduced as indicated by data collected during the pump test (Section 5.6.2, Page 51). Other data, including residence time of water as evidenced by C-14 data (Section 5.2.3); ground water climaticity differences across major fault blocks (Section 5.9.3); lack of ground water mixing when comparing water from areas of the ore body to that outside the ore zone (Section 5.9.6); and drilling evidence of clay gauge material associated with the fault show minimal flow occurs across the major faults in the area of the pit. Also see modeling discussions (Section 6.2, page 20).

Response No. 14A
A steady-state, two directional analytical model (TWODAN) was developed to determine inflow rates into the final pit lake. Several scenarios were modeled, ranging from impermeable (3 gpm inflow) to neither resistant or impermeable (23 gpm) to no elevated conductivity in fault window (18 gpm) (WMC Section 6.7.3, page 79). This gave pit lake elevation of 4,804 feet, 4,901 feet and 4,874 feet, respectively, for a range of less than 100 feet of change in lake elevation, with more than a seven-fold increase in inflow rates. This shows more than a doubling of inflow rates to the pit does not significantly affect lake elevation. Additional description of the TWODAN modeling is included in the FEIS, page 4–27.

Response No. 14B
The increased flow into the lake should improve lake water quality, since the ground water quality is of better quality than the water infiltrating the unsaturated zone and discharging through the walls of the pit.

Response No. 14C
All scientific evidence suggests there will not be enough water to meet the needs of the mining operation.

[14C] cont. System permit would be required in order to discharge to surface waters.

The DEIS indicates that maximum drawdown would occur in 20 years. It is unclear why this would be the case for a project that would only last up to ten years. The FEIS should clarify this

Mitigation

The DEIS states that a case-by-case analysis of the economic feasibility and impacts of any mitigation plan would need to be developed prior to implementation. EPA believes that such analyses should be conducted **before** approval of the Plan of Operation (POO) to ensure that such mitigation would be feasible and that funds would be available for any necessary measures. EPA believes that the proposed project's impacts to surface and groundwater could be significantly worse than predicted. If mitigation of significant impacts would not be feasible for economic or technical reasons, the project, as proposed, should not be approved.

[15] One measure mentioned in the DEIS (p. 4-42) to mitigate the effects of the contaminated pit lake involves pumping fresh water into the pit to dilute pollutant concentrations. However, an active mitigation measure that would need to be implemented in perpetuity is not acceptable. Another mitigation measure mentioned is diverting site runoff into the pit. It is unclear that the amount of runoff would be adequate to dilute the pit lake, especially in light of the potential that the pit lake would not be as small as the DEIS projects. The FEIS should discuss these possible mitigation measures in more detail.

[16] The DEIS (p. 4-7) discusses measures to create nesting sites for raptors affected by the proposed project. However, these measures would only be effective after mining ceases. The FEIS should discuss the measures to mitigate nesting site losses during operations.

[17] The use of high-density polyethylene balls to exclude birds from solution ponds appears to be an effective deterrent, and we concur with Nevada Division of Wildlife's recommendation regarding their use on the site.

Clean Water Act Section 404

[18] The proposed Southwest Waste Rock Dump would be located over approximately 6,000 linear feet of waters of the U.S. However, the DEIS does not provide baseline information about these waters, such as affected acreage or habitat type. This

Response No. 15

Pumping would not be done in perpetuity. Sufficient water would be pumped into the pit lake at the time it was determined to be necessary from monitoring activities. Additional fresh water would be pumped into the pit lake so that the effects of evaporation were negated well into the future. The amount of water pumped into the lake would be determined by modeling. The amount of surface runoff available for runoff into the pit is limited because the pit is located near the top of the watershed. Thus, any runoff that did flow to the pit lake would provide only a small diluting effect.

Response No. 16

The Council on Environmental Quality (CEQ) does not require mitigation of all impacts. However, one prairie falcon nest site would be destroyed by the proposed action. The pair of birds occupying this site in 1995 would be forced to find a new nesting site if the proposed action is allowed. In 1995, an alternate nest site nearby was apparently occupied by another pair of birds. The birds displaced by the proposed action may be forced to move to a more distant site, though other potential nesting habitat is available in the Virginia Range.

Artificial nest sites for prairie falcons have seldom if ever been employed as a mitigation for the loss of a nest site. Information on the use or acceptance of artificial nest sites by these birds is, therefore, limited. Further, maintaining an artificial nest site in the project area could put birds using the site at risk (from blasting and fly rock, etc.). Accordingly, allowing the birds to select another site that meets their requirements at an off-site location would probably be the preferred course of action during the life of the project.

Response No. 17

A number of options are available for excluding birds from the solution ponds, including netting and the use of high-density polyethylene balls. Netting and the use of polyethylene balls are both effective measures. The mining company can use either the netting or the balls, as the objective of excluding birds can be accomplished by either method.

Response No. 18

The proposed southwest waste rock disposal area would be placed over about 6,000 lineal feet of ephemeral drainage classified as waters of the U.S. The waste rock disposal area would be a valley fill disposal area, therefore, covering of the ephemeral drainage would be inevitable. The southwest disposal area would cover vegetative areas consisting of mixed desert shrub as shown on the vegetation communities map in Figure 3.3 of the DEIS. Most of the southwest disposal area will be located in section 10, T18N, R24E. The southwest disposal area has a total area of 171 acres.

[18] cont. information should be provided in the FEIS. The FEIS should also discuss efforts to avoid, minimize, or mitigate the loss of this drainage. We urge BLM to require design of the facility such that the ephemeral drainage is avoided to the extent possible. Where waters of the U.S. cannot be avoided, we recommend that mitigation be required.

Other Comments

[19] Figure 3.7 of the DEIS refers the reader to Figure 3.10 for the location of cross-section A-A'. A-A' is not depicted on Figure 3.10. The FEIS should rectify this. Figure 3.7 should also provide a compass direction and vertical scale.

Response No. 19
Corrected map is Figure 4.2 in the FEIS

Letter No. 3

United States Department of the Interior

U.S. GEOLOGICAL SURVEY
Reston, Virginia 22092

APR 0 1 1996

In Reply Refer To:
Mail Stop 423

MEMORANDUM

To: Ron Moore, Environmental Impact Statement Project Manager

From: James F. Devine
Senior Advisor for Science Applications

Subject: Review of Draft Environmental Impact Statement for the Talapoosa Mine Project, Lyon County, Nevada

As requested by the Bureau of Land Management in their correspondence of January 22, 1996, the U.S. Geological Survey (USGS) has reviewed the subject draft environmental impact statement (EIS) and offers the following comments:

Summary, page S-5:

[20] The statement that pumping from the pit area would not produce water beyond that used by the mine is questionable. See detailed comments below.

Summary, page S-6:

[21] The statement that a pit lake high in sulfate and dissolved solids would result in a neutral chemistry is questionable. See detailed comments below.

Page 2-8, figure 2.3:

[22] Water levels shown in the cross sections for post-mining conditions are 300 to 400 feet lower than pre-mining water levels reported on page 3-52. If ground-water inflow rates are actually greater than those predicted by the ground-water flow model, as discussed below, water levels in the pit would be greater than 4,827 feet. In addition, cross-section A-A' does not include the post-mining outline or water levels for the Dyke Adit or East Hill Pits. These should be included in the final environmental impact statement (FES) to better define post-mining conditions at the site.

Page 2-19, Ancillary facilities:

[23] The first paragraph states that water use by the project could be as great as 1,500 acre-ft/yr, likely to be obtained from the Silver Springs Water District in Churchill Valley. Page 3-22 states that Churchill Valley is a Designated basin where ground-water withdrawals are limited by the Nevada State Engineer. Existing capacity of the water system in Silver Springs is stated to be 3,000 GPM, or about 4,800 acre-ft/yr, on page 3-35. The location of existing permits in the valley are shown on Figure E.7, but the existing rate of water use in the valley is not included in the EIS. In order to evaluate the impact of the project on existing water use, this data should be included in the FES.

Response No. 20
See response to Comment No. 14.

Response No. 21
Page S-6 of the DEIS states that "The lake is expected to be high in sulfate and dissolved solids resulting in a neutral chemistry." This is misstated. The statement should read: The lake is expected to be high in sulfates and dissolved solids and be near neutral to alkaline in pH. Chapter 3, Errata, of the FEIS reflects this change.

Response No. 22
Pump test data and ground water modeling results show that ground water flow rates would not be different from that predicted in the DEIS. Please see the response to Comments No. 5 and 14.

WMC's Section 6.7.3 provides discussions on post-closure steady-state flow towards the pit. As discussed in Comment 14 (B-1), a doubling of flow rate into the pit would not significantly raise the final pit water level. Modeling shows an increase from 3 gpm to 23 gpm would raise the final pit level less than 100 feet.

The Dyke Adit and East Hill pits will be above the water table and would have no effect on final water levels. Also, see Figures 6.8, 2.5 and 2.6 and discussion in Section 7.5.6, v.1 WMC, 1996. Also see Figures 4.5 and 4.6 of Chapter 4 of the FEIS.

Also, additional description of the pit lake lateral inflow modeling using the TWODAN model is included in the FEIS, page 4–27.

Response No. 23
See response to Comment No. 22. The FEIS provides additional information concerning the proposal for water for the mine (See Chapter 2, Page 2-12). The FEIS analyzes the potential impacts of the proposed water pipeline where it crosses public and private lands. As noted in the comment, Churchill Valley is a designated basin where ground water withdrawals are controlled by the State Engineer. Because any additional water needed by TMI would be obtained through the processes established by the State, and would be a reallocation of water use within the existing appropriation, no additional impacts on the Silver Spring aquifer are anticipated. The State Engineer has an established process for water right applications developed in accordance with NRS 533.370, Subpart 3, which provides for protection of other water right holders. NRS 533.370, Subpart 3, states: "Except as otherwise provided in subsection 5, where there is no unappropriated water in the proposed source of supply, or

Page 2-32, table 2.4:

[24] The impact of the proposed action on water resources results in a lowering of the water table in the basalt aquifer system but the cross-section on figure 3.12 shows the pit and lowered water levels will be in andesitic volcanic rocks; not basalt. If water-levels in the basalt aquifer are lowered, the FES should discuss how the flow of Rock Blind Spring could be affected.

Figure 3.7:

[25] The location of section A-A' is shown on figure 3.8, not 3.10 as stated. Figure 3.10 depicts the waters of the United States.

Page 3-51, Local Surface Water Systems:

[26] The FES should further discuss the effects of peak ephemeral flows from the project drainage basin. Although flow only takes place for short periods, as noted, they could be significant during intense storms and extend to the floor of Churchill Valley and to Lahontan Reservoir, only about 3 miles from the mouth of the ephemeral drainage.

Page 3-52, Ground-water recharge and discharge:

[27] A recharge rate of 2 percent of mean annual precipitation is less than that used in many Nevada ground-water studies. In these studies, recharge for areas receiving 8-12 in/yr is estimated to be 3 percent of mean annual precipitation, and recharge in areas receiving 12-15 in/yr is estimated to be 7 percent. If 2 percent was used to estimate recharge to the entire mountain block, recharge could be underestimated. Total recharge to the volcanic bedrock aquifer should be addressed in the FES. If it is equal to the rate of discharge presented in paragraph 4, the area used to calculate the rate should be defined.

Page 3-57, paragraph 1:

[28] It is not clear how the rate of recharge from precipitation was estimated and how, or if, it differs from the rate of discharge from the mountain block shown on page 3-52. If the rate of recharge from precipitation is the same as the rate of discharge from volcanic rock aquifers to basin-fill aquifers, the rates given on page 3-52 of 2.6 to 22 GPM are equivalent to 1.4 to 12.6 million gallons per year; not 20 to 30 million as shown. If the rate is for a different source of recharge, the method of estimation should be described.

Page 3-57, Project area ground-water quantity:

[29] Water quantity is not discussed in the section. Perhaps a better heading would be "Project area aquifer properties." Also, the source for reported values of transmissivity, porosity, and existence of barrier faults, should be referenced, presumably Water Management Consultants (WMC), 1995.

Response No. 23 (continued)

where its proposed use or change conflicts with existing rights, or threatens to prove detrimental to the public interest, the State Engineer shall reject the application and refuse to issue the requested permit. Where a previous application for a similar use of water within the same basin has been rejected on these grounds, the application may be denied without publication."

Response No. 24

Rock Blind Spring is a perched ground water system that occurs at the intersection of two major high-angle faults. It is not fed by the deeper ground water system of the volcanic bedrock aquifer. Rock Blind Spring is located in sinter, which is underlain by the rocks of the Upper Kate Peak formation which are much lower in vertical hydraulic conductivity (See Figure E.1 of the FEIS and Figure 7.1 of v.1 of WMC, 1996).

The precipitation falling over the outcrop of basalt and sinter in the location of the spring infiltrates and moves along shallow joints and fractures. This water is prevented from moving downward by the low hydraulic conductivity of the Upper Kate Peak rocks. As the accumulated water moves down the topographic slope by gravity, it is blocked by the northeast trending fault, which causes it to pool water at the surface as dictated by the local topography.

A 42-day pump test of Well PW-1, located in the ore body, produced no measurable drawdown in the Rock Blind Spring. More than 80 feet of drawdown was produced in the area of the ore body with no drawdown occurring north of the pit in the area of the spring. The closest observed drawdown was observed about 5,000 feet south of the spring (See Section 7.4.4 and Plan 5.2, v.1 of WMC, 1996.)

Response No. 25

See Response to Comment No. 19.

Response No. 26

Precipitation at the site can occur as high-intensity, short-duration storms. Most of the precipitation results in direct runoff from the mine site. These types of storms can cause rapid runoff with high sediment loading, and the runoff can travel for miles after a single storm event. The biggest concern with runoff from the mine site would be from the waste rock disposal areas. As part of the water pollution control permit, sedimentation basins would be installed downstream of the waste rock disposal areas. These sedimentation basins are considered best management practices for reducing the amount of sediment that may be transported off-site. See Local Surface Water Systems section, page 4–22 Chapter 4 of FEIS.

Response No. 27
Annual recharge is estimated at approximately 0.02 to 0.17 inches or about 2 percent of mean annual precipitation (WMC 1996, Section 5.2.1 of v.1). Recharge rates were estimated based on measured seasonal ground water level rises of between 0.4 and 2.4 feet in 1994 and 1995. Multiplying the rise in water level by a representative porosity of 0.006 gave the annual recharge rate of 0.02 to 0.17 inches.

The Maxy-Eakin method was used to approximate the recharge to the Churchill Valley from the Virginia Range. Using 12-15 inches as the average annual precipitation from the Virginia Range, the total recharge per lineal mile of range front is 20-30 million gallons per year, which averages to 40-60 gpm. If a five-mile distance from range crest to basin center is used, about 0.29 inches of recharge per year results, assuming 25 million gallons per lineal mile. As the author of the comment noted, this recharge rate of 2% is lower than other areas of Nevada, but is probably representative for the proposed project area.

The ground water flux beneath the southern flanks of the Virginia Range was estimated to be 2.6 to 22 gpm per lineal mile of rangefront. This is based on the ground water recharge rates calculated for the proposed project area of 0.02 to 0.17 inches per year and a zone of recharge extending northward from the rangefront a distance of four miles towards the crest of the range. The figure given in paragraph 4 on page 3-52 refers to recharge of the proposed project area, not the recharge directly to the alluvium or from surface runoff to the alluvium from the total Virginia Range. Thus, it is lower than the total net recharge estimate derived for the Churchill Valley from the Virginia Range of 0.29 inches per year. (See v.1 Sections 4.4.1 through 3.4.3, MWC, 1996).

Response No. 28
See response to Comment No. 27.

Response No. 29
Section heading has been changed per suggestion.

Page 3-58, Table 3.17, Ground-water quality:

[30] Because selenium is common in waters with high sulfate concentrations, an analysis for this constituent should be included in this section and in the discussion of pit-lake chemistry.

Page 4-36, WATER QUALITY AND QUANTITY:

[31] The statement that lowering of the water table would be confined to the immediate project area is questionable because of flaws in the conceptualization of the ground-water flow model. There is no discussion of how the volume of water needed to be removed from storage was calculated. If the ground-water flow model was used, the volume is questionable. If the volume was obtained from estimates of porosity and the volume of rock within the pit, it could be underestimated. If the permeable, "open" fault simulated in the model extends beyond the pit in an east-west direction, water stored in this zone would be removed from storage before less permeable rocks within the pit would de-water. See discussion on ground-water flow model, pages E-20 and 21.

Page 4-37, Water Budget of the Pit Lake:

[32] The modeling procedure and assumptions used in modeling by WMC (1995) should be presented in the appendix to allow evaluation of the methods used. The maximum lake level after 100 years of recovery should be presented in the FES together with how the rates of ground-water seepage to the pit lake were estimated. If derived from the ground-water flow model, they could be underestimated. Results of recovery-period transient simulations should be included in the appendix.

Page 4-37, Pit Lake Chemistry:

[32A] Inspection of the report WMC (1995, vol. 1, p. 118) shows that oxidation from pit walls was assumed to cease after submergence, yet turnover and complete mixing within the lake was also assumed. If the lake is completely mixed, dissolved oxygen from contact with the atmosphere will be present in the pit-lake water and oxidation will not cease after submergence.

[33] ANP/AGP ratios of 0.12 and 0.50 listed in table 3.15 for the andesitic rocks which will host the lake are much less than the Nevada Division of Environmental Protection limit of 1.2. This suggests that water in contact with the rocks will become acid (page 3-46). Results of the Meteoric Water Mobility Procedure analysis, summarized on page 3-50, show that the andesitic rocks yielded acid lechates that exceeded 10 times the drinking-water criterion for aluminum, cadmium, iron, lead, manganese, and arsenic. These data appear to conflict with results of chemical modeling. The FES should discuss the apparent conflicts and also include an analysis of selenium concentrations in pit-lake water.

Table 4.12:

[34] If assumed rates of ground-water inflow are derived from the ground-water flow model, results of chemical modeling are questionable. The results of chemical modeling are based on the questionable assumption that oxidation of pit wall rock ceases after submergence (see USGS comment above on p. 4-37). The FES should clarify this issue.

Response No. 30

Selenium is below the detection limit in all ground water samples (detection limit either 0.001 or 0.002 mg/l) (See Appendix F, v. 3 WMC, 1996). Selenium was also below the detection limit of 0.001 mg/l in all of the MWMP test results (See Appendix N, v.4, WMC, 1996) and was below detection limit in all HCT results (which includes the 1993 80-week test on three ore samples and the 1995 48-week test on six waste rock samples), with the exception of week 36 in the 1993 80-week tests when each sample showed a single spike (See Appendices Q and R of v.4, WMC, 1996). The data suggests that the spike is the result of analytical error. The detection limit for the 1993 80-week test was 2.5 mg/l and 0.001 mg/l in the 1995 test. Selenium was calculated in the geochemical model used to predict pit lake chemistry at half the detection limit and the full detection limit to ensure that the range of uncertainty was covered. Results of the model show that selenium would not exceed drinking water standards at either concentration. This is discussed further in Modeling of Pit Lake Chemistry in Chapter 4 of the FEIS (page 4–46) and in v. 1 Section 8 of WMC, 1996.

Because selenium could not be detected in any of the ground water samples or leachate solutions from the ore or waste rocks using two separate testing procedures, it is not expected to be a problem. Sensitivity modeling of the pit lake using the maximum detection limit concentration for selenium shows selenium will be in compliance with the drinking water standards.

Response No. 31

The concept that lowering of the water table will be confined to the proposed project area is based on the structural geology, pump test data showing negative boundaries correlating to mapped faults, limited and slow recovery of observation wells and the pumping well after completion of the pumping test, large residence time of the water based on C-14 age dating and ground water chemistry variations within the ore body compared to outside of the ore body. (Section 5.8, pages 56-58).

Also, pumping to depressurize the mine area is described in Section 7.1, page 81 of v.1 of the WMC report. These calculations and modeling results indicate the pumping rate for the first seven years will be about 30-50 gpm and about 5-15 gpm for subsequent years. This calculates to 335 to 450 million gallons of ground water removed (page 84, WMC). The values are assumed to be conservative relative to inflow volumes and permeable rather than impermeable faults. See Section 6.7.3, page 79 and discussion 7.3 on page 83-85.

Also see reply to Comment No. 14 for discussion of calculation of porosity.

Response No. 32

Data and discussions relative to the modeling and the lake levels after 100 years are presented in the v.1 of WMC report, Section 6, page 69-80. Section 7.5 (page 86-91) also includes discussion of final pit lake elevations and inflow/water balance calculations and model output for the final pit lake. This information indicates the final pit elevation would be at 4,843 feet based on a 10 gpm influx and 4,906 feet based on a 24 gpm influx. See Section 7.5.4, page 89-90. Also, Figure 6.8 shows the head after 100 years and is discussed in Section 6.6.3, page 78.

Additional discussion concerning the MODFLOW and TWODAN modeling are included in Chapter 4 of the FEIS, page 4–27.

Response No. 32A

As submergence of the pit walls occurs from the ground water inflow, the effect of the pit walls themselves on the chemistry of the pit lake water will also diminish. The lake would be oxidized, but the rate of oxidation in water would be less than that of the open air. The high residual alkalinity of the ground water inflows is the control on pit lake pH. Oxidation will continue after submergence but will be much lower than the open air. After submergence, ground water inflow is expected to dominate chemical effects to the lake. See Pit Lake Chemistry section in Chapter 4 of the FEIS, page 4–47.

Response No. 33

Since the writing of the DEIS, additional acid-base accounting results were obtained for the rocks of the two satellite pits. The following table lists the new results and is included in Chapter 4 of the FEIS, Acid-Base Accounting, page 4–6.

TABLE 4.3 (REVISION OF TABLE 3.15 OF THE DEIS) AVERAGE ACID BASE ACCOUNTING RESULTS*

GEOLOGIC UNIT	ANP/AGP	NNP+
Qal/Qc	12.6	14.6
Tlb	73.6	18.2
Tcvts	11.2	10.0
Tkx	4.2	12.1
Tka(UBC)	.14	-19.7
Tka(LBC)	.50	-14.0
Tkdi	33.4	42.4
Tksed	324	16.2
Tklahar	63.3	11.2
Tkb	2,180	109

*Using AGP PyriticS.
+Tons of $CaCO_3$ / 1,000 tons rock.

The MWMP data are not relevant to the pit lake modeling because the HCT data and the average ground water chemistry of influent water were used for model inputs, not the MWMP. The MWMP data is of limited use and value. See the response for Comment No. 7. The HCT data for weeks 32-48 of the testing were used in the pit lake geochemistry model. See the response for Comment No. 30 concerning the presence of selenium.

The influent ground water of the pit lake has high residual alkalinities that will control the pH of the lake. The pH of the in-situ water of the ore zone is neutral. This water has been in contact with the pyritic rocks of the ore zone for 19,000 years, based on C-14 dating. Based upon the high residual alkalinity of the influent ground water and the neutral pH of the background water, the pit

Response No. 33 (continued)

lake is not expected to be acidic. See the response to Comment No. 3. Also see Modeling of Pit Lake Chemistry section, page 4–46, and Pit Lake Chemistry section, page 4–47 of Chapter 4 of the FEIS.

Response No. 34

Acid leachates produced by the pit wall result from the oxidation of pyrite exposed to the atmosphere and the accumulation of product acid Fe (III) salts in the pit wall due to evaporation. Pyrite oxidation will not cease after immersion of the wall in the pit lake, although the evaporative concentration of acid salts will obviously cease. Regardless, the importance of pit wall oxidation will certainly decrease relative to the influence of ground water inflows on pit lake chemistry. The composition of ground waters which are oxidized, discharging into the pit lake through the immersed pit walls, should dominate over any chemical effects the walls may have on lake chemistry once submerged. See responses to Comments No. 14 and 32A.

Page 4-42, Seepage from Reclaimed Waste Dumps:

[35] Assumptions used in the Hydrologic Evaluation of Landfill Performance model (HELP) should be included in the appendix. Model results cannot be evaluated without details of the simulation and, as a result, are questionable. Although total annual precipitation is low, precipitation often takes place in the form of intense storms. Was the maximum precipitation intensity (2.00 inches in 24 hours, page 3-2) used in the model? If not, percolation through waste rock dumps could occur and leachate production could take place. There is evidence at existing waste rock dump sites where the HELP model was applied and no percolation was predicted, that seepage was actually taking place.

Page 4-45, WATER QUALITY AND QUANTITY:

[36] Studies of peak ephemeral flows from the Talapoosa drainage are not presented in the EIS. Thus, the statement that little precipitation exists to transport sediment or runoff from waste rock dumps, as noted on page 4-42, to the Carson River is not supported. The statement that there will be no impacts to ground-water resources off the project site is not substantiated. These matters should be clarified in the FES.

Appendix E:

[37] Important supporting data are not included in the appendix, including: Discussion of methods and assumptions used in the pit-lake chemistry modeling, discussion of methods and assumptions used in the HELP modeling, and discussion of transient recovery simulations. The information should be included in the FES.

Page E-20, paragraph 3:

[38] There is no discussion of how the volume of water stored in the pit area was calculated (335 to 450 million gallons). If calculated by the ground-water flow model, it is underestimated for reasons stated below. If calculated using estimated porosity and the volume of rock removed to form the pit, it could be underestimated if open fracture zones extend beyond the boundaries of the pit. This should be clarified in the FES.

Pages E-20 to 21, Ground Water Flow Model:

[39] A map showing the trace of the ground-water flow model should be included in the FES to precisely show the modeled area, and allow evaluation of how reasonable the distribution of hydraulic conductivity might be. Also, a cross-section showing how recharge was distributed in the model should be included, similar to WMC (1995, fig. 6.2). If recharge was estimated to be 2-percent of precipitation to the crest of the Virginia Range, recharge could be underestimated and this could affect model results.

[40] Justification for conceptualization of the ground-water flow system as a two-dimensional vertical slice is not presented in the EIS. Inspection of the document WMC (1995) shows that a two-dimensional model was deemed appropriate because the model orientation is perpendicular to

Response No. 35
The maximum value used 1.73 inches in the HELP model is not much different than the 2.00 inches recommended by the comment author. (See v.1 Use of the HELP Model to Predict Seepage from the Reclaimed Waste Rock Disposal Areas, Appendix A, Peak Daily Values, WMC, 1996.)

Response No. 36
Runoff modeling performed subsequent to the DEIS shows that significant amounts of runoff would occur from the waste rock disposal areas. Left uncontrolled, the peak runoff rates would transport sediment off-site for several miles. Best management practices consisting in part of sedimentation basins below the waste rock disposal areas would assist in reducing the downstream impacts of the sedimentation.

Response No. 37
The HELP model descriptions and discussion are given in Chapter 4 of the FEIS, page 4–44. Refer to v.1, Use of the HELP Model to Predict Seepage from the Reclaimed Waste Rock Disposal Areas, WMC, 1996.

Response No. 38
The value of 335 million to 450 million gallons is the amount of water that will be removed from volcanic bedrock in the main project area as the ore body is depressurized. Pump test and recovery data show only a weak connection between the fracture system with strong compartmentalization occurring in the proposed project area. These extensive open interconnecting fractures do not appear to be present in the proposed project area. Also, see reply to Comment No. 31 for discussion of calculation of porosity.

Response No. 39
Please refer to Section 6.3 and specifically to Section 6.4.3 and Figures 6.1, 6.2, 6.3 and 6.4 of v.1, WMC, 1996 and Appendix E of the FEIS.

Response No. 40
Justification of the two-dimensional model is presented in WMC's Section 6.1 and 6.4 with the discussions of input parameters and model output in subsequent portions of Section 6.

Transient simulation and changes in storage that relate to pit water supply pumping and subsequent pit recovery after mining stops was done through a steady-state, aerial, two-dimensional analytical element model. (Section 6.1, page 69, Section 6.6, page 77-78, and Section 6.7, page 78-80 of WMC, 1996 v.1.) A description of this model is included in the FEIS, page 4–27.

structures that control ground-water flow, and parallel to the potentiometric gradient. For steady-state simulations which do not include changes in ground-water storage, this configuration is reasonable. For transient simulations which include changes in ground-water storage, the two-dimensional model is not appropriate. This issue should be discussed in the FES.

[40A] In transient simulations, the two-dimensional model does not include ground water from the entire volume of the proposed pit, or from fractured zones that could extend beyond the pit. Boundary conditions for the vertical sides of the cross-sectional model are not discussed in the EIS. In the supporting document WMC (1995, p. 70), it is stated that only 6 cells near the southern end of the model were simulated as constant head. Thus, it must be assumed that remaining cells in the model have no-flow boundaries on their vertical sides, and during transient simulations, ground-water storage in aquifers adjacent to the one-foot wide slice represented by the model is not included. If the entire volume of rock within the pit is dewatered, pumping will cause water-level declines in an east-west direction beyond the boundaries of the model. Permeable zones perpendicular to the model could produce substantial quantities of water to the pit, particularly when the pit is dewatered several hundred feet. Using the two-dimensional model, water-level declines and changes in ground-water storage cannot be predicted for areas east or west of the one-foot wide modeled area. Thus, the volume of water removed from storage and the area of influence caused by pumping are underestimated by the model. These model deficiencies should be discussed in the FES.

Page E-21, Results of Pumping-Period Transient Runs:

[41] The pumping rate and amount of water removed from ground-water storage during the transient simulation should be presented and discussed in the FES.

Copy to: Nevada State Representative, Water Resources Division
Director, Office of Environmental Policy and Compliance

Response No. 40A

The two-dimensional MODFLOW model was used only to determine the downgradient effects of pumping, and not to determine the flow rate into the pit. The TWODAN model was used for the latter. Discussion of both models are included in the FEIS, page 4–27.

We agree that the vertical two-dimensional cross sectional model can not be used for predicting inflow into the pit. (See WMC Section 6.1, page 69, of v.1).

Response No. 41

The amount of water removal and the pumping rate during pit water supply pumping is presented in Section 6.6. of v.1 WMC report. Drawdown is expected to be 650 feet to 700 feet, which is approximately 100 feet below the pit floor (Section 6.6.2 of v. 1 WMC). Approximately 335-450 million gallons of water are expected to be removed during the water supply pumping phase (Section 7.3.1, page 84). Initial maximum pumping rate will be 170 gpm, dropping to an average of 30-50 gpm during the first seven years of the mine life, with an estimated final pumping rate of 5-15 gpm after the first seven years (Section 7.1, page 81).

Letter No. 4

The Toiyabe Chapter of the Sierra Club
Nevada and Eastern California
PO Box 8096, Reno, NV 89507

One Earth, One Chance.

March 31, 1996

Bureau of Land Management
Carson City District Office
Ron Moore, EIS Project Manager
1535 Hot Springs Road
Carson City, NV 89706

Dear Mr. Moore:

These comments are in response to the Talapoosa Mine Project draft EIS. They are admittedly brief and not refined, but hopefully will be considered. This mine appears to have some of the most reactive rock of any mine I have seen in recent years. The BLM should be cautioned that this may become an extremely expensive public expense. The analysis on the chemical aspects is insufficient and, I believe, in many cases substantially understates the problem.

[42] 1. Pit lake water quality. I cannot see how the data support the contention that the pit lake will be neutral. The pit lake will exist almost exclusively in highly acid generating rock, and although buffering capacity exists in the higher reaches of the pit, the lake water is unlikely to ever reach those levels. It is probably based on assumptions of how deeply the rock will be oxidized. These assumptions are almost certainly wrong and neglect the dewatering cone of depression which exposes much greater quantities of sulfide to oxygen. The numbers on page 4-40 suggest that only 201 mg/L of sulfate will be obtained from the Tka rock, while the humidity cell tests show concentrations well over an order of magnitude higher. It is unclear how the numbers were obtained for the modeling exercise. They appear to be not useful for any modeling exercise, but certainly are not useful for accurately predicting pit lake water quality.

If review of comments on this EIS follows examples in other districts, you will probably send this to the consultant who did the study. He will disagree with me and the response will simply be that I am wrong, which will be reflected in the FEIS. This was done in the Round Mountain EIS and the consultants don't need to waste their time and the mining company's money by justifying their estimates.

We can all save time by the BLM simply indicating that the mining company will be responsible for any acidified water in the pit lake. If it forms, they will be responsible for neutralizing it and maintaining the historic water quality of the ground water over the

Response No. 42

We agree with the commenter that the pit lake would not likely reach the level of rocks that have a net neutralization potential according to Table E.3. The pit lake model does not consider the depth of dewatering caused by mining, and does not consider any effects it might have on pit lake chemistry. Such effects are considered unimportant as discussed below.

In the pit lake model, pit lake chemistry is assumed to result from the mixing of pit wall leachates with ground water inputs and rain, modified by evaporation. In the base case, pit wall leachates contribute about 17.2 gpm and ground water 10 gpm to the lake. (See WMC, 1996, Section 8.6, Tables 8.17 and 8.18). In the base case pit model, all inputs to the pit lake (but rain) contain measurable alkalinity, except for leachate from Tka rocks exposed in the pit walls (see FEIS Table 4.11). Leachate from Tka has a pH of 3.5 and a zero alkalinity. However, Tka leachate contributes only 35 percent of the water input into the pit lake. On the other hand, ground water discharging into the lake, which constitutes 58 percent of lake inputs, has a pH of 7.37 and an alkalinity (as $CaCO_3$) of 135 mg/l. The result, upon evaporation from the lake surface (which increases the alkalinity and raises the pH) is the lake pH values of 7.5 and above, and alkalinity's between 24 and 68 mg/l as $CaCO_3$ after 25 and 100 years, depending on model assumptions.

In the FEIS, water compositions assumed for pit wall leachates are based on results after 32-48 weeks of humidity cell tests run with rock samples from formations that will be exposed in the pit walls. (See HCT results in Table E.5) The pit lake model presented in the DEIS was based on HCT test results available after 16 weeks:

After mining is completed the ground water will be in contact with partially oxidized rocks in formations that contain significant amounts pyrite, although the most pyrite-rich rock will have been removed by the mining. All the rock formations including those in the ore zone, contain significant amounts of sulfate, as evidenced from the fact that total sulfur AGP values significantly exceed values for pyritic sulfur AGP (Table E.3). This suggests that all rocks at the site, including those below the present water table, are partially oxidized. Ground waters sampled from these rocks have pH values that range from 6.99 to 7.46, and alkalinities between 52 and 768 mg/l (Table E.7). These rocks are clearly capable of neutralizing any acid rock drainage created by pyrite oxidation, even though acid-base accounting analyses suggest that they should produce acid ground waters. This disagreement reflects the fact that alkaline minerals such as clays and feldspars present in the rock do not have time to react with the acid used in the laboratory tests run to measure acid neutralization potential (ANP), but do react with and neutralize acid ground waters at the site because of longer contact times.

Response No. 42 (continued)

Other factors contribute to the neutral pH of the pit lake. Pit lakes located in arid regions such as this (eight inches of rain annually) generally have less sulfide oxidation of wall rocks that occurs in more humid regions. This is because of the lower moisture content of the rock in arid climates. Further, less frequent precipitation results in less washing of the accumulated acid salts into pit lakes (cf. Miller et al., 1996, Envir. Sci. & Technol. 30 (3), 118A-123A).

Based on 32-48 weeks of the 1995 HCT tests, the average SO_4 figures referred to in the comments came from the 80-week HCT tests conducted in 1993 on sulfide-rich ore that will be removed by mining.

See Modeling Pit Lake Chemistry section in Chapter 4 of the FEIS, page 4–46.

[43] long term. This should be bonded appropriately using current standard methods for neutralizing acidic water and probably involves addition of lime. **The method for remediation and bonding amount should be clearly stated in the EIS, and not merely "study" or "consider" or "examine" the problem.** Performance standards are clear and can be enforced. This should also be the case for any contaminant which exceeds the historic water quality in the surrounding aquifer. Simply make them clean up the pit lake in perpetuity, without bothering with meaningless modeling results which look scientific and quantitative, but are no more than hypothetical hot air (this was USGS geochemist Kirk Nordstrom's term). Better yet, make them fill in the pit.

[44] Even under circumstances where the lake has been neutralized, the pit lake is likely to present a risk to wildlife. Nevada regulations preclude forming a water body which has the "potential to affect adversely the health of human, terrestrial or avian life" The draft EIS suggests strongly that such threats exist. I was a bit surprised that LD_{50} values were used to assess toxicity to wildlife in the supporting documents. If those values were not met, there was an implicit assumption that there was no problem. The Nevada standard does not require death for regulatory action, but simply the *potential* to *affect adversely* the *health* of wildlife. This standard is much more stringent than death. On page 4-42 the statement is made that "A pit lake would be formed whose hydrochemistry would exceed some pre-mining baseline conditions and Nevada drinking water standards for pH, sulfate, aluminum, arsenic and nickel. Exceeding these standards could potentially affect wildlife and livestock that use the pit lake either for habitat or drinking water" Sounds to me that the draft EIS indicates that the pit lake has the *potential* to *affect adversely the health of wildlife*. If this simple comparison is valid, the BLM cannot legally allow this lake to form. Thus, unless they refill the pit back to the water line the BLM cannot permit the mine under the present conditions. Page 4-45 also makes statements that suggest that wildlife could be affected by the pit lake.

[45] On page 4-42 there are several suggestions as to what can be done for mitigation and monitoring. I did not see even one of these which would be required. They were all simply suggestions. Without statements that they will be undertaken and the standards which will be met, these statements should all be dropped since they are meaningless. With all due respect to both the State of Nevada and the BLM, I doubt seriously that any mining company would react favorably to any of those suggestions, and would do nothing unless ordered to do so.

[46] On page 4-36, the statement is made that "surrounding groundwater would not be impacted (by the pit lake) because the pit would act as a sink with water flowing toward it." This assumes a groundwater flow regime which I saw no data to support. It appears to be unsubstantiated conjecture. Figure F.1 shows a long gradient towards lower elevations, and suggests that water will indeed move out of the pit lake, and again be in violation of NAC 445.24352 which prohibits a pit lake from *potentially* degrading the
[46A] ground waters of the state. Clearly, there needs to be an alternative examined which refills the pit to the pre-existing water table. NEPA requires alternatives, and the lack of

Response No. 43

For bonding discussion, see responses to Comments No. 46 and 84. As with any modeling, geochemical modeling is an approximation and a prediction of reality. Geochemical models have been found to be successful in predicting pit lake chemistry and naturally occurring lakes in closed evaporation basins (Davis et. al, 1996).

Response No. 44:

The FEIS reviews the potential for the pit lake to become a hazard to wildlife. This discussion includes a review of research conducted on wildlife exposure to elements or compounds that modeling suggests may exceed State Water Quality Standards in the Talapoosa Pit lake. This discussion is not a prediction of water quality in the lake, but a review of potential pit water quality development. Monitoring of water quality in the pit lake would drive the implementation and extent of mitigation measures that could be employed to minimize impacts to wildlife. FEIS Appendix D, "Talapoosa Pit Lake Water Quality Risk Assessment for Wildlife," describes potential impacts on wildlife for the lake.

If monitoring (as described in Appendix A) determines a strong future possibility of violating NAC445A.429, TMI will evaluate and propose mitigation measures.

Response No. 45

Refer to Appendix B, Waste Rock Management Plan for revisions.

Response No. 46

See response to Comments No. 31 and 32. Modeling results indicate the final pit could range from 4,843 feet to 4,906 feet elevation, approximately 300 feet to 350 feet below the base line (initial) ground water level for the area near the pit. This would result in a hydraulic depression with ground water flowing towards the depression (Section 7.1, page 81, of v.1 WMC report). With evaporation exceeding recharge (ground water plus precipitation, Table 7.1 of WMC) for the proposed project area, there will be a continuous movement of ground water towards the pit.

Although the pit lake is projected by the model to exceed state Drinking Water Standards for TDS, sulfate, antimony, arsenic, manganese, thallium, and nickel, post-closure monitoring as required by Nevada law would make the final determination whether the existing and proposed facilities have the potential to degrade waters of the state. In addition, Nevada law prohibits the creation of pit lakes that have the potential to degrade waters of the state or the potential to adversely affect human health or terrestrial and avian life (Nevada Administrative Code 445.2435). As a result, pit lake water quality monitoring would

[46A] cont. alternatives in this case both violates NEPA and also is inconsistent with a real analysis of methods to decrease the long-term impact of this mine.

2. Heaps and Waste Rock Dumps: I have never read an environmental document which indicates that 98% of the ore will be acid generating. I recognize that addition of lime during creation of the heaps will help to buffer the acid, but the very clear possibility exists that, over the long term, parts of the heap may become acidic. The BLM could be left

[47] with a very severe problem, similar to a part of the pro`lem at Summitville where a heap went sour. How does the BLM know that this heap will not become acidic? The acid-base accounting system suggests that it will be come acidic, and the draft EIS gives clear data to support that hypothesis. What will the BLM do if it becomes acidic? Will a sufficient bond be in place to manage this site.

The same argument exists for the waste rock dumps. 54% of the waste rock dumps will be from the acid generating rock. There are clear examples of acid generation

[48] in climates of this type, and present a substantial management problem. There is no plan for handling this rock (page 4-35), other than a series of very vague suggestions. I have not seen a discussion such as this for a Nevada mine since the mid 1980's and this analysis represents a big step backward in planning for contamination from a mine.

In the supporting documents, I noticed a Table XIV.6: Waste Rock Pile HELP results. This model supposedly predicted almost no percolation through the waste rock dump. On what basis is that estimate made. It assumes reclamation, or a compacted surface, which was not required in those sections of the draft EIS. Both waste rock dumps and heaps are most often highly permeable. The amount of water which will be

[49] delivered to the interior of these dumps appears to be underestimated, but under any circumstances is based on a set of conditions which are not being required. These are not "conservative" calculations. For the heap, the probability of delivering fluids from the heaps is very high. How will those fluids be managed over the long term. These almost certainly would be highly contaminated.

3. Reclamation. There appears to be very little required. What is the preexisting density and diversity of vegetation. How will revegetation success be assured for the above-mentioned waste rock dumps. Why is the BLM allowing the company to have 2.5:1 slopes (much less 2:1 slopes)? This again seems to be a mid-1980's EA in its lack of requirements for reclamation. I always get nervous when the statement is made that "the waste rock dumps will be revegetated without the addition of growth medium". These are

[50] acid-generating sterile rock surfaces, so the hope of getting something to grow is no more than that. Basically, reclamation on this site will not be possible without a substantial amount of effort over the long term. Where is the bonding calculation that takes this into account? What density and diversity standards will be required for this site. The reclamation section should be simply replaced with a statement that all waste rock dumps will be recontoured to a 3:1 slope, and the vegetation on all of the surfaces (except the high walls) will be 100% of pre-existing vegetation. It should be bonded sufficiently to recontour the dumps, bring in topsoil and get the vegetation growing. When the bonds

Response No. 46 (continued)
be required by the Nevada Division of Environmental Protection as part of post-closure monitoring requirements to demonstrate that the pit lake would not have the potential to adversely affect human health or terrestrial and avian life. The project area is not considered to be a key area or heavily used area by wildlife, and the area is not grazed by livestock. Response to Comment No. 4 describes the potential impacts of the pit lake on wildlife. The DEIS recognized the uncertainty associated with modeling and the BLM/State has established a specific sampling and monitoring program to compare actual sampling results with modeling predictions. The Monitoring Plan for the pit lake is described in detail in Appendix A and in the state Water Pollution Control Permit. The BLM and the state will require specific mitigation requirements if the monitoring identifies a problem. The BLM and the state will require sufficient bonding to provide for mitigation if a problem develops.

Response No. 46A
Several alternatives were considered for the pit lake, including total backfilling of mined pits with waste rock, potential partial pit backfilling, and pit drainage off-site. These alternatives were eliminated from detailed consideration as described in the DEIS on pages 2-27 and 2-28.

The DEIS also described several possible mitigation measures on page 4-42. Implementation of any of these options would depend upon results from the monitoring program.

Response No. 47
Refer to Comments No. 7, 8 and 9. The heap leach would be composed of 98% Tka material, which exhibits the potential to generate acid. Prior to placement in the heap, the ore would be crushed to minus 0.125 inches, thereby increasing its reactive ability. The ore would be mixed with water, lime and Portland cement in a rotary mixer. The heap would then be leached and releached with a weak cyanide solution of pH 10 to 11 at a rate of 0.0025 to 0.0045 gpm per square foot. The pH of the leaching solution must be kept at an alkaline pH in order to recover the gold and silver.

The leaching would continue for several years in order to adequately recover the precious metals. The entire column of the heap would be saturated by the highly alkaline leaching solution. Following the completion of mining and recovery of precious metals, the heap would be neutralized. Fresh water would be added to the heap until the rinsate meets state cyanide standards and the pH of the leachate coming out of the heap is between 6 and 9. Monitoring and testing will be done on the heap leach material to determine that the heap is neutralized. The final closure plan will be based upon this testing.

Response No. 47 (continued)

The commenter refers to the heap at the abandoned Galactic Resources mine near Summitville, Colorado. Summitville is located at a high elevation in an alpine climatic regime. Long-term precipitation for the area is between 35-36 inches (National Climatic Data Center and Natural Resource Conservation Service, 1996). Much lower evaporation rates exist at Summitville than at Talapoosa. The Talapoosa site receives approximately eight inches of rainfall per year and evaporation is 5.5 times the precipitation received. The two sites are not comparable in conditions that will promote acidification of the heap. Methods of construction and the hydraulic properties for these two heaps are not similar. See the response to Comment No. 64 concerning reclamation bonding. See Appendix B of the FEIS for further discussion.

Response No. 48

See responses to Comments No. 7, 8 and 9. See Appendix B of the FEIS.

Response No. 49

See the response to Comments No. 10 and 11. The HELP model has been revised and re-run based on the comments. A sensitivity analysis was run by varying the model inputs. The complete description of the model and its assumptions are Chapter 4 of the FEIS, page 4–44.

Response No. 50

The goal or requirement for revegetation is to establish a self-sustaining reclaimed disturbed plant community. This is in line with the Nevada Interim Standards for Successful Revegetation.

Although a flatter (3h:1v or greater) slope is generally more suitable for revegetation, a 2h:1v or 2.5h:1v slope can be less impacting (as in this case) on steeper ground as less total area is disturbed.

The waste rock slopes would have very low potential for acid-generation, according to modeling reported in the DEIS. Thus, plant growth would probably not be affected by acid conditions on the disposal area surfaces.

The lack of topsoil in the proposed mine area precludes having sufficient topsoil available to cover all the disturbed acreage or disposal areas. The importation of additional soil resources usually requires additional disturbance at another site that would require reclamation with a corresponding increase in impacts.

[50] cont. are in place, let the mining proponent figure out how best to reclaim. If they can't, there will be enough money to do the job with contractors.

[51] 4. The Meteoric Water Mobility Test (MWMT) is of very limited use on non-acid generating rock. It is grossly wrong on acid generating rock. If it is to be used in the FEIS, I ask that someone explain how it predicts drainage water quality, where has it been tested and found to accurately predict anything at a mine site, how can it possibly be used for any regulatory determination, and finally, what remote possibility is there for useful information on acid generating rock? This request is (perhaps) a bit cynical, since I have requested the same information on every recent EIS, and the only response that seems to be forthcoming is that Nevada requires it. If that is also the response in this case, why is a federal agency using a useless test to assess contamination of U.S. public land and water resources? With all due respect, I do hope that the Carson City district will look into this issue. The MWMT has never been evaluated and validated for predicting drainage water quality or contaminant total quantity by the EPA, USFS, BLM, USGS, (former) US Bureau of Mines or any state in the nation, including Nevada.

[52] 5. Last point: The tables in the back of the draft EIS are misnumbered. Several studies are referenced, but no reference section exists. Units on table 5 are missing.

[53] Finally, this draft has so many problems that it should be reissued as a new draft EIS. I doubt that this will be done, but as the draft stands now, it has so many errors and omissions that it would not stand up to an appeal.

I apologize for the sharpness of these comments, but this proposed mine is one of the most potentially problematic mines that I have seen in recent years, and the draft EIS did not do a good job of assessing those impacts. There is a clear possibility that the BLM will be stuck with a major problem mine, particularly if expensive problems come up and the mining company goes under.

Thanks for the opportunity to make these comments. In most places in the world they don't ask.

Sincerely,

Glenn C. Miller
Chair of the Toiyabe Chapter on Mining

Response No. 50 (continued)
The southwest disposal area would be recontoured and blended with the natural slope to lessen visual impact.

Response No. 51
The comments made regarding the use of the Meteoric Water Mobility Test (MWMT) for predicting drainage water quality are noted. Although we concur with many of the writer's concerns about the limitations on the use of the MWMT, the BLM cooperates closely with the states on mining issues, and the State of Nevada requires the test, as the writer points out. The determination of the use of MWMT for predicting drainage water quality is beyond the scope of this EIS, but the BLM will forward the comment to the state for its consideration. The BLM and the state have an interest in working together in using the best possible tools for impact analysis and to simplify the process for both the industry and the public.

Response No. 52
The tables referred to are in Appendix E of the Draft EIS. Three tables, Table 1, 2 and 5, were taken from the 1995 WMC report. Tables 1 and 2 will be renumbered, and Table 5 will be adopted by reference from Appendix Q of WMC, 1996. Table 1 has been revised to reflect the latest ground water sampling.

Response No. 53
CEQ does not require re-issuing a draft in this case. Modification and clarification in this FEIS meet all legal requirements.

Letter No. 5

United States Department of the Interior

FISH AND WILDLIFE SERVICE
NEVADA STATE OFFICE
4600 KIETZKE LANE, BUILDING C-125
RENO, NEVADA 89502-5093

April 2, 1996
File Nos. EC.32.7
BLM 6-4

Memorandum

To: EIS Project Manager, Carson City District Office, Bureau of Land Management, Carson City, Nevada (Attn: Ron Moore)

From: State Supervisor, Nevada State Office, Reno, Nevada

Subject: Talapoosa Mine Project Draft Environmental Impact Statement

The Fish and Wildlife Service (Service) has reviewed the January 1996 Draft Environmental Impact Statement (DEIS) for Talapoosa Mining Inc.'s Talapoosa Mine Project, Lyon County, Nevada. The DEIS analyzes impacts associated with mining and construction of an open-pit mine, waste rock disposal facilities, ore stockpiles, a valley fill leach pad, process solution ponds, a processing plant, water treatment and supply facilities, and administration support and ancillary facilities. The Proposed Action would disturb approximately 596 acres over a 7- to 10-year period with excavation of an estimated 42 million tons of ore-grade material and 90 million tons of waste rock. Our comments on this project are provided below.

GENERAL COMMENTS

[54] The Service is concerned with limited descriptions of the Proposed Action and potential environmental effects that may occur. Incomplete descriptions are particularly evident in sections pertaining to management of waste rock disposal, effects of development of a pit lake, proposed mitigation measures, and cumulative impacts. Lack of specific information makes it difficult to thoroughly assess potential impacts which may occur from the Proposed Action. We recommend specific descriptions of all development related to mining operations be included and measures that will be used to reduce impacts be described more thoroughly. When possible, quantitative descriptors should be used instead of qualitative measures.

For waste rock disposal, there appears to be no well-defined procedure to prevent the possibility of acid generation. Further, the waste rock management plan presented is based on treating acid generation problems after they have been created, instead of preventing these

Response No. 54

The description of the Proposed Action has been expanded in response to comments. See Chapter 2 of the FEIS for a complete description of the Proposed Action. The Plan of Operations/Reclamation Plan includes a detailed description of the proposed mining activities and is available for review at the BLM's Carson City District Office and the NDEP, Bureau of Mining Regulation and Reclamation.

[55] situations from occurring. The Service recommends designing a waste rock management plan which is less reliant on post-project monitoring, and instead incorporates concepts of prevention, such as sealing waste rock dumps or other engineering controls.

[56] The cumulative effects analysis does not adequately address potential use of the pit lake by wildlife, including potential exposure of birds to trace elements in the water and through the food chain. The document indicates that the pit would receive low waterfowl use because of wetland availability at Lahontan Reservoir. We believe this underestimates the potential for waterfowl use of the pit lake and, therefore, underestimates the potential risk the pit lake poses to wildlife. Ongoing evaluations of wildlife use at pit lakes, including the Anaconda pit lake near Yerington, Nevada, indicate these lakes are used much more extensively than was previously assumed. The Anaconda pit lake is near the Mason Valley wetlands, yet waterfowl use the pit lake extensively. The Service recommends that wildlife use of the pit lake be re-evaluated taking these case studies into consideration. Mitigation measures for minimizing the potential impact to wildlife resulting from use of the pit lake should be clearly described in the final environmental impact statement (FEIS).

[57] [58] We also recommend that other potential mitigation measures to minimize impacts to wildlife be described in greater detail. Consultation with authorities knowledgeable on ecological requirements of the impacted wildlife may help to refine potential mitigation measures that are briefly described in the DEIS. We also recommend that cumulative effects be described in greater detail, including anticipated future drawdown of ground water if mine expansion were to occur.

Specific comments on the DEIS are attached. We appreciate the opportunity to comment on the DEIS for this project. If you have any questions, please contact John Miesner on contaminant issues, Tom Kennedy on general wildlife issues, or Mary Jo Elpers at (702) 784-5227.

Carlos H. Mendoza

Carlos H. Mendoza

Attachment

Response No. 55
The Waste Rock Management Plan has been rewritten and is included in Appendix B of the FEIS.

Response No. 56
See FEIS Appendix D for an evaluation of potential impacts on wildlife associated with the pit lake.

Response No. 57
The implementation of mitigation measures to minimize potential impacts to wildlife would be driven by monitoring of water quality in the pit lake, as noted in the response to Comment No. 44 and described in FEIS Appendix A. Other wildlife mitigation measures that would be employed to reduce project impacts on wildlife include timing of construction activities to minimize impacts. Specific wildlife mitigation requirements are listed in Appendix A.

FEIS Appendix A requires that the water level at Rock Blind Spring be monitored on a regular basis. Modeling suggests this spring, the nearest water source to the project area and the only perennial surface water source in the immediate area, would not be affected by water supply pumping operations. Should pumping reduce or eliminate flow from this spring, however, a solar well will be installed at this site to maintain a water source at the location of this spring. Alternately, water could be trucked to the spring. This latter strategy may require frequent trips to the spring to provide sufficient water, or the construction of a lined pond at the site in order to maintain an available surface water source during the life of the mine.

Response No. 58
A screening level risk assessment was prepared as part of the FEIS and is included in Appendix D of the FEIS. Cumulative effects for wildlife are included in the DEIS and are expanded on in the FEIS Appendix D. Expansion of the mine and any potential effects to ground water from such an expansion is speculative. The DEIS and FEIS are to focus on the indirect, direct and cumulative effects of the proposed action. Since speculative proposals as the one described in the comment are not included in the proposed action, analysis of the type included in the comment are not appropriate. Any mine expansion and its associated effects would need to be handled in another NEPA document.

cc:
Administrator, Nevada Division of Environmental Protection, Carson City, Nevada
Administrator, Nevada Division of Wildlife, Reno, Nevada
Regional Manager, Nevada Division of Wildlife, Fallon, Nevada
Chief, Nevada Office, Army Corps of Engineers, Reno, Nevada
State Director, Bureau of Land Management, Reno, Nevada
Chief, Office of Federal Activities, Environmental Protection Agency, San Francisco, California
Chief, Wetlands Section, Environmental Protection Agency, San Francisco, California
Assistant Regional Director, Interior Basin Ecoregion, Fish and Wildlife Service, Portland, Oregon
Assistant Regional Director, Ecological Services, Fish and Wildlife Service, Portland, Oregon

(all w/atch.)

ATTACHMENT

Talapoosa Mine Project Draft Environmental Impact Statement

SPECIFIC COMMENTS

CHAPTER 2. DESCRIPTION OF PROPOSED ACTION AND ALTERNATIVES

[59] Proposed Mining Operations: Pre-Production Development. Page 2-1. The proposed seed mix to be used for reclamation includes several non-native species (table 2.3). Reclamation of mining areas should have as its goal the restoration of natural ecosystems. The Fish and Wildlife Service (Service) recommends that revegetation of disturbed areas be done using native plants indigenous to the area.

[60] Proposed Mining Operations: Open-Pit Development. Page 2-2. The Proposed Action states that three open pits will be excavated. However, pit characteristics are developed for only one (Main Pit). The Service recommends that a full analysis be done and characteristics of the other proposed pits (Dyke Adit and East Hill) be described. Potential environmental impacts of these proposed pits should be thoroughly described in chapter 4. One specific question to be addressed is whether the pits will contact ground water. If so, mitigation measures should be developed for three pit lakes, not one.

[61] Proposed Mining Operations: Overburden/Interburden Disposal Areas. Page 2-7. The second paragraph in the section for Ore and Waste Rock Characterization states that waste rock will be placed in the waste dump without special handling or segregation in an effort to blend acid generating and acid neutralizing rocks. The project proponent anticipates this procedure will create a net acid neutralizing effect within the waste dump. It would seem that a more well-defined plan based on the timing and volume of the various waste rock types to be removed from the pit could be developed. This would help in the development of a more well-defined waste rock management plan based on preventing acid generation from occurring within the waste dumps. The Service recommends the waste rock dumps be permanently sealed to prevent water infiltration, thereby reducing the potential for acid generation and release.

[62] Proposed Action: Proposed Reclamation. Page 2-23. The third paragraph in the section for Overburden/Interburden Disposal Area Reclamation is vague, and implies that very little may be done to revegetate the disposal areas. We have concerns about acid generation in the waste rock dumps and the waste rock management plan, as indicated above. The Service recommends that the reclamation plan presented in this section: 1) Design and implement a plan to completely seal the waste rock dumps to prevent water infiltration; 2) define plans for placement of growth medium on the waste rock dumps; and 3) define plans to implement revegetation in order to prevent erosion and protect the dump seals. These comments also refer to the section on Geology and Minerals: Potential Mitigation and Monitoring of Resources on page 4-35.

Response No. 59
The Nevada Interim Standards for Successful Revegetation allow for the use of non-native species in the seed mix for the establishment of the reclaimed disturbed plant community to meet post-mining objectives for soil stabilization and providing wildlife habitats.

Response No. 60
See Response to Comment No. 5. The DEIS describes the three pits on pages 2-2 and 2-7, Table 2.1 and Figure 2.2. Both the Dyke Adit Pit and the East Hill Pit would be constructed to depths with a bottom elevation greater than 5,000 feet. Since ground water is encountered at below 5,000 feet in elevation, both of the smaller pits are expected to be dry. A pit lake of approximately 14 acres will be formed in the main pit, and environmental impacts are described in Chapter 4 and Appendix D of the FEIS.

Response No. 61
See response to Comments No. 8, 10 and 55, and page 2-5, Appendix B of the FEIS.

Response No. 62
Page 2-17 of the FEIS provides that the final surfaces would be contour-scarified to prepare a suitable seed-bed and the seed would be applied during the optimum "seeding window."

The FEIS (page 2-17) provides that test plot programs will be developed to refine specific reclamation needs and in developing site-specific reclamation treatments for the proposed mine facilities. The details for placing the growth medium and specific revegetation prescriptions will be the emphasis of the test plot program. See response to Comment No. 50 for additional information.

CHAPTER 3. AFFECTED ENVIRONMENT FOR PROPOSED ACTION AND ALTERNATIVES

[63] Threatened, Endangered and Candidate (TEC) Species: Plants and Animals. Pages 3-12 to 3-15. As of February 28, 1996, the Service has modified its policy on candidate species (61 Federal Register 7596). With publication of the new candidate policy, species formerly identified as category 2 candidates are no longer regarded as candidates for listing. However, the Service remains concerned about these species (now informally known as "species of concern") and recognizes that further biological research and field study are needed to resolve the conservation status of these taxa. Many of these species of concern may eventually be found to not warrant listing, either because they are not threatened or endangered, or because they do not qualify as species under the definition of the Endangered Species Act of 1973, as amended. Other species may become candidates for listing in the future. We recommend this section of the document be revised to reflect changes in candidate status.

[64] Geology and Minerals: Acid Rock Drainage. Page 3-46. We question whether data presented in appendix E support conclusions that were reached in the section on Acid-Base Accounting (paragraph four). As shown in table E.2 in appendix E (Summary of Technical Data for Geology and Water Quality and Quantity), approximately 72 percent of the waste rock to be placed in dumps is acid generating and, as shown in Figure 3.7, almost all waste rock generated from deeper strata in the pit will be of acid generating types. Therefore, it does not seem likely that sufficient quantities of acid neutralizing rock types will be available to create a net acid neutralizing climate within waste rock dumps in later periods of mining operations. It has become evident at other Nevada mine sites that simply creating a "net neutralizing capacity" does not prevent liberation and mobilization of metals from a waste rock dump. At these sites, metals are flushed in precipitated forms which are still available for biological processes. The Service recommends these concerns be addressed and that a more proactive effort in preventing potential liberation of metals and acid in waste rock dumps be developed and described for the final environmental impact statement (FEIS).

[65] Water Quality and Quantity: Springs, Seeps, and Wells. Page 3-51. In reference to information presented in the section on Springs and Seeps, the Service is concerned that actual ground water drawdown during mining operations may potentially impact Rock Blind Spring to a greater extent than found in trial runs of pumping the basalt aquifer. We recommend specific mitigation measures be developed to prevent desiccation of the spring (see comments on chapter 4: Wildlife and Fisheries Resources: Potential Mitigation and Monitoring of Resources).

Response No. 63

As noted in this comment, as of February 28, 1996, the U.S. Fish and Wildlife Service (USFWS) modified its policy on candidate species. Species formerly identified as Category 2 Candidate (C-2) Species are no longer regarded as candidates for listing. Under the new policy, as outlined in the February 28, 1996, Federal Register (61 Federal Register 7596) Table 3.4 in the DEIS (p. 3-15) would be changed. Please see Appendix G or the revised table.

Response No. 64

See responses to Comments No. 7, 8 and 9. The figure of 72 percent referred to in the comment is in error. This figure may refer to the amount of sulfide-bearing rock in the block model, which is 72 percent. Although rock may be sulfide, it does not necessarily generate acid. Static and kinetic testing are the only ways to determine whether sulfide rock has an acid-generation potential. This testing has been conducted, and static testing shows that the Lower Kate Peak formation (Tka) has the potential to generate acid. This formation comprises 54 percent of the rock total, not 72 percent as noted in the comment. A revised Waste Rock Management Plan has been prepared and is included in Appendix B of this FEIS.

Response No. 65

The DEIS states that Rock Blind Spring would be monitored on a regular basis (p. 4-7). The initiation and frequency of monitoring, and the triggering of mitigation measures are described in Appendix A.

CHAPTER 4. CONSEQUENCES OF THE PROPOSED ACTION AND ALTERNATIVES

[66] Wildlife and Fisheries Resources: Potential Mitigation and Monitoring of Resources. Page 4-7. We recommend potential mitigation measures be described in greater detail. For instance, it is unclear how a solar well will maintain water level at the spring. We also question whether an above-ground water supply could adequately mitigate for a below-ground source. This method would seem cost prohibitive due to frequency of trips involved to supply water to the spring. Also, roots of hydrophytic vegetation at springs are exposed to water at all times. An above-ground source would not likely provide the same degree of soil saturation, leading to reduction of primary production. This could alter use of the spring by wildlife. The FEIS should also provide specific details on implementation of monitoring procedures at Rock Blind Spring, including frequency of monitoring.

[67] Wildlife and Fisheries Resources: Unavoidable Adverse Impacts. Page 4-7. Mining activities may necessitate the removal of vegetation during construction of roads and other activities. Destruction of bird nests and/or their contents may result if these actions are conducted during the avian breeding season. Such destruction may be a violation of the Federal Migratory Bird Treaty Act. We recommend that either vegetation removal be done outside the avian breeding season, or that surveys be conducted prior to brush removal to ensure that nests are not harmed or that mining activities do not result in nest failures.

[68] The Service is concerned about loss of cliff habitat in the area that supports an active prairie falcon nest. Sightings of other prairie falcons and an inactive golden eagle nest near Rock Blind Spring indicate this area may be a significant resource for raptor nesting. We support conscientious efforts to mitigate for loss of nest sites. Alternate nest sites on pit walls should not be encouraged because of possible exposure to contaminants once the pit fills with ground water. We suggest more appropriate solutions be examined and Nevada Division of Wildlife personnel be consulted to determine whether alternate sites are available and could be enhanced for raptor nesting.

[69] Threatened, Endangered, and Candidate (TEC) Species-Animals. Page 4-9. The Service encourages efforts to minimize disturbance of bat populations in the project area. We suggest bat roosting sites that will be impacted by the Proposed Action be replaced by alternative suitable roosting sites on a 1:1 basis and improved with bat-gates. Closure of adits should be done in the fall, between mid-August to September, to avoid harassing bats during the reproductive season in the spring and during winter hibernation (P. Brown, Brown-Berry Biological Consulting, personal communication, March 22, 1996). Consultation with individuals such as Pat Brown may help to define additional suitable methods.

Response No. 66
See response to Comments No. 57 and 65. As noted in the response to Comment No. 57, a solar (or other power source-driven) well will be the most effective means of mitigating impacts to Rock Blind Spring, should such impacts be detected by monitoring. Such a well could be drilled to a depth necessary to maintain a flow similar to that naturally occurring at this spring.

Response No. 67
TMI has not planned to schedule construction activities so as to avoid disturbance to nesting avian species, particularly since the nesting season may extend for five to six months of the year (potentially, March into August, when both early nesting species and second nesting attempts are considered). Much of the area that would be disturbed has been subject to intensive exploration activity. Potential nesting habitat in these areas is limited, and impacts to nesting bird species would be minimal to low. TMI will schedule construction activities to the extent possible so as to minimize impacts to avian nesting habitat during the nesting season.

Response No. 68
Continued pit lake water quality investigations would determine the advisability for creating raptor nest sites on the pit walls of the Talapoosa Pit. Available cliffs and outcrops in and near the project area were apparently the sites of two active prairie falcon nest sites in 1995, including the nest site in the Talapoosa project area. The golden eagle nest site located near the project area was not active in 1995, and apparently has not been active in recent years, judging by the condition of the nest itself and the lack of whitewash on the nest outcrop. Five stick nests had been built on this outcrop, but all were destroyed by a range fire. Additional outcrops are available in the eastern Virginia Range and could serve as alternate nest sites for the pair of prairie falcons found nesting in the Talapoosa project area in 1995.

Response No. 69
The procedure for closing shafts and adits occupied by bats discussed in the DEIS (p. 4-9) follows the recommendations of Pat Brown, Brown-Berry Biological Consulting. As noted in the comment, late summer to early fall is the recommended time to perform this procedure. Additional shafts and adits exist in the general area and represent alternate roosting and hibernation sites. These sites will be bat gated to minimize disturbance to bats utilizing these sites. See FEIS, Chapter 3 (Errata) for modification of DEIS, page 4-9.

[70] We also support efforts to minimize impacts to burrowing owls during construction activities. We suggest that if active burrows are found, construction in these areas be postponed until after young individuals are independent of their parents, which may not occur for at least 2 months after fledging (G. Herron, NDOW, personal communication, March 22, 1996). We recommend that after this time, burrows be dug out by hand to avoid smothering any owls which may still be underground. Artificial burrows should be installed in areas with conditions similar to active burrow sites and near adequate food resources.

[71] Water Quality and Quantity. Page 4-36. The Service is concerned about direct impacts the project may have on ephemeral streams in the area. This project will require discharge of material into waters of the United States. Such discharge is regulated by the Army Corps of Engineers (Corps) pursuant to section 404 of the Clean Water Act. We recommend the applicant contact the Corps' Reno Field Office, 300 Booth Street, Room 2120, Reno, Nevada, 89509, (702) 784-5304, regarding the need for a permit.

[72] We also recommend defining and implementing other mitigation measures to reduce impacts that would limit wildlife use of the affected ephemeral drainages and their associated habitat. One measure that could be developed would be to expedite riparian growth in artificial channels by planting young willow trees or other riparian vegetation native to the impacted area, if any exists. Diverted stream courses should be located in areas where mining activity will not inhibit wildlife use.

[73] Water Quality and Quantity: Direct and Indirect Impacts of the Proposed Action. Page 4-37. We are unclear on how information was developed for the section on Pit Lake Chemistry. Tables F.3 and F.4 in appendix F (Supporting Information: Geology and Water Quality and Quantity) present input data and model results for the pit lake which will form as a result of this project. It is unclear in these tables and in the text how water entering the pit lake from various geologic zones (with pH values less than 7.0) can combine to have a pH value greater than the maximum value measured (greater than 8.0). Intuitively, it would seem that when waters of differing pH are combined, the resulting pH value would fall somewhere within the range of high and low values measured. It would also seem reasonable that chemistry of the ground water entering the pit will be affected by characteristics of the pit walls. According to table E.2, approximately 73 percent of the pit walls will be acid generating. As depicted in figure F.1, most of the ground water entering the pit enters through lower strata that are acid generating and will not come into contact with acid neutralizing rocks in the upper strata of the pit.

[74] Water Quality and Quantity: Direct and Indirect Impacts of the Proposed Action. Page 4-42. In the section on Seepage from Reclaimed Dumps, the evaluation of predicted conditions within waste rock dumps assumes acid generation will occur only under conditions when water flows through the dumps. We believe this assumption to be in error. Acid generation has the

Response No. 70
No active burrowing owl burrows were found during 1995 surveys of the project area. Evidence of past burrowing owl use was detected in the southern portion of the project area. This area would be minimally affected by the Proposed Action. If active burrows are found in an area scheduled to be disturbed, the operation would be required not to disturb the nest site and would contact the BLM Authorized Officer. Occupied burrows would not be disturbed during the nesting season. Following the nesting season, these sites would be hand excavated to ensure no owls are entombed by construction activities. If burrowing owl sites are disturbed, artificial burrows could be installed in suitable habitat not scheduled for disturbance. Such burrows will be installed on a 2:1 ratio, relative to nests disturbed as described in FEIS Appendix A.

Response No. 71
An application for a Section 404 permit has been submitted. See responses to Comments No. 18 and 26 and Local Surface Water Systems section of Chapter 4 of the FEIS, page 4–22.

Response No. 72
Riparian habitat near the project area is very limited. An approximately 25-yard-long strip of wild rose borders Rock Blind Spring and a four-trunked cottonwood tree (approximately 25 feet tall) grows in the drainage southeast of Rock Blind Spring. Neither of these sites is within the actual project area. The project area lacks riparian vegetation. Drainages in the project area are primarily wetted only by snow melt and storm runoff. Planting willows or other riparian species in artificial drainages or diversion ditches would not be practical given the low water table and runoff totals that occur in the project area. (Mean annual average precipitation at both Fallon and the Lahontan Reservoir was 5.31 inches for the period 1961-1990. Estimated precipitation in the project area is higher, approximately eight inches annually.)

Response No. 73
See response to Comment No. 3. A complete discussion of the development and assumptions for the pit lake model is included in Chapter 4 of the FEIS, Modeling of Pit Lake Chemistry, page 4–46, and Section 8.6 of v.1, Text of Figures of WMC, 1996.

Response No. 74
See responses to Comments No. 10, 11 and 35. See Seepage from Reclaimed Waste Disposal Areas, FEIS pages 4–43 and 4–44.

[74] cont. potential to occur whenever acid generating rock types are exposed to oxygen and humidity (SRK, Inc. 1989). In this situation, acids and leached metals may accumulate within the waste rock dump until they are flushed by infrequent periods of high runoff. While the assessment is correct in suggesting that average daily runoff exiting waste rock dumps will be very low, it would be more accurate to state that flows exiting waste rock dumps will be periodic in nature and associated with snow-melt and precipitation events. This condition will liberate any acids and metals which have accumulated since the previous runoff period. Depending on magnitudes of these runoff events, flushing scenarios may liberate more leachate than proposed. In this context, we recommend table F.5 in appendix F (Supporting Information: Geology and Water Quality and Quantity) be restructured to address this concern.

[75] Cumulative Effects Analysis: Water Quality and Quantity. Page 4-45. It is unclear whether ground water levels will be impacted from dewatering operations over the life of the mine. The FEIS should indicate how long it will take for ground water to equilibrate following mine closure and describe possible impacts to surface water levels in the Carson River.

[76] The Service is concerned about the possibility of Churchill Valley aquifers becoming over-allocated if mining operations were extended for additional years. This may affect the Carson River aquatic ecosystem by significantly reducing river flows. We recommend that future use of ground water by the proposed mining project and future municipal developments in the area be described more thoroughly under the section on Cumulative Effects. A specific item of discussion in this section should be whether there will there be a net deficit in ground water recharge.

Response No. 75
See responses to Comments No. 23, 31, 32, 36 and 41.

As discussed in response to Comment No. 36, the impact to the aquifer in the Silver Springs area is expected to be less than 0.1 feet after 20 years of water supply pumping, which is twice the expected life of the project. The Carson River is a losing stream in the area. During periods of high flow in the spring, the water from the Carson River fills the Lahontan Reservoir, causing a significant water table rise in the aquifer around Silver Springs. This water table rise is an order of magnitude greater than the decline (0.1 feet) simulated by the modeling effort for the Talapoosa project.

Response No. 76
See Response to Comment No. 23.

REFERENCES

Steffen Robertson and Kirsten (B.C.), Inc. 1989. Draft acid rock drainage technical guide. Volume 1. Prepared for British Columbia Acid Mine Drainage Task Force. 221 pp.

U.S. Fish and Wildlife Service. 1996. Endangered and threatened wildlife and plants; review of plant and animal taxa that are candidates for listing as endangered or threatened species. Federal Register 61(40): 7596-7613.

Letter No. 6

Building and Construction Trades Council of Northern Nevada

Chartered June 5, 1928

Affiliated with: Nevada State AFL-CIO
Building and Construction Trades Department, AFL-CIO

1150 Terminal Way · Reno, Nevada 89502 · (702) 322-3361

NEVADA WORKS BEST WHEN WE SAY... UNION YES

BUR OF LAND MGMT. CARSON CITY DISTRICT OFFICE APR 1 2 19 PM '96

Representing: Asbestos Workers, Boilermakers, Bricklayers and Allied Craftsmen, Carpenters, Cement Masons, Electrical Workers, Elevator Constructors, Floor Coverers, Glaziers, Hod Carriers, Iron Workers, Laborers, Millwrights, Operating Engineers, Painters and Allied Trades, Piledrivers, Plasterers, Plumbers, Roofers and Allied Workers, Sheet Metal Workers, Sprinkler Fitters, Teamsters

March 28, 1996

BLM, Carson City District Office
Ron Moore, ELS Manager
1535 Hot Springs RD
Carson City, NV 89706

Dear Mr. Moore,

The Building and Construction Trades Council of Northern Nevada (BCT) is an organization of thousands of skilled construction workers who live and work throughout Northern Nevada. Our many members and their families, hunt, fish, hike, and otherwise enjoy the sporting and recreational opportunities of northern Nevada, including the enjoyment of these activities son BLM lands, including the areas in and near the vicinity of the proposed Talapoosa Mine.

Attached are the BCT's comments on the DEIS for the proposed Talapoosa Mine. Please send any further materials regarding this project, including the FEIS, to our address below:

Richard Houts, Secretary-Treasurer
Building and Construction Trades Council
of Northern Nevada
1150 Terminal Way
Reno, NV 89502

Very truly yours,

Rich Houts
Secretary Treasurer

RH:mw/opeiu #29 afl-cio

encl.

COMMENTS ON THE DRAFT ENVIRONMENTAL IMPACT STATEMENT FOR THE TALAPOOSA MINE PROJECT

AIR QUALITY IMPACTS

Access to the site is by unpaved road. The large amount of traffic from workers' vehicles, vendors, deliveries, and export of mine ore will produce significant road dust impacts. The DEIS should have discussed paving of this road, and the haul road, as an air quality mitigation measure. Paving main roads also reduced wear and tear on vehicles and is cost-effective. The Kennecott Utah tailings expansion recently studied and approved the paving of a main haul road, concluding it would reduce air quality impacts and would also save money, by reducing the impact on equipment and by allowing faster truck haul speeds.

Crushers and conveyors may be equipped with water sprays for dust control (2-10), this is an inferior dust control measure. The DEIS should have discussed the alternative of using baghouses and enclosing crushers and conveyor transfer/drop points.

The DEIS failed to estimate the annual, or daily and hourly peak emissions of any air pollutant, including particulate dust from the various mine activities, or the emissions from combustion sources at the mine, or the tailpipe emissions from mine equipment. The DEIS failed to establish that these air pollution sources will not cause or contribute to a significant adverse impact that should be mitigated.

[77] Included in the dust emissions from this mine, will be certain amounts of toxic and hazardous materials also present in the ore and soils, such as silica and metals. The retort and lab furnace may also be sources of toxic air emissions. The DEIS failed to discuss this potentially significant impact. (3-40)

The DEIS claims that because levels of particulate are within national standards, there is no significant air quality impact. The DEIS fails to consider that the current national standard for particulate is currently under review, and published reports indicate that the national standard will be sharply lowered for fine particulate. The increases in particulate (38.7 ug/M3) attributable to the project is comparable with the levels of particulate increases that have caused significant adverse health impacts, according to several recent studies.

The DEIS was deficient in failing to provide an annual PM 10 concentration for the project area, thus failing to insure that significant adverse impacts on human health may occur from the project. (3-4)

SURFACE WATER QUALITY IMPACTS

Collection and solution ponds are designed to contain a 25-year, 24 hour storm (2-7, 26). While this may be the minimum to comply with state standards, it is insufficiently conservative
[78] to provide adequate environmental protection. There is about a 50% chance of this size storm occurring within the mine's life. It is not a conservative approach to design a mine and allow a 50% chance of an overflow of a solution pond, which will contain many toxic and hazardous

Response No. 77

Access to the site. The proposed operations at Talapoosa meet all requirements of the NDEP-BAQ as found by their air quality operating permit review process. Vendors, workers, etc. would gain access to the site through the use of an unpaved road. This access road is not proposed as a haul road to be used for transporting overburden or ore as part of mining operations. The relative minimal vehicle usage of this road is not expected to create adverse impacts.

An expected increase in vehicle speed and reduced wear of vehicles, which would result from paving an access road, is not a subject for consideration in an EIS.

The haul roads were accepted as unpaved. Fugitive dust will be controlled at all times by chemical stabilization, water or other methods as allowed in TMI's air quality operating permit dated July 26, 1996.

Dust control for crushers and conveyors. The proposed crushers and conveyors are planned to be equipped with baghouses and water sprays to reduce fugitive dust emissions. Emission estimates performed by the NDEP-BAQ used control efficiencies of baghouses and water sprays. Refer to the "Proposed Processing Facilities" section on page 2-10 of the DEIS.

Annual, daily, hourly emission rates. Emission rates for appropriate time periods related to applicable standards were calculated by NDEP-BAQ in completion of emissions estimates. This document is available to the public. The associated emission limitations are found in Talapoosa's air quality operating permit dated July 26, 1995.

Toxic and hazardous materials. There are no regulatory limits at this time pertaining to hazardous air pollutants (HAPs), if any, associated with fugitive dust and other emissions at the mine site. The significance cannot, therefore, be established. The dust is regulated by the NAAQS for PM_{10}.

National Ambient Air Quality Standard for particulate. Currently, the only standard related to particulates is for PM_{10}. Any other particulate-related standard is in draft stage, subject to comment. All predicted ground level concentrations were compared to the current National Ambient Air Quality Standards (NAAQS) for PM_{10}. It is impractical to speculate on future changes that could occur to the NAAQS.

Annual PM_{10} concentrations for the Project Area. Annual predicted concentrations of PM_{10} were not addressed in the DEIS. The 24-hour predicted concentration of PM_{10} was below the allowable concentration for an annual average as provided for by NAAQS. The annual concentration would, therefore, be

[78] cont. substances, and which will harm the environment. A greater freeboard for the ponds should have been discussed as an alternative design of this project.

[79] The proposed sizes of these ponds should have been provided in the DEIS, along with a discussion of the size of the drainage areas which will empty into each pond. The DEIS also failed to provide and adequate discussion of the size of the possible large storms in the mine area, including a warm rain-on-snow storm event. This is a potentially important issue since there is a moderate to high erosion potential at this site. (-7)

ACID ROCK DRAINAGE

The Mine roads will be surfaced with waste rock (2-10), but the waste rock is acknowledged to contain acid generating properties, according to pp. S-5, 2-7 and 3-49. This means that the rainwater runoff and leachate from the road will contain elevated levels of heavy metals and surface, and will potentially cause pollution of any surface waters that are contacted, and it would also tend to taint soils over which road runoff flows.

[80] Likewise, 80% of the ore is pyrite-bearing rock, which has a strong potential for production of acid rock drainage. (3-40) Meteoric water testing determined that elevated levels of chromium, iron and sulfate were produced by the testing, and that the resulting concentrations in ore leachate of aluminum, cadmium, iron, lead, and manganese would vastly exceed drinking water standards. Additional testing showed that sulfate, aluminum, arsenic, manganese and nickel will be produced in the leachate from weathered waste rock and pit walls.

[81] These results are troubling enough. But in addition to violating drinking water standards, chronic and acute water standards have been established for many of these metals and toxic materials, and those standards in most cases are far more stringent than the drinking water standards. This means the water quality violations are far more serious than implied in the DEIS. For instance, the copper concentration in the leachate, as shown in Table E.8, is an average of .117. This is compared to a drinking water action of "1" and thus appears to be safe. But the facts are that the acute water quality criteria for copper is .018, which is vastly exceeded by the average value of copper in the leachate.

The DEIS did present the water quality standards at Table 3.18, but it did not compare these standards to the metal that will be present in the leachate. The DEIS should have compared to the projected leachate concentrations of metals and toxics to the acute and chronic water quality criteria, rather than to the relatively more lenient drinking water standards. It appears that water criteria for antimony, cadmium, chromium VI, lead, mercury, silver, and zinc would be exceeded by the average concentrations presented in Table E.8.

[82] The future problems at this site from ARD will probably come from animal and aquatic life that is exposed to the leachate. Thus the leachate's metals concentrations should also be compared to the water quality criteria, in addition to the drinking water standards.

[83] In summary, because the vast majority of ore is pyrite-bearing, ARD will likely present future problems. At some sites, generation of ARD can be effectively controlled by highly

Response No. 77 (continued)

well below the NAAQS for PM_{10}. NDEP-BAQ predicted by dispersion modeling that the maximum annual concentration of PM_{10} at the point of closest public access would be 3.6 μg/m^3 located at a receptor 275 feet west-northwest of the source. NDEP-BAQ assumed an annual background PM_{10} concentration of 9.0 μg/m^3. The combined annual predicted concentration would then be 12.6 μg/m^3. The predicted annual concentration is below the NAAQS and Nevada standard of 50 μg/m^3.

Response No. 78

See page 2-9, column 2, paragraph 4 of the DEIS. The collection and solution ponds are devised to contain a 25-year, 24-hour storm as required by state standards. Additionally, diversion structures would be designed to divert runoff from the 100-year, 24-hour storm event around the leach facilities. The leach system would be able to withstand the 100-year, 24-hour storm event, as required by State of Nevada regulations.

Response No. 79

The pond sizes will be provided in the FEIS, as well as the design storms. See page 2-6 and Local Surface Water Systems section of Chapter 4 of the FEIS, page 4–22.

Response No. 80

The waste rock that would be used to surface mine roads would come from initial pit opening and would be from oxide rocks with no acid-generating potential. Roads would be constructed on material at the surface which are not ARD producing.

Response No. 81

See response to Comment No. 7. The MWMP test, with its short (24-hour) time frame and large volume of leaching solution used, gives results that have little relevance to the long-term chemistry of waters in a low-rainfall, arid site, such as the proposed mine site. The chief purpose of the MWMP test as presented in the EIS is to screen rocks to decide which are potential acid rock drainage producers and so should be studied further in static and kinetic tests.

The State of Nevada uses the drinking water standards for setting maximum contaminate limits (MCLs). Table E.8 of the DEIS does compare the applicable Nevada standards to the MWMP test results. The MWMP results are also compared to 2X drinking water standards. The DEIS uses this comparison to determine which analytes could be leached rather than the more liberal 10X drinking water standards allowed for in the NDEP guideline.

Response No. 81 (continued)
The comment states that "water quality criteria for antimony, cadmium, chromium VI, lead, mercury, silver and zinc would be exceeded by the average concentrations presented in Table E.8." This statement is not correct. Total chromium (not Chrome VI as stated in the comment), mercury, silver and zinc do not exceed applicable standards. Antimony appears to exceed the standards because the detection limit of 0.5 mg/l is higher than the standard of 0.006 mg/l. The actual value for antimony is unknown, half the detection limit was used in the table.

Histograms showing the distribution of data from the MWMP test indicated that with the exception of aluminum and iron, approximately 75 percent of the samples fall below the 2X drinking water guideline while only the outlyers exceed the criteria (v. 4, Appendix O, WMC, 1996).

Response No. 82:
Appendix D of the FEIS provides a screening level ecological risk assessment for metals concentration of the pit lake.

Response No. 83
See response to Comment No. 8.

[83] cont. effective reclamation procedures that reduce rainwater seepage into the former waste rock piles. But at this site, there is a very poor supply of soil available for reclamation. This shortage of good soils will interfere with achieving effective reclamation. Ineffective reclamation will allow accelerated production of ARD.

The combination of ARD favorable conditions, and unfavorable reclamation conditions, combine to create a high probability of undue degradation of the public lands to be mined.

[84] TMI should be required to post a bond to pay for monitoring its reclaimed areas for virtually hundreds of years, because ARD may take many years to develop. The lack of adequate soils on site with which to accomplish a meaningful reclamation effort will increase the possibility of ARD being produced in the future.

WATER USE

The Project will use up to 450 million gallons of water every year (S-5, 2-19). This is a significant unmitigated impact. Groundwater from beneath public lands is part of the public trust and the depletion of about one-half billion gallons over the mine's life is a adverse impact that should be compensated for by the developer. Loss of this amount of groundwater is an undue degradation of public property.

[85] A water pipeline may be constructed to bring in additional water from the Silver Springs Water District (2-19). But the DEIS does not describe the potential impacts on the customers of the District, or the impacts of the pipeline construction, or the impacts of the potential construction of an electrical substation.

The DEIS does not discuss what other alternative water sources are under consideration if the Silver Spring District does not provide additional water.

The DEIS states that the Lyon County Master Plan requests that the Nevada State Engineer should conduct a hydrologic study of the potential depletion of the County water basins and the related aquifers. The Mine projects will further deplete the area's aquifers, but no additional hydrologic studies are contemplated in the DEIS, despite this suggestion in the County Plan. The DEIS does not demonstrate how the mining project will comply with this element of the County Plan.

Nevada has issued an Order of Designation that limits water uses. The DEIS has not demonstrated that the mine's use of water, including consumption of process water, and losses of water through evaporation in the open pit left after mine closure, will comply with this Nevada State order. (3-22)

GROUNDWATER AND PIT WATER IMPACTS

[86] The waste rock and pit wall will release many heavy metals and toxic materials that will degrade groundwater and pit water quality. (S-5, 2-7)

Response No. 84

Monitoring and potential mitigation of the pit lake and overburden/interburden disposal areas will be completed in accordance with the Monitoring and Mitigation Plan (Appendix A) and state permit requirements. Reclamation will be completed in accordance with the approved Reclamation Plan. BLM and the state requires bonding for reclamation, which will be maintained until all requirements are met.

Response No. 85

As described in Response No. 23, any potential impacts to the Churchill Valley aquifer for the additional water would be prevented as part of the State Water Rights Adjudication/Appropriation process. The State Engineer has established the basin as a designated basin for the express purpose of protecting existing rights within the designated watershed. Lyon County has issued a Special Use Permit to TMI. The Lyon County Master Plan policies were considered by Lyon County prior to issuance of the Special Use Permit. See FEIS Chapter 2 Preferred Alternative, Ancillary Facilities (page 2-12) for the specific proposal, and FEIS Chapter 3, Errata changes to DEIS pages 4-8 , 4-13 and 4-31 for the analysis of potential impacts associated with the proposed water line and power line.

Response No. 86

See response to Comments No. 3A, 7, 46 and 64.

[87] The pit water is predicted to exceed drinking water standards for several metals, arsenic, and sulfate after mine closure (4-7). This is a violation of state law, and water quality standards and an unmitigated impact that should be mitigated under NEPA. (S-6)

[88] The DEIS does not describe how the disposal of human wastes will be accomplished, through a septic field or otherwise. Since there will be over 100 workers employed at the mine, there will be about 2 million gallons of sewage generated annually. This is a significant amount, and disposal through a septic infiltration system could degrade groundwater. The DEIS does not describe a safe method of disposing of the human generated waste water and sewage from this facility. Nor does the DEIS discuss the suitability of the project area for a large septic field.

HABITAT IMPACTS

The open pit will not be filled. This means there is a net loss of the values of 113 acres of public lands. This is a loss of recreational values and habitat values, and is significant and adverse. The developer should be required to either fill the pit, or to acquire other lands and dedicate the acquired lands into the public trust, or to improve the habitat and recreational values of existing public lands to compensate for the loss of 113 acres, to insure no net loss of public lands.

[89] The project may degrade or destroy 176 acres of low and mountain sagebrush habitat. There is no indication that reclamation of the mining area will include re-establishment of this type of habitat, which is important to many species including pygmy rabbit. (3-8, 14) As discussed below, instead much of this area will be reseeded with non-native species. The loss of almost 200 acres of sagebrush and its replacement with non-native species is a significant adverse impact that could be avoided and mitigated.

[90] Rock Blind Spring may be degraded by the project. This Spring is one of the only water sources in the area. This Spring supports mule deer, chukar, wild rose which is a food supply for non-game birds (3-11, 12). The DEIS claims at one point that this Spring draws from a perched aquifer, but perched aquifers are often interconnected with deeper groundwater aquifers that would be affected by the Mine's dewatering and water supply pumping efforts. The DEIS notes that the underlying rock is deeply fractured which would tend to promote connections between perched aquifers and underlying aquifers. (3-52)

The DEIS concedes that Rock Blind Spring may be harmed by the project's water pumping. The suggested mitigation is a solar well and/or trucking in water. But the DEIS does not provide sufficient discussion of these proposed mitigations to insure that the impacts would be mitigated to insignificant levels.

[91] The DEIS conceded that the project area supports raptors but this issue is not discussed adequately. (3-11) It does not appear that the project site was surveyed for Altered Andesite Buckwheat, or White-faced Ibis, which are candidate species.

[92] The project will destroy habitat for several candidate bat species but no mitigation is presented. This is an undue impact and mitigation should be mandated in the EIS (4-8)

Response No. 87
See Response to Comment No. 46.

Response No. 88
Human wastes would be tanked and treated, with the resulting liquid used as make-up water in the barren solution for application to the heap.

Response No. 89
The area of the Talapoosa Pit, affecting 147 acres, would be surrounded by a safety berm but would not be reclaimed. The remainder of the project site would be reclaimed. Relative to surrounding available habitat, and considering the relatively low recreation and wildlife use of the area, the loss of 147 acres is considered a low impact. Reclamation activities would have the goals of returning the site to a beneficial post-mining land use that is similar to and compatible with pre-mining uses of the site. Reclamation efforts would focus on stabilizing the site in order to reduce or eliminate erosion and establish a beneficial post-mining use of the area, while also ensuring public safety. Since vegetation communities develop in stages (seral stages), a native, pre-disturbance community may not become established until the site is stabilized and soil conditions can support a later seral stage community. As planned, reclamation will set the stage for colonization by native species, while minimizing soil loss due to erosion and also establishing a community which will support use as wildlife habitat.

The "no net loss" policy has been applied to wetlands, but no such policy exists for public lands or other habitats in general. No wetlands would be dredged or filled by the proposed action.

Response No. 90
See responses to Comments No. 24, 65 and 66. Modeling suggests Rock Blind Spring will not be impacted by the Proposed Action, but a monitoring program will be instituted to document potential impacts. Should this monitoring indicate the spring is being impacted, mitigation measures will be implemented to maintain flow and habitat at the spring as describe in FEIS Appendix A.

Response No. 91
Raptors recorded in the area are discussed in the DEIS Affected Environment (p. 3-12). The area represents potential hunting (foraging) habitat for a variety of raptors. The only raptor nesting documented in the area is also discussed in this section of the DEIS. Potential nest sites in or near the proposed project area are limited to cliffs and outcrops, since no trees occur in the area. A single, four-trunked cottonwood tree grows in one canyon northwest of the project area,

Response No. 91 (continued)
and junipers occur higher in the Virginia Range, to the west and northwest. Outcrops in the area were searched for additional raptor nests, and those found are noted in the document.

The altered andesite buckwheat, as its name implies, occurs on altered andesite soils. As noted in the DEIS (p. 3-13), no altered andesite soils are known to occur in the proposed project area. No such soils and no altered andesite buckwheat plants were noted during soil and vegetation surveys of the area.

White-faced ibis forage in marshes, wet meadows and agricultural areas. The species nests in colonies in wetland/marshland habitats. No such habitats occur in the project area. The species could be attracted to the pit lake following formation of that water body. Factors affecting wildlife use of the pit lake, and monitoring and mitigation measures that could be implemented to minimize potential hazards created by the lake, are discussed in the responses to Comments No. 4 and 56.

Response No. 92
Mitigation for the loss of bat habitat is discussed on page 4-9 of the DEIS. See also the response to Comment No. 69.

POST-CLOSURE IMPACTS
EROSION

[93] The final rock disposal areas will have slopes of 2-1 to 2.5-1 (horizontal to vertical). These are too steep and will produce excessive erosion. (5-2) The DEIS claims that in several instances steep slopes have been successfully reclaimed. But the citations for these claims of success are from 4 to 6 years old. In one case, the natural slope of the area mandated a steep contour. The DEIS did not demonstrate that the natural slopes in the TMI vicinity mandate use of steep slopes of the waste rock areas, nor did the DEIS describe more recent inspections of the other reclaimed mine sites to demonstrate that over the long term, slopes this steep may be successfully reclaimed. There are abundant claims in other mining literature and BLM correspondence that slopes of at least 3:1 are needed to facilitate successful revegetation. Further, the DEIS should have described remedial measures should recla00mation fail on the steep sides of the reclaimed waste rock piles.

[94] A less severe slope should have been discussed and presented as an alternative project design. A gentler slope was presented as an alternative in the BLM EIS for the Bald Mountain Mine expansion, for instance, so this is a reasonable request with a precedent within Nevada BLM'sNEPA evaluations of mines.

There is apparently not enough growth medium available to cover all of the degraded areas that will need reclamation. Soil types in the project area are often shallow, stony, and of poor quality, and not well suited for reclamation. At previously disturbed sites, even after many years, the areas have not revegetated naturally. (3-24)

[95] The DEIS claims that roads will not need growth medium since stockpiled soil will bladed back on the roads. But the road bed underlying these soils will be greatly compacted by about 10 years of traffic and may be unsatisfactory for reclamation. The soi0ls that would be replaced on the roads, will also be degraded from several years of sitting in the open, exposed to sun, and wind and water erosion. The DEIS admits that the stockpiled soil quality will decline. (4-3)

[96] There is a reference to using sewer plant sludge as a reclamation material (2-23). Far more information is needed about this method and the source of the sludge, since sewage sludge may contain a variety of undesirable materials. The DEIS discussion of this alternative was inadequate considering the potential impact.

[97] Crested Wheatgrass is proposed as a reclamation planting (2-24). The DEIS should have discussed whether this plant type is a native materials. Reclamation with non-native grasses is an adverse impact that deserves a detailed analysis.

This is an especially significant impact, since to a certain degree, the project will involve the losses of various types of sagebrush habitat, which will ultimately be replaced with non-native wheatgrass.

Response No. 93
See response to Comment No. 12.

Response No. 94
TMI and the DEIS did consider the potential for an alternative site for the northeast disposal area site because of the 2h:1v slope. After a review of possible locations, an alternative site was not considered feasible because the general topography in the vicinity of the mine severely limited the availability of alternative sites. (See page 2-27 of DEIS.) Also, TMI does not control lands in Section 35 at the base of the northeast disposal area, and is restricted by land ownership in the immediate area. (See page 2-23 of DEIS.) Although flatter slopes are generally easier to revegetate, there is evidence that steeper slopes can be satisfactorily revegetated. See response to Comments No. 12 and 50.

Response No. 95
Page 3-9 of the Reclamation Plan in the DEIS and page 2-17 of the FEIS state that recontouring, ripping and scarifying would be used to loosen packed road materials and prepare a suitable seedbed.

Response No. 96
Material commonly thought of as sewage sludge will not be used as a reclamation material. Processed wastewater residuals that meet the metals, pathogens and vector reduction requirements of 40 CFR Part 503 and the State of Nevada "Program Statement-Biosolids Reuse and Domestic Sewage Sludge Disposal" shall be used. These processed wastewater residuals that are specifically processed for agricultural and reclamation reuse under the above-mentioned regulations and are called biosolids shall be reused. The commenter is encouraged to read the above-mentioned documents to understand the delineation between sludge and biosolids.

Response No. 97
Crested wheatgrass is acceptable as a seeded species in the Nevada Interim Standards for Successful Revegetation by the BLM and the NDEP. There are 11 separate species suggested for the proposed reclamation plant mix. Crested wheatgrass does have the ability to establish itself and maintain a low-density cover on adverse sites. The low-density cover does not provide an effective erosion cover on steep slopes. Crested wheatgrass often out-competes native species especially on adverse sites. A monotypic pasture of crested wheatgrass could exclude many native species from colonizing the site. The establishment of a pure crested wheatgrass stand in the revegetation disturbed plant community would affect the return of the native sagebrush and desert shrub communities. However, a diverse plant mixture is proposed for reclamation. The

[97] cont. All of these factors raise the possibility that reclamation will be quite incomplete, and the post-mining vegetation cover will be sparse in some cases, and in other cases the revegetation will be non-native species. The possibility of incomplete reclamation with non-native plantings is a significant adverse impact. (2-22)

HAZARDOUS MATERIALS

[98] The piping anti-scalant is not identified on Table 2.2. There is no description of the area where waste oil and antifreeze is drained from vehicles for recycling (p. 2-16).

[99] Fuel tanks and the processing plant will be contained by earth berms capable of containing 110% of a tank's contents (2-16, 26). But the berms may already be partly full with rainwater at the time a tank or the plant bursts or leaks, thus allowing an overflow. Also, if a tank bursts and empties rapidly, the sudden release of contents will break open an earthen berm. The mine should provide for constantly draining of rainwater from these bermed areas, disposal of tainted water in an appropriate sump, and the mine should design the structural integrity of the berms to withstand a sudden release of a tank's contents.

[100] The DEIS did not discuss in sufficient the nature of TMI's plans to respond to releases of hazardous materials during transport. The DEIS failed to establish that TMI will be prepared to react to a large magnitude incident without allowing a significant adverse environmental impact. (2-18) If TMI will reply on outside sources for this response, there is no indication that these sources are located close enough to potential releases to react before significant harms occur from releases.

[101] The DEIS apparently failed to include a detailed site examination and survey of the mine are for hazardous wastes and toxic material left by prior operations. The discovery of hazardous and toxic materials at this site would be a potentially significant and adverse impact that should be discussed in an EIS. An EIS should include a close site examination for these materials (3-38)

[102] TMI will operate open solution ponds, which will contain highly toxic substances. At many mines in the West, birds and animals have been poisoned by toxic substances at mine ponds. The DEIS refers to use of floating balls to exclude wildlife from these ponds, but the DEIS does not actually state what methods will be used to eliminate wildlife deaths from contact with those toxic liquids.

SOCIO-ECONOMIC IMPACTS

[103] About 150 construction workers will be required. While the DEIS alleges that local firms would be used, the DEIS failed to provide any mechanisms to assure that local workers are hired for the construction work. Nor did the DEIS discuss the adverse socio-econnmic impacts if there is an imported construction work force of 150 workers with many of their families temporarily relocating to the Mine vicinity. (2-19)

It is possible that there are enough of the 590 local construction workers available to build the proposed mine. But large imported work forces have appeared at other mine jobs. For

Response No. 97 (continued)
maximum loss of indigenous plant communities would be similar to that stated in Table 4.1 of the DEIS.

Response No. 98
The piping anti-scalant, Nalco 9714, is non-hazardous. Oil and antifreeze would be changed at the shop building.

Response No. 99
Storage tank containment areas will be designed to meet all applicable state and federal standards. As the site is arid and the 25-year storm event is less than two inches of precipitation, it is highly unlikely that the bermed areas would ever contain a significant amount of rain water.

Response No. 100
Monitoring, Emergency Response, Temporary Closure plans, and other state- and BLM-specific monitoring and reporting requirements were described on pages 2-16 and 2-17 of the DEIS. As discussed, the Emergency Response Plan would describe spill reporting procedures prepared in accordance with all applicable regulations, including the Nevada Notification of Release regulations, NAC 445.238 through 445.242, and all stipulations of the Water Pollution Control Permit. In the event of a spill of a reportable quantity of a hazardous material, all appropriate agencies would be notified. These agencies may include one or more of the following: the Nevada Division of Environmental Protection (NDEP); the Bureau of Land Management; tha Environmental Protection Agency; the Nevada Division of Emergency Management; the County Sheriff; the Fire Department; the Nevada Highway Patrol; and, the Chemical Manufacturers Association, Chemical Transportation Emergency Center. Should a reportable spill occur, site remediation would be enforced by state or federal agencies.

Response No. 101
Active mining has not occurred at the site for more than 40 years, and reports indicate that the ore mined at that time was shipped to Silver City for processing. Consequently, there are neither tailings nor hazardous processing materials from previous operators at the site.

Response No. 102
See response to Comment No. 17.

Response No. 103
The BLM does encourage TMI to use the local labor force as much as possible during both construction and during operation of the mine. However, the BLM does not have the authority to require local hiring. The best estimate of the 125-

[103] cont. instance, the recent Barrick Mine EIOS stated that 70% of its construction work force would be imported from out of the local area. The EIS, Record of Decision, and Plan of Operations for the proposed TMI mine should contain pointed provisions to mandate the maximum degree of local hiring of the construction and production work force, to mitigate the socio-economic upset conditions that would otherwise occur if a large work force was imported into Lyon County. An imported work force would harm many social services, such as schools and housing.

The Mine will be located adjacent to 800 acres available for residential development But the prior development of this mine will inevitable reduce the desirability of this area for residences, because of the dust, noise and traffic associated with mining. This is an adverse
[104] socio-economic impact on a neighboring land use, in that residential development and its resulting economic and housing supply benefits will be reduced because of this project. This impact should be studied in the EIS.

The DEIS says there are already severe shortages of local rental housing. The Mine project could further worsen this situation by its adverse impact on the potential neighboring
[105] housing development, and by instituting the importation of hundreds of construction and mine production workers from out of the local area. (3-32)

The DEIS also states that schools are facing capacity restraints and degrees of crowding.
[106] (3-33) An imported construction and production work force would worsen these situations.

The County Land Use element of its Master Plan mandates development of an equitable process for assessing the impacts from mining and the necessary mitigation that would be
[107] required. (3-21) The DEIS does not establish that the proposed project will comply with this plan element of assessing and mitigating the mine's impa^ts.

NOISE

The DEIS has failed to establish the existing level of compliance with local and federal
[108] noise standards. The current level of noise at this area was not monitored. This is an important omission since the mine will have high levels of noise to the ambient levels. (3-26)

Indeed, the DEIS states that mine noise will on occasion reach 102 dBA during blasting, far in excess of the 65dBA suggested in HUD guidelines (4-23).

NEPA COMPLIANCE
EXPLORATION IMPACTS

NEPA requires the discussion of the indirect impacts from a project. This mine will have
[109] several indirect impacts; a new water pipeline, and the increased use and consumption of electrical power and the resulting expansion of electrical equipment such as potentially new substations and power lines. (3-34)

This project will also generate solid wastes, and will produce an increased demand on the
[110] sewer system from the mine employees who will hook up to the city systems. The DEIS failed to discuss the effect of the mine's additional generation of soil waste, on the effective life

Response No. 103 (continued)
person work force for mine operations indicate that approximately 20 employees would transfer from the company's Golden Eagle Mine at Virginia City, 80 employees would be filled by local job-seekers, and the remaining 25 people requiring special skills would come from outside the local area (See page 4-26 of DEIS.) Most of the people relocating would probably locate in a number of communities, including Silver Springs, Yerington, Fallon, Fernley and along the Dayton Corridor as well as in Carson City. The construction force of approximately 150 people would consist of construction firms that are generally mobile and self-sufficient for their needs and local job seekers. The construction crews would be in the area for approximately eight months.

Response No. 104
See response to Comments No. 159, 160, 161, 162, 164, 166 and 167 for details about potential impacts to private lands.

Response No. 105
See response to Comment No. 103 and page 4-28 of the DEIS. Although the DEIS indicates a projected need for an additional 51 housing units in Lyon County, the county is capable of providing the additional housing and no adverse impacts are anticipated.

Response No. 106
The impacts on the schools are described on page 4-31 of the DEIS, and the impacts associated with an additional 54 new students distributed in various grades and schools are not considered a significant impact. The economic benefits (taxes) associated with the mine should provide a net increase in revenues available to the schools and other county services.

Response No. 107
Lyon County was a Cooperating Agency in development of the DEIS and has reviewed all aspects of the proposal in relation to the Lyon County Master Plan. Lyon County has issued a Special Use Permit to TMI and the Lyon County Master Plan requirements were reviewed by the county prior to issuance of the Special Use Permit.

Response No. 108
The existing noise level near the residences in Section 15 is that of a rural setting and the major impact is the traffic along U.S. 50, one to two miles away. The concern raised by the local residents was the potential impacts of the mine project on their homes (two permanent residents) in Section 15. It was determined that specific monitoring of existing noise levels was not necessary to evaluate the impacts. In fact, we believe that since the site is a remote area and many of the noises occur only occasionally, monitoring may not accurately

[110] (currently estimated at 17 years) of the Carson City landfill, where the mine solid wastes may be
cont. hauled. (3-35)

[111] This DEIS fails to provide a sufficient discussion which would satisfy NEPA, regarding the proposed new water supply lines, and the power lines and any new substations which will service the project.

Response No. 108 (continued)
reflect existing conditions. The closest residence is approximately 2,400 feet or about ½ mile from the southwest disposal area. Based on a conservative or worse case estimate, the noise levels from the project are expected to fall within EPA and HUD guidelines established for housing. The projected level of noise, although noticeable, should not interfere with routine activities such as speaking and sleeping. Appendix C in the DEIS provides a list of common sounds for various activities as a reference. Blasting, which will be done once a day at the end of the day shift, would produce a short duration sound (couple of seconds duration) that would exceed EPA and HUD guidelines, but would be within the established ranges considered safe by the Bureau of Mines to prevent glass breakage. Overall, there would be an increase in noise from the project over current levels, but the increases should be within the established ranges considered safe by federal standards. TMI will monitor the impacts of their project on the local residents and work with the local homeowners to minimize conflicts as much as possible.

Response No. 109
Indirect impacts for the water and power lines were addressed in responses to Comments No. 23 and 85. The proposed 60kV power line to the Talapoosa Project would result in minimal energy requirements, when compared with the available electrical energy.

Response No. 110
Non-hazardous solid wastes would be disposed of at the on-site landfill, for which TMI has received a Class III waiver from the State of Nevada. Non-hazardous solid waste would not be disposed of at the Carson City landfill.

Response No. 111
See response to Comments No. 23 and 85.

Letter No. 7

LASER, INC.

LEGAL AND SAFETY EMPLOYER RESEARCH
AN INDEPENDENT, INCORPORATED DIVISION OF THE WESTERN STATES PIPE TRADES
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BLM–RON MOORE, EIS MANAGER
CARSON CITY, NV BY FAX TO 702-885-6147
APRIL 2, 1996

Dear Mr. Moore:

LASER is a non-profit group that reviews large industrial projects in the West. Many members of organizations that support LASER hunt, fish, hike, boat, and camp in the vicinity of the proposed Talapoosa Mine.

Here are LASER's comments on the DEIS for this proposal. Please send the FEIS to LASER's consultant:

JOHN WILLIAMS
12770 SW FOOTHILL DR.
PORTLAND, ORE 97225

Thank you for you and your agency's past and future cooperation. A mailed copy follows.

Yours,

Jim Wilson
cc: John Williams
Bob Lopes, UA #350
attorney Linda Williams

COMMENTS BY LASER REGARDING THE DRAFT ENVIRONMENTAL IMPACT STATEMENT FOR THE TALAPOOSA MINE

ACID ROCK DRAINAGE

Many metal mines in the West have problems with acid rock drainage. This occurs when oxygen and water contact sulfite-bearing rock that is exposed by mining, and the resulting chemical reaction produces an acidic solution. This solution, in turn, leaches metals and other pollutants out of the exposed ore and waste rock. This leachate is termed Acid Rock Drainage (ARD) in this DEIS.

[112] The TMI proposal will include the mining of several different geologic rock types and ore zones. The vast majority of the ore is from the Lower Bear Creek horizon of the ore body, which is the geologic unit "Tka." The acid-base accounting calculated for the DEIS shows that this ore zone has an ANP/AGP of .5. An ANP/AGP value of less than 1.2 under Nevada State definitions, is considered acid-generating. Likewise, the Upper Bear Creek horizon, also is the "Tka" geologic unit. It will be mined for ore, and this rock type has an ANP/AGP of .12, meaning it is also considered acid generating.

The majority of waste rock will come from the Lower Kate Peak Formation, which is also in the "Tka" geologic unit. According to the DEIS, tests on this rock indicated it would produce ARD. The Upper Kate Peak formation will be the source of a significant fraction of the Mine's waste rock. Tests show this rock will produce elevated levels of arsenic.

In summary, most of the ore and waste rock from this proposed mine, and the rock in the exposed pit walls, may be acid generating, and leachate from these rocks will contain high levels of metals and arsenic. As mitigation, the EIS claims that acid generating rock would be blended and covered with acid neutralizing rock, and/or capped to reduce rain infiltration.

This discussion was limited, and inadequate in the DEIS, considering the importance of preventing ARD. The mitigation measures were described in less than one page.

[113] Blending, covering and isolating ARD generating rock is highly problematic for several reasons. First, there is potentially much more acid generating than acid neutralizing rock. ARD rock is the majority of ore and waste rock to be mined. Second, over time, the rocks' acid neutralizing properties may become exhausted, while the acid generating reactions continue. At that time, ARD will be produced. Third, rock piles containing ARD potential tend to develop "hot spots" at which the acid generating potential overwhelms any acid neutralizing potential. Fourth, blending the waste rock does deal at all with the problems of ARD in the exposed walls of the pit, which will be left open to the elements for hundreds of years. Sulfate, aluminum, arsenic, manganese and nickel will be produced in the leachate from weathered rock in the pit walls. Fifth, at this site, there is a little suitable soil available for capping ARD generating rock This shortage of soils may interfere with an effort to effectively cap this rock. For these reasons, the DEIS discussion of mitigating ARD is inadequate.

Response No. 112

See responses to Comments No. 7, 8, 9, 47, 64, 74 and 80.

Response No. 113

See responses to Comments No. 3, 7, 8 and 61.

[114] In addition, the mine's roads will be surfaced with the waste rock . Since most of the waste rock may contain acid generating properties, rainwater runoff and leachate from the road may contain elevated levels of heavy metals and arsenic. This will potentially cause pollution of any surface waters that are contacted by road runoff, and it would also taint soils over which road runoff flows. [1]

This potential runoff and leachate from the roads, waste rock, exposed mining areas and pit walls, may violate drinking water standards, and the federal and state chronic and acute water standards. This means the water quality violations are more serious than implied in the DEIS.

[115] Nevada regulations also state that "Bodies of water that are the result of mine pits penetrating the water table must not create an impoundment which (a) has the potential to degrade the ground water of the state; or (b) has the potential to affect adversely the health of human, terrestrial, or avian life." The pit waters after closure of this Mine will contain elevated levels of many pollutants with the potential to degrade groundwater, and to harm the health of human and animal life. This is a potential violation of the Nevada rules. The EIS claims that because of the current water balance, the pit water will not discharge to ground water. The DEIS admits that the pit lake water could harm wildlife or livestock. If so, that would be an apparent violation of the Nevada regulations. The DEIS failed to discuss either these state regulations, or the potential violations of these regulations, by the poor pit water quality remaining after closure.

The DEIS should have compared the projected pollution of the leachate to the acute and chronic water quality criteria, and commented on the implications of the potential exceedances of these standards. The NEPA statutes require an EIS to consider whether a project "threatens a violation of Federal, State or local law and requirements imposed for the protection of the environment." (40 CFR 1509.27(b) (10).

[116] TMI should be required to post a bond for the monitoring its reclaimed areas for ARD for virtually hundreds of years, because ARD may years to develop. There is predecent for this type of procedure. The Cortez Pipeline mine owner will be required to post a bond to cover the potential expense of that mine's long term water quality and quantity impacts.

<u>AIR QUALITY IMPACTS</u>

[117] Access to the site is by unpaved road. The traffic from workers' vehicles, vendors, deliveries, and export of mine ore will produce large amounts of road dust. The DEIS should have discussed paving of this road, and the haul road, as an air quality mitigation measure. Paving main roads also reduces wear and tear on vehicles and is cost-effective. The Kennecott Utah tailings expansion recently studied and approved the paving of a main haul road, concluding it would reduce air quality impacts and would also save money, by rcducing the impact on equipment and by allowing faster truck haul speeds.

Crushers and conveyors may be equipped with water sprays for dust control. these

Response No. 114
See response to Comment No. 80.

Response No. 115
See response to Comment No. 46. A screening level risk assessment has been included in Appendix D of the FEIS.

Response No. 116
See response to Comments No. 42 and 84.

Response No. 117
See response to Comment No. 77.

[117] cont.

devices do not control fine particulate matter adequately. The DEIS should have discussed the alternative of using baghouses and enclosing crushers and conveyor transfer/drop points.

The DEIS failed to estimate the annual, or daily and hourly peak emissions of any air pollutant, including fine particulate dust (PM 10) from the various mine activities, or the emissions from combustion sources at the mine, or the tailpipe emissions from mine equipment. The DEIS failed to establish that these air pollution sources will not cause or contribute to a significant adverse impact that should be mitigated.

Toxic and hazardous materials present in the ore and soils, such as silica and metals will be emitted as part of the mine's dust. The retort and lab furnace may also be sources of toxic air emissions. The DEIS failed to discuss these potentially significant impacts.

The DEIS claims that because levels of particulate are within national standards, there is no significant air quality impact. The DEIS fails to consider that the existing national standard for particulate is 10 years old, and is currently under review. Published reports indicate that the latest scientific studies show that PM is far more hazardous that previously believed, and the national standard for allowable concentrations of PM will be sharply lowered for fine particulate. The project-related increases in PM 10 is higher than the levels of PM 10 increases that have caused significant adverse health impacts, according to several recent studies. [3]

The DEIS was deficient in failing to provide an annual PM 10 concentration for the project area, thus failing to insure that significant adverse impacts on human health may occur from the project. The DEIS should also have discussed the health impacts of the project-generated concentrations of PM, in combination with the existing levels of PM.

SURFACE WATER QUALITY IMPACTS

[118] Collection and solution ponds are designed to contain a 25-year, 24 hour storm (2-7, 26). While this may be the minimum to comply with state standards, it is insufficiently conservative to provide adequate environmental protection. There is a significant chance of a 25-year size storm occurring within the mine's prospective life of ten years. This means there is literally a 50% chance of an overflow of a solution pond, which will contain many toxic and hazardous substances, and which will harm the environment. Larger ponds with greater holding capacity should have been discussed as an alternative design of this project.

The proposed sizes of these ponds should have been provided in the DEIS, along with a discussion of the size of the drainage areas which will empty into each pond. The DEIS also failed to provide an adequate discussion of the size of the possible large storms in the mine area, including a warm rain-on-snow storm event. This is a potentially important issue since there is a moderate to high erosion potential at this site.

[119] WATER USE

The Project will use up to 450 million gallons of water every year. This is a significant

Response No. 118
See response to Comment No. 78.

Response No. 119
See response to Comments No. 23 and 85.

[119] cont. unmitigated impact. Groundwater from beneath public lands is part of the public trust and the depletion of about one-half billion gallons over the mine's life is a adverse impact that should be compensated for by the developer. Loss of this amount of groundwater is an undue degradation of public property.

A water pipeline may be constructed to bring in additional water from the Silver Springs Water District. But the DEIS does not describe the potential impacts on the customers of the District, or the impacts of the pipeline construction, or the impacts of the potential construction of an electrical substation.

The DEIS does not discuss what other alternative water sources are under consideration if the Silver Spring District does not provide additional water. Nor did the DEIS discuss the impacts from taxing the alternative water sources.

The DEIS states that the Lyon County Master Plan requests that the Nevada State Engineer should conduct a hydrologic study of the potential depletion of the County water basins and the related aquifers. The Mine project will further deplete the area's aquifers, but no additional hydrologic studies are contemplated in the DEIS, despite this suggestion in the County Plan. The DEIS does not demonstrate how the mining project will comply with this element of the County Plan.

Nevada has issued an Order of Designation that limits water uses. The DEIS has not demonstrated that the mine's use of water, including consumption of process water, and losses of water through evaporation in the open pit left after mine closure, will comply with this Nevada State order.

<u>GROUNDWATER AND PIT WATER IMPACTS</u>

[120] Over time and after exposure to water and air, the waste rock and pit walls will release many heavy metals and toxic materials that would degrade groundwater and pit water quality.

[121] The pit water is predicted to exceed drinking water standards for several metals, arsenic, and sulfate after mine closure . This is a potential violation of state law and water quality standards, and an unmitigated impact that should be mitigated under NEPA.

[122] The DEIS does not describe the how the disposal of human wastes will be accomplished, through a septic field or otherwise. Since there will be over 100 workers employed at the mine, there will be about 2 million gallons of sewage generated annually. This is a significant amount, and disposal through a septic infiltration system could degrade groundwater. The DEIS does not describe a safe method of disposing of the human generated waste water and sewage from this facility. Nor does the DEIS discuss the suitability of the project area for a large septic field.

[123] <u>HABITAT IMPACTS</u>

The open pit will not be filled. This means there is a net loss of the values of 113 acres of

Response No. 120
Refer to Appendix D and the Pit Lake Chemistry section of Chapter 4 of the FEIS, page 4–47.

Response No. 121
See response to Comment No. 46.

Response No. 122
See response to Comment No. 88.

Response No. 123
See response to Comment No. 89. Regarding impacts to pygmy rabbits and mountain big sagebrush habitat, pygmy rabbits were not detected during surveys of the project area. Habitat for this species (dense sagebrush or a mix of sagebrush and other shrub species, in deep, friable soils) is quite limited within the project area. A total of 156 acres of mountain big sagebrush was found within the 2,673-acre vegetation survey area (approximately 6% of the survey area). Further, this habitat is distributed in small pockets within the vegetation survey area, further limiting the suitability for pygmy rabbits. A total of 36 acres of this habitat type would be disturbed by the proposed project.

public lands. This loss of recreational values and habitat values is significant and adverse. The developer should be required to either fill the pit, or to acquire other lands and dedicate the acquired lands into the public trust, or to improve the habitat and recreational values of existing public lands to compensate for the loss of 113 acres, to insure no net loss of public lands.

[123] cont. The project may degrade or destroy 176 acres of low and Mountain sagebrush habitat. There is no indication that reclamation of the mining area will include re-establishment of this type of habitat, which is important to many species including pygmy rabbit. As discussed below, instead much of this area will be reseeded with non-native species The loss of almost 200 acres of sagebrush, with is potential habitat for candidate species, and its replacement with non-native species is a significant adverse impact that could be avoided and mitigated.

[124] Rock Blind Spring may be degraded by the project. This Spring is one of the only water sources in the area. This Spring supports mule deer, chukar, wild rose which is a food supply for non-game birds. The DEIS claims at one point that this Spring draws from a perched aquifer, but perched aquifers are often interconnected with deeper groundwater aquifers that would be affected by the Mine's dewatering and water supply pumping efforts. The DEIS notes that the underlying rock is deeply fractured which would tend to promote connections between perched aquifers and underlying aquifers. (3-52)

The DEIS concedes that Rock Blind Spring may be harmed by the project's water pumping. The suggested mitigation is a solar well and/or trucking in water. But the DEIS does not provide sufficient discussion of these proposed mitigations to insure that the impacts would be mitigated to insignificant levels.

Some studies of the impacts of mining on groundwater suggest that the greatest impacts on springs may occur after mining has ceased, and the open pit filled with groundwater. This effect of the pit filling up at the TMI proposal may cause water losses at Rock Blind Spring long after closure of the TMI facility, when TMI will be unavailable to truck in water or maintain a well. The possibility of water supply impacts after mine closure should be mitigated in the FEIS and ROD, through provision of a long-term bond to finance these mitigations.

[125] The DEIS conceded that the project area supports raptors but this issue is not discussed adequately. It does not appear that the project site was surveyed for Altered Andesite Buckwheat, or White-faced Ibis, which are Candidate species. The Ibis is highly mobile, and is known to live in the general vicinity of the Mine. The Ibis may frequent the area on occasion, and the proposed site should be considered potential habitat for the Ibis.

[126] The project will destroy habitat for several candidate bat species but no mitigation is presented. This is an undue impact and mitigation should be mandated in the EIS.

POST-CLOSURE IMPACTS
EROSION

Response No. 124
See response to Comment No. 90. A well installed at the spring, such as the solar well described in the DEIS (p. 4-7) could be maintained even after cessation of mining in the project area. The well could be installed at a depth sufficient to maintain flow at the site.

WMC Section 7.4, page 85-86 of v.1 of the WMC report, describes conditions and modeling results for the assessment of impact to Rock Blind Spring. Since the information available (geologic and hydraulic) indicates the spring is a perched system and not connected hydraulically to the deeper ground water flow system, there would be minimal impact to the spring due to mine-related water supply pumping activities. The high permeable rocks (basalt and sinter) allow infiltration of rain and snow melt. The underlying rocks of the upper Kate Peak formation are less permeable and act as a barrier to ground water percolation, providing the mechanism for surface discharge of the local ground water flow system in the basalts and sinter deposits. This is described in Section 7.4.3, page 85 of v.1 of the WMC report.

The DEIS stated that the proposed mining activity could "conceivably" impact Rock Blind Spring. This statement as been amended in the FEIS Chapter 3, Errata. All available information indicates that water supply pumping from the proposed activity will not impact Rock Blind Spring. This spring will be monitored during mining activity. If in the improbable event mining operations do impact the spring, a solar-powered well will be installed to maintain this water source.

Upon pit closure, the pit will begin to fill with water, causing the ground water bank in the area surrounding the pit to also rise. This would further reduce any potential effect the pit and water supply pumping activities would have on Rock Blind Spring.

Response No. 125
See response to Comment No. 91.

Response No. 126
See response to Comments No. 69 and 92.

[127] The final rock disposal ares will have slopes of 2-1 to 2.5-1 (horizonal to vertical). these are too steep and will produce excessive erosion. (S-2) The DEIS claims that in several instances steep slopes have been successfully reclaimed. But the citations for these claims of success are from 4 to six years old. In one case, the natural slope of the area mandated a steep contour. The DEIS did not demonstrate that the natural slopes in the TMI vicinity mandate use of steep slopes of the waste rock areas, nor did the DEIS describe more recent inspections of the other reclaimed mine sites to demonstrate that over the long term, slopes this steep may be successfully reclaimed.

There are abundant claims in other mining literature and BLM correspondence that slopes of at least 3:1 are needed to facilitate successful revegetation. For instance, the FEIS for the Zortman/Landusky Mine, prepared under the supervision of the Montana BLM, states:

> "The potential for reclamation to be successful is greatly enhanced with slopes of 3:1 or less ... there is less erosion and vegetation is established faster ... there is no information that this mitigation is "cost-prohibitive. The 3:1 slopes are more stable."[4]

The DEIS should have described remedial measures should reclamation fail on the steep sides of the reclaimed waste rock piles, since reclamation is less likely on steeper slopes.

[128] A less severe slope should have been discussed and presented as an alternative project design. A gentler slope was presented as an alternative in the BLM EIS for the Bald Mountain Mine expansion, for instance, so this request has a predecent within Nevada BLM's NEPA evaluations of mines.

There is apparently not enough growth medium available to cover all of the degraded areas that will need reclamation. Soil types in the project area are often shallow, stony, and of poor quality, and not well suited for reclamation. At previously disturbed sites, even after many years, the areas have not revegetated naturally.

[129] The DEIS claims that roads will not need growth medium since stockpiled soil will bladed back on the roads But the road bed underlying these soils will be greatly compacted by about 10 years of traffic and those soils may be unsatisfactory for reclamation. The soils that would be replaced on the roads, will also be degraded from several years of sitting in the open, exposed to sun, and wind and water erosion. The DEIS admits that the stockpiled soil quality will decline.

[130] Sewer plant sludge may be used as a reclamation material. Far more information is needed about this method and the source of the sludge , since sewage sludge may contain a variety of undesirable materials, including bacteria and metals. The DEIS discussion of this alternative was inadequate considering the potential impact.

[131] Planting Crested Wheatgrass is proposed for reclamation. The DEIS should have

Response No. 127
See response to Comments No. 12 and 50. While the flatter slopes would no doubt support increased plant cover and possibly a greater diversity of plants, the goal of the Nevada Interim Standards for Successful Revegetation provides for the establishment of a disturbed plant community if it meets post-mining land management objectives.

Response No. 128
See response to Comment No 94.

Response No. 129
See response to Comment No. 95.

Response No. 130
See response to Comment No. 96.

Response No. 131
See response to Comment No. 97.

discussed whether is a native plant. Reclamation with non-native grasses is an adverse impact that deserves a detailed analysis.

[131] cont. This is an especially significant impact, since to a certain degree, the project will involve the losses of various types of sagebrush habitat, which will ultimately be replaced with non-native wheatgrass.

All of these factors raise the possibility that reclamation will be quite incomplete, and the post-mining vegetation cover will be sparse in some cases, and in other cases the vegetation will be non-native species. The possibility of incomplete reclamation with non-native plantings is a unnecessary, significant adverse impact.

<u>HAZARDOUS MATERIALS</u>

[132] There is no description of the area where waste oil and antifreeze is drained from vehicles for recycling. At several mines, including the Idaho Stibnite Mine, improper disposal of waste oil has created large scale groundwater contamination. The widespread of heavy equipment at mine sites, means that a mine generates large quantities of waste engine oil, with the potential to cause significant adverse impacts.

[133] The piping anti-scalant is not identified on Table 2.2

[134] Fuel tanks and the processing plant will be contained by earth berms capable of containing 110% of a tank's contents. If the berms are already partly full with rainwater at the time a tank or the plant bursts or leaks, then the berm may overflow. Also, if a tank bursts and empties rapidly, the sudden release of contents can break open an earthen berm. The sudden release of fluid caused by the breakage of a cyanide tank at the Idaho Delamar Mine caused a toxic flood at that site, with several resulting injuries of mine employees.

[135] This mine should provide for constantly draining of rainwater from these bermed areas, disposal of tainted water in an appropriate sump, and the mine should design the structural integrity of the berms to withstand a sudden release of a tank's contents.

[136] The DEIS did not discuss in sufficient the nature of TMI's plans to respond to releases of hazardous materials during transport. The DEIS failed to establish that TMI will be prepared to react to a large magnitude incident without allowing a significant adverse environmental impact. If TMI relies on outside sources for this response, there is no indication that these sources are located close enough to potential releases to react before significant harms occur from releases.

[137] The DEIS apparently failed to include a detailed site examination and survey of the mine are for hazardous wastes and toxic material left by prior operations. The discovery of hazardous and toxic materials at this site would be a potentially significant and adverse impact that should be discussed in an EIS. An EIS should include a close site examination for these materials.

Response No. 132
See response to Comment No. 98.

Response No. 133
See response to Comment No. 98.

Response No. 134
See response to Comment No. 99.

Response No. 135
See response to Comment No. 99.

Response No. 136
See response to Comment No. 100.

Response No. 137
See response to Comment No. 101.

[138] TMI will operate open solution ponds, which will contain toxic substances. At many mines in the West, birds and animals have been poisoned by toxic substances at mine ponds. The DEIS refers to use of floating balls to exclude wildlife from these ponds, but the DEIS does not state what methods will be used to eliminate wildlife deaths from contact with toxic liquids.

SOCIO-ECONOMIC IMPACTS

About 150 construction workers will be required. While the DEIS alleges that local firms would be used, the DEIS failed to provide any mechanisms to assure that local workers are hired for the construction work. Nor did the DEIS discuss the adverse socio-economic impacts of there is an imported construction work force of 150 workers with many of their families temporarily relocating to he Mine vicinity. (2-19)

IMPORTED WORK FORCE

[139] It is possible that there are enough of the 590 local construction workers available to build the proposed mine. But large imported work forces have appeared at other mine jobs. For instance, the recent Barrick Mine EIS stated that 70% of its construction work force would be imported from out of the local area. The EIS, Record of Decision, and Plan of Operation for the proposed TMI mine should mandate the maximum local hiring of the construction and production work force, to mitigate the potential socio-economic upset conditions that would otherwise occur if a large work force was imported into Lyon County. An imported work force would place heavy demands on many social services, such as police, schools and housing. For instance, law enforcement agencies have written to the BLM about similar mines, such as Bald Mountain near Ely, expressing concerns about the costs to their agencies from policing the mine expansion.

HOUSING IMPACTS

[140] The Mine will be located adjacent to 800 acres available for residential development. But the prior development of this mine will inevitable reduce the desirability of this area for residences, because of the dust, noise and traffic associated with mining. This is an adverse socio-economic impact on a neighboring land use, in that residential development and its resulting economic and housing supply benefits will be reduced because of this project. This impact should be studied in the EIS.

[141] The DEIS says there are already severe shortages of local rental housing. The Mine project could further worsen this situation by its adverse impact on the potential neighboring housing development, and by instituting the importation of hundreds of construction and mine production workers from out of the local area. (3-32)

SCHOOLS

[142] The DEIS also states that schools are facing capacity restraints and degrees of crowding. (3-33) An imported construction and production work force would worsen these situations.

[143] The County Land Use element of its Master Plan mandates development of an equitable

Response No. 138
See response to Comment No 17.

Response No. 139
See response to Comment No. 103.

Response No. 140
Comment noted concerning impacts to private lands. See response to Comments No. 104, 159, 160, 161, 164, 166 and 167.

Response No. 141
See response to Comment No. 105.

Response No. 142
See response to Comment No. 106.

Response No. 143
See response to Comment No. 107.

[143] cont. process for assessing the impacts from mining and the necessary mitigation that would be required. (3-21) The DEIS does not establish that the proposed project will comply with this plan element of assessing and mitigating the mine's impacts.

NOISE

The DEIS has failed to establish the existing level of compliance with local and federal noise standards. The current level of noise at this area was not monitored. This is an importani
[144] omission since the mine will had high levels of noise to the ambient levels. (3-26)

Indeed, the DEIS states that mine noise will on occasion reach 102 dBA during blasting, far in excess of the 65 dBA suggested in HUD guidelines (4-23).

NEPA COMPLIANCE
EXPLORATION IMPACTS

Exploration will be ongoing, and will have many impacts including degradation of lands from construction of drill pads, roads and truck traffic, air quality impacts form drill rig,
[145] compressor and truck tailpipe emissions, and potential groundwater and surface water impacts from disposal of drilling byproducts such as drilling fluids cuttings, and detergent additive into sumps. . But the DEIS provides only a 2 page discussion of the impacts from exploration, and the discussion is superficial and not in the depth of analysis required to comply with NEPA.

INDIRECT EFFECTS

NEPA requires the discussion of the indirect impacts from a project. This mine will
[146] have several indirect impacts; a new water pipeline, and the increased use and consumption of electrical power and the resulting expansion of electrical equipments such as potentially new substations and power lines. (3-34)

This project will also generate solid wastes, and will produce an increased demand on the sewer system from the min employees who will hook up to the city systems. The DEIS failed to
[147] discuss the effect of the mine's additional generation of soil waste, on the effective life (currently estimated at 17 years) of the Carson City landfill, where the mine solid wastes may be hauled. (3-35)

This DEIS fails to provide a sufficient discussion which would satisfy NEPA, regarding
[148] the proposed new water supply lines, and the power lines and any new substations which will service the project.

Response No. 144
See response to Comment No. 108.

Response No. 145
The FEIS (page 2-13) provides the site-specific Plans of Operation and Reclamation within the project area. The plans would be submitted prior to the beginning of each drilling season. The potential impacts of exploration within the project area were described in the DEIS. The annual exploration proposal would be reviewed to assure potential impacts were considered in the DEIS. Additional analysis may be required on a case-by-case basis.

Response No. 146
See response to Comment No. 109

Response No. 147
See response to Comment No. 110

Response No. 148
See response to Comments No. 23 and 85 for the water line. The proposed routing for the proposed power line and potential impacts associated with the line are described in FEIS Chapter 2, Preferred Alternative, and Chapter 3, Errata changes to DEIS Chapter 4.

ENDNOTES

1. Meteoric water testing determined that elevated levels of chromium, iron and sulfate were produced by the testing, and that the resulting concentrations in ore leachate of aluminum, cadmium, iron, lead, and manganese would vastly exceed drinking water standards..

2. For instance, hexavalent chromium, lead, mercury, silver, and zinc would be exceeded by the average concentrations presented in Table E.8.

3. "Particulate Air Pollution and Hospital Emergency Room Visits for Asthma in Seattle." American Review of Respiratory Disease. Schwartz, Slater, Larson, Pierson, and Koenig. V. 147, pp 826-831, 1993.

"Air Pollution and Daily Mortality in Birmingham, Alabama." American Journal of Epidemiology. Joel Schwartz. Vol. 137, No. 10, 1993. See particularly figure 6, page 1145 for an illustration of how any increase in PM10 correlates to increased deaths.

"Air Pollution and Daily Mortality in Steubenville, Ohio.' American Journal of Epidemiology. Joel Schwartz and Douglas Dockery. Vol. 135, No. 1. 1992.

"Increased Mortality in Philadelphia Associated with Daily Air Pollution Concentrations." American Review of Respiratory Disease. Schwartz & Dockery. 145:600-604. 1992.

"Pulmonary Function and Ambient Particulate Matter." Archives of Environmental Health. Chestnut, Schwartz, Savitz, and Burchfiel. May/June 1991 (Vol. 46 (No.3) p 135-144.

"Particulate Air Pollution and Daily Mortality: A Synthesis." Schwartz. Public Health Review 1991/92; 19:39-60/

4. Montana BLM. FEIS, Zortman-Landusky Mine. p 6-65, Volume II. March, 1995.

Letter No. 8

BOB MILLER
Governor

STATE OF NEVADA

BUR OF LAND MANAGEMENT
CARSON CITY
DISTRICT

JOHN P. COMEAUX
Director

APR 1 2 33 PM '96

DEPARTMENT OF ADMINISTRATION
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March 29, 1996

Ron Moore, EIS Project Manager
Bureau of Land Management
Carson City District Office
1535 Hot Springs Road
Carson City, NV 89706

Re: SAI NV # 96300109

Project: DEIS – Talapoosa Mining Inc.'s Talapoosa Mine Project (Lyon County)
N36-94-002P, 1793/3809, NV-932.8, NV-030/034

Dear Mr. Moore:

Enclosed are the comments from the Nevada Division of Minerals, the Nevada State Historic Preservation Office, the Nevada Department of Transportation, the Nevada Division of Environmental Protection, and the Nevada Division of Wildlife concerning the above referenced project. These comments constitute the State Clearinghouse review of this proposal as per Executive Order 12372. Please address these comments or concerns in your final decision. If you have any questions please contact either me, at 687-6382, or Julie Butler, Clearinghouse Coordinator/SPOC, at 687-6367.

Sincerely,

Terri Rodefer

Terri Rodefer, Environmental Advocate
Nevada State Clearinghouse

Enclosures

Letter No. 9

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STATE OF NEVADA
BOB MILLER
Governor

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February 16, 1996

CLEARINGHOUSE COMMENTS

NDEP # 96-066
SAI NV # 96300109

TITLE: BLM - Draft EIS for Talapoosa Mining Inc's Talapoosa Mine Project

The Division of Environmental Protection has reviewed the aforementioned State Clearinghouse item and has the following comments:

[149] The water quality toxic standards were revised by the Nevada State Environmental Commission on November 7, 1995. Table 3.18 should be revised to reflect the current water quality regulations. These updated regulations are attached.

David R. Cowperthwaite
Clearinghouse Coordinator
Division of Environmental Protection

Response No. 149
Table 3.18 in DEIS is replaced in Appendix C of the FEIS.

ADOPTED PERMANENT REGULATION OF THE NEVADA STATE ENVIRONMENTAL COMMISSION

LCB File No. R128-95

EXPLANATION: Matter in *italics* is new; matter in brackets [ ] is material to be omitted.

AUTHORITY: NRS 445.201 and NRS 445.244

Section 1. NAC 445A.144 is hereby amended to read as follows:

445A.144 Except as otherwise provided in this section, the following standards for toxic materials are applicable to the waters specified in NAC 445A.123 to 445A.127, inclusive, and NAC 445A.145 to 445A.225, inclusive. If the standards are exceeded at a site and are not economically controllable, the commission will review and adjust the standards for the site.

Chemical	Municipal or Domestic Supply (μg/l)	Aquatic Life (μg/l)	Irrigation (μg/l)	Watering of Livestock (μg/l)
Antimony	*146*	-	-	-
Arsenic	50	-	100	200
Arsenic (III)	-	-	-	-
1-hour average	-	342	-	-
96-hour average	-	180	-	-
Barium	[1,000]*2,000*	-	-	-
Beryllium	*0*	-	100	-
hardness <75 mg/l	-	-	-	-
hardness >=75 mg/l	-	-	-	-
Boron	-	[550]	750	5,000
Cadmium	[10]*5*	-	10	50
1-hour average	-	0.85exp[1.128 ln(H)-3.828]	-	-
96-hour average	-	0.85exp[0.7852ln(H)-3.490]	-	-
Chromium (total)	[50]*100*	-	100	1,000
Chromium (VI)	-	-	-	-
1-hour average	-	15	-	-
96-hour average	-	10	-	-
Chromium (III)	-	-	-	-
1-hour average	-	0.85exp[0.8190 ln(H)+3.688]	-	-
96-hour average	-	0.85exp[0.8190 ln(H)+1.561]	-	-

Petition 96004 (LCB File No. R128-95) was adopted as a permanent regulation by the State Environmental Commission on November 7, 1995.

Copper	·	·	200	500
1-hour average	·	0.85exp(0.9422 ln(H)-1.464) ·		·
96-hour average	·	0.85exp(0.8545 ln(H)-1.465) ·		·
Cyanide	200	·	·	·
1-hour average	·	22	·	·
96-hour average	·	5.2	·	·
Fluoride	·	·	1,000	2,000
Iron	·	1,000	5,000	·
Lead	50	·	5,000	100
1-hour average	·	0.50exp(1.[illegible] ln(H)-1.460) ·		·
96-hour average	·	0.25exp(1.273 ln(H)-4.705) ·		·
Manganese	·	·	[illegible]00	·
Mercury	2	·	·	10
1-hour average	·	2.0	·	·
96-hour average	·	0.012	·	·
Molybdenum	·	19	·	·
Nickel	13.4	·	200	·
1-hour average	·	0.85exp(0.8460 ln(H) + 3.3612) ·		·
96-hour average	·	0.85exp(0.8460 ln(H) + 1.1645) ·		·
Selenium	(10)50	·	20	50
1-hour average	·	20	·	·
96-hour average	·	5.0	·	·
Silver	(50)	0.85exp(1.72 ln(H)-6.52) ·	·	
Sulfide				
undissociated hydrogen				
sulfide	·	2	·	·
Thallium	13	·	·	·
Zinc ·	·	·	2,000	25,000
1-hour average	·	0.85exp(0.8473 ln(H) + 0.8604) ·		·
96-hour average	·	0.85exp(0.8473 ln(H) + 0.7614) ·		·
Acrolein	320	·	·	·
Aldrin	0	3	·	·
Chlordane	0	2.4	·	·
24-hour average	·	0.0043	·	·
2,4-D	100	·	·	·
DDT & metabolites	0	1.1	·	·
24-hour average	·	0.0010	·	·
Demeton	·	0.1	·	·
Dieldrin	0	2.5	·	·
24-hour average	·	0.0019	·	·
Endosulfan	75	0.22	·	·
24-hour average	·	0.056	·	·

Endrin	0.2	0.18	.	.
24-hour average	.	0.0023	.	.
Guthion	.	0.01	.	.
Heptachlor	.	0.52	.	.
24-hour average	.	0.0038	.	.
Lindane	4	2.0	.	.
24-hour average	.	0.080	.	.
Malathion	.	0.1	.	.
Methoxychlor	100	0.03	.	.
Mirex	0	0.001	.	.
Parathion	.	.	.	.
1-hour average	.	0.065	.	.
96-hour average	.	0.013	.	.
Silvex	10	.	.	.
(2,4,5-TP)				
Toxaphene	5	.	.	.
1-hour average	.	0.73	.	.
96-hour average	.	0.0002	.	.
Benzene	5	.	.	.
Monochlorobenzene	488	.	.	.
m-dichlorobenzene	400	.	.	.
o-dichlorobenzene	400	.	.	.
p-dichlorobenzene	75	.	.	.
Ethylbenzene	1,400	.	.	.
Nitrobenzene	19,800	.	.	.
1,2 dichloroethane	5	.	.	.
1,1,1-trichloroethane (TCA)	200	.	.	.
Bis(2-chloroisopropyl) ether	34.7	.	.	.
Chloroethylene	2	.	.	.
(vinyl chloride)				
1,1-dichloroethylene	7	.	.	.
Trichloroethylene (TCE)	5	.	.	.
Hexachlorocyclopentadiene	206	.	.	.
Isophorone	5,200	.	.	.
Trihalomethanes (total)	100	.	.	.
Tetrachloromethane	5	.	.	.
(carbon tetrachloride)				
Phenol	3,500	.	.	.
2,4-dichlorophenol	3,090	.	.	.
Pentachlorophenol	1,010	.	.	.
1-hour average	.	exp{1.005 (pH)-4.830}	.	.
96-hour average	.	exp{1.005 (pH)-5.290}	.	.
Dinitrophenols	70	.	.	.

Petition 96004 (LCB File No. R128-95) was adopted as a permanent regulation by the State Environmental Commission on November 7, 1995.
[illegible] became effective [illegible] upon filing with the Secretary of State by the Legislative Counsel Bureau.

4,6-dinitro-2-methylphenol	13.4[a]	·	·	·
Dibutyl phthalate	34,000[a]	·	·	·
Diethyl phthalate	350,000[a]	·	·	·
Dimethyl phthalate	313,000[a]	·	·	·
Di-2-ethylhexyl phthalate	15,000[a]	·	·	·
Polychlorinated biphenyls				
(PCBs)	0[a]	·	·	·
24-hour average	·	0.014[a]	·	·
Fluoranthene	42[a]	·	·	·
(polynuclear aromatic hydrocarbon)				
Dichloropropenes	87[a]	·	·	·
Toluene	14,300[a]	·	·	·

Footnotes and References

(1) Single concentration limits and 24-hour average concentration limits must not be exceeded. One-hour average and 96-hour average concentration limits may be exceeded only once every 3 years. See reference a.

(2) Hardness (H) is expressed as mg/l $CaCO_3$.

(3) If a [criteria] *criterion* is less than the detection limit of a method that is acceptable to the division, laboratory results which show that the substance was not detected will be deemed to show compliance with the standard unless other information indicates that the substance may be present.

(4) If a standard does not exist for each designated beneficial use, a person who plans to discharge waste must demonstrate that no adverse effect will occur to a designated beneficial use. If the discharge of a substance will lower the quality of the water, a person who plans to discharge waste must meet the requirements of NRS 445.253.

(5) The standards for metals are expresses as total recoverable, unless otherwise noted.

a. U.S. Environmental Protection Agency, Pub. No. EPA 440/5-86-001, Quality Criteria for Water (Gold Book) (1986).

b. Federal Maximum Contaminant Level (MCL), 40 C.F.R. §§ 141.11, 141.12, 141.61 and 141.62 [(1988.)] *(1992)*.

c. U.S. Environmental Protection Agency, Pub. No. EPA 440/9-76-023, Quality Criteria for Water (Red Book) (1976).

d. National Academy of Sciences, Water Quality Criteria (Blue Book) (1972).

e. California State Water Resources Control Board, Regulation of Agricultural Drainage to the San Joaquin River: Appendix D, Water Quality Criteria (March 1988 revision).

f. The criteria for trihalomethanes (total) is the sum of the concentrations of bromodichloromethane, dibromochloromethane, tribromomethane (bromoform) and trichloromethane (chloroform). See reference b.

g. This standard applies to the dissolved fraction.

END OF LCB File No. R128-95

Petition 96004 (LCB File No. R128-95) was adopted as a permanent regulation by the State Environmental Commission on November 7, 1995 [illegible] 128-95 became effective on November 30, 1995 upon filing with the Secretary of State by the Legislative Counsel Bureau

Letter No. 10

STATE OF NEVADA
DEPARTMENT OF MUSEUMS, LIBRARY AND ARTS
STATE HISTORIC PRESERVATION OFFICE
Capitol Complex
100 Stewart Street
Carson City, Nevada 89710

BOB MILLER
Governor

JOAN G. KERSCHNER
Department Director

RONALD M. JAMES
State Historic Preservation Officer

JAN 31 1996
DEPT. OF ... DIRECTOR'S OFFICE

January 30, 1996

Mr. Ron Moore
EIS Project Manager
Bureau of Land Management
Carson City District Office
1535 Hot Springs Road
Carson City NV 89706

RE: Draft Environmental Impact Statement (EIS) for Talapoosa Mining Inc.'s Talapoosa Mine Project, Virginia Range, Lyon County.
Nevada State Clearinghouse SAI #: 96300109, Comments Due: March 29, 1996.

Dear Mr. Moore:

The Nevada State Historic Preservation Office (SHPO) reviewed the draft EIS for the proposed undertaking.

This office notes an apparent discrepancy in the text of this document. The Affected Environment section (page 3-36) states:

> "Of the 92 recorded cultural resources, only one of the sites was determined to be eligible for listing on the National Register of Historic Places, and this site is not within the proposed project area."

[150] In contrast, the Environmental Consequences section (page 4-31) states:

> "In total, 21 sites and 71 isolated artifacts [92 cultural resources] were located in the proposed project area. All of these sites have been determined to be *Not Eligible* [emphasis added] to the National Register of Historic Places."

With the clarification or correction of the above apparent discrepancy, the SHPO will support the above document.

If you have any questions concerning this correspondence, please feel free to call me at (702) 687-5138.

Sincerely,

Rebecca Lynn Palmer
Archaeologist

Response No. 150

The text on page 4-31 of the DEIS has been revised in response to the comment. See Chapter 3, Errata, of the FEIS for the appropriate wording.

Letter No. 11

BOB MILLER
Governor

STATE OF NEVADA
DEPARTMENT OF BUSINESS AND INDUSTRY
DIVISION OF MINERALS
400 W. King Street, Suite 106
Carson City, Nevada 89710
(702) 687-5050 • Fax (702) 687-3957

LAS VEGAS BRANCH:
4220 S. Maryland Pkwy
Suite 304
Las Vegas, Nevada 89119
(702) 486-7250
Fax (702) 486-7252

RUSSELL A. FIELDS
Administrator

February 23, 1996

RECEIVED
FEB 27 1996
DEPT OF ADMINISTRATION
DIRECTOR'S OFFICE

Julie Butler, Coordinator
Nevada State Clearinghouse
Department of Administration, Planning Division
Blasdel Bldg., Room 200
Carson City, NV 89710

Re: Nevada SAI #96300109 -- Draft Environmental Impact Statement (DEIS) -- Talapoosa Mining Inc. -- Talapoosa Mine Project -- Lyon County -- Due Date: March 29, 1996

The Nevada Division of Minerals is pleased to have the opportunity to review and provide comments on the DEIS for the Talapoosa Mine project.

This project will take place in an area of Lyon County that has been of prospective interest for many years. We are pleased that today's mining technology and current economic conditions will finally make this operation possible. The project will provide significant employment and revenue opportunities for the benefit of Lyon County and surrounding counties, the State of Nevada, and the Nation.

The Division has only minor comments relative to the DEIS:

[151] 1. What method will be used to cover the solution ponds to protect birds and other wildlife? There should, perhaps, be some discussion of this included in Chapter 2, Alternatives Including the Proposed Action, under the "Valley Fill Leach Pad and Solution Ponds" section (page 2-9 of the DEIS).

[152] 2. There is no discussion regarding the use of angle of repose for waste rock dump slopes. Angle of repose waste rock dumps generally result in a lesser degree of surface disturbance and are more economical. The nearly flat or gently contoured top surfaces retain moisture, resulting in healthier and more lush vegetation. The Division would like to see a comparison of angle of repose slopes versus 2:1 or 2.5:1 slopes for waste rock dumps relative to surface disturbance, economic factors, vegetation success, and visual quality.

Response No. 151

See response to Comment No. 17.

Response No. 152

The northeast disposal area would be sited on a steep slope and would require construction by benches to maintain stability of the structure. The terraces left from the bench construction would provide terrain suitable for maximum plant growth and help establish plant cover on the adjoining slopes. The use of an angle of repose disposal area could increase the down slope disturbance in this steep drainage but would probably be less costly to construct. The angle of repose sloped disposal area will have a smaller acreage on the top in comparison to other disposal area construction.

The southwest disposal area would have 2.5h:1v slopes and the benches would be regraded to a smooth contoured slope. The decision to regrade was based on the need to reduce the visual impact of this disposal area. The 2.5h:1v slope also emulates the adjoining natural slope angles to further lessen visual impact.

This project has the full support of the Division of Minerals. We would like the opportunity to review and comment on the final EIS for this project once it becomes available.

Please contact Division staff at any time for additional information or assistance.

Sincerely,

Bill Durbin

Bill Durbin - Chief
Bureau of Abandoned Mine Lands

bd\aa196109

Letter No. 12

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION
1263 S. Stewart Street
Carson City, Nevada 89712

BOB MILLER, Governor

February 27, 1996

TOM STEPHENS, P.E., Director

In Reply Refer to:

PSD 7.01

Julie Butler, Coordinator
Nevada State Clearinghouse
Department of Administration
Budget Division
Blasdel Building, Room 204
Carson City, NV 89710

Dear Ms. Butler:

The Nevada Department of Transportation has reviewed the project titled DEIS - Talapoosa Mining Inc.'s Talapoosa Mine Project (Lyon County) SAI#96300109.

Based on the information submitted, we have the following comments on the proposed project.

[153] The primary access to this proposed facility is from US-95A north of the junction US-50. US-95A is a two-lane road with an Average Annual Daily Traffic (AADT) of 4,215 in 1994. Given the nature of the vehicles entering and leaving this facility, the Department will require a traffic study to analyze the access onto US-95A and propose modifications to the intersection to allow safe ingress/egress onto US-95A.

Thank you for the opportunity to review this project.

Sincerely,

Thomas J. Fronapfel

Thomas J. Fronapfel, P.E.
Assistant Director
Planning

TJF:PAF:dg

cc: Keith Maki
Jim Dodson

Response No. 153

Discussions between TMI and the Nevada Department of Transportation regarding requirements for an access onto U.S. 95 Alt. have been completed and a permit has been issued by NDOT for access onto U.S. 95 Alt.

Letter No. 13

BOB MILLER
Governor

STATE OF NEVADA
DEPARTMENT OF CONSERVATION AND NATURAL RESOURCES
DIVISION OF WILDLIFE
P.O. Box 10678
1100 Valley Road
Reno, Nevada 89520-0022
(702) 688-1500 • Fax (702) 688-1595

PETER G. MORROS
Director
Department of Conservation and Natural Resources

WILLIAM A. MOLINI
Administrator

Nevada Division of Wildlife
Region 1 Ph 423-3171
380 West B Street
Fallon, Nevada 89406

March 20, 1996

Nevada State Clearinghouse
Department of Administration
Budget and Planning Division
ATTN: Terri Rodefer
Blasdel Building, Room 200
Carson City, NV 89710

RE: Nevada SAI# 96300109 DEIS - Talapoosa Mine Project

Dear Terri:

Thank you for allowing the Nevada Division of Wildlife to review Talapoosa Mining Inc.'s Draft Environmental Impact Statement for the Talapoosa Mine Project. As stated in the DEIS there are wildlife resources that would be affected by the mining operation and should be mitigated.

[154] ♦ The loss of the prairie falcon eyrie should be mitigated on-site by a commitment to create a pothole in a residual high wall, if the project proponents can guarantee with relative certainty that a stable high wall compliant with BLM and NDEP regulations will be left after the project. If we cannot gain pre-project assurance based on geological projections, then the eyrie's loss must be mitigated off-site.

[155] ♦ To mitigate the loss of Townsend's Big-eared Bat hibernacula, suitable alternative sites occurring on public lands or patented lands controlled by TMI should be bat-gated at a 1:1 ratio, or until all alternative sites are exhausted.

[156] ♦ The loss of burrowing owl burrows should be mitigated by digging artificial burrows built to NDOW specifications and installed at a 2:1 ratio.

Response No. 154
See response to Comment No. 16.

Response No. 155
See response to Comment No. 69.

Response No. 156
See response to Comment No. 70

Nevada SAI# 96300109
March 20, 1996
Page 2

[157] ♦ We would also like five guzzlers installed outside of the project area to mitigate for loss of habitat and to have an alternate watering site available for wildlife use. This would aid in keeping wildlife away from the project area.

Thank you again for this opportunity to review and comment on the DEIS. Please do not hesitate to contact John Gebhardt or Larry Neel at 423-5810 if you have any questions.

Sincerely,

WILLIAM A. MOLINI, ADMINISTRATOR

Mike D. Sevon (acting)

Richard T. Heap, Jr.
Regional Manager
Region I

JLG/jg
cc: Habitat, Reno

Response No. 157
BLM concurs with the comment. See FEIS Appendix A.

Letter No. 14

W.R.Hamilton
P.O.Box 23.
Silver Springs
Nv.89429

U.S. Department of Interior
Bureau of Land Management
1535 Hot Springs Road
Carson City District Office
Carson City, Nevada 89706

RE. Draft Enviromental Impact Statement
Talapoosa Mining Inc;s
Talapoosa Mine Project.

Dear Sirs.

I am and have been, a resident of Silver Springs for 35 years. I have heard stories of the Gold mine called Talapoosa. Upon recently hearing of a re-opening of the"Mine,"I quickly set out to find out as much as I could, to confirm or deny the story.

Having aquired a copy of the Draft Envrimental Impact Statement, I became very excited; the mineral deposits,the size, and exact locations that were mapped was impressive. Whereupon, after making several phone calls, the news was that April 2, 1996 is the projected date of opening.

If you would be so kind as to send me some applactions; I will see that they are used to there fullest, with appiicinat Names and proper Information.

[158] I do want, and would like to see the "Mine" open.

Respectfully,

W.R.Hamilton
P.O.Box, 23
Silver Springs Nev. 89429

Response No. 158
Comment noted.

Letter No. 15

BUR OF LAND MANAGEMENT CARSON CITY DISTRICT

APR 1 2 39 PM '96

Jennifer Larson
600 E. William Street, Ste. 300
Carson City, NV 89701

March 29, 1996

Ron Moore
EIS Project Manager
Bureau of Land Management
Carson City District Office
1535 Hot Springs Road
Carson City, NV 89706

RE: TALAPOOSA MINE PROJECT

Dear Mr. Moore:

The purpose of this correspondence is to comment on the above named mine project. Throughout this letter I will be referring to the U.S. Department of the Interior's Draft Environmental Impact Statement dated January, 1996, (hereinafter referred to as "Statement.")

Several years ago I bought 13 acres in this area which bordered BLM land. I thought I had found a beautiful, secluded place where my husband and I could retire. Last year we began planning the home we would build when we discovered the mine project. Needless to say we have had to put our plans on hold.

[159] This mine project has ruined my visions and plans for myself, my children and grandchildren. This mine has drastically devalued my property! Who would want to build a home next to a rock dump full of chemicals!?

[160] There will be 24 hour, year round mining going on for <u>seven to ten years</u>. After which I will have the "privilege" of looking out my window at a 64 million ton, 500 feet high wall of waste rock and who knows what else! (Statement at p.2-7.)

[161] The mine wants to put in a 60kv line on top of the 25kv line that runs across <u>my</u> property. (Statement at p.2-19.) I say <u>absolutely</u> not! There is enough noise coming off the 25kv line. It is a researched <u>fact</u> that high tension lines cause health problems. Are there plans to build schools and churches in this area too, as it seems to reason that since there is no concern for homeowners, why not sell off more land for a few extra bucks?

[162] Out of the 2,340 acres of BLM land a different 64 million ton rock dump could have been located somewhere else instead of near Section 15, an area that has already been subdivided for homesites!

Response No. 159

See responses to Comments No. 3, 7, 8 and 9.

Response No. 160

Following successful reclamation and revegetation of the overburden/ interburden disposal area, the feature would blend in with the surrounding landscape (see Figure 4.2 of the DEIS). A "wall" would not result following reclamation because the southwest disposal area would be shaped to blend with the surrounding terrain. No materials other than the reclaimed land disturbances would remain at the site following reclamation.

Response No. 161

The route for the power line will not be located on the writer's property, but will be on public lands in the area of concern. Electric and magnetic fields can be generated from power lines, as well as common household appliances. A number of studies have been conducted on 765kV, 345kV and 230kV power transmission lines. The long-term health effects of these large lines have not been conclusively determined. It has been suggested that increasing the distance between the source and the exposed individuals can be one of the most cost-effective ways to reduce exposure to electrical and magnetic fields. There are no state standards for separation of power lines from structures in Nevada, but as an example, the California Public Utilities Commission (GO-95) has established a minimum separation distance from line conductor to a structure is 15 feet. There are no other separation distance requirements based on health and safety issues. The closest structure to the proposed 60kV line is more than ¼ mile. Based on existing studies, the size of the line to be installed, and the distance of the proposed line to the nearest residence, the line is not expected to impact public health.

Response No. 162

See response to Comment No. 94. As described in the DEIS on page 2-27, Alternatives Eliminated from Detailed Consideration, each of the components were reviewed as the basis for possible alternatives. The topography of the areas within the vicinity of the proposed mine greatly limited the options for alternative overburden/interburden disposal area sites. Essentially the southwest disposal area site was determined to be the only practical location that would meet the needs of the operation.

[163] Ruby Avenue is not maintained by Lyon County, as stated by Lyon County. (Statement at p.3-22.) It is only maintained by the residents in the area and as far as I know there has been no involvement from BLM on maintenance of Ruby Avenue.

[164] The mine is also going to have night lights. (Statement at p.4-21.) The nighttime noise from dumping will create noise that will be annoying. This has been acknowledged by the EPA. The L_{DN} is calculated to be 63 dBA. In my conversation with an audiologist I was informed that this constant noise can cause tension, high blood pressure, stress and is considered environmentally dangerous.

What has been stated in this Environmental Impact Statement has been assumed and estimated. I believe it is fair for me to assume that it will be more extreme than stated because the mine wants to downplay the situation.

This whole business has already caused me a great deal of stress and tension and has wreaked havoc on my work and home life. I am totally against this project.

Response No. 163
Page 3-22 of the DEIS, second paragraph under "Access," states: "The southern access to the site is currently via Ruby Avenue. Privately maintained, Ruby Avenue serves two residences." Ruby Avenue is on the County road system from the junction with Highway 50 to Curtis Street (approximately 0.9 mile), but the county does not schedule the road for maintenance. The county does have a 60-foot right-of-way for the road corridor.

Response No. 164
As mentioned in the DEIS on pages 4-23, the noise levels for the project are expected to be within EPA and HUD guidelines, except for blasting, which will be exceeded only for a few seconds daily. The concern whether the annoyance from induced noise can result in a health problem is difficult to measure as individuals react differently to stress, which can come from a variety of sources, including increased noise. Public health was a factor consideration in the development of the EPA and HUD noise standards. See Response to Comment No. 108.

Letter No. 16

Comment Sheet
Miramar Talapoosa Mine Project

FEB 27

Do you have a concern or a comment concerning the Talapoosa Mine Project Draft Environmental Impact Statement?

Please use this form to let us know your concerns. You may give this form to BLM staff during or after the meeting, or send it to:

Ron Moore
Bureau of Land Management
1535 Hot Springs Road
Carson City, Nevada 89706-0638
(702) 885-6155

Comments are due by April 2, 1996

NAME: Ruben T. Luna

ADDRESS: P.O. Box 7000-251, Alta Loma, Calif. 91701

PHONE #: 909 987 1402

COMMENT:

I fully agree that project will benefit our county. I am in favor of it.

[165] The part I disagree is that the approach to this mine should be from highway 50 thru or on Ruby Road to Saphire. This would give a greater benefit to the Silver Springs Community.

Ruben T. Luna
2·23·96

Response No. 165
The use of Ruby Avenue to access the mine was considered and dropped primarily because development of the pit and southwest disposal area obliterated the existing road through the mine property and there is no practical way of relocating the road through the mine site. Additionally, the impacts of using the existing road on the homeowners along Ruby Avenue would be significant. The closure of the road beyond the private lands should help reduce existing impacts to the private lands associated with travel as in conjunction with the mining, the communications site, and general recreational uses.

Letter No. 17

Comment Sheet BUR OF LAND MANAGEMENT
Miramar Talapoosa Mine Project

MAR 22 2 25 PM '96

Do you have a concern or a comment concerning the Talapoosa Mine Project Draft Environmental Impact Statement?

Please use this form to let us know your concerns. You may give this form to BLM staff during or after the meeting, or send it to:

Ron Moore
Bureau of Land Management
1535 Hot Springs Road
Carson City, Nevada 89706-0638
(702) 885-6155

Comments are due by April 2, 1996

NAME: Pio Pico

ADDRESS: P.O. Box 597, Silver Springs, Nevada 89429

PHONE #: (702) 722-0108

COMMENT: Our concern regarding the "Talapoosa Mine Project"
[166] is what impact it will have on our property? Our well now pumps 300 gallons a minute and is excellent water. We certainly do not want this to change.
[167] Next is the noise. How much, how long, and how often will they be blasting? We do not want any damage done to our home or property, such as cracks in the interior and exterior, nor do we want any broken windows inside or out. If any of the above should happen who would be responsible for repairing or replacing the damage? Last, but not least,
[168] is the wild life. What will be done to protect them? Will there be enough water provided for them? What will be done to protect them from drinking any of the contaminated water?

Response No. 166
See response to Comments No. 36 and 75.

Response No. 167
Blasting would occur routinely during daylight hours near the end of the day shift (DEIS page 4-23) and would last for only a few seconds. The analysis indicates that although the homeowners may hear and feel the blasting, the level is considered safe by the Bureau of Mines to prevent glass breakage. TMI would work closely with the local homeowners to minimize any potential for impacting the private lands as much as possible. Mining operations near residential areas are not unusual in this area. With the closest residence approximately 6,125 feet (more than one mile) from the pit, the potential for damaging a residence from sound generated by blasting should be minimal.

Response No. 168
Wildlife protection measures are discussed on pages 4-6 through 4-9 of the DEIS. These measures include: excluding wildlife from exposure to hazardous solutions; constructing power supply lines to prevent electrocution of raptors; avoiding disturbance to the prairie falcon nest site during the nesting season; and mitigating for the loss of bat roosting and hibernation habitat. Shafts and adits used by bats would not be disturbed without first allowing bats to vacate these sites. As discussed in the response to Comments No. 65 and 66, water levels flowing from Rock Blind Spring would be monitored. Should mining activities reduce or eliminate flows from this spring, a well powered by solar energy or another method would be employed to maintain this water source. Also as noted in the DEIS (p. 4-7), guzzlers will be installed in and near the project area to provide additional sources of water.

Finally, potential impacts of noise on wildlife have been projected as an extended "zone of influence" (p. 4-6). As noted, more sensitive wildlife species may avoid the area by approximately ¼ mile during operations. A total of 1,874 acres would be included in this indirect zone of influence (including the area of direct disturbance) around the mine site. Another 580 acres lie within ¼ mile of the access road. Some, but certainly not all, wildlife may avoid this area during operations at the mine. Also as noted in the DEIS, wildlife use of the area is limited by the scarcity of water and low habitat diversity present. The considerable acreage of undisturbed habitat surrounding the mine would be available as habitat for wildlife that avoid the mining area.

Will all of the noise and blasting cause them to leave the area? I certainly hope not. Too, it will take many, many years for any vegetation to grow again in this area. In the meantime it will be nothing more then land stripped of it's natural nutrients. Will the B.L.M. continue to monitor the environmental concerns of our community? To some the concerns listed are not important issues, but to those of us living in the Canyon, they truly are.

Mr. & Mrs. Pio Pico

Letter No. 18

People for the West!

BUR OF LAND MGMT CARSON CITY DIST

MAR 29 2 37 PM '96

Fighting for America's Communities

March 27, 1996

Ron Moore, EIS Project Manager
Bureau of Land Management
Carson City District Office
1535 Hot Springs Rd.
Carson City, NV 89706

Dear Mr. Moore,

As a member of the Walker River Chapter of 'People for the West!', I was asked to review and comment on the Talapoosa Mine Project Draft EIS. Specific comments on the draft EIS are as follows:

[169] Page 2-19 — It is assumed TMI will finish reviewing alternate available water sources and include the results of this review in the final EIS.

[170] Page 2-23: — The final slope of the northeast disposal area will be something less than 2h:1v. This slope appears to be justified by TMI's land ownership boundary and steepness of surrounding landforms. Is there a technical analysis which supports this final slope?

[171] Page 2-25 — It is unlikely that evaporate residues remaining in process ponds will be neutral. Accordingly, it would be prudent to plan on removing the liners and residues to an appropriate disposal area and handled accordingly.

[172] Page 4-13 — Safety berms and warning signs may be ignored by OHV users, exposing them to harm from steep pit walls. Shouldn't there be a fence around the pit(s) to ensure humans and wildlife are not "exposed to harm"? Isn't this asking for potential long term liability?

[173] Page 4-35 — Many waste rock management scenarios are discussed which address possible acid generating potential and corresponding remedies. Irrespective of water balance, is the mine plan actually flexible enough to provide these remedies in the event waste rock generates acid? Is it possible to construct a mine plan which accounts for the sequence of AGP and ANP horizons encountered which, in effect, ensures net neutralization?

General comments on the draft EIS are as follows:

The document addresses pertinent issues without reams of technical jargon impossible to wade through

Between Lyon County, the State of Nevada, and BLM keeping an eye on about every aspect of operation it is highly unlikely any undesirable actions would take place on the Talapoosa project site. TMI should, however, plan on maintaining constant dialog with the residents of Silver Springs to address potential local project related concerns as they arise.

Response No. 169
See response to Comments No. 23 and 85.

Response No. 170
The terrain of the steep slope requires a benched construction for the disposal area to contain the material in the desired footprint. The terraces provide an ideal site for revegetation in the steep terrain of the disposal area slopes. The use of steep slopes similar to the natural slopes also provides additional acreage on the flat top of the disposal area, a more desirable terrain for revegetation than any slope. The 2h:1v slope also emulates the surrounding steep slopes lessening the visual impact.

Response No. 171
The text on page 2-25 of the DEIS acknowledges this possibility.

Response No. 172
BLM believes properly constructed safety berms and signs would provide for greater public safety for the long-term than a fence that would require continuous maintenance.

Response No. 173
See response to Comment No. 9.

Indirect analysis of project economics suggests the Talapoosa will probably be a marginal project. The BLM should ensure adequate bonds are in place, during all phases of project life, to ensure complete and final reclamation at any point in time.

In general it appears few if any environmental or cultural resources will be compromised during, and after, mining operations at Talapoosa.

Sincerely,

Greg Blaylock

Greg Blaylock
Walker River Chapter
People for the West
59 Rowntree Lane
Smith, NV 89430

CHAPTER 6

CONSULTATION AND COORDINATION

LIST OF AGENCIES, GROUPS AND PERSONS TO WHOM COPIES OF FEIS WERE SENT

This chapter includes a list of additional groups and persons to receive a copy of the FEIS based on response to the DEIS. The additional names are:

Federal

- U.S. Documents Department (KW), The Libraries, Fort Collins, CO
- U.S. EPA (Jeanne Geselbracht)
  U.S. Interior Department, WO 320, Washington D.C.

Groups / Individuals

- Cristofer Christie
- Cortez Gold Mines (Al Reuter)
- EMA (Julie Twiss)
- Environmental Leadership (Patty Moen)
- Duane W. Garrabrant
- Mackey School of Mines, Department of Mining Engineering (Pierre Moussant-Jones)
- Nevada Mining Assoc., Reno, NV
- Nevada Outdoor Recreation Association, Charlie Watson
- Parson, Bailey, and Latimir (Michael Malmquist)
- Riverside Technology (Judy Small)
- Charlene Toomer

APPENDIX A

MONITORING AND MITIGATION PLAN

MONITORING AND MITIGATION PLAN

All practical means to avoid or minimize environmental harm from the Preferred Alternative have been adopted. The operation will be monitored under the inspection and enforcement procedures according to 43 Code of Federal Regulations 3809. This would require periodic compliance exams by the Bureau of Land Management during construction and quarterly mine plan compliance exams by the Bureau of Land Management during operation of the project.

The operator would have a quality assurance/quality control program established for the construction of the process facilities as outlined in the State of Nevada Water Pollution Control permit. The final reports will be submitted to the Bureau of Land Management after construction is completed.

WATER RESOURCES

Monitoring

TMI would collect hydrologic information on a periodic basis as part of its ongoing monitoring program. The hydrologic monitoring would be performed to maintain a ground water chemistry database and report any changing conditions in water levels and quality. The State of Nevada has primary responsibility on water quality issues and has established specific monitoring requirements described in the Nevada Water Pollution Control permit.

Pit de-watering would also be monitored and compared to the predictive model.

Monitoring of water supply pumping activities would allow detection of potential impacts. Rock Blind Spring and private wells in Section 15 will be monitored quarterly. Ground water quality and quantity would be monitored through a network of five wells.

A system of five groundwater wells will be installed with three wells downgradient and cross-gradient from the heap leach pad, and one well downgradient from each of the waste rock disposal areas.

The pit lake in-flow and leachate from the pit walls (if any) would be sampled and analyzed for water quality parameters during and following reclamation. Monitoring results would be compared with modeling predictions. If conditions warrant, actions would be taken to mitigate for any pit lake water quality problems in accordance with state law.

Under Nevada law, post-closure monitoring is required to demonstrate that the existing and proposed facilities do not have the potential to degrade waters of the state. In addition, Nevada law prohibits the creation of pit lakes that have the potential to degrade waters of the state or the potential to adversely affect human health or terrestrial and avian life (Nevada Administrative Code 445.2435). As a result, pit lake water quality monitoring will be required by the Nevada Division of Environmental Protection as part of post-closure monitoring requirements to demonstrate that the pit lake would not have the potential to adversely affect human health or terrestrial and avian life.

Mitigation

Impacts to Rock Blind Spring are not expected. However, should impacts to the spring result an alternate water source will be developed. See Wildlife section on p. A-4

Sedimentation basins will be installed downstream of the dumps and all runoff diverted to the basins. The sediment basins will trap sediment produced from the dumps until they are revegetated and stabilized.

Additional specific mitigation actions for water resources will be developed, if needed, in accordance with state law.

ACID ROCK DRAINAGE

Monitoring

Routine sampling and monitoring of waste rock removed from the open pits would be conducted on a quarterly basis. Quarterly testing would include static acid-base accounting and meteoric water mobility tests. The results of the evaluations would be used to refine waste management practices during mining of the proposed Talapoosa project.

The results of the water quality testing would continue to be submitted to the Nevada Division of Environmental Protection on a quarterly basis. Characterization data collected over the year would also be compared to the existing water quality database for the mine in an annual report to the Nevada Division of Environmental Protection.

Mitigation

TMI will implement the Waste Rock Management Plan described in Appendix B. Additional mitigation measures would be developed if the monitoring program identifies an acid rock drainage problem.

PIT LAKE WATER QUANTITY AND QUALITY

Monitoring

TMI will install ground water monitoring wells to monitor the quality of ground water adjacent to the main pit. These monitoring wells will be completed to measure the effects of the water, which is predicted to flow through the pit lake on adjacent ground water. At a minimum, one well will be installed upgradient of the main pit, and two wells will be installed downgradient of the main pit. Actual location of these wells will be determined in conjunction with the NDEP and BLM according to NAC445A.440. The monitoring wells will be installed if necessary. Once the pits begin filling with ground water, pit lake water quality samples will be collected, and water levels will be recorded.

Monitoring wells and the pit lake will be sampled at a frequency to be determined in conjunction with NDEP and BLM, and the samples will be analyzed for the parameters listed in Table 1.

TABLE 1: TALAPOOSA PROJECT WATER QUALITY PARAMETER LIST*

Alkalinity (as $CaCO_3$)	Lead
Bicarbonate	Magnesium
Total	Manganese
Aluminum	Mercury
Antimony	Nitrate
Arsenic	pH (±0.1 units)
Barium	Potassium
Beryllium	Selenium
Boron	Silver
Cadmium	Sodium
Calcium	Sulfate
Chloride	Thallium
Chromium	Total Dissolved Solids
Copper	Zinc
Iron	Fluoride

*all parameters analyzed on a dissolved basis

A system of five ground water monitoring wells will be installed to determine if unpredicted effects from the waste rock disposal areas and heap leach pad exist.

Monitoring reports will be submitted to NDEP and BLM. Monitoring will continue until such time as NDEP and BLM determine that sufficient data has been collected according to NAC445A.446.

Mitigation

TMI will conduct pit lake geochemical modeling every five years during the mine life and at the end of the mine life. These modeling efforts would use kinetic test data provided by actual wall rock samples from the open pit mines. Following mine closure, pit lake geochemical modeling will be conducted as determined by BLM and Nevada Division of Environmental Protection (NDEP), but no more frequently than every five years. Should refined predictions in the future show a strong possibility of violating NAC445A.429, TMI will evaluate and propose mitigation measures.

RECLAMATION

Monitoring

TMI will monitor and maintain all berms and signs on a regular basis to ensure public safety until reclamation is completed and the bond is released. TMI will monitor surface erosion on an annual basis. Revegetation monitoring will be conducted annually and will be coordinated with the appropriate regulatory agencies.

Mitigation

Erosion control structures will be maintained on an as-needed basis. Appropriate measures will be taken to mitigate any erosion problems, as needed.

NOISE AND LIGHTS

Monitoring

TMI will develop a monitoring program for noise and vibrations with the closest residents and will work with the residents to minimize impacts as much as possible.

Mitigation

All equipment will be maintained in good operating condition with appropriate mufflers tightly and correctly installed.

TMI will explore the use of an automatic reverse-activated strobe light on vehicles in lieu of audible reverse or backup alarms at night if a conflict with the private land owners use of their property develops.

TMI will plan blasting activities during the day or during periods when atmospheric conditions are unstable. The afternoon winds from the west should dissipate much of the noise if blasting is done during the windy part of the day.

SOILS

Mitigation

Long-term impacts on soils will be lessened by proper reseeding and reclamation, including the following:

1) Scarify soils or rip compacted areas to alleviate soil compaction.
2) Reseed, scarify and mulch reclaimed areas and stockpiles to minimize soil erosion.
3) Growth medium would be selectively placed on sideslopes and tops of reclaimed disposal areas and heap leach areas, where feasible.

WILDLIFE

Mitigation

Mitigation measures for impacts to wildlife will include the following:

1) Install five guzzlers outside the project area for birds and other small wildlife. Specific locations would be determined by BLM and NDOW Wildlife Biologists.
2) Install a solar well at Blind Rock Spring if monitoring indicates a loss in water level.
3) Avoid burrowing owls habitats during construction and operations. If burrowing owl sites are disturbed, TMI will construct artificial burrows at a 2:1 ratio in accordance with BLM standards.
4) To mitigate for the loss of Townsend's Big-eared Bat habitats, bat gate suitable alternative sites at a 1:1 ratio.

VISUAL QUALITY

Mitigation

The project generally meets the objectives of a Class IV visual area. However, to minimize impacts when viewed from U.S. 50, the slope gradients for the southwest disposal area will be rounded to reduce angular appearance.

PALEONTOLOGICAL RESOURCES

Monitoring

TMI would monitor for paleontological resources in the Coal Valley unit. If no paleontological resources are noted during this initial stage, it is probable that this portion is devoid of fossils, and no further monitoring will be required.

Mitigation

If paleontological resources are found during construction, TMI would immediately stop work and notify the appropriate BLM Official.

CULTURAL RESOURCES

Mitigation

If any new cultural sites are found during construction that were not identified during the original cultural surveys, construction will cease immediately and the BLM Archaeologist will be notified.

APPENDIX B

WASTE ROCK MANAGEMENT PLAN

WASTE ROCK MANAGEMENT PLAN

Waste Rock Monitoring

During the course of construction and operation of the Talapoosa Mining Inc.'s (TMI's) proposed Talapoosa Mine, the waste rock piles will be monitored continuously for runoff or leachate. If runoff or leachate are observed, quarterly sampling and analysis of the liquids will be conducted. The analysis will consist of the following:

1) Testing the pH of the runoff will be performed to determine if acid generation is occurring.
2) Collecting and analyzing random samples of dumped rock will be conducted quarterly to determine acid-generating and acid-neutralizing potentials.

This monitoring will be done continuously during construction of the disposal areas so that measures can be taken as the disposal area is constructed to prevent problem materials from exposure to meteoric waters. If monitoring during disposal area construction indicates that significant acid-generating material is encountered, the following waste rock management plan will be implemented for problem areas. The monitoring plan is specifically described below.

In accordance with NAC 445A.398, a program must be developed and implemented for characterizing spent process materials as they are generated. TMI proposes to conduct routine sampling and monitoring of waste rock removed from the open pit mine and placed in the waste rock disposal areas on a quarterly basis.

The quarterly sampling will consist of the following steps:

1) One five-gallon bucket of each waste rock type generated during the quarter will be collected.
2) Where more than one million tons of a particular waste rock type is produced during the quarter, one five-gallon sample of material will be collected for each one million tons.
3) Material will be classified based on lithology.
4) Approximate sample location, date and time of sampling, material type, and reference information will be recorded during each sampling event.
5) The total quantity of each type of material mined during the quarter and placed into the waste rock disposal areas will be recorded.
6) Test results will be evaluated as the disposal area is constructed so that the mitigation measures identified below may be employed as the disposal area is being built.

Quarterly testing will consist of static acid-base accounting and meteoric water mobility tests. Static acid-base accounting data will be reviewed using Nevada Division of Environmental Protection's (NDEP's) waste rock evaluation procedures set forth in the NDEP guidance, dated September 14, 1990. If a sample demonstrates a net acid generation potential (per NDEP's criteria), the procedures requiring kinetic testing will be followed.

Quarterly characterization data will be combined with initial testing results and re-evaluated, as appropriate. The results of the evaluation will be used to refine and direct waste management practices during disposal area construction and develop final closure plans. Should monitoring during construction indicate potential acid generation problems, one of the methods described below will be implemented.

In addition to characterizing waste rock materials as they are generated, TMI will monitor the waste rock disposal areas for leachate generation. Although leachate is not anticipated, should it be identified draining from either one of the disposal areas, samples will be collected and analyzed for comparison to Nevada water quality parameters. Additional waste management procedures may be implemented based on the water chemistry results.

Waste Rock Management Plan

The primary objective of a waste rock management plan is to prevent acid-forming materials from degrading the waters of the State. This will be accomplished with one or more of the following methods, used alone or in combination:

1) Selective handling and isolation of acid-forming waste rock.
2) Capping, contouring or drainage control to reduce infiltration.
3) Blending and diluting acid-generating materials with acid-neutralizing materials.

Several selective handling methods will be used to isolate acid-forming materials from continuous exposure to air and water. The selective handling technique to be used in a given area will depend on:

1) the geochemical character of the mined material;
2) the volume of material that is characterized as acid-forming;
3) the availability of fine-textured materials;
4) disposal area sequencing and pit phasing;
5) mining methods; and
6) other factors.

If acid-generating rock constitutes a significant portion of the disposal area material, the disposal area will be situated and designed to reduce infiltration to the extent possible.

APPENDIX C

STATE OF NEVADA DRINKING WATER STANDARDS

CHAPTER 445A

WATER POLLUTION CONTROL

445A.144 Standards for toxic materials applicable to designated waters. Except as otherwise provided in this section, the following standards for toxic materials are applicable to the waters specified in NAC 445A.123 to 445A.127, inclusive, and NAC 445A.145 to 445A.225, inclusive. If the standards are exceeded at a site and are not economically controllable, the commission will review and adjust the standards for the site.

Chemical	**Municipal or Domestic Supply** (μg/l)	**Aquatic Life** (μg/l)	**Irrigation** (μg/l)	**Watering of Livestock** (μg/l)
Antimony	146[a]	-	-	-
Arsenic	50[b]	-	100[c]	200[d]
Arsenic (III)	-	-	-	-
1-hour average	-	342[a,g]	-	-
96-hour average	-	180[a,g]	-	-
Barium	2,000[b]	-	-	-
Beryllium	0[a]	-	100[c]	-
hardness ≤75 mg/l	-	-	-	-
hardness ≥=75 mg/l	-	-	-	-
Boron	-	-	750[a]	5,000[d]
Cadmium	5[b]	-	10[d]	50[d]
1-hour average	-	0.85exp{1.128 In(H)-3.828][a,g]	-	-
96-hour average	-	0.85exp{0.7852In(h)-3.490}[a,g]	-	-
Chromium (total)	100[b]	-	100[d]	1,000[d]
Chromium (VI)	-	-	-	-
1-hour average	-	15[a,g]	-	-
96-hour average	-	10[a,g]	-	-
Chromium (III)	-	-	-	-
1-hour average	-	0.85exp{0.8190 In(H)+3.688}[a,g]		-
	-			
96-hour average	-	0.85exp{0.8190 In(H)+1.561}[a,g]		-
	-			
Copper	-	-	200[d]	500[d]
1-hour average	-	0.85exp{0.9422 In(H)-1.464}[a,g]	-	-
96-hour average	-	0.85exp{0.8545 In(H)-1.465}[a,g]	-	-
Cyanide	200[a]	-	-	-
1-hour average	-	22[a]	-	-
96-hour average	-	5.2[a]	-	-
Fluoride	-	-	1,000[d]	2,000[d]
Iron	-	1,000[a]	5,000[d]	-
Lead	50[a,b]	-	5,000[d]	100[d]
1-hour average	-	0.50exp{1.273 In(H)-1.460}[a,g]	-	-
96-hour average	-	0.25exp{1.273 In(H)-4.705}[a,g]	-	-
Manganese	-	-	200[d]	-
Mercury	2[b]	-	-	10[d]
1-hour average	-	2.0[a,g]	-	-
96-hour average	-	0.012[a]	-	-
Molybdenum	-	19[c]	-	-
Nickel	13.4[a]	-	200[d]	-
1-hour average	-	0.85exp{0.8460 In(H)+3.3612}[a,g]		-
	-			

Chemical	Municipal or Domestic Supply (μg/l)	Aquatic Life (μg/l)	Irrigation (μg/l)	Watering of Livestock (μg/l)
96-hour average	-	0.85exp{0.8460 ln(H)+1.1645}[a,g]		-
	-			
Selenium	50[b]	-	20[d]	50[d]
1-hour average	-	20[a]	-	-
96-hour average	-	5.0[a]	-	-
Silver	-	0.85exp{1.72 ln(H)-6.52}[a,g]	-	-
Sulfide				
undissociated hydrogen sulfide	-	2[a]	-	-
Thallium	13[a]	-	-	-
Zinc	-	-	2,000[d]	25,000[d]
1-hour average	-	0.85exp{0.8473 ln(H)+0.8604}[a,g]		-
	-			
96-hour average	-	0.85exp{0.8473 ln(H)+0.7614}[a,g]		-
	-			
Acrolein	320[a]	-	-	-
Aldrin	0[a]	3[a]	-	-
Chlordane	0[a]	2.4[a]	-	-
24-hour average	-	0.0043[a]	-	-
2,4-D	100[a,b]	-	-	-
DDT & metabolites	0[a]	1.1[a]	-	-
24-hour average	-	0.0010[a]	-	-
Demeton	-	0.1[a]	-	-
Dieldrin	0[a]	2.5[a]	-	-
24-hour average	-	0.0019[a]	-	-
Endosulfan	75[a]	0.22[a]	-	-
24-hour average	-	0.056[a]	-	-
Endrin	0.2[b]	0.18[a]	-	-
24-hour average	-	0.0023[a]	-	-
Guthion	-	0.01[a]	-	-
Heptachlor	-	0.52[a]	-	-
24-hour average	-	0.0038[a]	-	-
Lindane	4[b]	2.0[a]	-	-
24-hour average	-	0.080[a]	-	-
Malathion	-	0.1[a]	-	-
Methoxychlor	100[a,b]	0.03[a]	-	-
Mirex	0[a]	0.001[a]	-	-
Parathion	-	-	-	-
1-hour average	-	0.065[a]	-	-
96-hour average	-	0.013[a]	-	-
Silvex (2.4.5-TP)	10[a,b]	-	-	-
Toxaphene	5[b]	-	-	-
1-hour average	-	0.73[a]	-	-
96-hour average	-	0.0002[a]	-	-
Benzene	5[b]	-	-	-
Monochlorobenzene	488[a]	-	-	-
m-dichlorobenzene	400[a]	-	-	-
o-dichlorobenzene	400[a]	-	-	-
p-dichlorobenzene	75[b]	-	-	-
Ethylbenzene	1,400[a]	-	-	-
Nitrobenzene	19,800[a]	-	-	-
1.2 dichloroethane	5[b]	-	-	-
1.1.1-trichloroethane (TCA)	200[b]	-	-	-
Bis(2-chloroisopropyl) ether	34.7[a]	-	-	-
Chloroethylene (vinyl chloride)	2[b]	-	-	-

Chemical	Municipal or Domestic Supply (μg/l)	Aquatic Life (μg/l)	Irrigation (μg/l)	Watering of Livestock (μg/l)
1.1-dichloroethylene	7[b]	-	-	-
Trichloroethylene (TCE)	5[b]	-	-	-
Hexachlorocyclopentadiene	206[a]	-	-	-
Isophorone	5,200[a]	-	-	-
Trihalomethanes (total)[f]	100[b]	-	-	-
Tetrachloromethane (carbon tetrachloride)	5[b]	-	-	-
Phenol	3,500[a]	-	-	-
2,4-dichlorophenol	3,090[a]	-	-	-
Pentachlorophenol	1,010[a]	-	-	-
1-hour average	-	exp{1.005 (pH)-4.830}[a]	-	-
96-hour average	-	exp{1.005 (pH)-5.290}[a]	-	-
Dinitrophenols	70[a]	-	-	-
4,6-dinitro-2-methylphenol	13.4[a]	-	-	-
Dibutyl phthalate	34,000[a]	-	-	-
Diethyl phthalate	350,000[a]	-	-	-
Dimethyl phthalate	313,000[a]	-	-	-
Di-2-ethylhexyl phthalate	15,000[a]	-	-	-
Polychlorinated biphenyls (PCBs)	0[a]	-	-	-
24-hour average	-	0.014[a]	-	-
Fluoranthene (polynuclear aromatic hydrocarbon)	42[a]	-	-	-
Dichloropropenes	87[a]	-	-	-
Toluene	14,300[a]	-	-	-

Footnotes and References:

(1) Single concentration limits and 24-hour average concentration limits must not be exceeded. One-hour average and 96-hour average concentration limits may be exceeded only once every 3 years. See reference a.

(2) Hardness (H) is expressed as mg/1 $CaCO_3$.

(3) If a criterion is less than the detection limit of a method that is acceptable to the division, laboratory results which show that the substance was not detected will be deemed to show compliance with the standard unless other information indicates that the substance may be present.

(4) If a standard does not exist for each designated beneficial use, a person who plans to discharge waste must demonstrate that no adverse effect will occur to a designated beneficial use. If the discharge of a substance will lower the quality of the water, a person who plans to discharge waste must meet the requirements of NRS 445A.565.

(5) The standards for metals are expressed as total recoverable, unless otherwise noted.

a. U.S. Environmental Protection Agency, Pub. No. EPA 440/5-86-001, Quality Criteria for Water (Gold Book) (1986).

b. Federal Maximum Contaminant Level (MCL), 40 C.F.R. §§ 141.11, 141.12, 141.61 and 141.62 (1992).

c. U.S. Environmental Protection Agency, Pub. No. EPA 440/9-76-023, Quality Criteria for Water (Red Book) (1976).

d. National Academy of Sciences, Water Quality Criteria (Blue Book) (1972).

e. California State Water Resources Control Board, Regulation of Agricultural Drainage to the San Joaquin River: Appendix D, Water Quality Criteria (March 1988 revision).

f. The criteria for trihalomethanes (total) is the sum of the concentrations of bromodichloromethane, dibromochloromethane, tribromomethane (bromoform) and trichloromethane (chloroform). See reference b.

g. This standard applies to the dissolved fraction.

(Added to NAC by Environmental Comm'n, eff. 9-13-85; A 9-25-90; 7-5-94; A 11-29-95)

APPENDIX D

TALAPOOSA PIT LAKE WATER QUALITY: SCREENING RISK ASSESSMENT FOR WILDLIFE

INTRODUCTION

Talapoosa Mining, Inc. (TMI) is proposing to construct an open-pit mine in the eastern Virginia Mountains, Lyon County, Nevada. Development of the mine would include the excavation of an approximately 700- to 900-foot-deep pit (with depth varying relative to the portion of the pit rim considered). The depth of the ultimate main pit would be at an elevation of 4,680 feet above mean sea level (amsl).

Two small satellite pits would also be mined as a result of the operation. However, the maximum depths of these pits would be well above the water table. Thus, no lakes would form in these two small pits.

Following the close of mining, the bottom 163 feet of the main pit would be expected to collect ground water and form a pit lake of approximately 14.0 acres. Hydrologic modeling suggests that this lake would fill slowly, reaching an approximate surface elevation of 4,820 feet amsl in 50 years following the close of mining. The lake would reach its maximum surface area (at an elevation of 4,843 feet amsl) in approximately 200 years after the close of mining.

While no human consumption or use of the pit lake water would be expected following close of mining, wildlife may use the pit lake as a water source or as aquatic habitat. This review attempts to assess the risks that exposure to pit lake water would represent to wildlife.

POTENTIAL WILDLIFE USE OF THE PIT LAKE

Habitats near the proposed project area are now used by small numbers of mule deer, chukar and various small game and nongame species.

(The area is not currently used for livestock grazing, and since the pit lake would have no connection with other waters, fish would not be able to naturally colonize the lake.)

MULE DEER

Mule deer use of the pit lake would largely be determined by accessibility and the presence of cover and escape routes. Mule deer may be reluctant to enter a site with limited escape routes. Since the surface of the ultimate pit lake would be more than 500 feet or more below the rim of the pit (see Projected Characteristics of the Pit Lake, below), mule deer use of the lake is expected to be minimal unless substantial cover becomes established on the pit walls, an unlikely event considering the lack of soil material offered by the pit walls. Grading of the pit walls, which would help establish cover, is not planned.

SMALL MAMMALS AND BIRDS

Most small mammals and birds inhabiting the area can subsist with limited free water, though birds would be easily able to access the lake, and would use available water sources. Certain species, such as swallows, may also forage over the lake if food sources are present.

Mobile carnivores present in the area (coyotes, kit foxes, badgers) may also use the pit lake, though access to the lake would again limit use by these species.

Bats may be attracted to the site both as a water source and as a foraging area, particularly if flying insects are attracted to the lake. As noted in the Draft Environmental Impact Statement (DEIS, p. 3-14), bats recorded in the area include Townsend's big-eared bats, small-footed myotis and western pipestrelles.

WATERFOWL AND SHOREBIRDS

Waterfowl and shorebird use of the proposed project area currently is essentially nonexistent. The Lahontan Reservoir, Carson River and Carson Sink represent traditional waterfowl use areas near the proposed project area. Many of these ponds and lakes are connected by corridors of aquatic habitat (rivers, ditches and canals).

The Talapoosa pit lake following the close of mining would not be connected to the traditional use areas in the Lahontan Valley by any surface water corridors. (The pit lake would be located in the foothills of the Virginia Range at an elevation of approximately 4,843 feet amsl, with the rim of the pit at an elevation of approximately 5,400 feet amsl at its lowest point.)

Most local waterfowl movement would tend to follow rivers, canals and other aquatic corridors. Birds following these corridors would not have a direct line of sight to the pit lake and would not be attracted to the site by visual cues.

However, migrating or other higher flying birds would be able to see the lake and could be attracted to it. Common migrant waterfowl in the Stillwater and Lahontan Valley area include green-winged teal, mallards, pintails, northern shovelers, gadwalls, American wigeon, canvasbacks, redheads, lesser scaup and ruddy ducks (Alcorn, 1988).

Shorebird migrants recorded in numbers at Stillwater and the Lahontan Valley include killdeer, black-necked stilts, American avocets, western and least sandpipers, dunlin, long-billed dowitchers and Wilson's and red-necked phalaropes.

Habitat Development and Use

Once birds "discover" the lake (which, as noted, is projected to be approximately 14.0 acres in size at its maximum extent), movement between this water and the traditional use areas in the Lahontan Valley could occur.

The extent to which waterfowl and shorebirds use the lake would depend primarily on the habitats that develop in and near the lake and the distance to other water bodies. Lokemoen (1973) notes that distance from other ponds also influences waterfowl use of given sites, stating that "as distance from a pond to other water increased, use of the pond by pairs generally decreased."

Factors that would affect the type of vegetative and invertebrate community that may develop in the lake include the extent of shallow water habitat available (on which emergent or aquatic vegetation could become established, and which would be more effectively warmed by solar radiation than deep water habitats), the extent of and type of bank or bar habitat, and water quality.

(No development of shallow water habitat is planned as part of the Reclamation Plan for the pit.)

Waterfowl

If the lake includes little shallow water and supports little or no emergent and bank vegetation and a limited invertebrate population, waterfowl may use the lake only as a resting or stopover site. Should conditions allow the development of a more diverse vegetative and invertebrate community, waterfowl may make more extensive use of the lake, including its use as a feeding or nesting area (Lokemoen, 1973; Patterson, 1976).

Many species of waterfowl prefer open, grassy banks as resting sites, while brushy shorelines and upland cover are important components of nesting habitat (Lokemoen, 1973). Preference for emergent vegetation shown by waterfowl with broods varies with species. Pintail broods, for example, use emergent vegetation as escape cover while blue-winged teal and American wigeon often swim to open water when threatened.

Waterfowl species that commonly nest in the Stillwater and Lahontan Valley areas include Canada geese, mallards, cinnamon teal, gadwall, redhead and ruddy ducks (Alcorn, 1988).

Shorebirds

Most shorebirds feed on banks, bars and in areas of shallow water. Use of the pit lake by these species would be dependent on the extent of this habitat type present. This in turn would be determined by the location of benches within the pit relative to the water surface of the pit lake.

Common nesting shorebirds in the Stillwater and Lahontan Valley areas include killdeer, black-necked stilts, American avocets, spotted sandpipers and Wilson's phalaropes. Smaller numbers of willets and long-billed curlews also nest in the area (Alcorn, 1988).

Several species of herons and egrets also nest in the Stillwater-Lahontan Valley area. These include the great blue heron, the great and snowy egrets (with snowy egrets being the more common of the two) and black-crowned night herons. Stillwater and the Carson Lake area are important white-faced ibis nesting areas.

PIT LAKE CHEMISTRY MODELING

Modeling suggests that the water quality in the Talapoosa pit lake would exceed Nevada state drinking water standards for several elements or compounds.

Water quality, like water depth, is predicted to change over time. After 25 years, concentrations of total dissolved solids (TDS), sulfate, antimony, arsenic, manganese, nickel and thallium are expected to exceed state drinking water standards. After 100 years, concentrations of the above listed substances and chromium are predicted to exceed state drinking water standards.

Projected concentrations of these substances, excluding chromium (see discussion below), are shown in Table D.1. This table also compares the projected concentrations of these substances to Nevada state drinking water standards.

TABLE D.1. CONCENTRATIONS OF SUBSTANCES PROJECTED TO EXCEED STATE STANDARDS IN THE PIT LAKE.

ELEMENT/ SUBSTANCE	NEVADA DRINKING WATER STANDARDS (MG/L)	PROJECTED 25-YEAR CONCENTRATION (MG/L)		PROJECTED 100-YEAR CONCENTRATION (MG/L)	
		BEFORE PRECIPITATION	AFTER PRECIP. & ADSORPTION	BEFORE PRECIPITATION	AFTER PRECIP. & ADSORPTION
TDS	500mg/*	826.3	-	1,730.1	-
Antimony	0.006	0.024	0.024	0.051	0.051
Arsenic	0.05	0.402	0.277	0.799	0.595
Manganese	0.05	1.7	1.7	3.7	1.4
Nickel	0.1	0.13	0.123	0.28	0.26
Sulfate	250**	504.8	505.2	1,091.2	1,095.1
Thallium	0.002	0.0038	0.0038	0.0083	0.0083

*Nevada limit for livestock watering

**Nevada Secondary Drinking Water Standards

METHODOLOGY

A final geochemical model (PHREEQC and MINTEQA2) was prepared to predict the chemistry of the pit lake at the proposed Talapoosa mine. The model uses the water balance predicted for the pit lake based on more extensive humidity cell testing data than were used for the predictions from the preliminary model, the results of which were recorded in DEIS. Some differences were found and noted below.

Four components comprise the water balance of the pit lake following the end of mining:

1) precipitation falling into the lake;
2) precipitation falling on the pit walls and running off into the lake;
3) ground water inflows into the lake; and
4) evaporation.

Precipitation Falling into the Lake

Precipitation falling into the pit lake is extremely dilute (if not void) with respect to leachate and ground water chemical parameters. Thus, it does not contribute to the flux of dissolved chemical components in the pit laid.

Precipitation Falling on Pit Walls

Runoff from the pit walls has been estimated by applying the annual precipitation to the area of the pit walls. Leachate production was estimated by applying the pit wall runoff to the area of the pit walls taken up by the three main rock types; Lousetown Basalt (Tlb), Upper Kate Peak (Tkx), and Lower Kate Peak (Tka). Leachate chemistries for these rock types were measured using the average leachate analysis from weeks 32 to 48 of humidity cell tests conducted on each rock type.

Ground Water Inflows

Ground water inflows are estimated from measured long-term pump test results and analytical modeling. The chemistry of ground water inflows is based on average laboratory analysis of in-situ ground water that would flow into the pit.

Evaporation

Evaporation rates are based on observed levels at Lahontan reservoir and measured evaporation pan rates. Evaporation serves to concentrate any chemical analytes present in the lake since it is an outflow of solvent water. No ground water discharge is expected from the pit.

ALUMINUM WOULD BE WITHIN STANDARDS

In the DEIS, aluminum was included in those parameters expected to exceed state drinking water standards. This conclusion was based on preliminary geochemical modeling, which used the 16-week average of the 1995 humidity cell testing for the prediction of leachate chemistries for the rock types present in the pit. Further, no credit was taken for the precipitation of gibbsite, an expected aluminum-based mineral. Precipitation of gibbsite would take aluminum out of solution and make it unavailable for ingestion.

The more recent modeling overturned the earlier prediction for aluminum. Long-term humidity cell data (32-48 week average) were used in the final model. In addition, the chemistry of the lake will allow the precipitation of gibbsite. When these two factors are taken into account, aluminum is projected to meet drinking water standards for the proposed pit lake. Therefore, it is not included in this discussion.

DATA ADEQUACY

UNCERTAIN RESULTS FOR NICKEL AND CHROMIUM

The modeling indicated uncertain results for nickel and chromium for their potential to exceed state drinking water standards.

Nickel

Model input values for two of the three average leachate analyses for nickel were below laboratory detection limits. For these values, half the detection limit of 0.04 mg/l (0.02) mg/l was used in the model. Therefore, there is a large uncertainty as to whether nickel will be in exceedance of state standards.

Despite this uncertainty, nickel has been included in the discussion that follows.

Chromium

For chromium, all values for all three leachate types were below the laboratory detection limit of 0.1 mg/l. For the ground water inflows, 24 of the 25 samples that were measured had values below detection limit for chromium. One ground water sample yielded 0.012 mg/l. of chromium, just slightly above the detection limit of 0.01 mg/l. For the model, half the detection limit was used for the non-detect values.

Thus, most of the input data for chromium is below the detection limit. Therefore, there is also a large degree of uncertainty as to whether chromium would be in exceedance of state drinking water standards. Therefore, chromium is not included in the discussion that follows.

SENSITIVITY OF NONDETECTED VALUES

Model input values for pit wall leachate and ground water concentrations for several other analytes were below laboratory detection limits. For example, various laboratory results for antimony, thallium, chromium, and nickel were found to be below the detection limit.

Since measured concentrations for below detection limit values are not known, the model used half of the detection limit where below detection limit values occurred. This approach appears to be reasonable in that the actual values may range from 0 (not present) to the maximum detection limit for any analyte where the laboratory result was below detection.

As stated previously, this approach introduces uncertainty as to whether drinking water standards will actually be exceeded for the analytes exhibiting non-detectable analytical results. This is compounded by the geochemical model, which concentrates the analytes by evaporation over a long time frame.

For those analytes where half the detection limit is used, concentrations may either be overestimated or underestimated since they may range between 0 to the detection limit. In order to bracket the level of uncertainty, values of 0.0 mg/l, half the detection limit, and the maximum detection limit were used in the geochemical model for chemical analytes where nondetectable laboratory values existed. Table D.2 shows the results of this sensitivity analysis.

As can be seen from reviewing Table D.2, chromium exceeded the drinking water standards only at 25 years, if the maximum detection limit is used. It is predicted to be below the drinking water standard at half the detection limit. None of the leachate samples and only one of 25 ground water samples showed chromium above the detection limit.

Nickel exceeds the drinking water standard at half of the detection limit and the maximum detection limit but is below if zero detection is used. Thallium and antimony are projected to exceed the standards regardless of which value is used in the model.

TABLE D.2 SENSITIVITY OF NONDETECTED ANALYTES AT YEAR 25.

ANALYTE	HALF DETECTION	0 DETECTION	MAX. DETECTION	NDEP STD*
Antimony	0.024 mg/l	0.022 mg/l	0.027 mg/l	0.006 mg/l
Chromium	0.08	0.00	0.17	0.10
Nickel	0.123	0.089	0.158	0.10
Thallium	0.0038	0.0033	0.0065	0.002

*Nevada Division of Environmental Protection Standard

PROJECTED CHARACTERISTICS OF THE PIT LAKE

As noted above, the surface of the ultimate pit lake is projected to be more than 500 feet below the rim of the pit. Projections of the dimensions of the pit lake appear in Figure 2.3 in the DEIS (page 2-8).

Cross section A-A' of Figure 2.3 shows a crest elevation of the pit as being approximately 5,460 feet amsl. This projection shows the pit lake would have steeply sloping banks on the east and a small bench on the west.

Cross section B-B' of Figure 2.3 shows a crest elevation of approximately 5,580 feet amsl and steeply sloping banks on the south. The B-B' cross section also shows a near-surface bench on the north.

The north side of the pit would receive the greatest amount of solar radiation (insolation), which would, in turn, promote the growth of aquatic vegetation, given other suitable conditions. No grading or soiling of the pit walls, which would further promote the growth of aquatic vegetation, is planned.

POTENTIAL IMPACTS TO WILDLIFE INGESTING PIT LAKE WATER

Wildlife using the pit lake as a water source could potentially be adversely affected by ingesting the pit lake water. The investigation into potential impacts of pit water constituents on wildlife produced the following information.

TOTAL DISSOLVED SOLIDS (TDS)

The State of Nevada limit for TDS in water used for livestock watering is 3,000 mg/l, while the drinking water standard is 500 mg/l. TDS in in-situ ground water from the volcanic bedrock within the Talapoosa project area averages approximately 1,466 mg/l. After 25 years, modeling suggests that a TDS concentration of 826.3 mg/l may exist. After 100 years, this concentration is expected to have risen to 1,730.1 mg/l.

A high TDS concentration may cause osmotic regulation problems in aquatic life, limiting the species which could exist as the basis of a food chain in the pit lake. Concentrations of greater than 2,100 ppm are unsuitable for all but some salt tolerant plants (Masters, 1974). Further, high TDS water may be unpalatable to vertebrate wildlife species.

SULFATE

The State of Nevada has no primary drinking water standard for sulfate, but the secondary standard is established as 250 mg/l. Currently, baseline sulfate concentration in the ground water at the Talapoosa site averages nearly 776 mg/l.

According to pit water modeling, the concentration of sulfate is expected to increase over time in the pit lake. Sulfate concentration is expected to be approximately 505 mg/l after 25 years and 1,095 mg/l after 100 years. Sulfate concentration may account for much of the projected TDS level expected in the lake.

Aquatic life is sensitive to sulfate concentrations. Macroinvertebrate diversity (as measured by number of taxa present) diminished from more than 30 species present in water which contained less than approximately 50 mg/l sulfate to less than five species present in water containing more than 400 mg/l sulfate (Winget and Mangum, 1979).

The high sulfate concentrations expected to exist in the pit lake, particularly at the 100-year time frame, would limit invertebrate life. A sparse or nonexistent invertebrate community would support only a limited food chain, including few vertebrate species.

ANTIMONY

The State of Nevada drinking water standard for antimony of 0.006 mg/l. Projections of antimony concentration in the Talapoosa pit lake is 0.024 mg/l after 25 years and 0.051 mg/l after 100 years. The values for before and after sorption are the same since no antimony absorption reactions are considered in the modeling.

Little information concerning antimony toxicity to wildlife could be located in the literature. Values of LD_{LO} (lowest lethal dose) for rats and guinea pigs are listed as 100 mg/kg and 150 mg/kg, respectively (Sax, 1984). An avian LD_{50} (that concentration of a substance which will kill 50% of a test population) of 115 mg/kg/day and an NOAEL (no observed adverse effect level) for avian species of 0.035 mg/kg/day was listed by Parametrics in their analysis of the Twin Creeks Mine (Parametrics, 1996) (Wiemier, 1996).

Antimony can be expected to be an intestinal irritant. Toxic effects may manifest themselves as open sores on the skin and liver disorders. Oral feeding of antimony to rats has not produced excess tumors (Randolf, 1996).

ARSENIC

The State of Nevada primary drinking water standard for arsenic is 0.050 mg/l. For livestock watering, the state standard is 0.20 mg/l. The baseline concentration of arsenic in the ground water at the Talapoosa site averages 0.20 mg/l.

The projected arsenic concentration in the pit lake is expected to fall between 0.277 mg/l and 0.402 mg/l at 25 years after the formation of the pit lake. The concentration is then expected to increase to between 0.595 mg/l and 0.799 mg/l at 100 years. Variations in these concentrations again represent concentrations before (higher concentration) and after (lower concentration) factoring in precipitation and adsorption.

Arsenic, a heavy metal, occurs in a number of forms, and toxicity varies with form. Generally, the more soluble forms are more toxic, as these forms are readily absorbed by biological organisms. Arsenic readily binds with iron (dependent on pH), forming stable and less toxic (less soluble) compounds. In a review of arsenic hazards, Eisler (in Nriagu, 1994) states that the toxicity of arsenic can be affected by "water temperature, pH, Eh, organic content, phosphate concentration, suspended solids and the presence of other substances and toxicants, as well as arsenic speciation and duration of exposure."

Bioconcentration in Plants and Animals

Arsenic may persist in the environment for long periods of time and is subject to biological concentration in individual animals (Stoker and Seager, 1972). Eisler (1988) concluded that arsenic does not seem to biomagnify in the food chain.

However, Camardese et al. (1990) state that significant biological concentration may occur in some aquatic vegetation. In a later review, (Eisler, in Nriagu, 1994) suggests bioconcentration factors for aquatic organisms are relatively low except for some algae. Bioconcentration values for As^{+3} (generally a more toxic form of arsenic) in most aquatic invertebrates and fish exposed for 21 to 30 days did not exceed 17 times the exposure (background) concentration. Maximum concentration values for As^{+5} (usually a less toxic form than As^{+3}) were six times the exposure (background) concentration, and for organoarsenicals nine times the exposure concentration.

Eisler states some higher bioconcentration values reported in the literature indicate a need for further research of this issue.

Effects on Wildlife

Most cases of arsenic poisoning in wildlife tend to be acute or subacute, with cases of chronic (long-term) poisoning infrequently reported, evidently because low doses of arsenic are rapidly detoxified or excreted (Eisler 1988).

Arsenic can traverse placental barriers, and sensitivity to arsenic is greatest during early fetal developmental stages (Eisler, in Nriagu, 1994). Arsenic may cause birth defects (i.e. is teratogenic) or miscarriages at low concentrations (as low as 1.7 mg/kg of body weight in hamsters).

Various animals show quite different sensitivities to arsenic. Chukar, for example, showed an LD_{50} of approximately 2,000 mg/kg of body weight. Mallards show a higher sensitivity, with an LD_{50} of 323 mg/kg body weight. California quail showed a higher sensitivity still, with a single oral LD_{50} of 47.6 mg/kg of body weight. Mule deer showed an LD_{50} at doses of more than 320 mg/kg of body weight (Eisler, 1988; Eisler, in Nriagu, 1994).

Several studies have focused on the effects of arsenic on wildlife, particularly waterfowl. The results of some of them are given below.

Study 1

In one study, mallards fed arsenic at a concentration of approximately 300 parts per million (ppm) for a period of 48 days rapidly accumulated arsenic up to approximately 1 ppm in the blood and approximately 2 ppm in the liver. These concentrations then remained essentially constant until arsenic was removed from the birds' diet. The concentration in both blood and liver then quickly dropped to undetectable levels (Pendleton et al., 1995).

From this investigation, it was concluded that migrating or transient water birds would not be greatly affected by a brief exposure to moderate arsenic levels, providing the birds soon moved on to other, uncontaminated water bodies.

Study 2

Arsenic has been shown to inhibit growth in mallard chicks, with females apparently more sensitive than males (Camardese et al., 1990). In this study, mallard chicks were fed diets including 30, 100 and 300 ppm arsenic (added as sodium arsenate) for a period of 10 weeks. Little increase in mortality was noted, but all levels of arsenic exposure resulted in reduced growth in female birds. Males showed reduced growth only at the highest exposure level.

Birds fed the 300 ppm arsenic diet also showed increased resting time. The investigators noted a decrease in adenosine triphosphate in the brain in birds fed this higher arsenic concentration, and suggested this was responsible for the increased resting time. The authors note that concentrations as high as 430 ppm arsenic have been found in some aquatic vegetation.

Study 3

In a study of the effects of selenium, boron and arsenic on the development of American avocet young, Fairbrother et al. (1994) found that avocets that nested at a pond (Pryse Pond in California) containing a high arsenic concentration (1.1 ppm) produced smaller hatchlings, and adult birds hatched at this pond attained smaller size than birds in a control pond.

These authors note that arsenic can affect the immune system of birds. They note that Sharma (1981) found ingestion of low concentrations of arsenic can increase the antiviral activity of interferon, while exposure to high concentrations of arsenic inhibits the syntheses and action of interferon. In their study of contaminated ponds, Fairbrother et al. found birds reared at ponds contaminated with selenium, boron and arsenic showed inhibition of their immune systems.

The concentration of arsenic at Pryse pond was slightly higher than the predicted concentration in the Talapoosa pit lake before the effects of precipitation and adsorption are factored in to the projections of pit lake water quality. The concentration of arsenic present in the Talapoosa pit lake after 100 years, and after factoring in precipitation and adsorption, are approximately half that in occurring Pryse Pond.

MANGANESE

The State of Nevada secondary standard for manganese is 0.050 mg/l. Baseline ground water concentrations of manganese currently exceed this level by nearly a factor of 20 (1.01 mg/l). Manganese concentrations in the pit lake are projected to be 1.7 mg/l at 25 years and vary from 3.7 to 1.6 mg/l at 100 years. (Variations in these concentrations again represent concentrations before [higher concentration] and after [lower concentration] factoring in precipitation and adsorption.)

In nature, manganese is found in various salts and minerals. In natural waters, manganese ions seldom occur at concentrations of more than 1 mg/l. Manganese is not known to be a problem in water provided to livestock, but concentrations of 1 mg/l or higher may be toxic to plants at low pH (EPA, 1986). The pH of the pit lake is projected to be alkaline at 7.6 and 7.89 at 25 and 100 years, respectively.

NICKEL

The State of Nevada primary drinking water standard for nickel is 0.1 mg/l. Nickel concentrations in the pit lake are expected to be approximately 0.123 mg/l after 25 years and approximately 0.25 mg/l after 100 years. No detectable values of nickel were exhibited for baseline ground water.

Like arsenic, nickel may persist in the environment for long periods of time. The toxicity of nickel, however, is influenced by the hardness of the water (US EPA, 1986). Constituents in harder water compete (e.g. Ca and Mg) with nickel, limiting its toxicity to wildlife.

Cain and Afford (1981) note nickel concentrations in the Wanapitei River in Ontario, Canada, averaged 43 ppb nickel, while concentrations in the algal periphyton averaged 826 ppm; the average concentration in water plants (*Potamogeton*, sp.) in this river was 690 ppm. Waterfowl feeding on this vegetation could accumulate nickel loads.

To investigate potential effects of nickel ingestion, Cain and Afford fed mallard ducklings diets containing essentially no nickel (control), 200, 800 and 1,200 ppm nickel. Ducklings fed 1,200 ppm developed tremors and showed signs of paresis after 14 days. Birds fed the 1,200 ppm diet weighed less than birds raised on the other diets, and 71% of birds in this group died within 60 days of age. Female ducklings fed the 800 to 1,200 ppm nickel diet showed reduced bone density, while male ducklings fed diets containing 1,200 ppm nickel showed reduced bill growth.

These authors note that other research has shown concentrations as low as 300 ppm dietary nickel reduced growth rates in chickens (Ling and Leach, 1979). Concentrations of nickel in the ducklings tissues decreased with age.

THALLIUM

Thallium was not detected in the majority of baseline ground water samples.

Thallium may cause neuro, hepatic and renal injury. Little information could be located on thallium metal toxicity. Thallium-sulfate, a rodenticide, was found to have an LD_{50} of 36.7 mg/kg in mallards, 60-120 mg/kg for the golden eagle, and 23.7 mg/kg for pheasants (Hudson, et. al. 1984). The LD_{50} for rats is thought to be 30 mg/kg (Wiemier, 1996).

CONCLUSIONS

The pit water that would be expected to accumulate in the Talapoosa pit following the close of mining may be of limited palatability to wildlife. This is based on the following factors:

1) The concentrations of TDS and sulfate projected to occur in the pit lake may limit both aquatic vegetation and aquatic invertebrate life. This would limit any sources of food or nesting areas needed to attract wildlife species.

2) The distance of the pit lake from other waters and its location in the bottom of a relatively deep depression (the Talapoosa pit) would act to limit use by local waterfowl and shorebirds. Habitat sought for nesting and rearing would also be absent.

3) The extent of use the lake would receive would be further influenced by the aquatic community that develops in the lake, which is dependent in part on water quality.

Should only limited aquatic vegetation and a limited aquatic invertebrate community develop, low use of the pit lake by wildlife would be expected. The lake would probably be used as a resting place by some migrant waterfowl, and as a water source by some resident species, particularly passerine birds.

If better than projected water quality conditions developed in the lake, a more complex aquatic community, including both aquatic vegetation and invertebrates, could develop in the lake. It should be noted that reclamation plans for the pit will not include enhancements for aquatic life or vegetation. Such an aquatic community would attract a wider range of wildlife to the lake. Perhaps a worst-case scenario would entail the development of a diverse aquatic community concurrent with a high concentration of arsenic and other metals.

Table D.3 compares projected concentrations of elements/compounds in the Talapoosa pit lake with concentrations found to produce adverse effects, as discussed in the above review.

When reviewing the figures in this table, it must be born in mind that metals can be bioconcentrated significantly, either within individual animals or within the food chain. Thus, even though the concentration of some elements projected to be present in the pit lake appears well below concentrations known to produce harmful effects in wildlife, bioconcentration could result in the accumulation of harmful levels of some substances.

Arsenic concentrations probably represent the largest potential threat to wildlife that may use the pit water. Excepting acute toxicity problems, resident species using this water on a long-term basis would more likely be affected than transient or migrant individuals. This case is also true for antimony.

In general, resident species would run a higher risk of accumulating some substances, particularly heavy metals. Since arsenic is a teratogen (i.e., may cause birth defects), resident species watering at the pit lake may show an increase in birth defects or miscarriages.

The following general conclusions can be made regarding wildlife use of the pit lake following the close of mining:

TABLE D.3. CONCENTRATIONS OF SUBSTANCES WHICH MAY EXCEED STATE DRINKING WATER STANDARDS.

ELEMENT/ SUBSTANCE	CONCENTRATION SHOWN TO PRODUCE ADVERSE EFFECTS IN WILDLIFE	PROJECTED 25-YEAR CONCENTRATION (MG/L)		PROJECTED 100-YEAR CONCENTRATION (MG/L)	
		BEFORE PRECIPITATION	AFTER PRECIP. & ADSORPTION	BEFORE PRECIPITATION	AFTER PRECIP. & ADSORPTION
TDS	See Text	826.3	826.3	1,730.1	1,730.1
Antimony	0.035 mg/kg/day[1]	0.024	0.024	0.051	0.051
Arsenic	1.1 ppm (= approx. 1.1 mg/l)	0.402	0.277	0.799	0.595
Nickel	800 ppm	0.13	0.13	0.28	0.26
Sulfate	See Text	505	505	1,091	1,095
Thallium	36.7 mg/kg[2]	0.0038	0.0038	0.0083	0.0083

[1]Level above which adverse effects may be observed in avian species.
[2] LD_{50} for mallards for the compound thallium sulfate, a rodenticide

- The extent of waterfowl use of the lake would, as noted, be determined in part by the type of aquatic plant and invertebrate community that develops at the lake.
- Mule deer use of the lake would be a function of accessibility and presence of escape routes, both of which would be limited, based on current projections.
- Mobile carnivores (coyotes, badgers, kit foxes) would probably use the pit lake as a water source, if the lake's water is palatable and relatively accessible.
- Most nongame avian species residing in the project area (Say's phoebes, swallows, rock wrens, western meadowlarks, Brewer's and black-throated sparrows) and bats could and probably would access the lake as a water source to some extent. The location of the lake in a deep depression would probably limit this use by most species.
- Nongame migrant bird species may be attracted to the lake, particularly if a riparian vegetation community develops on the lake shore.

POTENTIAL MITIGATION MEASURES

The pit lake water quality would be subject to long-term monitoring. Should this monitoring show that the concentration(s) of one or more substances is approaching harmful levels, mitigation efforts could be implemented to either reduce the concentration of those substances, or to exclude wildlife from potentially hazardous solutions.

Concentrations of substances could be reduced by pumping clean water into the lake. Alternately, some substances can be removed or rendered less toxic by treatment. Arsenic, for example, can be removed by absorption onto iron oxides. Most metals are more soluble and thus more toxic at low pH. The pH of the Talapoosa pit lake is expected to be slightly alkaline and, thus, would limit solubility of metals. Nickel can be rendered less toxic in hard water environments.

If some substances proved difficult to remove or treat, however, exclusion may be required to preclude wildlife access to solutions containing high concentrations of these materials. Exclusion may take the form of fencing to prevent access by big game, or netting to limit avian access.

The development of aquatic vegetation in the lake could be limited by removing near-surface benches from the shores of the pit lake. This action could be accomplished by excavating or blasting benches prior to the development of the pit lake. Should water levels fluctuate considerably, however, this approach may be ineffective. Any actions that would prevent establishment of suitable nesting, rearing or cover habitats would also have a mitigating effect.

Alternate water sources, such as guzzlers, could be installed at more accessible locations in the vicinity of the Talapoosa Pit. Many wildlife species (particularly, but not exclusively, terrestrial species) could satisfy their water requirements at these more accessible water sources. This would reduce the attraction of the pit lake.

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APPENDIX E

SUPPORTING INFORMATION:

AFFECTED ENVIRONMENT

GEOLOGY AND MINERALS

ACID ROCK DRAINAGE

Selection of Samples for Geochemical Analyses and Tests

The near-surface portions of the Main and Upper Bear Creek Zones have been largely oxidized by gradual exposure to the atmosphere over geologic time.

The site is relatively arid, the water table in most areas is deep and all historic underground mine workings are dry and were developed in oxidized ore. Consequently, the proposed Talapoosa project area has not experienced any known acid drainage to date. However, sulfide-bearing unoxidized rocks are prevalent in the Lower Bear Creek Zone. These unoxidized rocks may potentially generate acid fluids if exposed to the atmosphere.

Because of this potential, a waste rock sampling and analysis program was performed to determine the potential of mined rocks to generate acid fluids. A critical goal of the geochemical sampling, testing and modeling program was to predict long-term effects of the proposed mining on the chemical quality of surface and ground waters.

Representative samples of the deposit's waste rock types and alteration styles were collected from drill core and surface samples. The Nevada Division of Environmental Protection (NDEP) requires that the materials sampled represent the entire range of material deposited in the waste disposal areas and exposed in pit lake walls.

Analytical procedures used to characterize the mined rocks included Acid Base Accounting (ABA), which compares the Acid Generation Potential (AGP) to the Acid Neutralization Potential (ANP), Humidity Cell Testing (HCT) and the Meteoric Water Mobility Procedure (MWMP). Descriptions of the analytical procedures are provided in the following sections.

A general description of the lithology of sampled geologic units is given in Table 4.2. Samples were collected based on geologic logging of drilled materials and visual observations of the rock's sulfide content and alteration style.

Nine types of waste rock from the pit area were identified in the pit's block model (WESTEC, 1995). In addition, four alteration styles were identified that were anticipated to have varying environmental effects when placed in waste rock disposal areas. Table E.1 lists the major rock units, the major alteration styles, type of analytical procedure performed and the number of samples run on each geologic/alteration unit.

TMI previously collected 118 samples for AGP analyses (Table E.1), including 106 from the Lower Kate Peak (Tka) ore zones and nine from shallower units. WESTEC collected 87 additional samples for analyses from all nine waste rock types and four alteration styles.

Three geologic units, Tka, Tkx and Tlb, make up approximately 96 percent of the projected waste rock volume (by weight). A total of 85 percent of the ANG/ANP tests, 65 percent of the MWMP and 100 percent of the HCT test samples were taken from these three units.

Geologic units Tcvts, Tkdi, Tksed, Tklahar, Tkb, and Qal/Qc make up approximately 4 percent of the projected waste rock volume. Each of these units received at least one ABA and one MWMP analysis. Table E.1 shows the number of ABA, MWMP, and kinetic test samples.

Data in Table E.2 shows that the ore is dominated (98 percent) by sulfide-bearing rock from the Upper and Lower Kate Peak Formation (Tkx and Tka). The waste rock and pit walls will expose important amounts (13.8 percent) of Lousetown basalt flow rock (Tlb), which is chiefly oxidized, and sulfide-bearing Upper (31.3 percent) and Lower (54 percent) Kate Peak Formation.

Acid Generating Potential and Acid Neutralization Potential

Laboratory measurements are used to estimate a rock's Acid Generating Potential AGP. The AGP is intended to measure the amount of acid a particular rock is capable of producing. For the proposed Talapoosa project, two methods were used to determine the AGP.

The first method measures the total sulfur in the rock and assumes that all of the sulfur is present as an iron sulfide. Because sulfur is chiefly present as sulfates in oxidized rocks, and also occurs in reduced rock as other sulfides such as ZnS, PbS and CuS, which do not produce acidity, this is a very conservative assumption (cf. Macdonald et al., 1994).

In an alternate and more accurate approach, the amount of sulfur present in sulfate form is ignored, and the AGP is estimated based solely on the quantity of sulfides.

Many minerals and non-ore rocks (except quartz), given sufficient time and appropriate conditions, are capable of partially or completely neutralizing acid rock drainage. The short-term ability of a rock to neutralize acid, the Acid Neutralization Potential (ANP), may be estimated in the laboratory.

In the ANP procedure, the rock sample is leached with hot acid for about 30 minutes and the resulting pH is measured. Rock with a high laboratory ANP contains highly reactive basic minerals such as calcium carbonate (calcite) that can be fully dissolved during this short time period.

The ANP does not measure the very important neutralization potential of silicate minerals such as the clays and feldspars, which are slower to react and typically take weeks to years to neutralize ARD. For this reason, the ANP will greatly underestimate the true *in situ* neutralization potential of rocks high in clays and micas, for example, as found in surface waste rocks at the Talapoosa site.

Prior to the ANP measurement, samples are usually crushed and sized (to <150 ms in this study, according to Gene McCleland). This somewhat enhances acid neutralization by coarser-grained minerals such as the feldspars.

Minimum, maximum and average AGP and ANP values from the laboratory tests and analyses are given in Table E.3. Because rock sulfides are the chief source of acidity, the AGP values based on pyritic sulfur and not total sulfur are the most correct. As an example, the elevated AGP total sulfur values reported for highly oxidized Quaternary alluvium are due primarily to sulfate minerals such as gypsum, which does not produce acid.

Further comparison of AGP total sulfur and AGP pyritic sulfur values suggests that about 25 percent of the total sulfur in the Kate Peak Formation is also from sulfate sulfur. However, the AGP pyritic sulfur values suggest that small amounts of pyritic sulfur are present in all the units, even in the largely oxidized units above the ore body (Qal, Tlb and Tcvts).

ANPs greatly exceed AGP pyritic sulfur values for the mostly oxidized units (Qal, Tlb and Tcvts), which are above the Kate Peak Formation. As expected, AGP pyritic S values are greatest in the ore body (Tka) and substantially exceed ANP values.

Acid-Base Accounting

In the acid-base accounting (ABA) procedure, values of ANP and AGP are converted to units of equivalent tons of $CaCO_3$/1,000 tons of rock and compared to determine if a rock will produce a net acid leachate.

The Humidity Cell Test (HCT)

Given that the AGP analysis will usually be an overestimate and the ANP an underestimate, the ABA procedure is likely to overstate the risk of acid water production. Consequently, TMI and its consultants decided to perform laboratory humidity cell tests (HCT).

Because the HCT examines the weathering behavior of geological materials as a function of time, it is termed a kinetic test. The HCT provides weathering

TABLE E.1: DETAILED DESCRIPTION OF SAMPLING PROGRAM FOR GEOCHEMICAL ANALYSES AND TESTS

UNIT	ORE ZONE	ALTERATION FACIES	% WASTE (TONS)	STATIC TESTS						KINETIC TEST	
				ABA old[3]	ABA	% ABA[4]	ABA Dyke Adit/ East Hill	MWMP	% MWMP[4]	Humidity Cell	% Humidity Cell[4]
Tlb			27.0	3	8	9.6		4	17.4	2	33.3
Tcvts			0.3	1	1	1.2		1	4.3	0	
Tkx			15.6	6		14.5			13	0	16.7
		bleached or argillized / sulfides			2			1		1	
		argillized			10			2		0	
Tka			53.7			60.5			34.8		50.0
	UBC[1]	leach ore		107	1		2	0		0	
		silicified waste			2		1	1		0	
		argillized waste			7			2		1	
		weakly altered waste			2		1	0		0	

Source: Water Management, 1996

1 Upper Bear Creek Zone
2 Lower Bear Creek Zone
3 AB analyses from 1993 samples
4 Percent of total ABA, MWMP and humidity cell tests, respectively

TABLE E.1: DETAILED DESCRIPTION OF SAMPLING PROGRAM FOR GEOCHEMICAL ANALYSES AND TESTS (CONTINUED)

UNIT	ORE ZONE	ALTERATION FACIES	% WASTE (TONS)	STATIC TESTS						KINETIC TEST	
				ABA old[3]	ABA	% ABA[4]	ABA Dyke Adit/ East Hill	MWMP	% MWMP[4]	Humidity Cell	% Humidity Cell[4]
	LBC[2]	leach ore			8			1		0	
		silicified waste			19			2		2	
		argillized waste			9			2		0	
		weakly altered waste			1			0		0	
Tkdi			1.5	1	3	3.8	2	3	13.0	0	
Tkseds			0.3		2	2.5		1	4.3	0	
Tklahar			0.5		2	2.5		1	4.3	0	
Tkb			0.5		2	2.5		1	4.3	0	
Qal/Qc			0.6		2	2.5		1	4.3	0	
TOTALS[5]			**100**	**118**	**81**	**100**	**6**	**23**	**99.7**	**6**	**100**

Source: Water Management, 1996

1 Upper Bear Creek Zone

2 Lower Bear Creek Zone

3 AB analyses from 1993 samples

4 Percent of total ABA, MWMP and humidity cell tests, respectively

5 Includes figures from both pages

TABLE E.2: EXPECTED PERCENTAGE OF TONS OF ROCK FROM DIFFERENT GEOLOGIC UNITS

GEOLOGIC UNIT[1]	% TOTAL	% ORE	% WASTE ROCK	% MINE PIT WALLS	CHIEFLY OXIDE (OX) OR SULFIDE (S)	TOTAL SAMPLES FOR ANAL. & GEOCHEM. TESTS
Qal/Qc	0.5	0	0.6	0	Ox	2
Tlb	21.8	0	27.0	13.8	Ox	11
Tcvts	0.2	0	0.3	0	Ox	2
Tkx	11.8	0.2	15.6	31.3	S	18
Tka	63	98	53.7	54	S	160
Tkdi	1.2	0.2	1.5	1.5	S	6
Tksed	0.4	1.1	0.3	0.3	S	2
Tklahar	0.4	0	0.5	0.5	S	2
Tkb	0.5	0.5	0.5	0	S	2
TOTALS	**99.8**	**100**	**100**	**101.4**	**27.9% Ox; 72.1% S**	**205**

Sources: WESTEC (1995) for all data except for that on mine pit walls, which is from Water Management (1996).

and leaching results and determines the time-dependent rate of generation of acidity and sulfate and metal species.

In the HCT a 1.2 kg sample of rock, crushed to less than 0.25 in. (<6.4 mm), is placed on a glass-wool-lined perforated disk on the floor of the humidity cell, and moistened with deionized water (DI). The cell is a flat-bottomed plastic box or cylinder with an air flow inlet at its top, and a sampling outlet under the perforated disk at its bottom. The test is run in repeated seven-day cycles.

For the first three days of each cycle, dry air is passed continuously over the sample. For the second three days, water-saturated air is circulated replacing the dry air. On the seventh day, DI water (about 1.2 liters in this study) is added to the cell and allowed to soak for one hour. The water is then drained completely from the cell, filtered and chemically analyzed. Tests are typically run for 20 weeks.

In early humidity cell tests (1993) of sulfide ore materials in the project, the tests were run for 80 weeks. Weekly HCT samples are analyzed for acidity, alkalinity, emf(Eh), total iron, ferric and ferrous iron and sulfate. Every four weeks a volume-weighted four-week composite sample is analyzed for Al, Sb, As, Ba, Be, Bi, Cd, Ca, Cr, Co, Cu, Ga, Fe, La, Pb, Li, Mn, Hg, Mo, Ni, P, K, Sc, Se, Ag, Na, Sr, Ti, Sn, Tl, V and Zn.

An 80-week test was also run on three sulfide rich ore (5-10% sulfides) samples in 1993 (See Table E.4). An additional six samples are currently being analyzed. Forty-eight weeks of data are currently available, and the tests are on-going.

Table E.5 shows the results for 1995 HCT analysis at week 48. Based on the results, sulfate, aluminum, arsenic, manganese and nickel can be expected to be present in leachate of the weathered waste rock and pit walls.

TABLE E.3: MINIMUM, MAXIMUM AND AVERAGE ACID-GENERATING POTENTIAL (AGP)#, ACID-NEUTRALIZATION POTENTIAL (ANP)# AND NET NEUTRALIZATION POTENTIAL (NNP)#

		AGP TOTAL S			AGP PYRITIC S			ANP			NNP
	N*	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Avg
Qal/Qc	2	7.5	10.6	9.05	0.6	1.9	1.25	13.1	18.5	15.8	14.6
Tlb	11	0.05	1.9	0.59	0.05	1.8	0.25	4.9	42	18.4	18.2
Tcvts	2	0.9	3.1	2	0.05	1.9	0.98	3.2	18.8	11	10.0
Tkx	18	0.2	47	5.9	0.05	40	3.76	4.4	62.3	15.9	12.1
Tka (UBC)	16	0.7	63.1	30.5	0.05	55.6	22.8	0.05	10	3.1	-19.7
Tka (LBC)	37	0.7	94	38.2	0.05	81	28.1	1.6	94	14.1	-14.0
Tkdi	6	0.2	11.9	2.4	0.05	7.5	1.31	10.4	64.8	43.7	42.4
Tksed	2	0.3	0.9	0.6	0.05	0.05	0.05	8.3	24	16.2	16.2
Tklahar	2	2.6	3.4	3	0.05	0.3	0.18	10.5	12.2	11.4	11.2
Tkb	2	0.3	2.1	1.2	0.05	0.05	0.05	38	180	109	109

#All units are in tons of $CaCO_3$/1000 tons of rock.
*N = the number of samples analyzed from each geologic unit.
NNP = ANP-AGP (PyriticS) (average values)
Source: Water Management, 1996

Weathering tests of the same materials will be constructed to run at the mine site. These tests have not been initiated as yet since no materials are available until the mine opens.

More than 35 years of baseline meteorological data collected at the weather station about six miles east of the proposed project site at Lahontan Dam indicate that the average annual rainfall at the Talapoosa site is about seven to eight inches. Given the low rainfall and high evapotranspiration rates at the site, it is expected that on-site weathering tests could take years before producing significant amounts of rock leachate for analysis.

The Meteoric Water Mobility Procedure (MWMP)

The NDEP requires that all operating mines in the state perform a static leaching test (the MWMP) of waste rock and overburden (NDEP Waste Rock and Overburden Evaluation, 1990).

Spent heap leach ore, process pond solids, tailings and waste rock must also be subject to the MWMP leaching test if they are relocated from their original sites of disposal (NDEP, 1995, Guidance Document, Alternate Use of Mine Waste Solids).

This test is intended to characterize the potential leachate created by the interaction of meteoric water with rock materials. The test involves leaching 5 kg of <5 cm particle size material with water of initial pH 5.5-6.0 for 24 hours.

For this project, the test vessel was a rolling bottle. One hour after the test, the leaching solution was decanted and filtered prior to chemical analysis. The leach solution is analyzed for alkalinity, Al, Sb, As, Ba, Be, Bi, Cd, Ca, Cl, Cr, Co, Cu, F, Ga, Ge, Pb, Li, Mg, Mn, Hg, Mo, Ni, NO_3, pH, P, K, Sc, Se, Ag, Na, Sr, SO_4, Tl, Sn, Ti, TDS, V, WAD CN and Zn.

The MWMP leaches out readily soluble salts associated with the sample, but does not provide information on the long-term behavior of geological materials under conditions at the mined site. Table 4.4 summarizes the results of these tests. (Also see the tables at the end of this appendix.)

As shown in Table 4.4, only aluminum exceeds 10 times the NDEP Drinking Water Standards. As for overall site leachate, aluminum is the species that most generally exceeds both 2 times and 10 times the drinking water standards.

Iron and manganese are the second most likely metals to exceed these criteria. In some samples, As, Cd, Pb and Zn also exceed one criterion.

In Table E.6, some of the meteoric water mobility test results are compared to chemical analyses of ground waters from the monitoring wells. This table shows there is no correlation between high aluminum and lead values in the MWMP Tka samples and monitoring well data for aluminum.

Aluminum is slightly elevated above the drinking water standard in the ground water monitoring wells, while lead is below detection limits in all ground water wells.

There is good correlation for the remaining analytes between Tka ground water samples and MWMP/Tka samples. MON-7, which is completed in Tka in the center of the ore body, has high concentrations of sulfate, TDS, Cd, Fe, Mn and Zn compared to MON-3 and MON-4. MON-3 and MON-4 are also completed in Tka, but are located outside of the main ore zone.

MON-7 strongly influences the average Tka concentrations for these analytes. MON-7 compares closely with MWMP/Tka samples. Arsenic is high in the MWMP sample for Tksed, but is not high in MON-5 completed in the same zone. Arsenic is elevated in MON-7, but is not elevated in any MWMP sample of Tka.

The NDEP uses 10 times the drinking water standard to determine potential metal loads in leachates from mining activity. Only aluminum exceeds the NDEP drinking water standards in the sum total of all rock types in the proposed project site.

Aluminum, arsenic, cadmium, iron and manganese may potentially be dissolved in water that comes into contact with exposed rocks.

TABLE E.4: APPROXIMATE TIME BEHAVIOR OF SPECIES CONCENTRATIONS OVER THE 80-WEEK LONG HUMIDITY CELL TESTS OF SULFIDE RICH SAMPLES FROM THE KATE PEAK FORMATION (TKA)

SPECIES	WEEKS TO MAXIMUM VALUE	MAXIMUM VALUE (MG/L)	WEEKS TO BACKGROUND OR BELOW DETECTION	BACKGROUND (B) OR DETECTION LIMIT (DL) (MG/L)
Al	8-20	35-82	70	~ 5(b)
As	20-50	8-15	70	0-1(b)
Ca	15-25	55-86	70	2-6(b)
Cd	15-30	0.31-0.37	50	0.075(dl)
Co	15-35	1.1-1.4	40	0.25(dl)
Cr	15-35	0.5-0.95	>80	0.1-0.16 (at 80 wks)[1]
Cu	15-30	1.2-1.4	68	0.5(dl)
Fe	20-35	900-1100	>80	160-280 (at 80 wks)[1]
K	0	12-22	20-30	2(dl)
Mg	12-28	37-54	50-70	1-8(b)
Mn	15-25	3-32	45	≤ 1(b and dl)
Na	0	16-32	20	1-3(b)
Ni	15-30	0.75-1.4	36	0.25(dl)
P	15-25	4-30	70	<1(b)
Pb	15-28	0.1-0.3	40?	<0.1(dl)
Sb	20-35	3.5-6.5	70	0.3(dl)
Sn	15-30	2.3-3.5	70-80	0.25(dl)
SO_4	20-30	2600-5400	>80	~ 1000(at 80 wks)[1]
Tl	15-25	4.7-11	68	~ 1.3(dl)
V	15-25	0.26-0.33	60	0.75(dl)
Zn	15-30	6-35	70	1-5(b)

[1] Species concentration still above background after 80 weeks.
Source: Water Management, 1996

TABLE E.5: SUMMARY OF WASTE ROCK HUMIDITY CELL TEST RESULTS FOR WEEK 48 (ALL VALUES ARE IN MG/L)

CHEMICAL ANALYTE							MAXIMUM REPORTED DETECTED LIMIT
Sample	**PE-3**	**TC-11**	**TAL-224**	**TAL-W-19**	**TC-14**	**TC-13**	
Unit	Tka-LBC HC-1	Tkx HC-2	Tlb HC-3	Tlb HC-4	Tka-UBC HC-5	Tka-LBC HC-6	
Aluminum	23	3.4	1.6	0.4	0.2	0.1	
Antimony	< 0.5 (.002)	< 0.5 (0.003)	< 0.5 (<0.002)	< 0.5 (0.012)	< 0.5 (0.004)	< 0.5 (0.004)	0.5 (0.002)
Arsenic	0.014	<0.005	<0.005	<0.005	< 0.005	<0.005	0.005
Barium	< 0.1	<0.1	< 0.1	< 0.1	< 0.1	< 0.1	.01
Beryllium	< 0.1 (0.007)	<0.1 (<0.0002)	<0.1 (0.0002)	< 0.1 (<0.0002)	< 0.1 (<0.0002)	< 0.1 (<0.0002)	0.1 (0.0002)
Bismuth	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	0.1
Cadmium	.004	< 0.002	< 0.002	< 0.002	< 0.0002	0.0026	0.002
Calcium	18	0.3	1.1	0.5	4.6	15	0.1
Chloride	0.3	0.3	0.5	0.5	<0.1	0.1	0.1
Chromium	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	0.1
Cobalt	0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	0.1
Copper	<0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	0.1
Fluoride	0.3	1.3	<0.1	<0.1	<0.1	<0.10.1	
Gallium	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	0.1
Iron	3.1	0.6	1.1	0.3	<0.1	<0.1	0.1

( ) = aa analytical values

TABLE E.5: SUMMARY OF WASTE ROCK HUMIDITY CELL TEST RESULTS FOR WEEK 48 (ALL VALUES IN MG/L)(CONTINUED)

CHEMICAL ANALYTE							MAXIMUM REPORTED DETECTED LIMIT
Sample	**PE-3**	**TC-11**	**TAL-224**	**TAL-W-19**	**TC-14**	**TC-13**	
Lanthanum	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	0.1
Lead	.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.002
Lithium	0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	0.1
Magnesium	48	0.4	0.4	0.1	2.5	8.4	.1
Sample	PE-3	TC-11	TAL-224	TAL-W-19	TC-14	TC-13	
Manganese	2.8	< 0.1	< 0.1	< 0.1	< 0.1	0.3	0.1
Mercury	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.0005
Molybdenum	<0.1	< 0.1	< 0.1	< 0.1	< 0.5	< 0.5	0.5, 0.1
Nickel	0.1 (0.15)	< 0.1 (<.04)	< 0.1 (<.04)	< 0.1 (<0.004)	< 0.1 (<0.04)	< 0.1 (<.04)	0.1 (0.04)
Nitrate	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1
pH	3.01	5.38	5.57	6.05	4.43	3.53	
Phosphorous	< 0.1 (0.02)	0.1 (0.009)	0.2 (0.17)	0.1 (0.14)	< 0.1 (0.02)	< 0.1 (0.02)	0.1 (0.02)
Potassium	2	1.0	0.3	<0.1	4.3	3.1	0.1
Scandium	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	0.1
Selenium	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.001
Silica	6.2	<1	8.2	9.4	-	-	1

( ) = aa analytical values

TABLE E.5: SUMMARY OF WASTE ROCK HUMIDITY CELL TEST RESULTS FOR WEEK 48 (ALL VALUES IN MG/L)(CONTINUED)

CHEMICAL ANALYTE							MAXIMUM REPORTED DETECTED LIMIT
Sample	**PE-3**	**TC-11**	**TAL-224**	**TAL-W-19**	**TC-14**	**TC-13**	
Silver	<0.005	<0.005	<0.005	< 0.0005	< 0.0005	<0.0005	0.005
Sodium	1.3	3.4	2.0	2.8	2.8	1.5	.1
Strontium	<0.1	<0.1	< 0.1	< 0.1	< 0.1	< 0.1	.1
Sulfate	440	0.7	0.4	0.3	50	350	
Thallium	< 0.1 (0.012)	< .1 (0.0015)	<.1 (<0.001)	< .1 (0.001)	< 1 (<.0005)	< 1 (<.0005)	1, 0.1 (.001, 0.005)
Tin	< 0.5	< .5	< 0.5	< 0.5	< 1	< 1	1, .5
Titanium	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	0.1
Vanadium	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	0.1
Zinc	1.2	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	0.1

( ) = aa analytical values

TABLE E.6: COMPARISON OF MWMP TEST RESULTS FOR TKA AND TKSED, AND GROUND WATER ANALYSES. ALSO LISTED FOR COMPARISON IS THE NDEP DRINKING WATER STANDARD. (ALL VALUES ARE MG/L EXCEPT PH)

	MWMP			MON-3	MON-4	MON-7	MON avg	MON-5	NDEP DWS
UNIT	Tka-max	Tka-avg	Tksed	Tka	Tka	Tka		Tksed	
Sulfate	1780	308	60	310	116	960	462	31	250
TDS	2842	593	520	578	531	1661	923	244	500
Aluminum	30	4.78	0.8	0.09	0.08	0.09	0.09	0.09	0.05 to 0.2
Arsenic	0.055	0.2	0.16	0.23	1.5	0.005	0.578	0.005	0.05
Cadmium	0.44	0.0583	0.0002	<0.0002	<0.0002	0.12	0.040	<0.0002	0.005
Iron	14.0	2.54	0.08	<0.02	<0.02	1.13	0.38	<0.02	0.3
Lead	2.2	0.276	0.002	<0.002	<0.002	<0.002	<0.001	<0.002	0.015
Manganese	1.9	0.48	0.05	0.03	0.03	2.20	0.75	0.13	0.05
Zinc	21	2.99	0.05	<0.02	<0.02	0.54	0.19	<0.02	5
pH				8.52	8.05	7.41		8.0	

Source: Water Management, 1995

WATER QUALITY & QUANTITY

SURFACE WATER

Regional Surface Water Systems

The proposed Talapoosa Mine lies within the Carson River Basin of west central Nevada. The Carson River flows from the Sierra Nevada Mountains into the Lahontan Reservoir located 4.2 miles southeast of the project site. Flows from the Lahontan Reservoir discharge to the Carson Sink approximately 35 miles northeast of the Lahontan Dam.

Water flows into the Lahontan Reservoir from the Carson River, and from the Truckee River via the Truckee Diversion Canal from the Derby Dam. Approximately 60 percent of the water in Lahontan Reservoir is supplied by the Carson River, with the remaining 40 percent being supplied from the Truckee River watershed.

The Carson River watershed encompasses 1,949 square miles, with the headwaters in Cretaceous granite and Pliocene volcanics of the Sierra Nevada Mountains along the Nevada-California border. The valley floor of the Carson River primarily consists of quaternary playa and lake sediments. The Carson River ends at the Carson Sink due to seepage and evapotranspiration.

The Lahontan Reservoir is the only major water body in the vicinity of the proposed Talapoosa project. The reservoir lies within the boundaries of

Pluvial Lake Lahontan, which was a large intermontaine lake covering most of northwestern Nevada during Pleistocene and earlier periods. The Lahontan Reservoir is approximately 17 miles long and 2.5 miles wide at its widest point and generally follows the old Carson River Channel.

Average annual flow through the Carson River at Fort Churchill was 259,900 acre feet for the period between 1919 and 1979. Average flow in the Carson River below Lahontan Dam was 377,000 acre feet for the period between 1919 and 1969.

Annual evapotranspiration losses from the Lahontan Reservoir are estimated at 58,000 acre feet. Inflow from ground water sources was estimated at 6,500 acre feet between 1919 and 1969 (WMC, 1995).

Precipitation

Precipitation in the area is typically brought by moist air from the Pacific Ocean carried inland by prevailing westerly winds. Much of the moisture is lost on the west slope of the Sierra Nevada Mountains due to orographic effects of air rising over these mountains. As a consequence, the air reaching Nevada is much drier, resulting in light to moderate precipitation, even during the more intense storms.

This rain-shadow effect results in an arid climate for the proposed project area, with annual precipitation for the project site estimated at 8.05 inches (WMC, 1996).

Snowfall generally accounts for up to one-third of the total precipitation in the area. Snowfall in the Virginia City area is approximately 55 inches per year, which equates to 2.75 inches of water content. The proposed Talapoosa project area is located 23 miles east, southeast of the Virginia City weather station, and receives lower snowfall than the Virginia City area. Table A.2, Appendix A of the DEIS, presents snowfall estimates for the proposed Talapoosa project site.

Annual evaporative rates have been calculated at 71.38 inches per year for the proposed project area with high rates during the months of May through August and low rates during December and January (WMC, 1996). Lake evaporation at the site is estimated at 50 inches at the Talapoosa site (WMC, 1996).

Local Surface Water Systems

There are no perennial streams or surface water occurrences within the proposed project site. Ephemeral stream channels (which contain water for only a short period) drain the area to the south and east. These channels only contain water during spring snow melt or summer rainstorms.

No records of flow from these drainages are known to exist. No information concerning runoff flows from the proposed project site was available at this writing. However, peak flows were predicted for the main drainage. This information is provided in Chapter 4, Local Surface Water Systems, of the FEIS.

Four of the ephemeral drainages located within the proposed project area were determined to be eligible as jurisdictional waters of the United States. No wetlands were identified during the baseline studies of the proposed project area (WESTEC, 1995; Delineation of Waters). Figure 4.8 shows the locations of these drainages.

Much of the rainfall received within the proposed project area infiltrates into the soil and is not available for runoff. Since no perennial streams are found within the proposed project area, little if any information is available concerning the quality of surface runoff from the area.

Runoff, when it occurs, is due to very high-intensity storms or snowmelt. Water from these events can be expected to have high turbidity, elevated total dissolved solids and high suspended-sediment loads as is typical of similar areas of the Great Basin.

SPRINGS, SEEPS, AND WELLS

Springs and Seeps

Only one spring, called Rock Blind Spring, is located in the proposed Talapoosa project vicinity. Rock Blind Spring is located approximately 5,500 feet north of the proposed mine pit in Section 35, T19N, R24E (See Figure 4.8).

Located in the bottom of an unnamed drainage that flows southwest towards Lahontan Reservoir, the spring lies at an elevation of 5,445 feet and occurs as a small pool in a topographic depression. No flow has been recorded to discharge from the pool during several inspections (WMC, 1996).

Field investigations and geologic mapping of the area indicate Rock Blind Spring is supplied by a perched ground-water system and is located near the intersection of two high-angle faults. The northeast-trending fault acts as a dam allowing a pooling at the surface forming Rock Blind Spring (See Figure E.1). The Lousetown Basalt forms the upgradient rock type, and the Kate Peak Formation occurs downgradient of the spring.

The Kate Peak Formation has a much lower hydraulic conductivity than the overlying basalt unit. Precipitation infiltrating into the Lousetown Basalt unit moves along joints and fractures until it reaches the comparatively watertight Kate Peak Formation, where it remains as a perched ground water system.

The system recharging the spring does not appear to be interconnected with the deeper basalt aquifer. Drawdown of the deeper ground water system should not impact the perched water supplying the spring. No impact was observed on the spring during long-term pumping tests.

No other seeps or springs are located in the project vicinity.

GROUND WATER

Ground Water Recharge and Discharge

Volcanic Bedrock Aquifer

Recharge to the bedrock ground water system occurs through infiltration from precipitation events and snow melt. Most of the infiltration occurs in February and March when the ground is saturated following snow melt, and mean daily temperatures are below 45° F, reducing evapotranspiration losses.

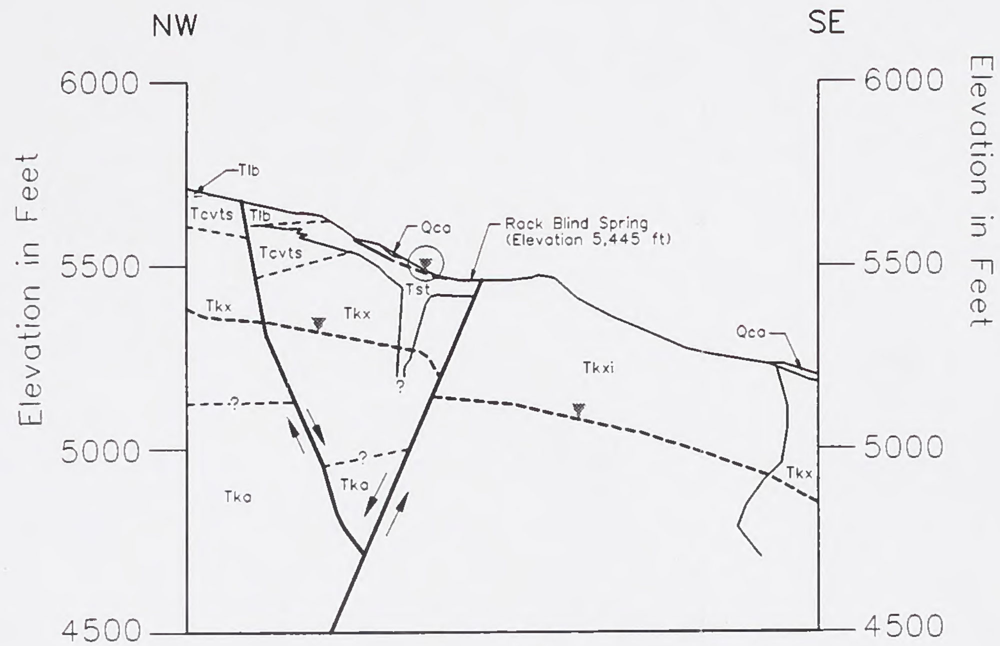
Data collected at other locations in Nevada in similar environments indicate recharge in steeper mountainous terrain is approximately 0.05 to 0.2 inches or about 2 percent of mean annual precipitation. Much of the water which infiltrates is intercepted by strong layering within the volcanic rocks and typically seeps downslope to the colluvial and alluvial deposits.

Ground water flow within the bedrock system moves from higher elevations to lower elevations and comprises both local and regional flow systems.

Local ground water systems tend to form small seeps and springs in upper elevations. Only one spring, the Rock Blind Spring, exists in the proposed project vicinity. The more regional systems flow through the fractured rock to the valley floor, discharging to the alluvial aquifer systems.

The bedrock flow systems are often quite complex because of faulting and fracturing in the host rock. Faulting can act either as a conductor to flow or a hydraulic barrier. The Kate Peak Formation in the proposed project area exhibits high overall clay mineralization, suggesting very low localized hydraulic conductivities (WMC, 1996).

Nearly all of the ground water within the volcanic bedrock aquifer located beneath the southern flanks of the Virginia Mountains discharges to the alluvium at the northern margins of the Churchill Valley. The rate of discharge varies from 2.6 gpm to 22 gpm per lineal mile of range front.



EXPLANATION

Qca	Colluvium
Tlb	Basalts
Tst	Sinters
Tcvts	Tuffs

Kate Peak Formation:

Tkx	Dacite flows
Tkxi	Dacite intrusives
Tka	Andesitic rocks

Perched groundwater in sinter and basalt

Deeper groundwater system

Vertical Exaggeration = 10

TALAPOOSA MINE PROJECT
ENVIRONMENTAL IMPACT STATEMENT

FIGURE E.1

GEOLOGIC CROSS SECTION
ROCK BLIND SPRING

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Ground water elevations in the bedrock aquifer near the ore body ranged from 5,163 feet on July 8, 1993 to 5,240 feet on June 6, 1995. Ground water elevations above 5,400 feet occur north of the ore body within the layered volcanic rocks.

To the east of the ore body, ground water elevations ranged between 5,198 and 5,240 feet, with evidence of strong structural control and compartmentalization. To the south of the proposed project area, ground water elevations ranged from 4,572 feet to 4,497 feet.

Further to the south, the ground water hydraulic gradients are 0.03 to 0.05. Ground water in the bedrock aquifer moves slowly downgradient and discharges into the basin fill deposits below the alluvial contact. The flow downslope from the pits, heap leach pad and processing facilities is calculated at approximately 1 gpm to 5 gpm over an area of approximately 30 million ft^2.

Basin Fill Alluvial Aquifer

Recharge to the alluvial aquifer occurs from several sources. The major source is through channelized flow infiltration from higher elevations. Recharge occurs as these flows reach the slopes of the alluvial material along the range front.

A minor amount of recharge occurs as underflow from the bedrock aquifer, as described previously. A significant portion of recharge occurs from the Carson River and the Lahontan Reservoir.

The filling of the Lahontan Reservoir in 1915 appears to have caused a general rise in ground water levels in the Churchill Valley. Ground water levels in some of the test wells near the reservoir in 1970 and 1974 seemed to correlate to surface water levels in Lahontan Reservoir (French, 1983).

The average annual recharge to ground water from the reservoir was estimated at about 6,500 acre feet between 1919 and 1969 (WMC, 1995). This recharge typically occurs in winter and spring when reservoir levels are higher than the surrounding ground water levels.

Recharge to the alluvial aquifer from precipitation and runoff from the Virginia Range was assessed using the Maxy-Eakin method (WMC, 1995). Using a value of 12 to 15 inches as the upper limit for average annual precipitation, a value of 20 million to 30 million gallons per year per mile of range front is predicted. Most of this recharge occurs from February to May as a result of snow melt and spring rains.

Ground water in the alluvial aquifer also recharges along the range front and migrates toward the central portions of the basin. Within the Silver Springs area, the ground water flow is to the southeast toward the Carson River and Lahontan Reservoir (See Figure 4.9).

Discharge from the alluvial aquifer occurs through pumping, evapotranspiration and regional underflow to the east towards the Carson Sink.

The Carson Sink area is the regional ground water discharge area where a large amount of evapotranspiration occurs. Evapotranspiration also occurs in localized areas of Churchill Valley where ground water levels are less than 35 feet from the surface and phreatophytic vegetation exists.

A significant amount of water loss occurs from the Lahontan Reservoir during the summer. At this time, reservoir levels are typically lower than the surrounding ground water levels. This results in the ground water system discharging into the reservoir.

Project Area Ground Water Quantity and Quality

Project Area Ground Water Quantity

Ground water depths in the area of the proposed pit are typically between 40 feet and 450 feet below the ground surface. Shallower ground water exists around the southwest perimeter of the main pit, while deeper ground water exists along the northern and southern portion of the pit. In the area of the processing plant and maintenance areas, depth to ground water is typically 350 feet to 400 feet.

Ground water depths in the vicinity of the northeast waste rock disposal area are 200 feet to 300 feet below the ground surface. Water Well No. 6 is located downslope and south of the central fracture zone within the recharge area near the range front. Pump testing of Well No. 6 indicated transmissivities of 3,500 to 3,750 ft^2 per day.

A long-term pump test was conducted on Well PW-1 in July 1995. Well PW-1 is located within the pit area and is completed in the central fracture zone of the Kate Peak Formation (WMC, 1995). The well was pumped at a constant rate of 175 gpm for approximately 42 days (60,570 minutes). The test included five primary observation wells, 15 background wells and the Rock Blind Spring.

Final drawdown in Well PW-1 was 116.6 feet. Drawdowns in the central fracture zone between the Road Fault and the Talapoosa Fault were generally between 70 and 90 feet. Drawdowns in most observation wells outside of the central fracture zone were generally less than four feet. No measurable drawdown was observed at Rock Blind Spring.

The pump test results indicate that geologic structures control the volcanic bedrock aquifer and thereby control the water supply within the proposed project area.

Transmissivity calculated from the first 12 minutes of pumping ranged from 32,000 ft^2 to 46,000 ft^2 per day. The pump test confirmed that the central fracture zone is in the immediate area of the pit and is highly fractured and hydraulically continuous.

In-situ hydraulic conductivity values calculated from drill-stem testing and recovery data indicate a value between 3.5 x 10^{-7} cm/sec and 2.5 x 10^{-5} cm/sec. Falling head tests gave transmissivity values ranging from less than 0.1 ft^2 per day to about 40,000 ft^2 per day.

These values indicate the variability found within the fractured volcanic rocks. Due to the strong geologic layering of the volcanic rocks of the Kate Peak formation, it is likely that water movement in the proposed project area would be horizontal along the orientation of the rock layers.

Overall transmissivity of the volcanic bedrock to the south of the proposed pit is estimated to be 0.7 ft^2 to 7.0 ft^2 per day.

Drainable porosity has been estimated from pump test data. Calculated porosities of 0.005 to 0.009 have been determined from the data. Approximately 335 million to 450 million gallons of water are stored in the 500 feet of volcanic rocks in the area influenced by the proposed water supply pumping for the project.

Results from long-term pumping tests show definite heterogeneity, or distinctly dissimilar test behavior, between observation wells and the pumping well and among different observation wells. Comparison of well locations with structural geologic maps points to a direct correlation of well test data with faults and well locations.

Test data indicate compartmentalization of the ground water system primarily due to high-angle faulting and shearing observed throughout the proposed project area. Local transmissivity within individual fracture zones between the inter-fault blocks often is high.

However, faulting can create low-level transmissivity across the ore body due to clay gouge within the fault trace. The area between the faults are sometimes not as fractured as the fault zone, creating lateral boundaries that act as barriers to flow.

Ground water elevation contours indicate that ground water flow is to the southeast through the proposed project site, and a flattening of the ground water gradient occurs in the area of the proposed project. The gradient steepens sharply to the south. This correlates with a series of faults to the south of the proposed project site and provides further evidence of fault-controlled hydraulic barriers. The gradients then tend to flatten out as the ground water system grades into the alluvial aquifer of Churchill Valley.

Ground Water Flow Models

Two groundwater flow models were developed to assist in determining groundwater impacts from the mine development. Descriptions and details of the models are presented in the following sections.

Model No. 1 - MODFLOW Model

A numerical model of the ground water flow was constructed to study the potential effects of mine development and related water supply pumping on areas downgradient of the proposed project. The purpose of the model was to predict whether drawdown from the mine development would have an effect on ground water levels downgradient of the mine in Churchill Valley.

To simulate the effect of changes to the hydrologic system, the system in its unaffected state must first be represented with sufficient accuracy. Therefore, the first goal of model construction was to adjust hydrogeologic inputs such that the calculated water-table elevation closely represents the known elevation.

Subsequently, the model was changed to reflect project development (water-supply pumping and eventual accumulation of a pit lake) and the hydrologic consequences were observed.

The two-dimensional numerical model was constructed along a representative flow line to analyze semi-quantitatively the impact of water-supply pumping and mine closure on the general hydrologic system. The model allows investigation of potential impacts on the downgradient area of the proposed mine.

The code used for the model was MODFLOW (McDonald and Harbaugh, 1988). MODFLOW uses the finite-difference method to simulate ground water flow within a rectilinear grid net of cells. A two-dimensional (cross-sectional) model was constructed in a single layer, and hydrologic properties of individual cells within this layer were adjusted to simulate flow within a vertical slice of earth that includes the Talapoosa site and Silver Springs.

Ordinarily a MODFLOW "layer" represents a hydrostructural element that is more or less horizontal, and of laterally variable or constant thickness. However, the hydraulic properties of each are represented by a single value for the layer.

For the proposed project, the single "layer" is vertical and precisely one-foot thick, but its hydrogeologic properties have wide internal variations. The rotated orientation of this "layer" can be used because in the computer model, hydrologic head can be established separately from elevation.

The grid layout is shown in Figure E.2. The gridded cross-sectional slice extends 30,000 feet north-south and 4,500 feet vertically, and is one-foot thick. This space is finely gridded in the middle, covering the proposed pit and the steeper slopes, and coarsely gridded toward the ends and away from the water table.

For the model, hydraulic conductivity and starting head were applicable variable parameters. Hydraulic conductivity was the sole property adjusted in the steady-state pre-development phase of modeling, since starting head was selected to match the water table at the Talapoosa site. Through the course of steady-state model runs, the sensitivity of varying conductivity values and boundaries of conductivity regions were investigated, but different lithologies maintained similar numerical relations to one another.

The steady-state, pre-development model run calculated head distribution as shown in Figure E.3. The final conductivity map is shown in Figure E.4. This map shows two open faults flanking one barrier fault and also shows that the bulk of the lower part of the model represents rock of very low conductivity. The sedimentary strata and unconsolidated sediments create a conspicuous high-conductivity wedge beneath Churchill Valley at the right-hand end of the section.

Modeling results indicate that certain "open" faults (faults that provide a high-conductivity path for ground water flow) exert little influence on water table elevations except in the immediate vicinity of the pumping well. Because the main faulting within the south part of the Virginia Range is nearly perpendicular to the line of section and ground water flow lines, it is considered a realistic representation of the faulting effects.

Closed or barrier faults exhibit a large influence on ground water flow. These faults appear to exist just downgradient of the proposed project. Without these faults or a low conductivity zone, the known and inferred contours of the present day water table cannot be reasonably matched.

The zone that follows the water table in the upland area is of moderately higher conductivity than the volcanic rocks below, representing weathering of the volcanics.

Model No. 2 - TWODAN Model

The analytical ground water flow model TWODAN was used to determine the rate and spatial distribution of inflow into the final pit (v.1 WMC, 1996, Section 6.7). The perimeter of the final pit was simulated as nine linear segments joined at the ends to form a semi-circle roughly the shape of the final pit (see figure 6.10 WMC, 1996).

The aquifer was modeled as a single layer of thickness, 3,000m. An annual recharge of 0.2 inches was used, which corresponds to the recharge estimates presented earlier in this EIS. The TWODAN model results were used together with a water balance to determine the steady-state water level in the pit.

TWODAN modeling was performed first at an inflow rate of 10 gpm, which was deemed to be the base case, or most likely inflow rate based on the data. In addition, to evaluate the uncertainty of the model, pit lake levels were determined for a range of inflow rates. Pit lake levels of 4,804 ft, 4,843 ft, 4,874 ft, and 4,905 ft were calculated when pit lake inflow rates of 3 gpm, 10 gpm, 18 gpm, and 24 gpm were used, respectively.

Results of Pumping-Period Transient Runs

The model results show drawdown of 650-700 feet at the bottom of the ultimate pit, which would leave the water table temporarily about 50 feet below the final pit floor (Figure E.5). The zone of high drawdown (greater than 100 feet) is limited to the immediate pit area because conductivities of the rocks around the pit are low and because the barrier fault impedes water movement toward the pit from the south.

Minor drawdown (less than 50 feet) spreads out more widely, but less than one foot of drawdown is predicted at the foot of the steep mountain slope. Predicted drawdown near Silver Springs is extremely small, less than 0.1 feet (Figure E.5).

At the 20-year time point, when maximum drawdown is observed, the large drawdown at the pit ensures that all ground water flow within the proposed project area is toward the pit (Figure E.6).

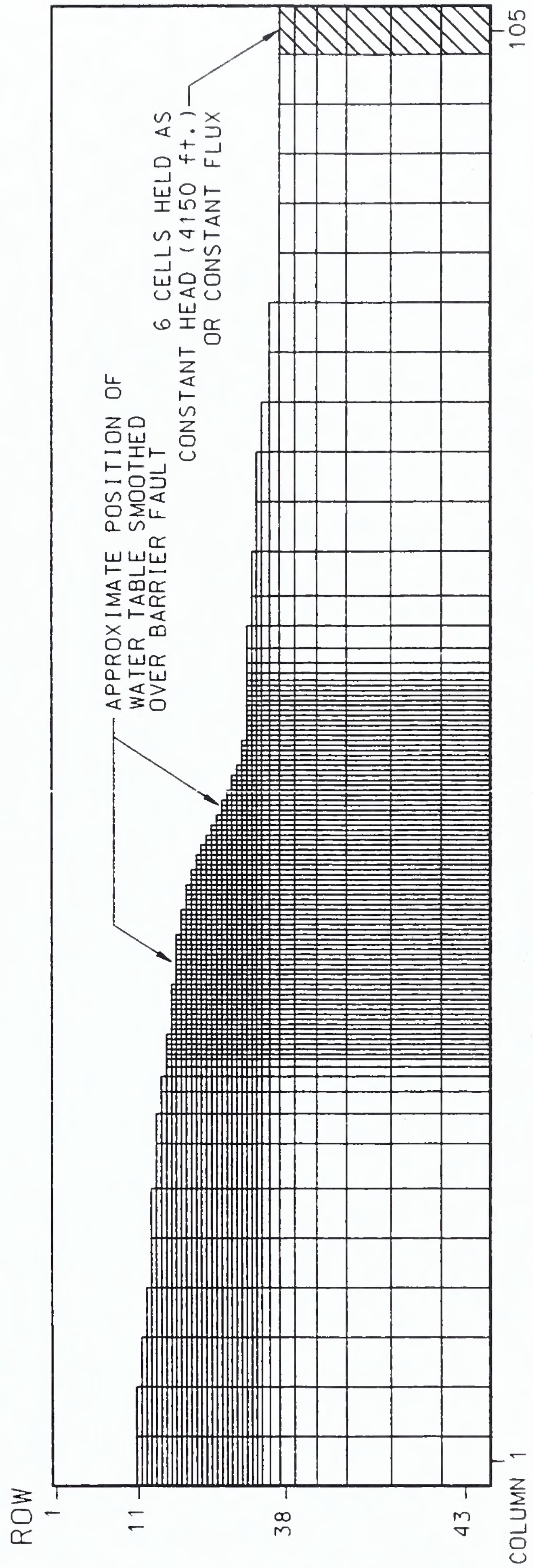
HELP Model for Estimating Seepage from Reclaimed Waste Disposal Areas

The waste rock material stored in the disposal areas has been shown to be acid producing. For this reason, it is important to quantify the amount of water that may infiltrate the disposal areas, or potentially seep from the base of the disposal areas.

The Hydrologic Evaluation of Landfill Performance (HELP) model was used to estimate percolation into the waste disposal areas. The HELP model is a deterministic model that performs a long-term water balance by calculating daily runoff, evapotranspiration, infiltration and drainage from the land surface.

HELP modeling was performed by Water Management Consultants (WMC, 1996, "Use of the HELP Model to Predict Seepage from the Reclaimed Waste Rock Disposal Areas"). There will be two waste disposal areas, with total areas of 73 and 171 acres. HELP modeling was performed on the larger disposal area.

Individual lifts in the waste disposal area would be about 50 feet thick. Since the lifts would be formed by end dumping, the tops of each lift would be compacted by the 150-ton dump trucks, but the end dumped waste rock material would not have as low a permeability as the compacted two- to three-foot thick surface layer (WMC, 1996).



TALAPOOSA MINE PROJECT
ENVIRONMENTAL IMPACT
STATEMENT

FIGURE E.2

GRID LAYOUT
CROSS SECTIONAL MODEL

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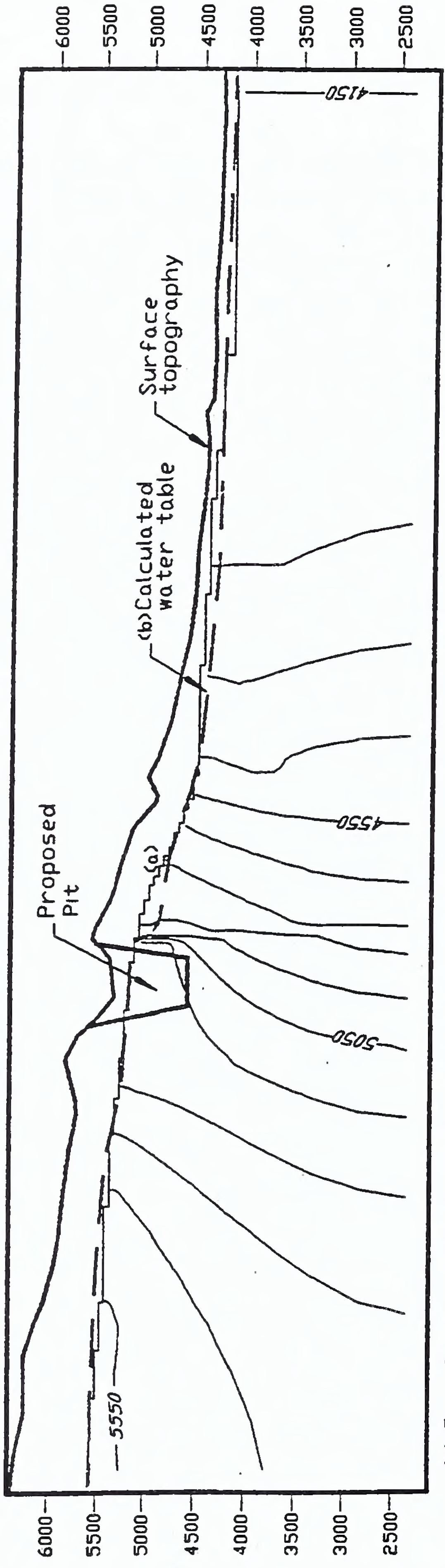

(a) Top of active cells (black stepped line) lies 100-200 ft above inferred actual water table in this area. Calculated water table (blue line) approximately equals actual water table. (See Figure 2.4, WMC, 1996)

(b) Calibration criteria for head values

- Values near the base of the rangefront slope of about 4,500 ft
- Values at the top of the steep rangefront slope of about 5,000 ft, and a steep gradient along the steep slope
- Values in the area of the proposed pit of about 5,200 ft
- Values at the crest of the range the highest cell of about 5,575 ft

TALAPOOSA MINE PROJECT
ENVIRONMENTAL IMPACT
STATEMENT

FIGURE E.3

HEAD (FT.) CALIBRATED
STEADY-STATE MODEL

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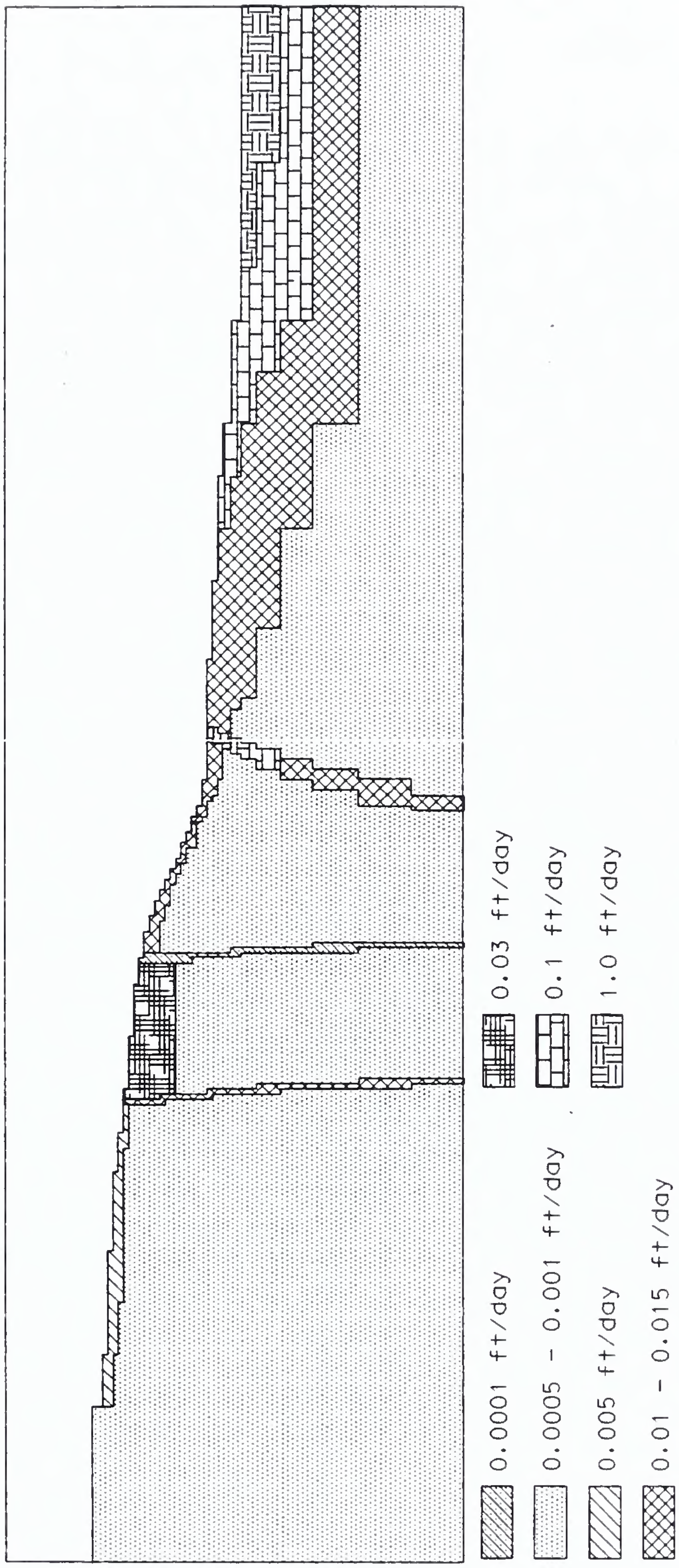

TALAPOOSA MINE PROJECT
ENVIRONMENTAL IMPACT
STATEMENT

FIGURE E.4

CONDUCTIVITY DISTRIBUTION OF
CALIBRATED STEADY-STATE CASE

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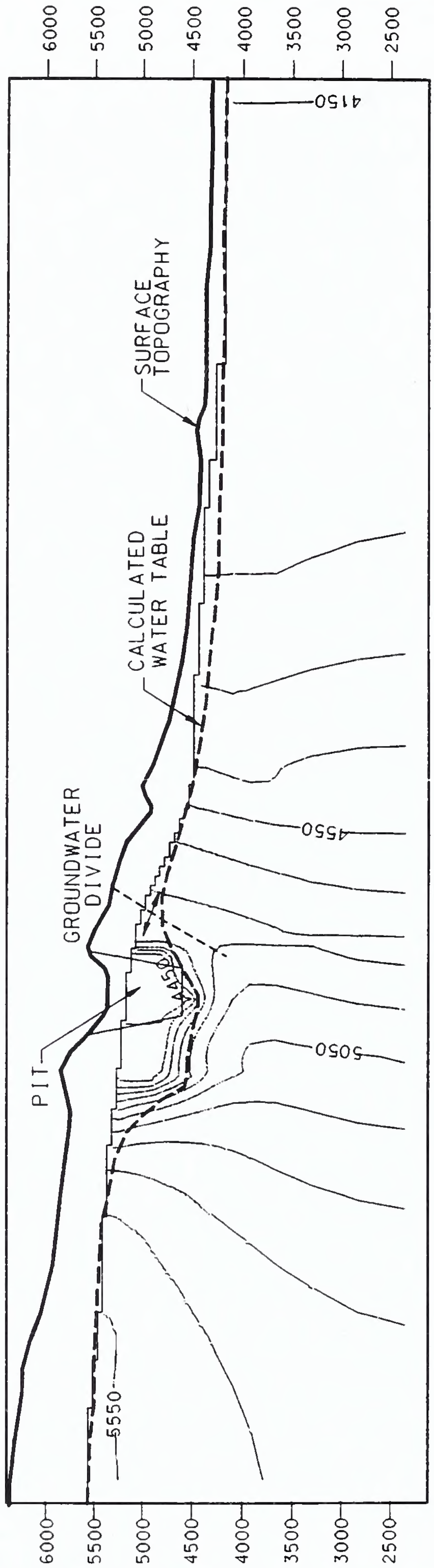

TALAPOOSA MINE PROJECT ENVIRONMENTAL IMPACT STATEMENT

FIGURE E.5

HEAD (FT.)
AFTER 20 YEARS PUMPING

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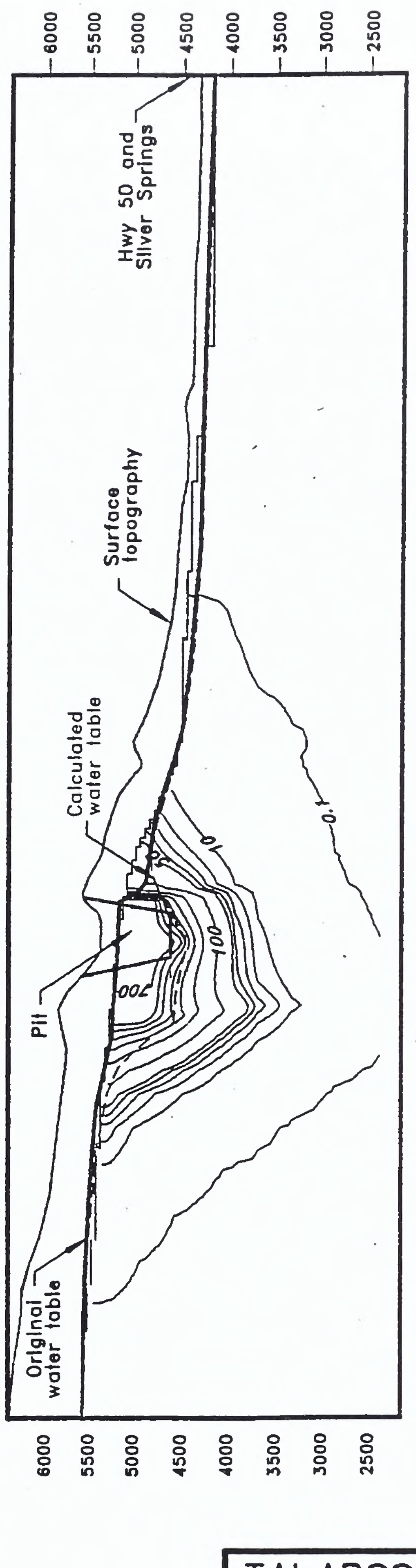


TALAPOOSA MINE PROJECT
ENVIRONMENTAL IMPACT
STATEMENT

FIGURE E.6

DRAWDOWN (FT)
AFTER 20 YEARS PUMPING

JANUARY 1996

A growth medium consisting of a sandy clay loam will be placed over the tops of the waste disposal areas. Since there is an insufficient amount of the sandy clay loam to cover both the tops and the side-walls of the disposal areas, only the tops will be covered.

WMC performed a variety of HELP model simulations to ascertain the uncertainty associated with the modeling. The modeling was divided into two groups. The first group of 16 simulations assumed that the upper compacted layer (termed the argillized layer) could be modeled as a clay soil. For these 16 simulations, a three-layer system (growth medium, compacted argillized layer, and waste rock) was used for the top of the waste disposal area, and a two-layer system (compacted argillized layer and waste rock) was used for the slopes.

The second group of 14 simulations were performed assuming no argillized layer, such that the growth medium, was directly over the uncompacted waste rock. Thus, the top consisted of a two-layer system (growth medium over waste rock) and the slopes consisted of the waste rock only.

A number of simulations were performed to assess the variability in results resulting from variable input parameters. The parameters of porosity, field capacity, wilting point, hydraulic conductivity, leaf area index, and evapotranspirative depth (ET) were varied. The ET depth was found to be the most sensitive of all parameters. For example, when the ET depth was varied between 18 and 24 inches, the average annual infiltration rate changed from 0.224 to 0.008 inches/year.

WMC presented the base case, and most realistic HELP model simulation, as one in which both the top and the slope was compacted, which gave an annual infiltration rate of 0.034 inches per year, or a total seepage rate of 0.34 gpm for the entire 171-acre disposal area. However, it is probable that the slopes of the waste rock disposal areas will not be as compacted as the tops, since the trucks will not drive on the slopes. Therefore, a more realistic scenario is one where the top is modeled with the compacted layer, but the slopes are modeled as a one-layer system with just the waste rock.

With this in mind, the weighted infiltration rate was calculated from the WMC Help modeling results using the following data:

- Average infiltration rate for sideslopes equals 0.35 inches/year
- Sideslope area equals 81.6 acres
- Average infiltration rate for top of disposal area equals 0.03 inches/year
- Top area equals 89.2 acres
- Weighted infiltration rate for entire disposal area (171 acres) equals 0.18 inches/year

The weighted infiltration rate of 0.18 inches per year corresponds to a seepage rate of 1.6 gpm for the entire 171 acre waste disposal area.

It is unlikely that the waste rock disposal areas would ever produce any leachate since the average annual infiltration rates are so low. Instead, the water that infiltrates the waste rock disposal area would probably infiltrate into the original ground surface at the interface with the bottom of the waste disposal area. At these very low infiltration rates, the water would flow under unsaturated conditions, and seeps only occur whenever saturated conditions exist.

Ground Water Quality

Thirty-five ground water samples were collected and chemically analyzed as part of the proposed project. These samples included two from Rock Blind Spring.

Chemical analyses of 11 wells and one spring in Churchill Valley were also available. These were obtained from previous work by the U.S. Geological Survey (USGS) and others between 1967 and 1971. Locations of these sampling points are shown on Figure 4.11.

A sampling and analysis plan developed for the proposed project was designed and implemented to ensure the collection of representative samples and accurate chemical analysis. Standard quality control and quality assurance procedures were followed from sampling through chemical analysis.

Samples collected prior to 1995, with the exception of the USGS samples, were analyzed by Minerals Processing and Environmental Laboratories, Inc. (MPEL). All subsequent chemical analytical work has been carried out by Sierra Environmental Monitoring Laboratory in Reno, Nevada.

Field pH and temperature values were also measured on nine ground waters in 1995.

Comparison of Ground Waters in the Proposed Talapoosa Mine Area and in Churchill Valley

Table 4.7 compares average values for the maximum, minimum and average chemical composition of ground waters from the area of the Talapoosa ore body. Table 4.8 shows the ground waters from Churchill Valley for species concentrations above detection.

In terms of equivalent concentrations, the average ground water from the ore body area is similar to Churchill Valley but has a higher ratio of sulfate to the major cations.

The tabulated results show that both the proposed project area and valley ground waters are slightly alkaline in pH, although the proposed project area waters average more than three times the total dissolved solids (TDS) and more than eight times the sulfate content of valley waters.

Both sulfate and TDS contents of proposed project area ground waters are consistent with enhanced weathering of the rock by acidities from the oxidation of pyrite. The alkaline pH values and high alkalinity of the proposed project area waters demonstrate the long-term ability of the rock to neutralize this acidity.

Compliance with Nevada Water Quality Criteria and Standards

Water quality criteria and for Nevada drinking water standards are listed in Appendix C. Considering the drinking water standards, mean concentrations of TDS, sulfate, antimony, arsenic, cadmium, lead and manganese in the ground waters of the ore body area exceed drinking water standards.

For Churchill Valley ground waters, average iron, manganese and antimony concentrations exceed drinking water standards.

Controls on Present and Future Ground Water Chemistry

Given the low local permeabilities of many rocks in the vicinity of the ore deposit, present ground waters will typically have had years to centuries to equilibrate with the rock. In fact, C-14 age dating of ground water from well PW-1 located in the proposed ore zone and WW-6 in the SE portion of the proposed Southwest waste disposal area indicates respective groundwater ages of 19,290 and 7,235 years before present.

In an arid climate in low-permeability rocks such as these, rock chemistry is the chief control on the water chemistry. For example, input of chemical analyses into the geochemical computer model MINTEQA2 (Allison et al., 1991, EPA/6003-91/021) shows that water from well TAL-239, drawn from the reduced sulfide zone in the ore body at a depth of 830 feet, is exactly at saturation with respect to both calcite ($CaCO_3$) and gypsum ($CaSO_4 \cdot 2H_2O$). These minerals thus limit and buffer concentrations of calcium, alkalinity, pH and sulfate in the ground water. Such mineral/rock controls on the water chemistry will continue to operate indefinitely.

Monitoring Well 7 (MON-7) was completed at a depth of 185 feet in the partially oxidized upper portion of the sulfide ore body in the lower Kate Peak Formation. Its water has a lab pH of 7.41, TDS of 1,661 mg/L, sulfate of 960 mg/L and bicarbonate content of 89 mg/L. It also contains 1.13 mg/l Fe (II) and 2.20 mg/L Mn (II) and so is oxygen-deficient.

This indicates that significant amounts of pyrite (FeS_2) remain in the shallow, oxidized zone. This water is chemically similar to ground waters from deeper wells such as TAL-239 that pump from the unoxidized sulfide zone of the ore body.

Waters from wells MON-7 and TAL-239 are probably chemically similar to ground waters that could be expected to form at depth in formations adjacent to the pits as the water table is lowered by mining, exposing the sulfides to oxidation and weathering.

Table E.7 gives the ion chemistry for wells completed in the Central Fracture Zone of the ore body. The Central Fracture Zone refers to the highly fractured portion of the volcanic bedrock aquifer located in the main pit area of the ore zone.

Water Uses

Surface water use in the area of the proposed project is primarily for agricultural irrigation via diversions from the Carson River and the Lahontan Reservoir.

The Lahontan Reservoir is also a major recreation site and sport fishery area. The Carson River and Lahontan Reservoir are important for wildlife habitat and support regionally important riparian and wetland habitats.

Rock Blind Spring is an important wildlife habitat since it is the only water supply in the area for support of wildlife. The Nevada Division of Wildlife has a water right permit (#29726) on Rock Blind Spring for 0.0006 cubic feet per second (cfs) (not to exceed 0.458 acre feet annually) for wildlife purposes, including consumption and habitat (Figure 4.8).

Ground water uses within Churchill Valley are for domestic water, municipal water and irrigation. Within the proposed project site, one water right exists and eight applications are on file in the Division of Water Resources of the Nevada Department of Conservation and Natural Resources. These are:

- Permit #52005 has been granted to Athena Gold Corporation for one (1) cfs (not to exceed 100 million gallons annually) for mining and milling purposes.
- Applications #58998-59005 have been filed by Pegasus Gold Corporation for one (1) cfs each and have been received by the Department of Conservation and Natural Resources. These applications are for mining, milling, dewatering and domestic purposes for the proposed Talapoosa project. The combined annual withdrawal is not to exceed 1.577 million gallons annually.

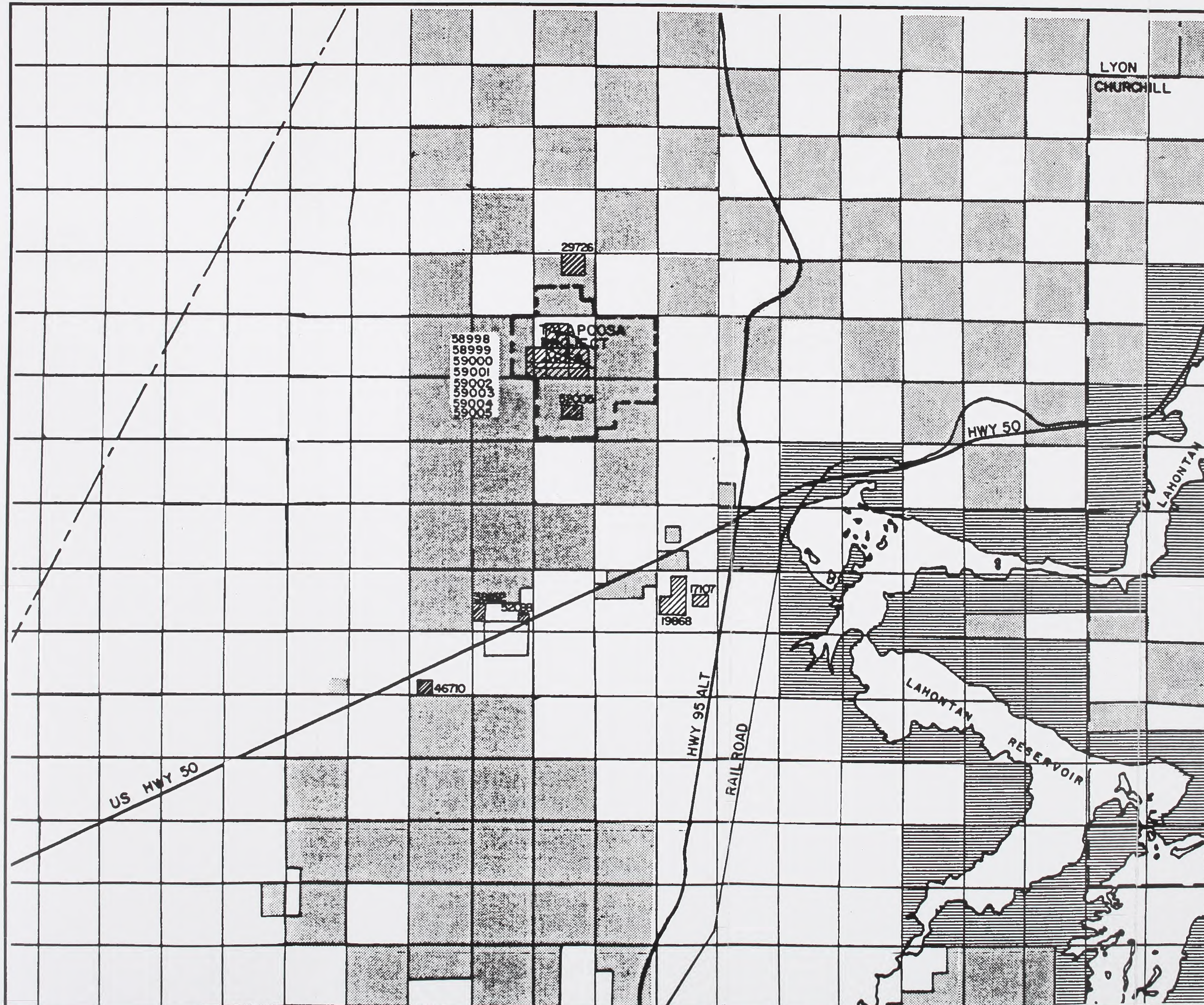
Previous applications filed by Athena Gold Corporation (#52006-52010) have been canceled since 1991.

Other water rights in Churchill Valley as shown in Figure E.7 are for domestic, municipal or agricultural water. Many domestic wells exist in this area that do not appear on this figure because individual domestic wells do not need a water right.

TABLE E.7: SUMMARY OF MAJOR ION CHEMISTRY FOR WELLS COMPLETED IN CENTRAL FRACTURE ZONE

CONSTITUENT*	PE-81	PW-1	MON-7	PE-61	TAL-281	TAL-239
Calcium	187	190	190	220	220	360
Chloride	36	36	43	45	40	50
Magnesium	98	89	86	116	68	110
Manganese	1.84	2.41	2.20	2.61	1.05	2.4
Potassium	19	14	15	16	19	20
Sodium	171	210	190	142	190	220
Sulfate	955	1,180	760	1,000	1,100	1580
Alkalinity as $CaCO^3$	56	8.1	73	279	768	52
Iron	3.3	8.1	1.13	1.37	0.12	0.03
pH Values	6.99	7.30	7.41	6.70	7.46	7.53

* All units in mg/l



LEGEND

WATER RIGHT ALLOTMENTS

TALAPOOSA PROJECT AREA

NOTES:

1. BASE MAP INFORMATION ACQUIRED FROM SILVER SPRINGS NORTH QUADRANGLE AND STOCKTON WELL QUADRANGLE, 7.5 MINUTE SERIES.

TALAPOOSA MINE PROJECT
ENVIRONMENTAL IMPACT
STATEMENT

FIGURE E.7
NORTHERN CHURCHILL VALLEY
WATER RIGHTS

JANUARY 1996

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APPENDIX F

SUPPORTING INFORMATION:

ENVIRONMENTAL CONSEQUENCES

TABLE F.1: SUMMARY OF ACID-BASE ACCOUNTING FOR THE PROPOSED TALAPOOSA MINE PROJECT

GEOLOGIC UNIT	% OF TOTAL TONS	% OF ORE	% OF WASTE ROCK	OXIDE OR SULFIDE?		AVERAGE OF ANP[1] VALUES	AVERAGE OF AGP[2] VALUES	AVERAGE OF NNP[3,4] VALUES	CALCULATED AMOUNT OF ACID GENERATING MATERIALS[5] IN WASTE ROCK
Qal	0.5	0	0.6	O		15.8	1.25	14.6	-7,880
Tlb	21.8	0	27.0	O		18.4	0.25	18.2	-442,000
Tcvts	0.2	0	0.3	O		11	0.98	10.0	-2,700
Tkx	11.8	0.2	15.6	S		15.9	3.81	12.1	-170,000
Tka	63	98	53.7	S	UBC Zone	3.1	22.8	-19.7	+817,000
					LBC Zone	14.1	28.1	-14.0	
Tkdi	1.2	0.2	1.5	S		42.4	1.31	42.4	-57,000
Tkseds	0.4	1.1	0.3	S		16.2	0.05	16.2	-4,400
Tklahar	0.4	0	0.5	S		11.4	0.18	11.2	-5,000
Tkb	0.5	0.5	0.5	S		109	0.05	109	-49,000
TOTALS	**99.8**	**100**	**100**	**27.9% O** **72.1% S**					**+79,020**

Source: WESTEC, 1995, WMC, 1996

[1]ANP = acid neutralizing potential (tons $CaCO_3$/1,000 tons material)

[2]AGP = acid generation potential based on pyritic S (tons $CaCO_3$/1,000 tons material)

[3]NNP = net neutralization potential = ANP - AGP(pyritics).(Average Values)

[4]NDEP's criterion for potentially acid-producing rock is a NNP less than 1.2

[5]In tons based on % times 90,000,000 tons of waste rock produced

[6]Acid neutralizing rocks have negative (-) values

TABLE F.2: COMPARISON OF ASSUMED INFLUENT GROUND WATER CHEMISTRY OF THE PIT LAKE (BASE CASE)

Constituent	Baseline groundwater in the project area*	Water in final pit after 25 years	Water in final pit after 100 years
TDS	1,466	826.3	1,730.1
pH	7.2	7.60	7.89
Sulfate	776	505.2	1,095.1
Antimony	0.021	0.024	0.051
Aluminum	0.10	0.009	.016
Arsenic	0.20	0.28	0.60
Manganese	1.01	1.7	1.4
Mercury	0.0006	0.0006	0.0012
Nickel	<.01	0.123	0.26
Lead	0.015	0.0001	0.0003
Thallium	<.0005	0.0038	0.0083

All values in mg/l, except for pH
* Mean values from baseline data

TABLE F.3: CHEMICAL INPUT DATA AND RESULTS OF FINAL PIT MODELING (WETTER CASE*)

	CHEMICAL INPUT DATA				MODELING RESULTS			
	Tka	Tkx	Tlb	Influent ground water	25 Year		100 Year	
					I	II	I	II
pH (s.u.)	3.4	6.8	7.0	7.1	8.0	8.1	8.4	8.5
Alkalinity ($CaCO_3$) (mg/l)	2.5	5	14	140	58	80	172	201
Sulfate (mg/l)	201	2.1	1.1	498	418	418	828	828
Phosphate (PO_4^{-3}) (mg/l)	0.15	0.15	0.30	-	0.20	0.004	0.30	0.014
Chloride (mg/l)	2	43	10.5	56	48	48	102	102
Aluminum (mg/l)	6.2	6.2	1	0.09	6.7	0.02	9.5	0.06
Arsenic (mg/l)	0.02	0.009	0.019	0.474	0.62	0.40	2.03	1.45
Barium (mg/l)	0.05	0.1	0.05	0.012	0.08	0.010	0.13	0.006
Cadmium (mg/l)	0.002	0.0001	0.0001	0.013	0.008	0.001	0.013	0.0008
Calcium (mg/l)	27	1	1.2	42	43	43	84	14

I MINTEQA2 results before precipitation
II MINTEQA2 results following expected precipitation and adsorption
* Wetter Case assumes a ground water inflow of 10 gpm, precipitation of 10 inches/year, and open water evaporation of 40 inches/year

TABLE F.3: CHEMICAL INPUT DATA AND RESULTS OF FINAL PIT MODELING (WETTER CASE*) (CONTINUED)

	CHEMICAL INPUT DATA				MODELING RESULTS			
	Tka	Tkx	Tlb	Influent groundwater	25 Year		100 Year	
					I	II	I	II
Iron (mg/l)	2.2	1.1	0.7	0.27	2.20	0.0003	3.0	0.0005
Lead (mg/l)	0.003	0.002	0.001	0.001	0.003	0.0006	0.005	0.0014
Magnesium (mg/l)	20	1.2	0.3	13.1	22	22	42	42
Manganese (mg/l)	0.96	0.05	0.05	0.48	0.97	< 0.05	1.3	< 0.05
Mercury (mg/l)	0.00025	0.00025	.00025	.00025	0.00044	0.00044	0.0008	0.0008
Nickel (mg/l)	0.2	0.05	0.05	0.009	0.17	0.16	0.3	0.3
Potassium (mg/l)	6.0	3.2	0.6	5.1	8.2	8.2	16.2	16.2
Silver (mg/l)	0.0006	0	0.0002	0.0002	0.0006	0.0006	0.001	0.001
Sodium (mg/l)	5.3	8.8	7.2	295.6	171	171	353	353
Zinc (mg/l)	2.1	0.05	0.05	0.08	1.55	1.19	2.6	2.1

I MINTEQA2 results before precipitation
II MINTEQA2 results following precipitation and adsorption
* Wetter Case assumes a ground water inflow of 10 gpm, precipitation of 10 inches/year, and open water evaporation of 40 inches/year

TABLE F.4: CHEMICAL INPUT DATA AND RESULTS OF FINAL PIT MODELING (DRIER CASE*)

	CHEMICAL INPUT DATA			MODELING RESULTS				
	Tka	Tkx	Tlb	Influent groundwater	25 Year		100 Year	
					I	II	I	II
pH (s.u.)	3.4	6.8	7.0	7.1	8.3	8.4	8.9	9.0
Alkalinity ($CaCO_3$) (mg/l)	2.5	5	14	140	148	179	719	750
Sulfate (mg/l)	201	2.1	1.15	498	827	826	2,920	2,919
Phosphate (PO_4^{-3}) (mg/l)	0.15	0.15	0.30	-	0.29	0.01	0.79	0.26
Chloride (mg/l)	2	43	10.5	56	95	95	341	341
Aluminum (mg/l)	6.2	6.2	1	0.09	9.7	0.058	25.3	0.20
Arsenic (mg/l)	0.02	0.009	0.019	0.474	0.62	0.40	2.03	1.45
Barium (mg/l)	0.05	0.1	0.05	0.012	0.12	0.006	0.33	0.004
Cadmium (mg/l)	0.002	0.0001	0.0001	0.013	0.018	0.0008	0.049	0.0005
Calcium (mg/l)	27	1	1.2	42	81	18	230	3

I MINTEQA2 results before precipitation
II MINTEQA2 results following expected precipitation and adsorption
* Drier Case assumes a ground water inflow of 10 gpm, precipitation of 6 inches/year. and open water evaporation of 60 inches/year

TABLE F.4: CHEMICAL INPUT DATA AND RESULTS OF FINAL PIT MODELING (DRIER CASE*) (CONTINUED)

	CHEMICAL INPUT DATA			MODELING RESULTS				
	Tka	Tkx	Tlb	Influent groundwater	25 Year		100 Year	
					I	II	I	II
Iron (mg/l)	2.2	1.1	0.75	0.27	3.2	0.0005	8.5	0.001
Lead (mg/l)	0.003	0.002	0.0015	0.001	0.005	0.0012	0.01	0.002
Magnesium (mg/l)	20	1.2	0.35	13.1	38	38	133	133
Manganese (mg/l)	0.96	0.05	0.05	0.48	1.61	< 0.05	4.19	< 0.05
Mercury (mg/l)	0.00025	0.00025	.00025	.00025	0.0007	0.0007	0.0026	0.0026
Nickel (mg/l)	0.2	0.05	0.05	0.009	0.24	0.24	0.86	0.84
Potassium (mg/l)	6.0	3.2	0.6	5.1	14.1	14.1	49.8	49.8
Silver (mg/l)	0.00065	0	0.00025	0.00025	0.001	0.001	0.003	0.003
Sodium (mg/l)	5.3	8.8	7.2	295	381	381	1,357	1,357
Zinc (mg/l)	2.1	0.05	0.05	0.08	2.24	1.70	7.29	5.99

I MINTEQA2 results before precipitation
II MINTEQA2 results following precipitation and adsorption
* Drier Case assumes a ground water inflow of 10 gpm, precipitation of 6 inches/year. and open water evaporation of 60 inches/year

TABLE F.5: WASTE ROCK PILE HELP MODEL (WITH ARGILLIZED LAYER) RESULTS

RUN	MODEL	RUNOFF (%)	ET (%)	PERCOLATION (%)	PERCOLATION RATE FOR ENTIRE (CENTRAL AND SLOPES) SOUTHWEST DISPOSAL AREA	
					(GPM / ACRE)	(IN/YEAR)
1	Central	4.26	95.61	0.42	0.002	0.034
	Slopes	4.85	95.04	0.43		
2	Central	1.09	99.06	0.42	0.002	0.034
	Slopes	4.85	95.04	0.43		
3	Central	4.98	95.07	0.43	0.002	0.035
	Slopes	4.85	95.04	0.43		
4	Central	7.99	90.13	1.49	0.006	0.120
	Slopes	9.92	88.19	1.49		
5	Central	3.52	95.97	0.85	0.003	0.052
	Slopes	4.76	95.11	0.42		
6	Central	4.26	95.61	0.59	0.002	0.045
	Slopes	4.85	95.03	0.53		
7	Central	4.26	95.62	0.00	0.000	0.000
	Slopes	4.85	95.04	0.00		
8	Central	4.45	92.50	3.39	0.012	0.224
	Slopes	5.06	93.18	2.12		
9	Central	3.87	96.28	0.00	0.000	0.008
	Slopes	4.11	96.64	0.21		

TABLE F.5: WASTE ROCK PILE HELP MODEL (WITH ARGILLIZED LAYER) RESULTS (CONTINUED)

RUN	MODEL	RUNOFF (%)	ET (%)	PERCOLATION (%)	PERCOLATION RATE FOR ENTIRE (CENTRAL AND SLOPES) SOUTHWEST DISPOSAL AREA	
					(GPM / ACRE)	(IN/YEAR)
10	Central	3.60	96.79	0.00	0.000	0.000
	Slopes	3.84	97.46	0.00		
11	Central	1.35	97.87	1.06	0.004	0.086
	Slopes	1.40	97.94	1.07		
12	Central	9.55	90.67	0.21	0.000	0.009
	Slopes	9.70	90.58	0.00		
13	Central	4.26	95.61	0.47	0.002	0.038
	Slopes	4.85	95.05	0.47		
14	Central	4.26	95.61	0.62	0.002	0.047
	Slopes	4.85	95.04	0.53		
15	Central	4.22	95.08	1.06	0.004	0.085
	Slopes	4.41	94.85	1.05		
16	Central	4.45	94.83	1.05	0.002	0.044
	Slopes	27.26	72.87	0.00		

TABLE F.6: WASTE ROCK PILE HELP MODEL (WITHOUT ARGILLIZED LAYER) RESULTS

RUN	MODEL	RUNOFF (%)	ET (%)	PERCOLATION (%)	PERCOLATION RATE FOR ENTIRE (CENTRAL AND SLOPES) SOUTHWEST DISPOSAL AREA	
					(GPM / ACRE)	(IN/YEAR)
1	Central	3.79	94.17	4.02	0.017	0.337
	Slopes	3.04	92.87	4.35		
2	Central	1.05	95.91	3.31	0.016	0.307
	Slopes	3.04	92.87	4.35		
3	Central	4.32	93.90	2.12	0.013	0.257
	Slopes	3.04	92.87	4.35		
4	Central	6.51	91.37	2.75	0.018	0.343
	Slopes	3.04	91.68	5.91		
5	Central	3.19	94.07	3.05	0.015	0.296
	Slopes	3.04	93.01	4.34		
6	Central	3.81	94.80	1.97	0.009	0.184
	Slopes	3.08	94.80	2.62		
7	Central	3.78	93.69	2.66	0.017	0.332
	Slopes	3.02	91.64	5.72		
8	Central	4.17	83.95	12.16	0.062	1.203
	Slopes	3.13	79.66	17.94		
9	Central	3.68	93.27	3.39	0.021	0.403
	Slopes	2.96	90.66	6.76		

TABLE F.6: WASTE ROCK PILE HELP MODEL (WITHOUT ARGILLIZED LAYER) RESULTS (CONTINUED)

RUN	MODEL	RUNOFF (%)	ET (%)	PERCOLATION (%)	PERCOLATION RATE FOR ENTIRE (CENTRAL AND SLOPES) SOUTHWEST DISPOSAL AREA	
					(GPM / ACRE)	(IN/YEAR)
10	Central	3.42	97.46	0.43	0.008	0.151
	Slopes	2.89	94.63	3.44		
11	Central	1.14	95.69	3.62	0.019	0.372
	Slopes	1.05	93.73	5.70		
12	Central	8.40	90.44	1.68	0.010	0.188
	Slopes	7.89	89.47	3.04		
13	Central	3.78	92.80	3.69	0.028	0.535
	Slopes	3.10	87.33	9.87		
14	Central	3.83	95.55	1.14	0.006	0.119
	Slopes	3.12	95.55	1.84		

APPENDIX G

CORRECTED TABLES

Table 3.4 (Corrected): U.S. Fish and Wildlife Service (USFWS) and BLM Status of Wildlife Species Occurring in Western Nevada, and Potential for Occurrence in the Project Area, Based on Surveys, Habitats Present and Available Information.

SPECIES	STATUS SFWS	STATUS BLM	POTENTIAL FOR OCCURRENCE
Mammals			
Spotted Bat (Euderma maculatum)	-[1]	S[2]	Recorded irregularly in western Nevada
Small-footed Myotis (Myotis ciliolabrum)	-	S	Found in adits within the project area
Long-eared Myotis (Myotis evotis)	-	S	Possible, fairly common in some parts of the Great Basin
Fringed Myotis (Myotis thysanodes)	-	S	Possible
Long-legged Myotis (Myotis volans)	-	S	Possible
Yuma Myotis (Myotis yumanensis)	-	S	Possible, a large colony historically occupied a building in Wadsworth, NV
Pale Townsend's Big-eared Bat (Plecotus townsendii pallescens)	-	S	This species was found hibernating in adits in the project area and recorded emerging from adits during the spring season. The subspecies present was not identified.
Pacific Townsend's Big-eared Bat (Plecotus townsendii townsendii)	-	S	

1 - = Former USFWS Candidate, Category 2 Species - taxa which may warrant listing as threatened or endangered, but for which sufficient biological information to support a rule to list is lacking.

2 S = BLM State Sensitive Species, incorporating former USFWS C2 species pending the gathering of additional biological information.

TABLE 3.4 (CORRECTED): U.S. FISH AND WILDLIFE SERVICE (USFWS) AND BLM STATUS OF WILDLIFE SPECIES OCCURRING IN WESTERN NEVADA, AND POTENTIAL FOR OCCURRENCE IN THE PROJECT AREA, BASED ON SURVEYS, HABITATS PRESENT AND AVAILABLE INFORMATION. (CONTINUED)

SPECIES	STATUS SFWS	STATUS BLM	POTENTIAL FOR OCCURRENCE
Pygmy Rabbit (Brachylagus (Sylvilagus) idahoensis)	-	S	Unlikely, not recorded in area, habitat limited
BIRDS			
Bald Eagle (Haliaeetus leucocephalus)	T[3]	T	Possible migrant or occasional winter visitor
American Peregrine Falcon (Falco peregrinus anatum)	E[4]	E	Possible migrant
Northern Goshawk (Accipiter gentilis)	-	S	Unlikely, habitat not suitable
White-faced Ibis (Plegadis chihi)	-	S	Unlikely, but could be attracted to ponds. Nests in Lahontan Valley
Western Snowy Plover (Charadrius alexandrinus)	3[5]	-	Unlikely, nests on nearby alkali flats (i.e., Soda Lake area)
Long-billed Curlew (Numenius phaeopus)	3	-	Unlikely, but could be attracted to ponds. Nests in Lahontan Valley
Western Burrowing Owl (Athene cunicularia hypugea)	-	S	Possible, - older sign (pellets) in southern part of project area.
INVERTEBRATES			
Springsnails (Pyrgulopsis)	-	S	Not found during site surveys

3 T = Threatened

4 E = Endangered

5 3 = Candidate, Category 3 Species - Species found to be more abundant or widespread than previously thought, and/or not subject to any identifiable threat.