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U.S. Department of the Interior
Bureau of Land Management

Preliminary Environmental Assessment

Robinson Mine Expansion Project

DOI-BLM-NV-L010-2016-0005-EA

October 2016

PREPARING OFFICE

U.S. Department of the Interior
Bureau of Land Management
Ely District Office, Nevada

Preliminary Environmental Assessment

Robinson Mine Expansion Project

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List of Acronyms and Abbreviations

ABA	Acid-Base Accounting
ACHP	Advisory Council on Historic Preservation
AIRFA	American Indian Religious Freedom Act
AGP	Acid Generating Potential
AGT	Alta Gold Tailings
ALM	Acid Leached Material
AMSL	Above Mean Sea Level
ANP	Acid Neutralizing Potential
APE	Area of Potential Effect
ARD	Acid Rock Drainage
ARPA	Archaeological Resources Protection Act
BGEPA	Bald and Golden Eagle Act
BLM	Bureau of Land Management
BMP	Best Management Practice
BMRR	Bureau of Mining Regulation and Reclamation
BOC	Barge Operating Channel
BWPC	Bureau of Water Pollution Control
CAA	Clean Air Act
CESA	Cumulative Effects Study Area
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
cfs	Cubic Feet Per Second
CO_2	Carbon Dioxide
CR	County Road
CR 44A	County Road 44A/County Road 1146
CWRMP	Comprehensive Waste Rock Management Plan
DRZ	Damage Rock Zone
EA	Environmental Assessment
E-Cell	Evaporation Cell
EOML	End-of-Mine-Life
EOY	End-of-Year
EPA	Environmental Protection Agency
EPM	Environmental Protection Measure
ESA	Endangered Species Act
FEIS	Final Environmental Impact Statement
FLPMA	Federal Land Policy and Management Act
FONSI	Finding of No Significant Impact
GHG	Greenhouse Gas
GHMA	General Habitat Management Area
gpm	Gallons Per Minute
HCT	Humidity Cell Test
HDPE	High Density Polyethylene
H:V	Horizontal:Vertical

Kennecott	Kennecott Copper Corporation's Nevada Mines Division
KOP	Key Observation Point
kV	Kilovolt
LOM	Life of Mine
LR2000	BLM's Land and Mineral Legacy Rehost 2000 System
MBTA	Migratory Bird Treaty Act
MCL	Maximum Contaminant Level
MD	Management Decision
mg/L	Milligrams Per Liter
mph	Miles Per Hour
MR	Minerals Resources
MT	Million Short Tons
MWMP	Meteoric Water Mobility Procedure
NAC	Nevada Administrative Code
NAAQS	National Ambient Air Quality Standards
NAGPRA	Native American Graves Protection and Repatriation Act
NDEP	Nevada Division of Environmental Protection
NDOM	Nevada Division of Minerals
NDOW	Nevada Department of Wildlife
NDWR	Nevada Division of Water Resources
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NOI	Notice of Intent
non-PAG	Non-Potentially Acid Generating
NRHP	National Register of Historic Places
OHMA	Other Habitat Management Area
PAG	Potentially Acid Generating
PHMA	Priority Habitat Management Area
Plan	Plan of Operations
Plan boundary	Plan of Operations boundary
Project	Robinson Mine Expansion Project
PSD	Prevention of Significant Deterioration
RDF	Required Design Feature
RFFA	Reasonably Foreseeable Future Action
RMLP	Robinson Mining Limited Partnership
RMP	Resource Management Plan
RNMC	Robinson Nevada Mining Company
ROD	Record of Decision
ROW	Right-of-Way
Schlumberger	Schlumberger Water Services
SHPO	State Historic Preservation Office
SSS	Special Status Species
TCP	Traditional Cultural Property
TDS	Total Dissolved Solids
TSCP	Tailings Seepage Collection Pond

TSF	Tailings Storage Facility
TSS	Total Suspended Solids
UCED	University Center for Economic Development
U.S.	United States
USC	United States Code
USFS	United States Forest Service
USFWS	United States Fish and Wildlife Service
VRM	Visual Resource Management
WPCP	Water Pollution Control Permit
WRD	Waste Rock Dump

Chapter 1 Introduction

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1.1 Introduction

The Robinson Mine is located in the Egan Range in the central portion of White Pine County, in east-central Nevada. The Robinson Mine is located on private lands owned or controlled by Robinson Nevada Mining Company (RNMC) and public lands administered by the Bureau of Land Management (BLM) (Figure 1-1). On January 19, 2016, RNMC submitted a Plan of Operations (Plan) Amendment, Minor Modification, and 3-Year Update to Reclamation Plan Revision for Disturbance (3-Year Update to Reclamation Plan) through End of Year 2018 (RNMC, 2016a) to both the Nevada Division of Environmental Protection (NDEP), Bureau of Mining Regulation and Reclamation (BMRR), and the BLM Ely District Office. On June 28, 2016, a revised Plan Amendment was submitted to BLM (RNMC, 2016b). RNMC is proposing to expand the existing Ruth Pit and Jupiter Waste Rock Dump (WRD), increase total yard and interfacility disturbance, raise the embankment height of the Giroux Wash tailings storage facility (TSF), relocate and create new growth media stockpiles, expand the TSF borrow areas, re-route a portion of County Road (CR) 1146/44A, re-route the Ruth Pit dewatering pipeline, re-route the Ruth East power line, re-locate the Ruth Overlook Weather Station, and incorporate newly acquired claims into the project boundary.

The Robinson Mine is currently authorized to conduct mining and processing operations under BMRR Reclamation Permit #0021. The public land components of the Robinson Mine are regulated under the BLM Plan NVN-68654. Mining activities were described in the Plan (RMLP, 1994) and were analyzed in accordance with the National Environmental Policy Act (NEPA) under the Final Environmental Impact Statement (FEIS), which was authorized in a Record of Decision (ROD) published on September 9, 1994.

1.2 Identifying Information

1.2.1 Title, Environmental Assessment Number, and Type of Project

Robinson Mine Expansion Project (Project), DOI-BLM-NV-L010-2016-0005-EA, Environmental Assessment (EA).

1.2.2 Location of Proposed Action

White Pine County, Nevada

The Project is located approximately seven miles west of Ely, in Township 16 North (T16N), Range 61 East (R61E), Sections 1, 2, 11 through 14, 23-26, 35, and 36; T16N, R62E, Sections 2 through 24, and 28 through 31; T16N, R63E, Sections 7, 8, and 17 through 20; and T17N, R62E, Sections 20, 21, 28, 29, and 32 through 35, Mount Diablo Baseline and Meridian (Figure 1-1).

1.2.3 Name and Location of Preparing Office

Bureau of Land Management
Ely District Office
702 North Industrial Way
Ely, Nevada 89301

1.2.4 BLM Case File Number

NVN-068654

1.2.5 Applicant Name

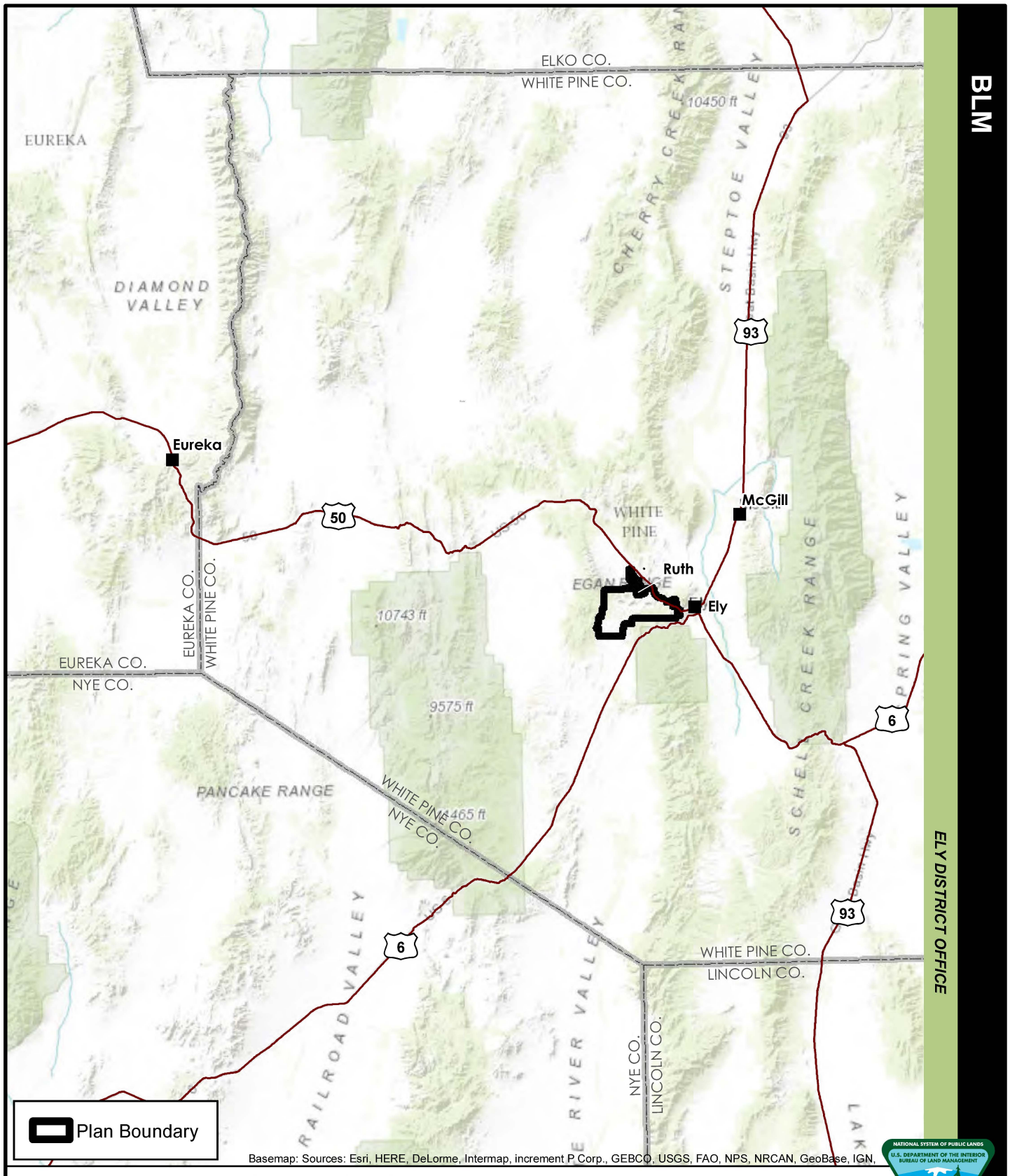
Robinson Nevada Mining Company

1.3 Background Information

Mining in the Robinson District dates back to 1868, when early mining activity in the area centered on small deposits of precious metals. Mining for precious metals declined near the turn of the century and by the early 1900s, mining in the district focused almost exclusively on copper.

Large-scale copper mining began in 1908 and by 1958 all the principal operations were consolidated into Kennecott Copper Corporation's Nevada Mines Division (Kennecott). In 1985, Silver King Mining Company, operating under a lease agreement with Kennecott, initiated gold mining activities within the Mining District. This operation became Alta Gold and then the Alta Bay Joint Venture. Since that time, the mine ownership has transferred several times (RNMC, 2016a) and is currently held by Robinson Holdings (USA) Ltd., which is a wholly-owned subsidiary of KGHM International Ltd.

During the 1980s and early 1990s, a previous operator mined oxide gold ores from the Star Pointer, Aultman, Pilot Knob, Liberty, Kranovich, and Ruth open pits. Waste rock from these pits was disposed of on the Aultman dump, the Pilot Knob dump, the Liberty dump, the Veteran dump, the Kranovich dump and in the Star Pointer pit. The oxide ore was processed using heap leach pads. Mining of leach grade ores was suspended in August 1992. Leaching continued through mid-1994, when sodium cyanide addition was stopped and neutralization-rinsing was initiated. Additional information on previous operations is available in the 3-Year Update to Reclamation Plan (RNMC, 2016a), as well as the FEIS (BLM, 1994a).



BLM

ELY DISTRICT OFFICE

FIGURE 1-1 GENERAL PROJECT LOCATION

KGHM
ROBINSON MINE EXPANSION PROJECT

0 15 30 Miles

1 inch = 15 miles

MAP LOCATION

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EGAN FIELD OFFICE

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1.4 Purpose and Need for Action

The BLM's purpose is to respond to RNMC's proposal for a mine expansion within the Plan boundary and the extension of mine life on their active existing mining claims on BLM and private lands. The BLM must determine if changes, including additions, or conditions to the Proposed Action are necessary prior to approval of the Plan Amendment to meet the requirements of the BLM surface management regulations (43 Code of Federal Regulations [CFR] 3809), within the context of RNMC's statutory rights under federal mining laws. The need for the action is established by the BLM's responsibility under the Mining Law of 1872, Section 302 of the Federal Land Policy and Management Act (FLPMA), and the BLM Surface Management Regulations at 43 CFR 3809. Under these statutes and regulations, the BLM is required to review the Plan Amendment (RNMC, 2016b) to ensure that RNMC's activities do not cause unnecessary or undue degradation of the public lands and include appropriate reclamation.

1.5 Decision to be Made

The BLM will make the following decisions on the Robinson Mine Plan Amendment:

- A determination under 43 CFR 3809 of compliance under the mining laws.

The BLM will also make a decision regarding the Plan Amendment to:

- Approve the Plan Amendment as submitted, or
- Approve the Plan Amendment subject to certain conditions imposed to ensure the operation meets the performance standards outlined in 43 CFR 3809.420 and does not result in unnecessary or undue degradation, or
- Disapprove or withhold approval of the Plan Amendment.

1.6 Scoping, Public Involvement, and Issues

Internal scoping was conducted by the BLM interdisciplinary team on March 7, 2016, which discussed the potential consequences of the Proposed Action. Issues regarding how the Proposed Action may affect certain resources, identified during the internal scoping meeting included:

- Air Quality: Dust abatement and emissions of fugitive dust during construction;
- Cultural Resources: The project may impact historic properties and the characteristics that make them eligible for the National Register of Historic Places (NRHP);
- Migratory Birds: Need for pre-construction clearance surveys;

- Noise: Potential noise impacts to greater sage-grouse (*Centrocercus urophasianus*) leks within four miles of the project or breeding habitat near the project;
- Socioeconomics: Potential impacts of extending the life-of-mine;
- Special Status Species: Potential impacts to greater sage-grouse and pygmy rabbits (*Brachylagus idahoensis*);
- Visual Resources: Potential impacts at Key Observation Points (KOPs); and
- Wildlife: Potential impacts to habitat.

Potential impacts were evaluated in accordance with criteria listed below to determine if detailed analyses were required. Consideration of some of these items is to ensure compliance with laws, statutes, or Executive Orders that impose certain requirements upon all federal actions. Other items are relevant to the management of public lands in general, and to the BLM Ely District. While many issues may arise during scoping, not all the issues raised warrant analysis. Issues raised through scoping are analyzed if:

- Analysis of the issue is necessary to make a reasoned choice between alternatives; or
- If there is a disagreement about the best way to utilize a resource, or resolve an unwanted resource condition or potentially significant effects of a Proposed Action or alternatives.

Public scoping was not conducted in the preparation of this EA due to the anticipated low potential for controversy. BLM determined that the small size and scale of the project did not warrant public scoping meetings.

1.7 Conformance, Permits, and Approvals

1.7.1 Permits and Approvals

RNMC and/or its contractors are responsible for obtaining valid permits and approvals from all relevant federal and state agencies to construct, operate, and reclaim the proposed project. Federal, state, and county permits and approvals needed for this project are shown in Table 1-1.

Table 1-1 Authorizations, Permits, Reviews, and Approvals Necessary for the Proposed Action

Authorizing Action or Permit	Agency	Status
Federal		
Plan Amendment	BLM Ely District Office	Approval Pending Decision Record and FONSI
State		
State Mine and Reclamation Plan	NDEP-BMRR	Pending Plan Amendment Approval by BLM
Operating Permit for Surface Area Disturbance, includes a Dust Control Plan	NDEP-Bureau of Air Pollution Control	Required prior to beginning disturbance (Class II Air Permit held by Robinson)
Construction Storm Water Permit; including Storm Water Pollution Prevention Plan and Notice of Intent	NDEP, Bureau of Water Pollution Control (BWPC)	Required prior to beginning construction disturbance (held by Robinson)
Expansion requires a modification to Dam Safety Permit J-413	Nevada Division of Water Resources (NDWR), State Engineer's Office	Permit modification required before proposed TSF dam height increase (Application scheduled for submittal in October 2016)
Construction of a pond associated with the tailings expansion – Industrial Artificial Pond Permit	Nevada Department of Wildlife (NDOW)	Permit obtained before proposed pond is built
County		
Commission Approval Re-route of CR 44A/1146	White Pine County	Commission has not yet approved CR 44A/1146 Re-route. Request is on Commission meeting agenda for 10/12/16.

FONSI = Finding of No Significant Impact

The following is a list of current permits for the Robinson Mine:

- Class II Air Quality Operating Permit No. AP1021-0373.02, issued by NDEP-Bureau of Air Pollution Control;
- Nevada Hazardous Materials Storage Permit No. 2917-7336, FDID No. 17856, issued by Nevada State Fire Marshal;
- Hazardous Waste Facility Identification # NVD982440539, issued by the United States (U.S.) Environmental Protection Agency (EPA);
- General Permit for Stormwater Discharges Associated with Industrial Activity from Metals Mining Activities No. NVR300000, issued by NDEP-BWPC;
- Discharge Permit No. NEV94013 for Operation of Wastewater Treatment Facility, issued by NDEP-BWPC;
- Water Pollution Control Permit (WPCP) No. NEV0092105, issued by NDEP-BMRR;

- Dam Safety Permit J-413, issued by State Engineer's Office, NDWR;
- Permit to Operate a Public Water System, Permit No. WP-0855-12NTNC, issued by NDEP;
- Radioactive Material License 17-11-0372-01, issued by Bureau of Health Protection Services, Radiological Health;
- BHP Nevada Mining Water Rights Woodburn and Wedge letter, June 21, 2004 to H. Ricci, Nevada State Engineer;
- Mining Operation Reclamation Permit No. 0021, issued by NDEP-BMRR;
- Liquefied Petroleum Gas License No. 5-4546-01, Class 5, issued by the Nevada Board for the Regulation of Liquefied Petroleum Gas;
- Plan of Operations, Robinson Project No. N46-92-004P, BLM;
- Hazardous Materials Certificate of Registration, Reg. No. 080408 003 011QS, Issued by U.S. Department of Transportation Pipeline and Hazardous Materials Safety Administration;
- Industrial Artificial Ponds Permit No. S-26608 for Mill/Tailings, issued by NDOW;
- Industrial Artificial Ponds Permit No. S-26609 for A, B & C East Heaps, issued by NDOW;
- Industrial Artificial Ponds Permit No. S-26610 for D Pad Heap, issued by NDOW;
- Solid Waste Mining Site Class III Waiver, Application No. SWMI-17-62, issued by NDEP-Bureau of Waste Management Class III Landfill Waiver # F-1736 (C-Pad Disposal Area); and
- Gleason Creek Water Discharge Permit NEV2010111, NDEP-BMRR.

1.7.2 BLM Land Use Plan(s)

The proposed Plan Amendment has been analyzed within the scope of the *Ely District Record of Decision and Approved Resource Management Plan* (RMP), as amended (BLM, 2008a). The Proposed Action and alternatives described herein are in conformance with the 2008 Ely RMP (BLM, 2008a). Goals and objectives in the RMP for mineral extraction are listed on pages 92 through 103. The goal listed on page 92 states the following: "Allow development of solid leasable and locatable minerals in a manner to prevent unnecessary or undue degradation" to the public lands. The objective and minerals decision MIN-14 states the following: "Allow locatable mineral development on approximately 9.9 million acres of federal mineral estate, subject to the prevention of unnecessary or undue degradation of the public lands" (BLM, 2008a).

The BLM is responsible for administering access to mineral rights on certain federal lands as authorized by the General Mining Law. Under the law, reasonable access to mineral deposits is entitled on public domain lands that have not been withdrawn from mineral entry. The BLM is also responsible for reviewing surface resources pursuant to the FLPMA (43 United States Code [USC] 1701 et seq.) and the attendant regulations for surface management of lands on mining claims under the General Mining Law (43 CFR 3809). The surface management regulations require the BLM to comply with NEPA, as amended (42 USC 4321 et seq.), ensure that the operator “conduct all operations in a manner that complies with all pertinent federal and state laws" (43 CFR 3809.420), that BLM concur with State approval of a Plan (43 CFR 3809.203[a]), and would not cause unnecessary or undue degradation of the public lands.

The Ely RMP was amended by incorporation of the Nevada and Northern California Greater Sage-Grouse Plan Amendment, September 15, 2015 (BLM, 2015). This project is a non-discretionary 43 CFR 3809 action and BLM is limited to preventing unnecessary and undue degradation, thus the project is not subject to Management Decisions (MD) Special Status Species (SSS) 2A, SSS 2F, SSS 3A, and SSS 3E of the Nevada and Northeastern California Greater Sage-Grouse Plan Amendment (BLM, 2015). However, Robinson has voluntarily committed to environmental protection measures (EPMs) that would avoid, minimize, or reduce the impacts identified in the EA. However, the Proposed Action is in accordance with the following MD’s for locatable minerals:

- MD Minerals Resources (MR) 15, by applying MD SSS 1 through 4:
    - MD SSS 1 – The Proposed Action avoids Priority Habitat Management Area (PHMA) completely, avoids General Habitat Management Area (GHMA) where possible, and the proposed disturbance is adjacent to existing disturbance and infrastructure;
    - MD SSS 2 – The Proposed Action does not occur within PHMA; and
    - MD SSS 3 and 4 – Required Design Features (RDFs) have been voluntarily committed to by Robinson Mine to minimize impacts in GHMA and Other Habitat Management Area (OHMA). (*Note: As a non-discretionary project, RDFs are not required by BLM but are recommended.*)
- MD MR 17 by incorporating exploration within their Plan boundary; and
- MD MR 18 because the project would avoid or minimize impacts within greater sage-grouse habitat to the extent practicable.

1.7.3 Relationship to Statutes, Regulations, and Other Plans

NEPA is one of many authorities that contain procedural requirements that pertain to treatment of elements of the environment when the BLM is considering a federal action. The Proposed Action and alternatives are consistent with federal, state, and local laws; regulations; and plans and programs. Appendix 1 of the BLM NEPA Handbook H-1790-1 contains a list of many of the supplemental authorities that may apply to BLM actions.

The Proposed Action and alternatives are consistent with these federal statutes and regulations, as well as state plans and policies for the management of mineral and water resources, conservation of SSS, and cultural resource protection (Nevada State Historic Preservation Office), as well as with the White Pine County Master Plan (WPC, 2009) and White Pine County Public Lands Policy Plan (WPC, 2007).

Chapter 2 Proposed Action and Alternatives

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2.1 Current Operations – No Action Alternative

The Robinson Mine is currently authorized to conduct mining and processing operations with a total associated surface disturbance of 8,204.5 acres, of which 7,169.6 acres are authorized on private land and 1,034.9 acres (Table 2-1) are authorized on public land administered by the BLM (BLM, 1994a and 1994b) (Figure 2-1). Current operations are summarized below. Additional details on current operations are available in the 3-Year Update to Reclamation Plan and Plan Amendment (RNMC, 2016a and 2016b).

Under the No Action Alternative, the Plan Amendment would not be approved. Authorized mining as described in Section 2.1 and in the approved Plan (RMLP, 1994) would continue. Once mining is complete, final reclamation operations would continue. A total of 8,204.5 acres would be disturbed (Table 2-1). Under the No Action Alternative, mining would be extremely limited after February 2017 and cease in 2018; further, because the TSF would reach its maximum permitted height, no further processing of ore could occur. The No Action Alternative would prevent expansion of the Ruth Pit, which would effectively prevent future mining.

2.1.1 Pits

There are four active open pits at the Robinson Mine with a total authorized surface disturbance of 1,852.1 acres as follows:

- Aultman Pit (20.0 acres);
- Liberty Pit (670.6 acres);
- Ruth Pit (606.9 acres); and
- Tripp/Veteran Pit (554.6 acres).

Of the 1,852.1 acres of open pits, 1,850.1 acres are authorized on private lands and 2.0 acres of the Ruth Pit are on BLM-administered land (Table 2-1). The authorized pit locations and footprints for end-of-mine-life (EOML) 2018 are shown on Figure 2-1. No current mining is being conducted in the Aultman, Liberty, or Tripp/Veteran pits; however, the Liberty and Tripp/Veteran pits could be mined in the future. Current mining activities are focused in the Ruth Pit until the EOML 2018.

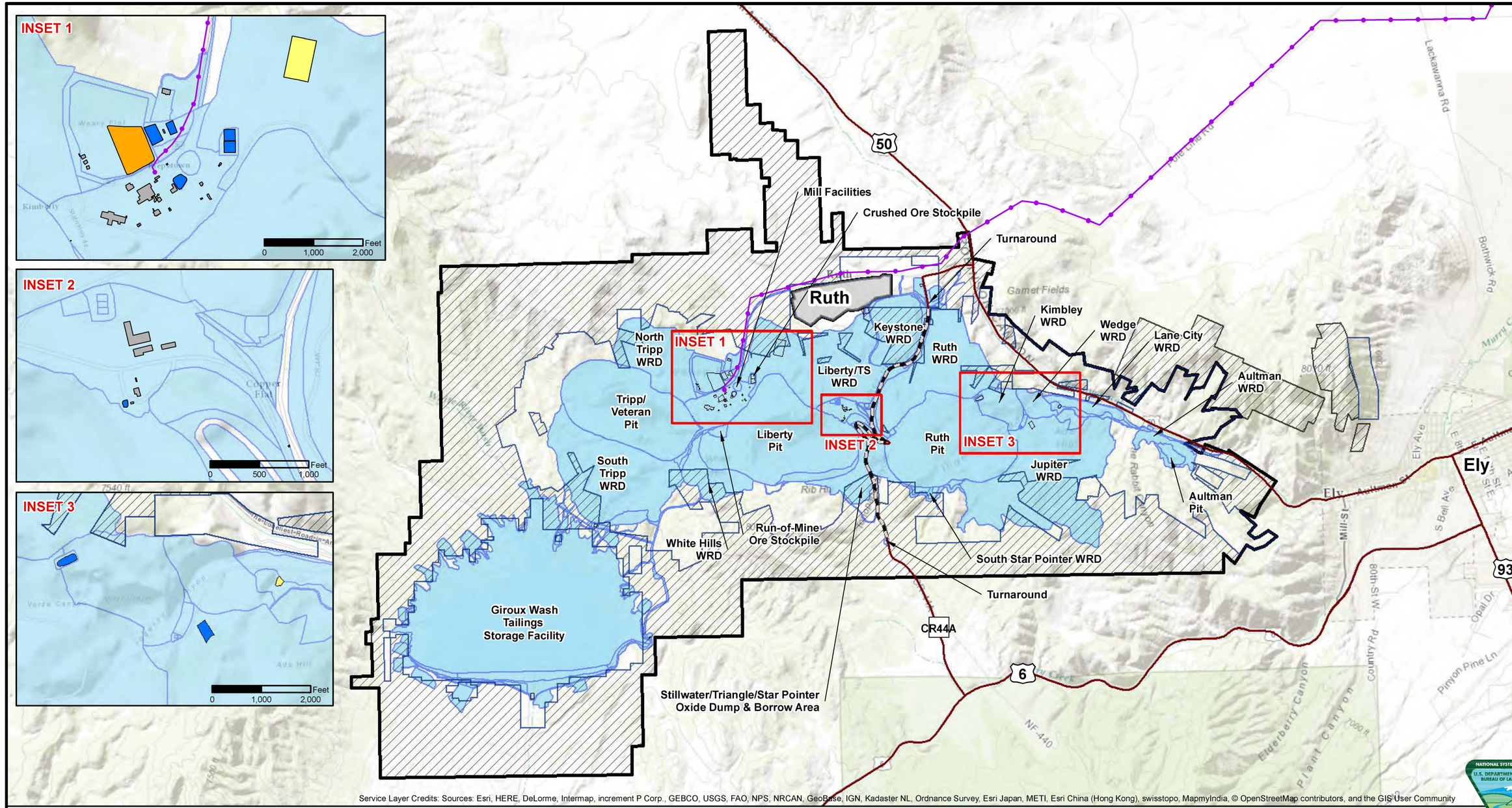
2.1.2 Backfilled Pits

Two open pits, known as the Kimbley Pit and Wedge Pit, were largely backfilled in 2014-2016. These pits were authorized for a total disturbance of 135.8 acres. No further mining would occur in these areas. Disturbance associated with the footprints of these facilities are categorized under WRDs and are identified as the Kimbley WRD and Wedge WRD. WRDs are discussed further in Section 2.1.3.

Table 2-1 Robinson Mine Authorized Disturbance in Acres

Component	Disturbance Acreage		
	Private	Public	Total
Pits			
Aultman Pit	20.0	0.0	20.0
Liberty Pit	670.6	0.0	670.6
Ruth Pit	604.9	2.0	606.9
Tripp/Veteran Pit	554.6	0.0	554.6
Subtotal Pits	**1,850.1**	**2.0**	**1,852.1**
Waste Rock Dumps[1]			
Aultman WRD	47.4	0.1	47.5
Jupiter WRD (includes C-pad Disposal Area)	532.2	247.4	779.6
Kimbley WRD (backfilled Kimbley Pit)	85.2	2.1	87.3
Liberty/TS WRD	467.7	96.7	564.4
North Tripp WRD	236.8	40.2	277.0
Ruth WRD (including A-Pad and North B-Pad)	421.8	24.1	445.9
South Star Pointer WRD	6.3	2.3	8.6
South Tripp WRD	481.5	86.8	568.3
Stillwater/Triangle/Star Pointer Oxide Dump and Borrow Area	111.0	37.6	148.6
Wedge WRD (backfilled Wedge Pit)	48.5	0.0	48.5
White Hills WRD	78.2	53.6	131.8
Crushed Ore Stockpile	3.9	0.0	3.9
Run-of-Mine Ore Stockpile	11.5	0.0	11.5
Subtotal WRDs	**2,532.0**	**590.9**	**3,122.9**
Other Facilities			
Access Roads	40.9	37.0	77.9
Buildings	14.2	0.1	14.3
CR 44A turnarounds	1.6	2.1	3.7
D-Pad Leach Pad	60.1	0.0	60.1
Drainage Control	14.7	7.8	22.5
E-Cells (evaporation cells)	19.1	4.6	23.7
Exploration Areas	49.9	0.0	49.9
Giroux Wash TSF	1,903.4	70.5	1,973.9
Haul Roads	49.2	0.7	49.9
Pipeline route	11.7	1.4	13.1
Power Lines to Gonder	1.1	0.7	1.8
Process Ponds	3.1	0.4	3.5
Tailings Cover Soil Borrow Areas	13.9	26.6	40.5
Two-track Access Roads	5.5	4.9	10.4
Yards/Clearance Areas	599.1	285.2	884.3
Subtotal Other Facilities	**2,787.5**	**442.0**	**3,229.5**
Total EOML 2018 Acres	**7,169.6**	**1,034.9**	**8,204.5**

[1]The Lane City and Keystone WRDs are considered “pre-regulation” and therefore not included in this table.



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BLM

ELY DISTRICT OFFICE

FIGURE 2-1 EXISTING AUTHORIZED DISTURBANCE

KGHM
ROBINSON MINE EXPANSION PROJECT

- Plan Boundary
- Authorized Disturbance
- County Road 44A Closed to Public
- Transmission Line
- Existing Buildings
- D-Pad Leach Pad
- E-Cell Evaporation Pond
- Process Ponds

Land Ownership

- Private Land
- BLM Land - Public

MAP LOCATION

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U.S. BUREAU OF LAND MANAGEMENT
ELY DISTRICT
EGAN FIELD OFFICE

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2.1.3 Waste Rock Dumps

A total of 11 WRDs are authorized at the Robinson Mine with a total combined authorized surface disturbance footprint of approximately 3,122.9 acres (2,532.0 acres private land, 590.9 acres BLM-administered land). Authorized WRD locations are depicted on Figure 2-1. Authorized WRD disturbances are presented in Table 2-1 and are discussed below.

The Aultman WRD, located on the northern perimeter of the Aultman Pit, has an authorized surface disturbance of 47.4 acres (47.4 acres private land, 0.1 acre BLM-administered land). No waste rock placement would occur for the Aultman WRD through the EOML 2018.

The Jupiter WRD, located southeast of the Ruth Pit, is authorized for a total surface disturbance of 779.6 acres (532.2 acres private land, 247.4 acres BLM-administered land). The authorized footprint of the Jupiter WRD includes the C-Pad gold heap leach/C-Pad disposal area facility. RNMC is actively placing mined waste rock on the Jupiter WRD and plans to continue through the authorized EOML 2018. The Jupiter WRD is being constructed by encapsulating potentially acid generating (PAG) waste rock with 50 feet of non-potentially acid generating (non-PAG) waste rock on WRD sideslopes, thus eliminating the potential for exposing PAG waste rock during WRD regrading.

As previously discussed, the Kimbley Pit was largely backfilled in 2014-2016 to create the Kimbley WRD. A total of 87.3 acres of disturbance have been authorized for the Kimbley WRD (85.2 acres private land, 2.1 acres BLM-administered land). RNMC will continue to place waste rock on the Kimbley WRD through 2017. The final Kimbley WRD will be formed with a 50-foot thick oxide cover on the WRD sideslopes, thus eliminating the potential for exposing PAG waste rock during WRD regrading.

The Liberty/TS WRD, located directly north of the Liberty Pit, has a total authorized surface disturbance of 564.4 acres (467.7 acres private land, 96.7 acres BLM-administered land). RNMC is actively placing waste rock from authorized mining operations on the Liberty/TS WRD and plans to continue through EOML 2018. Consistent with the Comprehensive Waste Rock Management Plan (CWRMP) (RNMC, 2014a), the Liberty/TS WRD is being constructed by encapsulating PAG waste rock with 50-foot thick non-PAG waste rock on WRD sideslopes, thus eliminating the potential for exposing PAG waste rock during WRD regrading.

The North Tripp WRD, located directly north of the Tripp/Veteran Pit, has a total authorized surface disturbance of 277.0 acres (236.8 acres private land, 40.2 acres BLM-administered land). The authorized footprint includes disturbances for the previously planned North Tripp WRD expansion. However, no further waste rock placement or expansion of the existing dump footprint are planned for the North Tripp WRD through EOML 2018.

The Ruth WRD, located directly north of the Ruth Pit, has a total authorized surface disturbance of 445.9 acres (421.8 acres private land, 24.1 acres BLM-administered land). The authorized footprint of the Ruth WRD includes a portion of the A-Pad and North B-Pad gold leach facilities. The North B-Pad gold leach facility has now been closed by over-dumping. The A-Pad gold leach facility is scheduled to be closed in 2017. RNMC is actively placing mined waste rock on the Ruth WRD and plans to continue through the authorized EOML 2018. The final Ruth WRD is being constructed with 50 feet of non-PAG material placed on the WRD sideslopes, thus eliminating the potential for exposing PAG waste rock during final WRD regrading.

The South Star Pointer WRD, located south of the Ruth Pit, has a total authorized surface disturbance of 8.6 acres (6.3 acres private land, 2.3 acres BLM-administered land). RNMC does not plan to place additional waste rock on this WRD through EOML 2018.

The South Tripp WRD is located south of the Tripp/Veteran Pit, and has a total authorized surface disturbance of 568.3 acres (481.5 acres private land, 86.8 acres BLM-administered land). No further waste rock placement is planned for the South Tripp WRD through the EOML 2018.

The Stillwater/Triangle/Star Pointer WRDs, located southwest of the Ruth Pit have an authorized surface disturbance of 148.6 acres (111.0 acres private land, 37.6 acres BLM-administered land). These WRDs are no longer active and have been identified as a potential source of oxide waste rock that will be used as oxide cover material during reclamation. RNMC conducted characterization work to demonstrate the material's suitability as part of the CWRMP preparation (RNMC, 2014a). Characterization results indicate that oxide material on these WRDs has no potential for acid generation and is suitable for use as cover over WRDs for reclamation. (WRDs that require cover with oxide material per the waste rock management plan will be covered. Not all WRDs require oxide cover.) These WRD's top surfaces have also been used to stockpile salvaged growth media material.

As previously stated, the Wedge Pit was backfilled to create the Wedge WRD, which is located north of the Jupiter WRD. The Wedge WRD has an authorized surface disturbance of 48.5 acres, all of which are located on private land. RNMC does not plan to place additional waste rock on the Wedge WRD through the EOML 2018.

The White Hills WRD, located southwest of the Liberty Pit, has an authorized surface disturbance of 131.8 acres (78.2 acres private land, 53.6 acres BLM-administered land). No further waste rock placement would occur for this WRD through the EOML 2018.

The run-of-mine ore stockpile is 11.5 acres in size and the crushed ore stockpile is 3.9 acres; both are entirely on private lands. The run-of-mine ore is raw ore and the crushed ore is ready to be processed.

2.1.4 Giroux Wash Tailings Storage Facilities

Tailings produced during milling operations at the mine are placed in the authorized Giroux Wash TSF (Figure 2-1). The TSF is permitted by both the NDWR (Dam Safety Permit J-413) and NDEP WPCP #NEV0092105). The TSF at the Robinson Mine impounds tailings slurry, which is a byproduct of ore production. The TSF is permitted at a maximum dam height of 6,820 feet above mean sea level (AMSL). Based on the authorized Plan and production rate, the tailings deposition at the facility would reach that maximum permitted height by the End-of-Year (EOY) 2018.

The authorized surface disturbance for the TSF is 1,973.9 acres (1,903.4 acres private land, 70.5 acres BLM-administered land). The TSF and associated infrastructure consists of the following:

- Tailings slurry delivery pipelines (from the pump station to the impoundment);
- Tailings slurry deposition system (on embankment);
- TSF, including embankment, downstream stormwater and sediment control paddocks and seepage collection drains and pond, with pump back facilities;
- Barge operating channel (BOC) and reclaimed solution pumping and piping facilities; and
- Stormwater diversion facilities.

2.1.4.1 Tailings Storage Facility Embankment

The TSF embankment consists of a compacted soil starter embankment, constructed to an elevation of 6,710 feet AMSL that allowed initial (i.e., first two years) deposition without the requirement of embankment raises to increase tailings storage capacity. Current and future embankment raises utilize the coarse tailings and/or borrowed alluvium excavated from within the TSF footprint where tailings have not yet been deposited. The centerline method of construction is used for all embankment raises.

The TSF area and storage capacity characteristics and the tailings deposition rate determine the rate at which the embankment must be raised. With a constant deposition rate, the rate of increase of the tailings embankment reduces over time, as additional deposition area becomes available. A “Life-of-Mine” tailings impoundment design was submitted to NDEP on January 15, 2008 (SRK, 2008), with approval issued on April 7, 2008. This design contemplates all expansion phases to the authorized footprint of the Giroux Wash TSF for EOML 2018.

2.1.4.2 Tailings Delivery and Deposition System

The tailings delivery and deposition systems for slurry transport from the mill and flotation circuit to the TSF, and for reclaim water returned to the mill and flotation circuit, include the pipelines and the following components:

- The embankment header deposition system is serviced by a 30-inch-diameter rubber-lined steel pipeline and includes the following components:
  - 320 each, 10-inch cyclones at 25-foot spacing;
  - 320 each, 4-inch-diameter High Density Polyethylene (HDPE) cyclone overflow pipes;
  - 27 each, 6-inch HDPE spigots.
- The reclaim water break tank and the booster tank are both installed above-ground, steel, 24 feet high with internal diameters of 20 feet having individual capacities of 50,000 gallons;
- Tailings break tank, above-ground, steel, 20 feet high with 12-foot internal diameter and 15,600-gallon capacity;
- Re-pulp house containing a slurry re-pulp tank (12 feet high with 20-foot internal diameter, 15,600-gallon capacity) and reclaim booster pumping station with reclaim pumping appurtenances including pumps, piping, valves, and bypass pipes for slurry and reclaim water; and
- Secondary containment berms and controls along the entire slurry pipeline corridor from the tailings pump house to the impoundment.

The embankment header deposition system is serviced by a 30-inch-diameter rubber-lined steel pipeline and includes the following components:

- Above-ground reclaim water break tank and the booster tank;
- Above-ground tailings break tank;
- Re-pulp pump house containing a slurry re-pulp tank and reclaim booster pumping station with reclaim pumping appurtenances including pumps, piping, valves, and bypass pipes for slurry and reclaim water; and
- Containment berms and controls along the entire slurry pipeline corridor from the tailings pump house to the TSF.

2.1.4.3 Barge Operating Facilities

Barge operating facilities include a 150-foot wide, 10- to 15-foot deep channel with a bentonite amended and compacted soil liner on the base and sideslopes to provide a low permeability barrier to vertical seepage. One barge, equipped with three turbine pumps operating one at a time, provide the capacity to pump, via the reclaim pipeline and booster pumping facilities, up to 5,000 gallons per minute (gpm) of process water back to the mill for reintroduction into the process circuit.

2.1.4.4 Tailings Embankment Downstream Stormwater and Sediment Control System

This system consists of a series of adjoining earthen paddocks constructed along the southern extent of the tailings embankment and occupies 1.0 acre of private land and 1.1 acres of BLM-administered land. The main purposes of this system are to:

- Provide sediment storage capacity for tailings eroded off the southern slope of the embankment. The current system takes into account the gradual southern extension of the downstream slope and toe of the embankment resulting from embankment raising using centerline construction;
- Provide water storage capacity for run-off and suspended solids generated from average monthly rainfall and the 25-year, 24-hour storm event;
- Provide emergency containment for tailings slurry in the event of failure or leaking from the slurry deposition system located on the embankment crest; and
- Serve as an embankment underdrain to the cycloned tailings as the downstream toe of the embankment advances over the system.

The base of each paddock consists of, from bottom to top, a prepared subgrade, a layer of geotextile, an 18-inch layer of drain rock, a second layer of geotextile, and a 12-inch layer of graded cover material. A 12-inch-diameter perforated pipe is placed along the topographic low of each paddock to promote free drainage and to direct stormwater into the collection pipes.

2.1.4.5 Tailings Seepage Collection Pond

The Tailings Seepage Collection Pond (TSCP) is located on private land and consists of an excavated basin lined with a single layer of 60-mil HDPE liner. The basin is approximately 15 feet deep, with a base area of 5,000 square feet, surface (top) area of 31,250 square feet, and a storage capacity of approximately 1.5 million gallons. The pond is fenced with eight-foot-high chain-link to preclude terrestrial wildlife. An HDPE-lined ditch (approximately 8,000 feet long) conveys seepage from the blanket drain collection system, which is part of the tailings embankment downstream stormwater and sediment control system, to the TSCP.

2.1.4.6 Tailings Pump Back System

The tailings pump back system was constructed in September 2015, to allow pumping of groundwater with sulfate concentrations above 500 milligrams per liter (mg/L) in order to remediate the sulfate plume downstream of the TSF. The system consists of pump back wells WCC-G7, WCC-G9, WCC-G10, WCC-G11, PW-1 and PW-2 with flows from each well routed via separate conveyance pipeline from the respective well to a new 8,000-gallon holding tank and booster pump located west of well WCC-G7. From there, water is routed along the existing access road in a two-inch-diameter HDPE pump back pipeline to the reclaim water tank located at the re-pulp pump house. The water is combined with reclaim from the BOC and pumped to the mill for use in the process circuit.

The wells with elevated sulfate (above 500 mg/L) are all located on patented ground.

2.1.4.7 Mill and Flotation Circuits

Construction, operation, and closure of the process circuit, including the TSF, are authorized by WPCP #NEV0092105 granted by the NDEP, Dam Safety Permit J-413 issued by the NDWR, and Industrial Artificial Pond Permit #S-31612 issued by NDOW.

Operating components of the mill and the copper and molybdenum flotation circuits are located on private land and listed below.

- Primary crusher, 40-foot by 60-foot metal maintenance building on concrete pad, conveyors, crushed ore stockpile, with reclaim feeders;
- Grinding circuit;
- Gravity gold recovery circuit;
- Concentrator building including flotation cells, XCELL™ flotation machines, and associated columns, basins, sumps, pumps and piping necessary to interconnect the components within the building;
- Two tailings thickeners and a tailings pump station;
- Two copper concentrate thickeners and one molybdenum concentrate thickener with secondary containment, including the liquid sodium cyanide tank and accessories;
- Concentrate drying filters, conveyor and load-out and storage facilities;
- Mill water storage ponds and tanks;
- Lime silos and a lime slaker;
- Emergency containment pond (i.e., Carr's Pond); and
- Facility accessories including transfer piping, valves, and pumps used for process solutions, as well as remote control or passive systems for the detection of process fluids to/from/between process components.

Mill tailings are pumped by slurry pipeline to the Giroux Wash TSF, and tailings reclaim water is pumped back to the mill for reuse in the circuit.

2.1.5 Gold Heap Leach and Process Facilities

The following gold heap leaching and process facilities are authorized at the Robinson Mine:

- A-pad and associated process solution ponds;

- B-pads (north and south), associated process solution ponds, and process plant facilities;
- C-pad, associated process solution ponds, and process plant facilities; and
- D-pad, associated process solution ponds, and process plant facilities.

NDEP approved overdumping of the Robinson East Heap Leach Facilities (i.e., A-Pad, B-Pad, and C-Pad) in a 2008 Minor Modification to WPCP (RNMC, 2009). Facilities associated with this overdumping included draindown collection pipes at the three pads, a buried pipe-in-pipe draindown transfer pipeline to the mill, and emergency overflow ponds at each of the three pads. For A-Pad, the barren pond is used to manage emergency overflow, for B-Pad the relined event pond is used, and for C-Pad a new overflow pond was constructed. Construction of these facilities was completed in 2010.

RNMC has completed the following gold heap leach facilities closure work:

- Closure of the C-Pad process solution ponds and process plant facilities was completed in 2010;
- Closure construction for the A-Pad pregnant pond and B-Pad process ponds and process plant facilities was completed in 2014 and approved by NDEP in 2015;
- South B-Pad spent ore, including pad liner and all potentially impacted underlying material, were removed during 2014 and 2015. A Final Closure Report was approved on July 14, 2015;
- RNMC completed overdumping of the North B-Pad by Ruth waste rock in November 2015, consistent with the revised Final Plan for Permanent Closure of North B-Pad and C-Pad heap leach pads that was submitted to NDEP on June 12, 2015; and
- The C-Pad Disposal Area (Phases I through V) was constructed within the C-Pad footprint to accommodate relocation of approximately 1.2 million tons (MT) of Alta Gold Tailings (AGT) from the Ruth Pit. This facility is also permitted as a Class III solid waste disposal facility. RNMC also placed materials mainly consisting of building rubble, pond sediments, liners, and impacted soils removed during closure construction of the A-Pad, B-Pad, and C-Pad ponds and process plants within the AGT Disposal Area. In addition, spent ore from the South B-Pad heap leach pad, pad liner, and subliner soils removed after leach pad spent ore removal, were also placed on the C-Pad Disposal Area.

RNMC plans to complete overdumping of the C-Pad/C-Pad disposal area consistent with the revised Final Plan for Permanent Closure of North B-Pad and C-Pad heap leach pads that was submitted to NDEP on June 12, 2015 (RNMC, 2015b) and approved on August 31, 2015. A final plan for closure of the D-Pad has not yet been submitted.

The A-Pad, B-Pad, and C-Pad draindown conveyance system, including pumps and buried pipeline that were used for management of the respective heap draindown flows, were discontinued due to frequent rerouting required to accommodate Ruth Pit expansions. Therefore, this system is no longer operational. Current water management of heap draindown consists of collecting draindown solution from the respective collection sumps and conveying the solutions to the mill via pump truck for incorporation into the process. D-Pad draindown flows (~0.4 gpm measured in 2015) are evaporated in the existing D-Pad process ponds.

2.1.6 Exploration

RNMC has an on-going exploration drilling program to provide information for the geologic model, better define the ore body, and provide metallurgical samples. RNMC is authorized to conduct exploration drilling within the Plan boundary; many of the drill sites are located on existing disturbance. Drill pads have an approximate dimension of 100 feet by 100 feet. The exploration holes are completed to depths from 600 to 1,500 feet below ground surface using both reverse circulation and core drilling. More than one hole can be drilled from each pad. Up to six holes could be open at any one time. The exploration disturbance area is planned for 49.9 acres on private land (Table 2-1).

2.1.7 Blasting

Drilling and blasting at the Robinson Mine are conducted on a near daily basis. Blast patterns are designed by the Drill and Blast Engineer and then uploaded to the drill rigs. Holes can vary from 9.0 inches in diameter to 12.25 inches; generally they are 56 feet deep. After the pattern is drilled, geologists log the holes and collect samples for assaying. On the designated day, RNMC's blasting contractor primes each hole with a detonator and booster. The detonators have a microchip in them that allow for precise timing of the detonation. After priming, the holes are loaded with the explosive product, generally Ammonium Nitrate and Fuel Oil. Once the hole is loaded to the specification provided by the Drill and Blast Engineer, crushed rock or stemming is placed in the top of the hole. The stemming serves to confine the explosive pressure that fractures the rock and to reduce air blast. After the entire pattern is loaded, the detonators are tied together into an electrical circuit. A designated zone is evacuated for safety. Once the safety zone is double checked for remaining personnel, the blast is initiated. After a few minutes, the blasting contractor approaches the area to check for unexploded holes. Once the check is complete the evacuation zone is declared safe and work resumes.

2.1.8 Other Facilities and Equipment

Support and other ancillary facilities at the mine include administration buildings and mine offices, access and haul roads, vehicle maintenance and storage areas, equipment laydown yards, fuel storage and dispensing, septic system, pipelines, ponds, etc. Although mostly on private lands, portions of ancillary facilities include BLM-administered lands.

2.1.8.1 Administration Buildings, Tanks, and Mill Facilities

Administration buildings, tanks, and other mill facilities are mainly located in one general area (Figure 2-1). A 14.3-acre area has been disturbed by these components (14.3 acres private lands, 0.1 acre BLM-administered land).

2.1.8.2 Borrow Areas

Borrow areas, including tailings cover soil, are located in various locations at the Robinson Mine. In total, there are 40.5 acres of borrow areas which includes 13.9 acres private land and 26.6 acres BLM-administered lands.

2.1.8.3 Access and Haul Roads

Access roads are an average width of 15 feet. Culverts have been installed at drainage crossings. There are 77.9 acres of improved access road (40.9 acres private, 37.0 acres BLM-administered lands). In addition, there are 10.4 acres of two-track access roads (5.5 acres private, 4.9 acres BLM-administered lands).

Haul roads comprise 49.9 acres (49.2 acres private lands, 0.7 acre BLM-administered lands).

2.1.8.4 Pipelines

Pipelines for the Robinson Mine comprise 13.1 acres of disturbance (11.7 acres private, 1.4 acres BLM-administered lands). Dewatering operations are conducted per Water Rights permits granted by the NDWR. Dewatering occurs to facilitate mining by development of production wells within and in the vicinity of the pits. Dewatering improves pit wall stability by reducing pressure within the walls. Additionally, production wells provide mill operations and fire water. Most water is consumed by the mill in the flotation circuit. Water removed from the Ruth Pit is transported via dewatering pipelines to the mill facility.

Tailings that are disposed from the operation are conveyed by a slurry pipeline to the TSF and reclaimed water from the TSF is returned to the mill circuit via a pipeline. The tailings pipelines and tailings water reclaim pipelines are located in a secondary containment ditch within the 85-foot-wide utility corridor.

RNMC also holds a discharge permit to discharge dewatering water meeting surface water effluent limits into Gleason Creek. RNMC has recently resumed discharging to Gleason Creek after several years of no operation. The discharge location occurs on private land.

2.1.8.5 Power

The Robinson Mine utilizes a 230 kilovolt (kV) electrical power line from the Gonder Substation south of McGill, Nevada to the mine. The power line corridor includes a portion of a previously abandoned corridor formerly used by Kennecott during their mining activity in the Robinson Mining District. The inclusion of a substation and transmission lines for Ruth Pit development have been incorporated into Reclamation Permit 0021, dated January 14, 2014. The power line corridor is 150 feet wide by approximately 13.7 miles long (249 acres), and uses dark brown, wood pole H-frame

structures. The corridor (utilities and access road) is a maximum of 85 feet wide. The power line comprises 1.8 acres of disturbance (1.1 acres private land, 0.7 acre BLM-administered).

The electrical distribution line for pumping of reclaim water is a 13.8 kV line installed on wooden poles with standard raptor-protective design.

2.1.8.6 Water Supply Wells

Water supply wells were initially installed near the town of Ruth (NRC-1P, WF-1P and K-2P), with pipeline corridors to the mill site. Additional wells were installed between 2008 and 2014 south of the Ruth Pit (including RW-1P through RW-32).

Of these:

- RW-4P, RW-10P, RW-9PR and RW-32 are used only for mill make-up water supply;
- RW-6P and RW-7P are used for city of Ely water supply and will not be abandoned following completion of mining activities;
- RW-2P, RW-3P, and RW-8P are used for either mill make-up water supply or gravitated via the Gleason pipeline into Gleason Creek; and
- RW-1P was plugged and abandoned per NDWR regulations; therefore, it no longer exists.

2.1.8.7 Drainage Control

The stormwater diversion channel located west-northwest of the TSF is designed to convey the flows generated from the watershed upgradient of the TSF during the 100-year, 24-hour storm event (3.00 inches) (NOAA, 2016). This 100-year, 24-hour storm event results in a peak flow rate of 1,902 cubic feet per second in the downstream section of the diversion. Channel dimensions are approximately 37,000 feet long, covering 22.5 acres (14.7 acres private land, 7.8 acres BLM-administered land), with an average gradient of approximately 0.1 to 0.2 percent, 2H:1V (Horizontal:Vertical) sideslopes, and ranges in depth from 8.5 feet at the head to 10.3 feet at the mouth with a width ranging from 10 feet to 20 feet. The storm diversion channel meanders across both public and private land from north of the TSF, to the west, then south where it discharges/terminates (south and west of the facility). A minimum one foot to maximum two foot freeboard was designed into the channel in order to accommodate additional flow beyond the 100-year, 24-hour event for a maximum conveyance volume of 2,966 cubic feet per second (cfs).

2.1.8.8 Mobile Equipment

The current mobile equipment inventory is presented in Table 2-2. The mobile equipment is typical of mining operations, mainly consisting of heavy-duty equipment (i.e., haul trucks, graders, dozers, etc.) and light-duty trucks.

Table 2-2 Mobile Equipment

Type	Number
Excavator	2
Dozer	7
Grader	4
Articulated trucks	2
Loaders	2
Rubber Tire Dozer	4
Water Truck	3
Haul Truck (Komatsu)	12
Haul Truck (Caterpillar)	21
Shovel Loader	6
Blasthole Drill Rig	4
Light-Duty Truck	68

2.1.8.9 Other

Other disturbances at the Robinson Mine include the process ponds (3.1 acres private and 0.4 acre BLM-administered lands) and the evaporation cells (E-cells) (19.1 acres private and 4.6 acres BLM-administered lands).

2.1.9 Transportation

Material/reagent deliveries and shipments to the Robinson Mine occur via truck traffic from Salt Lake City, Utah or Reno, Las Vegas, Elko, and/or Ely, Nevada. Traffic from the east and south enter the Robinson Mine on U.S. Highways 93 and 50 through Ely. Traffic from the west arrives at the Robinson Mine via U.S. Highway 50. Truck transport on any of these routes complies with all applicable safety, environmental, and other requirements imposed by the Nevada and U.S. Departments of Transportation (Title 49 CFR and the Federal Motor Carrier Safety Regulations of the U.S. Department of Transportation (parts 383, 390-397, and 399)).

Copper concentrate is shipped by trucks from the Robinson Mine to a loadout transfer station in West Wendover, Nevada, for subsequent rail shipment to the Port of Vancouver. The transload facility is operated by Wendover Bulk Transshipment Company, a subsidiary of RNMC. RNMC no longer uses rail for deliveries or shipment of concentrate directly to and from the Robinson Mine. The previous on-site rail car load-out at Robinson Mine has been partially dismantled, including removal of rail and tracks. At this time, it is planned to continue truck transport of copper concentrate throughout the duration of mining at the Robinson Mine.

The molybdenum concentrate is packaged into bulk “super-sacks” and trucked to North American refiners or to a port for overseas shipment and processing. Gold, silver, and other co-product metals are recovered during the smelting process off-site.

2.1.10 County Road 44A

A section of CR 44A/CR 1146 (CR 44A) crosses the active mining area of the Robinson Mine and connects CR 44 (the highway to Ruth) and U.S. Highway 6. RNMC, in coordination with White Pine County, closed this section of road to public traffic in 2014 to alleviate safety concerns at the intersection of CR 44A and the mine haul road (Figure 2-1). A road closure request was approved by the White Pine County Commission on December 17, 2014. To prepare for the CR 44A closure, two traffic turnarounds were constructed at the northern and southern limits of the closed road section. The total combined acreage for the turnarounds is 3.7 acres (1.6 acres private and 2.1 acres BLM-administered lands). The road is able to be opened for emergency vehicles as needed per agreement with the County.

2.1.11 Workforce

The Robinson Mine is operational 24 hours a day, 365 days a year. There are approximately 550 RNMC personnel. Normal operation consists of 12-hour shifts for mine, mill, and maintenance operations and eight- or 10-hour shifts for support personnel. Administrative support is normally available Monday through Friday during business hours.

2.1.12 Reclamation

The 2012 3-Year Update to the Reclamation Plan Revision (RNMC, 2014a) contains detailed reclamation information. Reclamation of the Robinson Mine has been planned and designed to return the area to a stable and productive condition that would be compatible and supportive of post-mining land uses.

RNMC's goals for reclamation of affected areas are to:

- Provide for public safety;
- Stabilize affected areas that are subject to Nevada Administrative Code (NAC) 519A and 43 CFR 3809; and
- Establish a productive vegetative community based on the applicable land use plan and designated post-mining land uses of wildlife habitat, rangeland, and industrial uses (private land only).

Those portions of the Plan boundary that will not be subject to continued disturbance by RNMC's activities are reclaimed concurrent with operations. Existing reclamation that has occurred to date includes:

- White Hill and Aultman WRD reclamation areas;
- Kimbley Pit and Wedge Pit were largely backfilled in 2014-2016;

- RNMC has completed overdumping of North B-Pad by the Ruth WRD in November 2015 and the South B-Pad material and liner was removed and that facility closed; and
- E-cells have been installed at both the Green Springs and Jupiter seep areas to close those historic Mine-Impacted Water sources.

As noted in the FEIS (BLM, 1994a), reclamation would not include pits, the stormwater diversion channel, and the re-routed CR-44A disturbances. The stormwater diversion channel located west-northwest of the tailings impoundment provides long-term protection of the tailings impoundment and will not be reclaimed.

2.1.12.1 Pits

Open pits will not be backfilled or revegetated. Some pits have been partially backfilled, but backfill is not a requirement of the State. Physical barriers (berms) consisting of adjacent non-acid generating natural materials (e.g., earth, rock, etc.) would be constructed to restrict access to the pits. The berms would be placed along a 50-foot setback distance from the final pit perimeter and constructed to a height of six feet with 2H:1V sideslopes. The berm height is provided to dissuade off-road vehicular traffic and the set-back is provided as a “safety bench” in the event that an off-road vehicle traverses the berm. The berms would be revegetated.

2.1.12.2 Waste Rock Dumps

Slopes of the WRDs would be constructed at the angle of repose for the respective types of material. During reclamation, water bars, terraces, contour furrows or other erosion control features would be constructed on slopes at intervals necessary to adequately control erosion (expected to be 100- foot or greater intervals). Top surfaces of the WRDs would be constructed or graded to configurations that promote run-off and minimize ponding of precipitation, thereby reducing the potential for infiltration of meteoric water. WRDs would be directly revegetated by amending dump surfaces in order to create an acceptable growth media.

Although the general reclamation of the WRDs is described above, specific treatments may vary by WRD. These are described in Reclamation Plan Revision for Disturbance up to December 2015 (RNMC, 2014a) for each of the WRDs that will exist at EOML 2018.

2.1.12.3 Tailings Storage Facility

The final tailings deposition would be managed so the impoundment surface would be contoured to promote run-off to the easternmost side of the impoundment. A post-operation drainage channel would be constructed on the capped impoundment to transport run-off from the TSF to the adjacent drainage leading back into the Giroux Wash. The last 100 feet of the channel through its confluence with the natural drainage channel would be lined with riprap or other erosion control features to protect against erosion and/or failure. The downstream face of the main dam would be constructed at an overall slope of 2.5H:1V. Upon completion of the final lift, no regrading to final slopes would be necessary, and the dam face would be covered with stockpiled topsoil and

revegetated. Soil materials from Giroux Wash that were stockpiled during construction of the impoundment would be placed over the entire tailings facility to a depth of approximately one foot. The TSF impoundment including the dam would be revegetated as part of final reclamation.

2.1.12.4 Access and Haul Roads

Access roads would be reclaimed. The majority of the haul roads at the facility are located either on top of WRDs that will eventually be reclaimed, or within open pits, which would not be reclaimed.

In general, CRs would not be affected by reclamation. CRs that traverse through mining features and would not be reclaimed include CR 44A (which currently traverses through the Stillwater/Triangle/Oxide Dump and Borrow Area) and CR 1147 (Old Lincoln Highway). Reclamation would include a short reach of State Highway 267 (from the Administration Building turn-off to the guard shack) because this portion of the road would no longer be needed when site-wide reclamation of the Robinson Mine is complete. Roads that qualify for reclamation will be reclaimed as described in the *Reclamation Plan Revision for Disturbance up to December 2015* (RNMC, 2014a).

2.1.12.5 Building and Ancillary Facilities

During final reclamation, all surface facilities and structures that would not be put to an industrial post-mining use (private land only) would be removed. Facilities to be removed include the tailings distribution system, reclaim pipelines and pumps, electric distribution lines and poles, run-off and sediment control structures as well as all buildings that would no longer be used after operations cease. It is anticipated that the mill and shop buildings on private land, as well as the administration building would be retained, although the cost for dismantling and removal of all buildings is included in the reclamation plan. Any facilities or corridors that could serve a beneficial future use on public lands (such as the approximately 13-mile long transmission line from the Gonder Substation) may remain in place following mining, upon approval by the appropriate regulatory agency.

2.1.13 Environmental Protections Measures and Mitigation

RNMC has committed to all environmental protection measures (EPMs) detailed in Section 2.2.16 of the FEIS (BLM, 1994a) as part of authorized activities at the Robinson Mine. EPMs from the FEIS (BLM, 1994a) were designed to reduce the potential for environmental impacts at the site and are presented below. Some of these are no longer relevant to the current operations. An explanation is noted when the EPMs listed below are outdated or irrelevant; additionally, some EPMs have been updated from the 1994 FEIS. (*Note: As referenced below in this section, RMLP is now RNMC*).

2.1.13.1 Geology

- Design the tailings embankment to sustain a seismic event of 6.8 on the Richter scale.

- Monitor stability of the tailings dam, WRDs, leach heaps, and pit walls.

2.1.13.2 Water Quantity and Quality

- If roads are to be utilized for more than one year, mulch and seed cut and fill slopes immediately after disturbance to control erosion and establish vegetative cover.

- Install synthetic lining and leak detection/collection system for copper leach pads. (*Note: Copper or gold leaching operations are no longer conducted and are not planned in the future at the Robinson Mine.*)

- Install leak detection and/or secondary containment systems for SX/EW tanks and storage tanks. (*Note: SX/EW system never constructed at Robinson Mine.)*

- Install double lining and leak detection/collection system for leach solution ponds and solution ditches for copper and gold leach facilities.

- Routinely inspect tanks for integrity.

- Divert surface water around the West Unit of the tailings impoundment, leach facilities, open pits, and WRDs.

- Build secondary containment berms and ditches for the acid unloading station and acid and reagent storage tanks, WRDs, soil stockpiles, mixer /settler tanks, and the tailings pipeline from the mill to the impoundment.

- Line sideslopes of retention ponds to prevent retention pond water from seeping through waste rock material.

- Recycling of water from pools in the tailings impoundment would provide a substantial volume of water for mineral processing; reduce the amount of water that would be obtained from other sources, primarily groundwater wells; reduce the size of the pool, which in turn enhances the consolidation and structural strength of the tailings for final reclamation; reduce seepage into the embankment; and reduce infiltration into the soils beneath the impoundment.

- Install sensors on tailings pump motors to identify ruptures of the tailings pipeline.

- Seed soil stockpiles with interim seed mix to minimize erosion.

- Design and operate tailings impoundment and copper and gold heap leach pads and ponds to prevent discharge to surface water.

- Implement waste rock management procedures to prevent the generation of acid and acid drainage from WRDs, including segregation, selective placement, mixing, and covering of waste rock materials.

- There are existing conditions that currently allow a small, localized spot of acid mine seepage to occur in one location on the Plan boundary. These conditions would be avoided by RNMC during planning for placement and expansion of

waste dumps so that acid mine seepage from dumps does not occur. (*Note: This acid mine seepage currently originates from the Liberty WRD and is captured in an engineered, lined collection channel and routed to the double-lined Juniper pond for evaporation [approved by the NDEP-BMRR]. The origination point of the seep is within the WRD which is primarily on private land; however, the evaporation pond [Juniper Pond] is on both private and public lands.*)

- Inspect the run-off containment system after major precipitation events.
- Construct an embankment seepage collection system, a solution recycling system, and monitoring wells in proximity to the Giroux Wash tailings impoundment.
- Riprap diversion channels to limit erosion and inspect and maintain, as necessary.
- Construct berms below the downstream face of the tailings embankment to fully contain all sediments within the berms.
- Place waste rock that has acid-generating potential in disposal areas in a manner that precludes infiltration by meteoric water and air. PAG waste rock is placed interior to WRDs and armored with non-PAG waste rock on the exterior of the dumps. This placement "encapsulates" the PAG and prevents direct exposure to meteoric water and air.
- Implement groundwater monitoring program.
- Contain or control run-off from disturbed areas pursuant to surface water quality standards.
- During the life of the project, revise and improve, as necessary, stormwater pollution prevention practices and procedures.
- Immediately prior to reclamation, limit slope lengths on waste rock, leach facility sideslopes, and the tailings disposal area embankment face to 100 feet with construction of appropriate benches, berms, or trenches. Rip along the contour and "moonscape," if appropriate.
- Regularly inspect pipelines, pumps, spigots, secondary containment ditches, berms, seepage collection ponds, the tailings impoundment pool, and the stormwater diversion channel.
- Use covered, enclosed mixer/settler tanks to prevent leaks to the environment.
- Dewater the Liberty, Ruth, and Kimbley pits, and possibly the Tripp/Veteran Pit, to provide some of the project's water requirements and reduce the amount of water withdrawn from production wells.

- Develop a general Emergency Response Plan.
- Take quarterly samples of tailings to test for acid-generating potential.
- Upgrade City of Ely water intake measuring system.
- Deepen wells in Gleason Creek, if impacted.
- The Murry Springs monitoring system has been upgraded by Robinson Mining Limited Partnership (RMLP). If it is demonstrated that Murry Springs water is affected due to operation of the Robinson Mine to the point that it no longer meets state standards for drinking water quality or is inadequate to meet the demands of the City; RMLP would take appropriate actions required by law, such as construction of a water treatment facility or development of a new source of water.

2.1.13.3 Soils

- If roads are to be utilized for more than one year, mulch and seed cut and fill slopes immediately after disturbance to control erosion and establish vegetative cover.
- Use water and possibly chemical additives to control fugitive dust from haul roads and construction areas.
- Stockpile up to one foot of available topsoil/growth medium from disturbed areas for use in reclamation.
- Build secondary containment berms and ditches for the tailings embankment, WRDs, mixer /settler tanks, and soil stockpiles.
- Grade and seed soil stockpiles with an interim seed mix to minimize erosion.
- Use covered, enclosed mixer/settler tanks to prevent leaks to the environment.
- Prior to reclamation, limit slope lengths on the waste rock, leach facility sideslopes, and the tailings disposal embankments face to 100 feet with construction of berms, benches, or trenches. Rip along the contour and "moonscape," if appropriate.
- Develop a general Emergency Response Plan.
- Develop a test plot program to evaluate techniques needed to achieve successful reclamation.
- During construction and operations, stabilize or reclaim transmission line construction disturbance areas (excluding access roads), water supply line routes, the East Unit of the tailings impoundment (once the West Unit is operational), diversion channels, temporary access roads, soil stockpiles,

portions of the waste rock facilities, and construction-related disturbances that would not be re-disturbed during operations.

- Initiate a program to monitor the success of erosion control measures on soil stockpiles and embankment areas. Remedy any evidence of inadequate erosion control.

2.1.13.4 Vegetation

- Restrict livestock and wild horse access to areas that have been seeded to allow for successful vegetation.
- Install a four-strand barbed wire fence around the tailings impoundment. (*Note: A Plan boundary fence has already been constructed.*)
- Reduce impacts on area vegetation by controlling noxious weed infestations in disturbed and revegetated areas through the use of Best Management Practices (BMPs), such as proper reclamation, judicious use of herbicides, and monitoring to identify potential problems.

2.1.13.5 Wildlife and Fisheries Resources

- Fence and cover/net leach solution ponds and channels and the proposed gold leach pad expansion. (*Note: This expansion was later withdrawn from the 1994 Plan).*
- Implement appropriate access control measures if ponding of solution on the heap occurs.
- Place a water tank on Rib Hill, a wildlife guzzler in the Egan Range, and two water tanks near the tailings facility. The locations of these water sources would be determined in conjunction with the BLM and NDOW.
- Water sources would contain wildlife escape ramps.
- Incorporate raptor protective design as presented in Rural Electrification Administration guidelines for the entire length of distribution lines within the mine area.
- Install an eight-foot mesh wire fence around the seepage collection ponds.
- Monitor (observe and record) bird and other wildlife use of the pit and tailings impoundment waters during water sampling activities.
- Receive permission from BLM and NDOW prior to sealing any mine openings (potential bat habitat) within the Plan boundary.

2.1.13.6 Air Quality

- If roads are to be utilized for more than one year, mulch and seed cut and fill slopes immediately after disturbance to control erosion and establish vegetative cover.
- Use water and possibly chemical additives to control dust from roads and construction areas.
- Collect and control particulate emissions from the crusher and the ore reclaim systems with dust control systems.
- Control dust emissions from the stacking conveyor system drop point with a pneumatic water spray dust suppression system.
- Use covered, enclosed mixer/settler tanks to limit the potential for airborne emission of reagents.
- Cover or stabilize concentrate during transport.
- Use mist suppression on electrowinning cells. (*Note: This system was never installed.*)
- Grade and seed soil stockpiles with an interim seed mixture to minimize wind erosion.
- Design the concentrate loading station to minimize fugitive dust emissions from concentrate transfer operations.

2.1.13.7 Noise

- Temporarily leave northwestern edge of the Keystone Dump in place as a sound barrier while mining the dump for the leach operation. (*Note: Leaching operations are no longer conducted at the Robinson Mine.*)

2.1.13.8 Social and Economic Values

- Require prime construction contractor to ensure adequate housing for the construction work force. RMLP and its contractor would bear the responsibility and cost for construction of these facilities.
- Cause to be built any additional housing units (including mobile home spaces) if, two months after the initiation of construction activities at the concentrator complex (trigger date), sufficient units either are not available or are not permitted for construction.
- Hire as much of the work force as possible from the local and surrounding communities.

- Continue to coordinate with community representatives during construction and operation of the Robinson Mine to identify any new issues arising from the project and cooperatively develop appropriate responses.

- Purchase bonds totaling $931,000, if offered by the City of Ely, the White Pine County School District, and White Pine County, to finance the identified measures in the amounts for each governmental entity as follows:

  White Pine County

  $250,000 – Landfill siting study/preliminary engineering;

  $ 30,000 – Sheriff squad car;

  $126,000 – Two sheriff salaries for two years.

  City of Ely

  $100,000 – Water well construction;

  $250,000 – Sewage sludge digester.

  White Pine County School District

  $175,000 – Shortfall funding for Ruth school operation;

  The bonds would be purchased by RMLP, at the request of each governmental entity, no earlier than two months after construction activity begins at the Robinson Mine;

- Reasonably assist in development of a new water well for the City of Ely, in addition to providing the $100,000 described above;

- Provide the City of Ely Fire Department and White Pine Fire District with two spill kits (up to a total value or cost of $40,000) and appropriate emergency response training to allow them to respond to a spill or other accident involving hazardous materials;

- RMLP would also make its own trained on-site personnel reasonably available to assist the Ely Fire Department and White Pine County Fire District in such an event at the request of the Fire Department, provided that RMLP shall have no liability to the city or county for any such advice, training, or assistance rendered;

- Allow the county, to the extent reasonably possible, to purchase liners and other equipment required by the planned regional solid waste landfill in conjunction with similar liner and equipment purchases by RMLP to the extent such purchases are actually made; and

- On December 31, 1992, the RMLP paid $13,836, in immediately available funds, to the White Pine County School District for marketing the 1992 School Construction Bond to the local electorate.

2.1.13.9 Transport of Process Materials, Products, and Hazardous Wastes

- Develop a general Emergency Response Plan (*Note: Most recent Emergency Response Plan, Version 1.0 was effective June 8, 2016 and was provided as Appendix M of the June 2016 Robinson Plan Amendment.*);

- Specify to the trucking company that RMLP adheres to regulations recently adopted by the U.S. Department of Transportation (49 CFR 1 71-177; 5 7 FR 20944 May 15, 1992) designed to aid in reducing the potential for accidents and in mitigating releases that may occur during transport of hazardous materials. These rules require that the truck drivers bringing sulfuric acid and other hazardous materials to the Robinson Mine receive training in the following areas: methods and procedures for avoiding accidents; pre-trip safety inspections; use of vehicle, including dangers associated with weather or road conditions; and loading and unloading of materials. Additional specialized training is also required for drivers of tank trucks, such as those transporting acid, including training on vehicle handling characteristics, and retest and inspection requirements for cargo tanks. In addition to these federal requirements, RMLP would also require that any trucking or rail companies transporting acid to the site have its own spill contingency plans emergency response and appropriate capabilities;

- Specify that all RNMC employees receive hazardous material training prior to initiation of rail service. (*Note: Rail services have been terminated.*);

- Ensure that the Ely Fire Department and White Pine County Fire District are aware of the nature of materials being transported to the mine site, and that they have appropriate training in the event of a spill or other accident involving hazardous material;

- Provide the Ely Fire Department and the White Pine County Fire District with emergency response training for sulfuric acid spills and the equipment necessary for such a response, and make trained on-site mine personnel available to assist in the event of an acid spill, if necessary. (*Note: Sulfuric acid is no longer used or stored in bulk at Robinson Mine.)*

2.1.13.10 Access

- Construct a new road for public access around the Giroux Wash West Unit tailings impoundment;

- Install a four-strand barbed wire fence around the tailings impoundment.

2.1.13.11Recreation

- Assist BLM with improvements to and/or maintenance of the Garnet Fields Rockhound Area.

2.1.13.12Visual Resources

- Construct buildings with natural, low-contrast colors;
- During reclamation, fill slopes designed to be similar with the surrounding natural topography to the maximum extent practical in keeping with the Reclamation Plan;
- Minimize visual disturbances near the Garnet Fields Rockhound Area by using dark brown transmission line poles and by placing poles out of public view where possible;
- To the extent practicable, spread the soils or materials excavated during construction and not stockpiled for reclamation into the cleared area and grade them to conform with existing terrain;
- Reduce potential visual impacts by avoiding, to the extent possible, disturbances to foliage adjacent to the site, so that there would be maximum available screening of the site. Where possible, disturbances would be created with curvilinear boundaries instead of straight lines, and grading would be done in a manner that minimizes erosion and conforms to the natural topography.

2.1.13.13Cultural Resources

- If previously undocumented archaeological sites or subsurface components of documented sites are discovered during construction, halt activities until the resources are examined by professional archaeologists in accordance with the procedures outlined in the 1992 Programmatic Agreement among the BLM, Nevada Division of Historic Preservation and Archaeology, the Advisory Council on Historic Preservation, and RMLP. (*Note: A new Programmatic Agreement became effective June 20, 2016 [BLM and Nevada SHPO, 2016].*);
- If resources were eligible for the NRHP, impacts would be mitigated through an appropriate treatment plan as stipulated in the Programmatic Agreement.

2.1.13.14Safety

- Station a fire truck on-site;
- Provide the Ely Fire Department and the White Pine County Fire District with emergency response training and equipment necessary for the potential spill of a project-related hazardous material;
- Install a four-strand barbed wire fence around the tailings impoundment;
- Place warning signs around the pits following reclamation.

2.1.13.15Reclamation

- Stockpile topsoil/growth medium from disturbed areas for use in reclamation;
- In reclamation of tailings and WRDs, include physical surface stabilization and revegetation procedures and financial assurance to ensure completion of successful reclamation;
- Develop a test plot program to evaluate techniques to achieve successful reclamation;
- Use concurrent reclamation practices in areas where no further disturbance is anticipated;
- Grade in a manner that would minimize erosion and conform to the natural topography;
- Begin reclamation of the East Unit portion of the tailings disposal facility as soon as the West Unit portion is ready for use, subject to adequate drying of the tailings surface. (*Note: The East and West Unit approach to tailings deposition was found to be untenable and both units began being utilized concurrently when the facility was commissioned (Scenario 6 in the FEIS, Table 2-10). Tailings deposition has continued to occur throughout the facility since startup. Reclamation would be conducted over the impoundment as one facility.*).

2.2 Description of the Proposed Action

RNMC proposes to modify authorized activities at the Robinson Mine, which would result in an overall increase of total surface disturbance within the Plan boundary (Figures 2-2A and 2-2B). However, RNMC proposes to reduce the EOML disturbance footprint of some components of the Robinson Mine from what is authorized. Further, as part of the Plan Amendment and to ensure appropriate reclamation, some disturbance acres would be reclassified (i.e., categorized as a different type of disturbance, such as a portion of the Ruth WRD being reclassified as part of Ruth Pit expansion). Lastly, RNMC proposes to modify the Plan to extend the EOML mining through calendar year 2022. The Proposed Action, which is consistent with operations and activities described in the 1994 FEIS and current reclamation plan, would consist of the following:

- Expand the existing Ruth Pit;
- Expand the existing Jupiter WRD, Liberty/TS WRD, and Ruth WRD onto previously undisturbed areas;
- Construct a new segment of CR 44A/1146;
- Increase the total yard and inter-facility disturbances adjacent to existing facilities, including the Giroux Wash TSF;

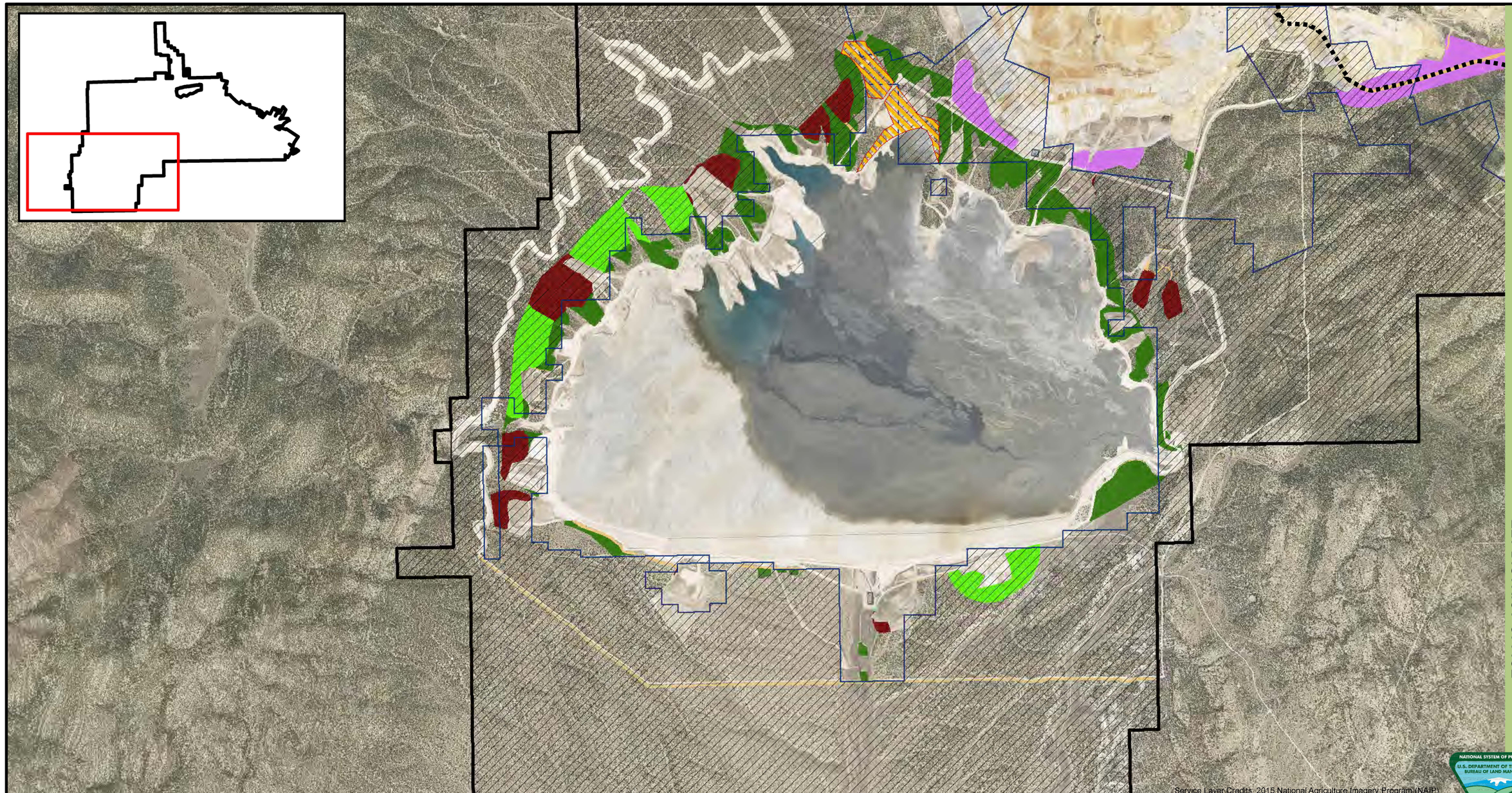
- Relocate the existing and create new growth media stockpiles adjacent to the Giroux Wash TSF to support the expansion;
- Raise the existing Giroux Wash TSF embankment and construct a perimeter berm around the remainder of the facility to increase storage capacity by vertically expanding the impoundment area;
- Expand the Giroux Wash TSF borrow areas for perimeter berm construction and obtaining future reclamation cover material (i.e., growth media);
- Re-route the Ruth Pit dewatering pipeline;
- Relocate a weather station;
- Reclassify and/or reduce acres of disturbance for several authorized mine components; and
- Incorporate a patented claim and an unpatented claim into the disturbance area.

Proposed activities, reductions in authorized footprints, and reclassification of some acres would result in a total increase of approximately 327.6 acres of surface disturbance within the Plan boundary for a new authorized disturbance of 8,532.1 acres (Table 2-3). Figure 2-1 presents the authorized surface disturbance by component and Figures 2-2A and 2-2B highlight the proposed changes. Table 2-3 presents the proposed changes and the total acres.

The proposed EOML 2022 total disturbance acreage would include 1,325.8 acres of BLM-administered land and 7,206.3 acres of private land for a total of 8,532.1 acres. Under the authorized Plan, the EOML 2018 affected acreage totals 8,204.5 acres (7,169.6 acres on private land, 1,034.9 acres on BLM-administered land). Thus, the increase in total disturbed land (327.6 acres) under the Proposed Action would constitute a four percent disturbance increase within the Plan boundary.

2.2.1 Ruth Pit Expansion

During mining activities through the proposed EOML 2022, the Ruth Pit would be expanded to the north, south, east, and west. The footprint of the pit would expand by 208.7 acres for a new total EOML 2022 footprint of 815.6 acres (784.0 acres private land, 31.6 acres on BLM-administered land). The pit would be expanded into areas of existing disturbance (i.e., 188.6 acres of Jupiter and Ruth WRDs that would be reclassified), as well as previously undisturbed areas located outside of the authorized surface disturbance footprint (20.1 acres). The new surface disturbance would occur in areas of private land, including the northeastern corner of the new claims described in Section 2.2.12 and public lands. Proposed EOML 2022 surface disturbance is detailed in Table 2-3 and shown on Figure 2-2B.



BLM

ELY DISTRICT OFFICE

NATIONAL SYSTEM OF PUBLIC LANDS
U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

FIGURE 2-2A PROPOSED DISTURBANCE

KGHM
ROBINSON MINE EXPANSION PROJECT

- Plan Boundary
- County Road 44A Realignment

Proposed Disturbances
- Access Roads
- Interfacility
- Process Ponds/E-Cells
- TSF Cover Borrow
- TSF Growth Media Stockpiles
- Yards
- Reclaimed Water Pond

Land Ownership
- Private Land
- BLM Land - Public

MAP LOCATION

N

0 1,000 2,000 Feet

U.S. BUREAU OF LAND MANAGEMENT
ELY DISTRICT
EGAN FIELD OFFICE

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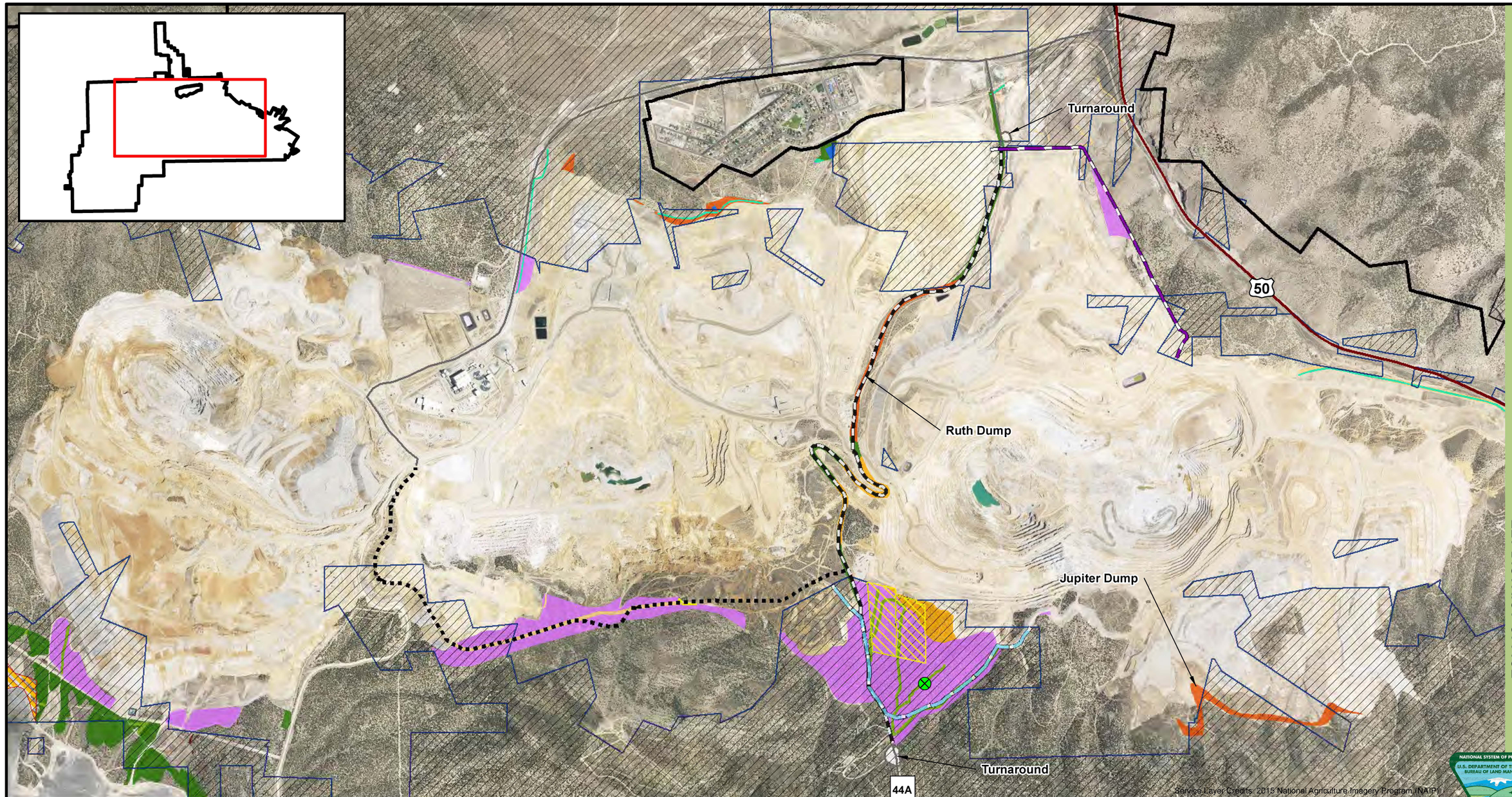

BLM

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FIGURE 2-2B PROPOSED DISTURBANCE

KGHM
ROBINSON MINE EXPANSION PROJECT

- Plan Boundary
- Proposed Weather Station
- Still Water Blue Sky Claims
- Proposed Ruth East Pipeline Realignment
- Proposed Ruth East Powerline Reroute
- County Road 44A Closed to Public
- County Road 44A Realignment

Proposed Disturbances

- Access Roads
- Drainage Control
- Dump
- Exploration/Wells Road
- Interfacility
- Ponds
- Ruth Pit
- TSF Growth Media Stockpiles
- Waste Rock Cover
- Yards
- Reclaimed Water Pond

Land Ownership

- Private Land
- BLM Land - Public

N

0 1,000 2,000 Feet

MAP LOCATION

U.S. BUREAU OF LAND MANAGEMENT
ELY DISTRICT
EGAN FIELD OFFICE

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Table 2-3 Authorized, Proposed, and Reclassified Disturbance Acres

Facility	Authorized			Proposed			Reclassified			Total		
	Private	Public	Total	Private	Public	Total	Private	Public	Total	Private	Public	Total
Pits												
Aultman Pit	20.0	0.0	20.0	0.0	0.0	0.0	0.0	0.0	0.0	20.0	0.0	20.0
Liberty Pit	670.6	0.0	670.6	0.0	0.0	0.0	-0.1	0.0	-0.1	670.5	0.0	670.5
Ruth Pit	604.9	2.0	606.9	7.5	12.6	20.1	171.6	17.0	188.6	784.0	31.6	815.6
Tripp/Veteran Pit	554.6	0.0	554.6	0.0	0.0	0.0	0.0	0.0	0.0	554.6	0.0	554.6
Subtotal Pits	**1,850.1**	**2.0**	**1,852.1**	**7.5**	**12.6**	**20.1**	**171.5**	**17.0**	**188.5**	**2,029.1**	**31.6**	**2,060.7**
Waste Rock Dumps												
Aultman WRD	47.4	0.1	47.5	0.0	0.0	0.0	0.0	0.0	0.0	47.4	0.1	47.5
Jupiter WRD (Includes C-Pad Disposal Area)	532.2	247.4	779.6	4.3	7.0	11.3	-131.4	-9.3	-140.7	405.1	245.1	650.2
Kimbley WRD	85.2	2.1	87.3	0.0	0.0	0.0	6.7	0.0	6.7	91.9	2.1	94.0
Liberty/TS WRD	467.7	96.7	564.4	2.2	3.6	5.8	-42.2	-7.8	-50.0	427.7	92.5	520.2
North Tripp WRD	236.8	40.2	277.0	-64.2	-27.6	-91.8	20.3	2.7	23.0	192.9	15.3	208.2
Ruth WRD (Including A-Pad and North B-Pad)	421.8	24.1	445.9	7.5	0.4	7.9	22.7	5.9	28.6	452.0	30.4	482.4
South Star Pointer WRD	6.3	2.3	8.6	0.0	0.0	0.0	-5.0	-1.8	-6.8	1.3	0.5	1.8
South Tripp WRD	481.5	86.8	568.3	0.0	0.0	0.0	0.1	-0.1	0.0	481.6	86.7	568.3
Stillwater/Triangle/Star Pointer Oxide WRD and Borrow Area	111.0	37.6	148.6	0.0	0.0	0.0	-56.6	0.2	-56.4	54.4	37.8	92.2
Wedge WRD	48.5	0.0	48.5	0.0	0.0	0.0	3.6	0.0	3.6	52.1	0.0	52.1
White Hills WRD (Excluding CR44A Re-route)	78.2	53.6	131.8	0.0	0.0	0.0	-4.8	-5.8	-10.6	73.4	47.8	121.2
Crushed Ore Stockpile	3.9	0.0	3.9	0.0	0.0	0.0	0.0	0.0	0.0	3.9	0.0	3.9
Run-of-Mine Ore Stockpile	11.5	0.0	11.5	0.0	0.0	0.0	0.0	0.0	0.0	11.5	0.0	11.5
Subtotal WRDs	**2,532.0**	**590.9**	**3,122.9**	**-50.2**	**-16.6**	**-66.8**	**-186.6**	**-16.0**	**-202.6**	**2,295.2**	**558.3**	**2,853.5**
Other Facilities												
Access Roads	40.9	37.0	77.9	5.9	15.1	21.0	68.5	33.3	101.8	115.3	85.4	200.7
Buildings	14.2	0.1	14.3	0.0	0.0	0.0	-2.9	0.0	-2.9	11.3	0.1	11.4

Facility	Authorized			Proposed			Reclassified			Total		
	Private	Public	Total	Private	Public	Total	Private	Public	Total	Private	Public	Total
CR 44A Re-route	0.0	0.0	0.0	8.4	2.8	11.2	13.4	5.8	19.2	21.8	8.6	30.4
CR 44A Turnarounds	1.6	2.1	3.7	0.0	0.0	0.0	0.0	0.0	0.0	1.6	2.1	3.7
D-Pad Heap Leach Pad	60.1	0.0	60.1	0.0	0.0	0.0	-46.5	0.0	-46.5	13.6	0.0	13.6
Drainage Control	14.7	7.8	22.5	1.9	0.9	2.8	-4.8	-5.8	-10.6	11.8	2.9	14.7
E-Cells	19.1	4.6	23.7	-7.8	-1.2	-9.0	10.1	4.3	14.4	21.4	7.7	29.1
Exploration	49.9	0.0	49.9	0.0	0.0	0.0	-10.0	10.0	0.0	39.9	10.0	49.9
Giroux Wash TSF	1,903.4	70.5	1,973.9	0.0	0.0	0.0	0.0	0.0	0.0	1,903.4	70.5	1,973.9
Haul Roads	49.2	0.7	49.9	7.7	0.1	7.8	-10.0	-0.7	-10.7	46.9	0.1	47.0
Pipeline Routes	11.7	1.4	13.1	0.0	0.0	0.0	-11.7	-1.4	-13.1	0.0	0.0	0.0
Power lines to Gonder	1.1	0.7	1.8	0.0	0.0	0.0	0.0	0.0	0.0	1.1	0.7	1.8
Process Ponds	3.1	0.4	3.5	0.0	0.0	0.0	0.6	-0.4	0.2	3.7	0.0	3.7
Reclaim Water Pond	0.0	0.0	0.0	0.0	0.0	0.0	11.8	19.2	31.0	11.8	19.2	31.0
Tailings Cover Soil Borrow Areas	13.9	26.6	40.5	3.7	67.5	71.2	-0.1	9.4	9.3	17.5	103.5	121.0
Two Track Access Roads	5.5	4.9	10.4	1.8	1.6	3.4	0.3	6.2	6.5	7.6	12.7	20.3
Yards/Clearance Areas	599.1	285.2	884.3	177.4	306.8	484.2	-123.1	-179.6	-302.7	653.4	412.4	1,065.8
Subtotal Other Facilities	**2,787.5**	**442.0**	**3,229.5**	**198.9**	**393.4**	**592.3**	**-104.3**	**-99.5**	**-203.8**	**2,882.1**	**735.9**	**3,618.0**
Grand Total EOML Disturbances	**7,169.6**	**1,034.9**	**8,204.5**	**156.2**	**389.4**	**545.6**	**-119.5**	**-98.5**	**-218.0**	**7,206.3**	**1,325.8**	**8,532.1**

Negative numbers indicate a proposed reduction in the component footprint from what is authorized under the Plan.
Authorized = Disturbance areas for EOML 2018 Plan in report dated 2015.
Proposed = Disturbance areas for EOML 2022 Plan that are either outside the previously Authorized areas, or a reduction to the Authorized areas.
Reclassified = Disturbance areas that have changed their facility type between the EOML 2018 and EOML 2022 Plans.

It is estimated that approximately 106 MT of ore and 283 MT of waste rock would be mined from the Ruth Pit through the planned EOML 2022. Ore would be milled as described under current operations and waste rock would be placed on existing WRDs (Section 2.1.2). Materials would be hauled via new and existing haul roads.

Construction activities for the expanded Ruth Pit area would be consistent with authorized construction techniques and would include site clearing activities such as vegetation removal and topsoil salvage. The salvaged topsoil material would be stockpiled to form growth media berms along the disturbance perimeter or placed in growth media stockpiles. V-ditches would be constructed upgradient of the berms to divert surface water flows into natural drainages and reduce the potential for erosion. Salvaged topsoil would be placed over the reclaimed disturbance areas during reclamation. In addition, safety berms and stormwater management BMPs (RNMC, 2016a), would be utilized during the construction as necessary.

Mining techniques for proposed activities would be consistent with current operations. As part of the expansion, the Ruth Pit would be expanded into the existing A-Pad heap leach facility. The authorized Plan shows that by EOY 2018 half of the A-Pad footprint would be mined out. Spent ore currently placed on the A-Pad synthetic liner from the pad footprint, and all potentially impacted material underneath the liner, would be removed and placed within the acid leached material (ALM) disposal area on the Ruth WRD. This material would be covered with a synthetic liner.

2.2.2 Waste Rock Disposal Areas

Waste rock mined from the Ruth Pit would continue to be placed on existing WRDs. As part of the Proposed Action, the authorized footprints of the Jupiter, Liberty/TS, and Ruth WRDs would be expanded.

Construction activities for the expanded WRD areas would be consistent with the authorized Plan (RMLP, 1994) and the CWRMP (RNMC, 2014b) and would include site clearing activities such as vegetation removal and topsoil salvage. The salvaged topsoil material would be stockpiled to form growth media berms along the disturbance perimeter or placed in growth media stockpiles. V-ditches would be constructed upgradient of the berms to divert surface water flows into natural drainages and reduce the potential for erosion. Salvaged topsoil would be placed over the reclaimed disturbance areas during reclamation. In addition, safety berms and stormwater management BMPs would be utilized during the construction as necessary.

2.2.3 Jupiter WRD

A portion of the ore mined from the expanded Ruth Pit (approximately 80 MT) would be placed on the Jupiter WRD through EOML 2022. In addition, the expanded Ruth Pit would consume a portion of the authorized western area of the facility. To accommodate the waste material, the facility would be expanded to the south and east into areas authorized as interfacility disturbance and areas currently unaffected by

operations. The expansion would result in 11.3 acres of new surface disturbance, of which 7.0 acres would be located on BLM-administered land.

Under the Proposed Action, the overall footprint of the Jupiter WRD would decrease through proposed EOML 2022 operations due to the expansion of the Ruth Pit into the WRD and reclassification of the associated acres. The footprint would decrease from the authorized 779.6 acres to 650.2 acres at EOML 2022.

As part of the proposed operations, the existing C-Pad Disposal Area would be fully overdumped by the Jupiter WRD. Construction of the expanded Jupiter WRD would be consistent with the authorized construction techniques. No changes to the overall height or material placement techniques are proposed.

2.2.4 Liberty/TS WRD

Approximately 60.7 MT of waste material mined from the Ruth Pit would be placed on the Liberty/TS WRD through EOML 2022. To accommodate the material, the Liberty/TS WRD footprint would be expanded by placing additional waste rock along the eastern side of the existing WRD. The expansion would result in 5.8 acres of new surface disturbance, of which 2.2 acres would be on private land and 3.6 acres would be located on BLM-administered land.

However, the overall proposed footprint of the Liberty/TS WRD at EOML 2022 would be smaller than the authorized footprint (Table 2-3). The decrease in size would be a result of revisions to the boundary between Liberty/TS and Ruth WRDs, consistent with the EOML 2018 topography and planned construction of Intera Pond/E-Cell within the authorized footprint. Therefore, the total authorized footprint of 564.4 acres would decrease to 520.2 acres by EOML 2022, due to disturbances being reclassified under other components/disturbances.

2.2.5 Ruth WRD

Approximately 104 MT of waste material mined from the Ruth Pit would be placed on the Ruth WRD through EOML 2022. To accommodate material, the Ruth WRD would be expanded to the west over the existing CR 44A (this segment is currently closed) (Figure 2-2B). Planned development of the Ruth WRD incorporates North B-Pad heap leach pad and a portion of the Kimbley WRD footprint (Section 2.1.2.4). The Ruth WRD would be expanded along the western boundary into areas authorized for other types of surface disturbance (i.e., yards, interfacility areas) and the Liberty/TS WRD. The Proposed Action would expand the boundary 36.5 acres through EOML 2022. New disturbance is proposed for 7.9 acres (7.5 acres private land, 0.4 acre BLM-administered land), and 28.6 acres of reclassification (22.7 acres private land, 5.9 acres BLM-administered land).

As discussed in Section 2.1.1, RNMC plans to remove the spent ore from the existing A-Pad heap leach pad, synthetic liner from the pad footprint, and all potentially impacted material underneath the liner and place them within the existing ALM disposal area on

the Ruth WRD. This material would be covered with synthetic liner. RNMC submitted the Final Plan for Permanent Closure of A-Pad heap leach pad to NDEP on July 10, 2015 (RNMC, 2015c) and engineering design documentation for the liner construction was submitted on January 29, 2016.

Construction of the expanded Ruth WRD would be consistent with authorized construction techniques. As the boundary expansion would provide additional capacity, there would be no changes to the overall height of the WRD or material placement techniques.

2.2.6 Kimbley WRD

Through EOML 2022, the Kimbley WRD would expand by 6.7 acres (private land) as a result of reconciling the footprint with the EOML post-reclamation disturbance and the 2015 aerial reconciliation, for a revised total disturbance footprint of 94.0 acres (91.9 acres private land, 2.1 acres BLM-administered land).

Although reclassification as discussed above increases the acres of disturbance, no new disturbance would occur at the Kimbley WRD, on BLM-administered or private land, as part of the Proposed Action.

2.2.7 South Star Pointer WRD

No new disturbance would occur at the South Star Pointer WRD and no waste rock placement is proposed as part of the Proposed Action. A portion of the north section of this WRD, which is located in the EOML 2022 Ruth Pit footprint, would be mined out. As a result, the total surface disturbance footprint of the facility would decrease by 6.8 acres, due to reclassification (5.0 acres private land, 1.8 acres BLM-administered land), with 1.8 acres of the WRD remaining by EOY 2018. No further decreases would occur through EOML 2022.

2.2.8 Stillwater/Triangle/Star Pointer WRDs

No additional waste rock placement would occur on these WRDs. Under the Proposed Action, a portion of these WRDs would be mined out during expansion of the Ruth Pit (Figure 2-2B). Based on the results of waste rock characterization work performed (RNMC, 2014b), these WRDs have been identified as a potential source of oxide waste rock that would be used as cover during reclamation. The top surfaces would also be used to stockpile salvaged topsoil material.

A portion of the re-routed section of CR 44A/1146 would be constructed over the Stillwater/Triangle/Star Pointer WRDs as part of the Proposed Action. Additionally, a portion of these WRDs would be mined out during expansion of the Ruth Pit. These adjustments (Figure 2-2B) would result in a 56.4 acre decrease to the disturbance footprint (i.e., reclassified acres), for a revised disturbance of 92.2 acres (54.4 acres private land, 37.8 BLM-administered land). No further decreases would occur through EOML 2022.

2.2.9 Wedge WRD

Waste rock material would not be placed on the Wedge WRD as part of the Proposed Action. The EOML boundaries between Jupiter, Kimbley, and Wedge WRDs were adjusted as necessary for consistency with the EOML 2022 topography resulting in 3.6 acres increase (i.e., reclassification) in the Wedge WRD EOML footprint, with total disturbance of 52.1 acres (private land).

2.2.10 White Hills WRD

Construction of the re-routed section of CR 44A/1146 (Figures 2-2A and 2-2B) (Section 2.2.3) would result in a 10.6 acre decrease to the WRD disturbance footprint (i.e., reclassified acres), for a revised disturbance of 121.2 acres (73.4 acres private land, 47.8 acres on BLM-administered land). No additional waste rock placement would occur at the White Hills WRD.

2.2.11 CR 44A/1146 Realignment

Under the Proposed Action, CR 44A/1146 would be re-routed because of proposed mining impacts to the current alignment of the road. This route would head west from a point on CR 44A south of the Ruth Pit and traverse west along the Stillwater/Triangle/Star Pointer WRD, skirt the southern edge of the Liberty Pit, then cross the White Hills WRD area, continue north through the mine buildings area via existing mine roads, and finally intercept CR 44 (Figure 2-2B). This route would include both BLM (8.6 acres) and private lands (21.8 acres). Construction of the new road would result in a 30.4 acre footprint, although 19.2 acres of it is on previously disturbed ground that would be reclassified (Table 2-3). The proposed route would provide a safe travel route for emergency traffic as needed during ongoing mining operations.

RNMC would maintain the proposed road to White Pine County road standards, in accordance with agreements made with the County, during the remaining life of the mine, but would relinquish maintenance responsibilities to the County following closure. Following completion of mining activities, the proposed road may remain in place and could form part of the permanently re-routed CR 44A/1146, if the County so chooses. The road would be opened to the general public and maintained by White Pine County.

Both the closure and rerouting of CR 44A/1146 would be consistent with the FEIS and 1994 Plan. The FEIS discussed rerouting of CR 44A (BLM, 1994a) and states that the “Reclamation acreage totals do not include pit, surface drainage diversion, and the re-routed CR acreages since these will not be reclaimed” (BLM, 1994a).

The proposed CR 44A/1146 rerouting and post-mining use was discussed with White Pine County Commission representatives and County Roads Superintendent on October 8, 2015, and was presented to the County Commission on April 27, 2016. RNMC would continue to work with the County to obtain the re-route approval through the full County Commission.

2.2.12 Tailings Storage Facility

As discussed in Section 2.1, the Giroux Wash TSF will reach maximum permitted height by 2018; therefore, under the Proposed Action, the permitted embankment height would be raised to 6,880 feet AMSL, an increase of 60 feet, to allow deposition of tailings beyond 2018.

In order to minimize the lateral expansion of the tailings and disturbance onto public lands, the primary embankment would be raised while at the same time constructing a perimeter berm around the tailings that would also be raised incrementally over time as the main embankment is raised. This design restricts the tailings deposition to the current footprint. The additional tailings to be deposited through the extended mine life would expand vertically within the perimeter berms rather than laterally onto previously undisturbed ground. Construction of the perimeter berm would utilize available borrow material adjacent to the facility.

In addition to the TSF changes to accommodate additional tailings deposition, changes would also be required for the management of the supernatant water at the TSF. The TSF is an unlined impoundment; the seepage from the impoundment has impacted downgradient groundwater causing an increase in sulfate in a couple monitoring wells. This is a concern to NDEP who requested a design alternative to reduce the potential for sulfate to migrate to groundwater. In response, RNMC proposes the addition of a lined pond, the Reclaim Water Pond, to contain and manage the supernatant water off of the TSF instead of the BOC. This proposed Reclaim Water Pond would be located on the north side of the existing TSF and would be a reclassification of acres (11.8 acres private land, 19.2 acres BLM-administered land) (Figure 2-2A).

2.2.12.1 Tailings Cover Soil Borrow Areas

The expansion of the TSF and construction of the Reclaim Water Pond would be in full compliance with all NDEP and NDWR regulatory requirements and approved under the Dam Safety and WPCP processes prior to construction. This pond has been designed and submitted for approval as a double-lined pond with leak detection.

Additional soil borrow areas would be designated around the perimeter of the Giroux Wash TSF as part of the Proposed Action. These areas would be utilized at closure to obtain additional cover material for the impoundment that was not generated (stripped) during construction activities.

Under the Proposed Action, a total of 71 acres of borrow area disturbance would occur during operations through EOML 2022 for a total disturbance of 121.0 acres (Table 2-3). The 71 acres of borrow area would be in previously unaffected areas, creating new surface disturbance. Of this, approximately four acres would occur on private land and 68 acres would occur on BLM-administered land. The remaining borrow areas (nine acres reclassified) would be developed in areas authorized for other disturbance (i.e., yards).

2.2.13 Ruth Dewatering Pipeline

Planned expansion of mining operations in the Ruth Pit would require a portion of the existing Ruth Dewatering Pipeline be re-routed. The potential new route for the affected pipeline section would be located along the currently-bonded service corridor, followed by pipeline installation along approximately 2,825 feet of the existing local access road to its junction with the CR 44A/1146 (Figure 2-2B). The re-routed pipeline would then be installed along CR 44A/1146 and reconnected to the existing Ruth Dewatering Pipeline sections. The re-routed pipeline would be approximately 4,900 feet longer than the existing Ruth Dewatering Pipeline. The re-route would occur within existing disturbance, with 6,120 linear feet on BLM-administered land and 628 linear feet on private land.

The proposed construction would include the following actions:

- Site clearing activities along the approximately 15-foot-wide pipeline corridor including vegetation removal and limited site grading to form an equipment accessible surface. Salvaged topsoil would be stockpiled to form growth media berms along the disturbance perimeter. V-ditches would be constructed upgradient of the berms to divert surface water flows into natural drainages and reduce the potential for erosion. Salvaged topsoil would be placed over the reclaimed disturbance area during reclamation;

- Cut-to-fill shaping, leveling, base compaction and grading along the pipeline corridor to form a flat, free-draining surface suitable for use by construction traffic;

- Construction of safety berms and stormwater management BMPs (RNMC, 2015d), as necessary; and

- Installation of 24-inch-diameter HDPE and/or steel pipe for the Ruth Dewatering Pipeline and associated appurtenances such as valves, fittings, anchor blocks, pipe supports, road crossing, and culverts.

Dewatering from the Ruth Pit expansion would create more water than the mill facility can process; therefore, RNMC would discharge excess water to Gleason Creek. RNMC currently holds a permit to discharge dewatering water meeting surface water effluent limits.

2.2.14 Weather Station Relocation

The original Ruth Overlook Weather Station was located within the proposed expanded Ruth Pit footprint and would therefore need to be relocated. RNMC is required to minimize the time gap during the weather station relocation in order to maintain as complete a weather record as possible. As such, RNMC recently acquired a right-of-grant (ROW) grant (Section 4.7) to move the weather station to another location before winter. Under the Proposed Action, the new weather station location, now near the crest of an adjacent hill, approximately 1,370 feet to the east and 3,260 feet to the south of

the previous location (Figure 2-2B), would be part of the Plan Amendment and the ROW would be relinquished. This location was identified in consultation with NDEP. The weather station was installed adjacent to the Robinson Mine piezometer RP-07-04 on the drill pad constructed for the piezometer installation with access via existing access roads. No new disturbances associated with relocation of the Ruth Overlook Weather Station would occur. The new weather station is not connected to the existing grid power system; rather it runs on solar energy.

2.2.15 Yards and Interfacility Disturbance Areas

The area around the perimeter of the Giroux Wash TSF has been classified as yard disturbance. Yards would generally be used for laydown, parking, or non-permanent access (Figures 2-2A and 2-2B). Other ancillary surface disturbances utilized throughout the Robinson Mine not otherwise identified as a specific mining facility (i.e., pit, WRD, tailings storage, etc.) or yards are classified as interfacility disturbance, such as the areas between the proposed new disturbances.

No specific construction is proposed within the interfacility disturbance areas. The areas would be reserved for auxiliary, non-mining uses as necessary (i.e., turnouts, parking areas, etc.) and are therefore also accounted for in the proposed affected area footprint. Yard and interfacility disturbances would generally not be the result of construction activities. However, prior to use, and to the extent practicable, topsoil would be stripped from the areas and stored for use in reclamation, as required.

As part of the expanded surface disturbance around the TSF, as well as expansion of the Ruth Pit and Jupiter WRD into previously undisturbed areas, growth media (i.e., topsoil) would be cleared from construction areas and relocated to stockpiles for future use in reclamation activities. These proposed growth media stockpiles are depicted on Figure 2-2A. Stockpiles would be stabilized (i.e., seeded for interim vegetative cover) and left in place for reclamation until EOML 2022, unless operations necessitate relocation.

For purposes of tracking surface disturbances, interfacility, yard, and growth media stockpile surface disturbance areas are included in the same category as Yards/Clearance Areas. As detailed in Table 2-3, there would be a 484.2 acre increase in disturbance and a 302.7 acre reclassification of disturbances; therefore, the total surface disturbance for this category would increase by 181.5 acres (54.3 acres private land, and 127.2 acres BLM-administered land).

The reclassification of disturbances includes:

- Addition of area adjacent to the D-Pad – this area is accounted as part of the D-Pad expansion in the current Reclamation Permit, and is proposed to be reclassified as Yards as the D-Pad expansion is no longer planned;
- Addition of areas located adjacent to northern and western toes of the Jupiter WRD – these areas are accounted as Jupiter WRD in the current Reclamation

Permit, and were revised to reflect revised Jupiter WRD configuration consistent with the EOML 2022 configuration;

- Addition of Yard disturbances around Mill Water, Juniper, Intera and B-Pad ponds – these disturbances are accounted as respective adjacent dumps in the current Reclamation Permit;
- Removal of Yards disturbances associated with previously planned Intera Pond/E-Cell location – this facility is now proposed for construction on top of Liberty/TS WRD and this authorized disturbance is no longer required;
- Removal of several authorized Yard areas in the TSF area – these disturbances were reallocated to Ruth Pit, TSF, and tailings cover soil borrow areas;
- Removal of Yards disturbances located within the proposed Ruth Pit footprint – these disturbances are now accounted as Ruth Pit;
- Removal of Yards disturbances located within the Ruth WRD footprint – these disturbances are now accounted as Ruth WRD; and
- Additional refinements to disturbance footprints based on EOML 2022 and 2015 Google aerial photo.

2.2.16 Utilities

The activities proposed under this Plan Amendment would not affect the existing utility corridors to the site. However, mining the Ruth Pit expansion would impact the existing power line that runs near the current CR 44A/1146 alignment, through the mine. A relocation of this existing interior power line, adjacent to and to the east of the Ruth WRD, is proposed. The 138 kV power line re-route would consist of 45-foot tall poles, with an average of 250 feet between poles; however, distance between poles would be dependent on the terrain and site-specific conditions. The re-route would be needed to provide power to the electric shovels and wells and to maintain power to the east side of the mine operations. The power line re-route would be 6,847 feet in length (749 feet on BLM-administered land, 6,098 feet on private land), requiring approximately 28 poles to construct, and would occur along existing utility corridors or access roads. There is no specified corridor width.

2.2.17 New Claim Areas

RNMC recently purchased 34 acres of land comprising the Blue Sky and Stillwater claims. The Stillwater claim is a patented claim and the Blue Sky claim is an unpatented claim for which RNMC now holds the lease. The two claims are located between CR 44A/1146 and the southwestern perimeter of the Ruth Pit, as shown on Figure 2-2B. As discussed in Section 2.2.1, 20.1 acres of proposed disturbance for the Ruth Pit expansion would be developed in previously unaffected areas creating new surface disturbance. Of the total new disturbance, 7.5 acres would occur on private land and

12.6 acres would occur on public BLM-administered land. The proposed expansion of the Ruth Pit would extend over the northeastern corner of the new claims (Figure 2-2B).

2.2.18 Exploration

No new exploration is proposed under the Proposed Action and the total anticipated exploration disturbance area would not exceed the authorized 49.9 acres. Currently, the total authorized exploration-related surface disturbance is slated for private land (Table 2-1). Under the Proposed Action, a portion of the exploration acreage (10.0 acres) would be re-categorized to public land and 39.9 acres would remain on private land. The exploration area on public land has not yet been specifically identified; however, this activity would be reviewed with and approved by BLM under a separate action prior to exploration activities being conducted.

2.2.19 Reconciliation

The following items were reconciled and acres adjusted or reclassified based on a 2015 Google aerial photograph to more accurately reflect features that are on the ground. Through this reconciliation, disturbance was reduced in some areas and added in others.

2.2.19.1 Disturbance Reduction

The following items had the authorized disturbance reduced:

- North Tripp WRD: Removal of disturbances for previously planned North Tripp WRD expansion – no mining in the Tripp/Veteran Pit and waste rock disposal on the North Tripp WRD are planned under EOML 2022;
- Keystone WRD: Removal of Keystone WRD disturbances – grandfathered WRD, no disturbances are planned under EOML 2022; and
- Intera Pond/E-Cell: Removal of Intera Pond/E-Cell placeholder disturbances – RNMC prepared design for the Intera Pond/E-Cell designs under *Final Plan for Permanent Closure for Intera Drain and Juniper Seep Area* (August 17, 2015) and the new E-Cell would be located on the Liberty/TS WRD.

2.2.19.2 Disturbance Additions

Disturbance acreage was added to the following areas:

- Previously unaccounted stormwater channel disturbance;
- Juniper Evaporation Pond disturbance; and
- Refinement to access roads, yards, and interfacility disturbances based on aerial photographs.

2.2.20 Life of Mine/Schedule

With implementation of the Proposed Action, the mine would continue to operate until 2022 before initiating closure and reclamation. The CR 44A/1146 re-route would be complete by EOY 2018.

2.2.21 Workforce

No additional workforce would be required for completion of the Proposed Action.

2.2.22 Reclamation

RNMC submitted a 3-Year Update to Reclamation Plan through EOY 2018 (RNMC, 2016a) in January 2016. This document details reclamation for the Proposed Action changes. In general, the reclamation is consistent with authorized reclamation practices and techniques. Overall, except for the CR 44A/1146 re-route and the Ruth Pit, all other disturbances would be reclaimed. Differences in reclamation acreages are related to reclassification of disturbance acres such as the Ruth Pit expansion encompassing portions of the Jupiter and Ruth WRDs.

2.2.23 Environmental Protection Measures

All activities would be performed in accordance with EPMs and mitigation measures identified in the 1994 FEIS (BLM, 1994a) as identified in Section 2.1.13. Measures have been designed to reduce the potential for environmental impacts at the site.

In addition, operations would continue to be conducted in accordance with regulations through the permits listed in Section 1.5. Additional EPMs RNMC has committed to as part of the Proposed Action are listed below, by resource.

2.2.23.1 Water Quantity and Quality

- Continue to manage mine-impacted waters in double-lined ponds and in accordance with the WPCP.

2.2.23.2 Wildlife and Fisheries Resources

- Transmission lines would be designed and constructed in accordance with applicable regulations or best available technology to minimize raptor electrocution and collision potential. To minimize the collision potential for foraging raptors and other birds, standard safe designs as outlined in *Reducing Avian Collisions with Power Lines* (APLIC, 2012) will be incorporated as applicable. To minimize the potential for electrocution of raptor species attempting to perch on the lines, standard safe designs as outlined in *Suggested Practices for Avian Protection on Power Lines: The State of the Art in 2006* (APLIC, 2006) and *Avian Protection Plan Guidelines* (APLIC and USFWS, 2005) would be incorporated as applicable;

- Guy wires supporting the relocated weather station would be marked with appropriate flags or tags to minimize collision hazards for avian species;
- Prior to any vegetation removal conducted between March 1 and July 31, nesting migratory bird surveys would be conducted by a qualified biologist. If an active nest is documented, it would be protected with the appropriate size buffer for that species until the young have fledged and the nest is determined inactive; and
- RNMC has voluntarily committed to those RDFs for greater sage-grouse, outlined in Appendix C.
- Any new fences would be constructed in accordance with BLM wildlife specifications and when necessary in coordination with NDOW.

2.3 Alternatives Considered but Not Analyzed in Detail

This section describes alternatives to the Proposed Action that will not be analyzed in detail in this EA because they were found to not meet the purpose and need; be technically practical and feasible; economically practical and reasonable; or would not be environmentally reasonable.

2.3.1 Tailings Storage Facilities – Smaller Dam Raise

In consideration of the TSF expansion, RNMC contemplated various alternatives. The first engineering design consideration was for a simple dam raise that would accommodate tailings deposition through EOML 2022. This engineering design option would not restrict the tailings deposition north of the dam so that tailings would continue to deposit up-gradient, laterally, with the incremental dam height raise. The smaller dam raise option would have resulted in a final TSF footprint of approximately 2,152 acres, which is 360 acres larger than the Proposed Action TSF expansion. This alternative was considered to not to be environmentally reasonable compared to the Proposed Action TSF expansion.

2.3.2 Tailings Storage Facilities – New Facility

A new TSF in another location would be neither technically practical nor economically or environmentally reasonable. A completely new TSF would require a prohibitively long permitting period, require significantly more capital expenditure that would render the Robinson Mine infeasible, and would result in a new, expansive disturbance footprint that is neither necessary nor environmentally reasonable.

2.3.3 County Road 44A/1146 – Alternate Route

When designing the CR 44A re-route, RNMC had initially proposed routing the road similar to the proposed re-route but started further south. This route would have disturbed more BLM-administered land, whereas the proposed route traverses across existing disturbance (i.e., WRDs). Additionally, there were concerns regarding cultural

resources that could have been impacted by this route. Therefore, this route was not included in the Plan Amendment and was dismissed from further analysis as it was determined to not be environmentally reasonable compared to the Proposed Action route.

Chapter 3 Rationale of Resource Analysis

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To comply with NEPA, the BLM must address specific elements of the environment subject to requirements defined by Supplemental Authorities associated with each element as specified by statues, regulations, or executive orders (BLM, 2008b). This chapter identifies the resources that may be affected by the Proposed Action and alternatives.

Table 3-1 identifies the Supplemental Authority elements that are addressed in this EA. Supplemental Authority elements determined to be not present or present yet not affected were not carried forward for analysis or discussed further in the EA. Supplemental Authority elements determined to be present that may be affected were carried forward for analysis in the EA, and are further discussed in the following sections. The elimination of elements determined to be not present or not affected follows the Council on Environmental Quality (CEQ) policy, as stated at CFR 1500.4.

Table 3-1 Supplemental Authorities

Supplemental Authorities	Present and Affected	Present and Not Affected	Not Present	Rationale/Comments
Air Quality (including Climate Change)	X			Potential impacts are analyzed in Section 4.2.
Areas of Critical Environmental Concern			X	There are no Areas of Critical Environmental Concern within the Plan boundary.
Cultural Resources (Including National Historic Trails)	X			Potential impacts are analyzed in Section 4.3.
Environmental Justice			X	There are no minority populations or low-income populations identified within the Plan boundary or the surrounding communities, including Ruth and Ely. Minority populations and low-income populations were evaluated in accordance with the criteria and direction provided in *Final Guidance for Incorporating Environmental Justice Concerns in EPA's NEPA Compliance Analyses* (EPA, 1998). A written analysis is part of the project record and is on file at the BLM Ely District Office and is available on request (Stantec, 2016b).
Farmlands, Prime or Unique			X	There are no prime or unique farmlands within the Plan boundary.
Fish Habitat			X	There is no fish habitat within the Plan boundary.
Floodplains			X	There are no floodplains within the Plan boundary.

Supplemental Authorities	Present and Affected	Present and Not Affected	Not Present	Rationale/Comments
Forests and Rangelands (Healthy Forest Restoration Act Only)			X	This is not considered a Healthy Forest Restoration Act project.
Human Health and Safety		X		RNMC has health and safety plans and measures in place. There would be no change from current conditions.
Migratory Birds	X			Potential impacts to migratory birds are analyzed in Section 4.4.
Native American Religious Concerns			X	Government to government consultation was conducted with the Te-Moak Tribe of the Western Shoshone Indians of Nevada, Duckwater Shoshone Tribe of the Duckwater Reservation, and Confederated Tribes of the Goshute Reservation. Project notification letters were mailed to these tribes on June 13, 2016. These letters included a description of the project and an invitation to ask questions, provide comments, and initiate official government-to-government consultation if desired. No issues or concerns have been received from any of the tribes invited to consult on the Proposed Action.
Noxious Weeds/Invasive Non-Native Species	X			Potential impacts are analyzed in Section 4.5.
Threatened and Endangered Species			X	There are no known threatened or endangered species or potential habitat in the Plan boundary.
Wastes, Hazardous or Solid		X		RNMC has an approved Spill Prevention Control and Countermeasure Plan (RNMC, 2015a) in place. There would be no change from current conditions. Measures to prevent the spills and releases of hazardous materials have been built into the alternatives. No hazardous materials issues are anticipated.
Water Quality (Surface and Ground)	X			Potential impacts are analyzed in Section 4.6.
Wetlands and Riparian Zones			X	There are no wetlands or riparian zones within the Plan boundary.

Supplemental Authorities	Present and Affected	Present and Not Affected	Not Present	Rationale/Comments
Wild and Scenic Rivers			X	There are no wild and scenic rivers within the Plan boundary.
Wilderness / Land with Wilderness Characteristics / Wilderness Study Areas			X	There are no lands designated as wilderness, Lands with Wilderness Characteristics, or Wilderness Study Areas within the Plan boundary.

In addition to the resources or elements managed under Supplemental Authorities, the BLM considers other resources and uses that occur on public land and the issues that may result from the implementation of the Proposed Action. Other elements or resources of the human environment that have been considered for analysis in this EA are listed in Table 3-2 as well as rationale for each element that is not present or would not be affected by the Proposed Action or No Action Alternative.

Table 3-2 Additional Resources

Additional Resources	Present and Affected	Present and Not Affected	Not Present	Rationale/Comments
Lands and Realty	X			Potential impacts are analyzed in Section 4.7.
Minerals	X			Potential impacts are analyzed in Section 4.8.
Paleontology			X	There are no known paleontological resources within the Plan boundary.
Rangeland Resources		X		The Plan boundary is located within the Georgetown Ranch, Copper Flat, and Giroux Wash allotments. However, no grazing is permitted within the Plan boundary.
Recreation			X	No recreation activities are present within the Plan boundary. There would be no change from current conditions.
Social and Economic Values	X			Potential impacts are analyzed in Section 4.9.
Soil Resources	X			Potential impacts are analyzed in Section 4.10.
Special Status Species	X			Potential impacts are analyzed in Section 4.11.
Vegetation Resources	X			Potential impacts are analyzed in Section 4.12.
Visual Resources	X			Potential impacts are analyzed in Section 4.13.

Additional Resources	Present and Affected	Present and Not Affected	Not Present	Rationale/Comments
Wild Horses		X		The Plan boundary is located within the Jake's Valley Herd Management Area. The Jake's Wash Herd Management Area is a herd of approximately 20 horses located to the west of the Plan boundary. The mine and is located outside the designated herd area and receives incidental use by horses.
Wildlife	X			Potential impacts are analyzed in Section 4.14.

Chapter 4 Affected Environment and Environmental Effects

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This chapter presents the existing environment (i.e., the physical, biological, social, and economic values and resources) within the Plan boundary and environmental impacts that could occur as a result of the Proposed Action and the No Action Alternative.

The affected environment section describes the existing conditions and trend of issue-related elements that may be affected by implementing the Proposed Action. Description of the affected physical, biological, and human resources is based upon data gathered from field investigations, BLM and other agency files, and baseline data.

The environmental impact analysis describes the direct and indirect environmental consequences that would result from authorization of the Proposed Action and the No Action Alternative.

Direct effects are those that are caused by the action and occur at the same time and place. Indirect effects are those impacts that are caused by the action and occur later in time or further removed in distance; however, they are still reasonably foreseeable. Indirect impacts may include growth-inducing effects such as changes in the pattern of land use, population density or growth rate, and related effects on air and water and other natural systems, including ecosystems.

NEPA requires that effects be discussed in terms of context and intensity (40 CFR 1508.27(b)(7)). In this EA, context refers to the location, type, or size of the area to be affected and intensity refers to the severity or level of magnitude of impact. The intensity of effects is defined as major, moderate, minor, or negligible. Effects resulting from actions may have beneficial or detrimental effects. In addition, the duration of effects can be temporary, short term, or long term. These terms are described more specifically in Table 4-1.

Table 4-1 Terms Used to Describe the Environmental Effects

Attribute of Effect		Description
Magnitude (intensity)	Negligible	No measurable change in current conditions.
	Minor	A small, but measurable change in current conditions.
	Moderate	A moderate, measurable change in current conditions.
	Major	A big, easily measurable change in current conditions.
Duration	Temporary	Short-lived (i.e., during construction)
	Short term	10 years or less
	Long term	More than 10 years

Review of the environmental consequences identified direct, indirect, temporary, short-term, long-term, and permanent impacts resulting from the Proposed Action and No Action Alternative. In this document, the terms “effect” and “impact” are used synonymously. The Proposed Action for each resource includes implementation of the EPMs identified in Sections 2.1.13 and 2.2.23.

4.1 General Setting

The Robinson Mine is located approximately seven miles west of Ely in White Pine County, Nevada, in the Egan Range. The Plan boundary encompasses approximately 8,530 acres.

The Robinson Mine is located near the east-central portion of the Great Basin. The local surrounding terrain consists of alternating mountain ranges and sagebrush-covered valleys, with the mine site situated on rolling terrain at elevations of 6,600 to 7,600 feet AMSL. The highest mountains in the Egan Range are over 10,000 feet AMSL. The mountains rise to about 4,000 feet above the surrounding valley floors, which are generally near 6,000 feet AMSL.

The climate is semiarid, mid-latitude with the mountains and valleys influencing the regional climate. In the high elevation, summer nights may be pleasant, but the season that is free from freezing temperatures is short. In the absence of larger-scale storms, the wind patterns in the area are driven by temperature differences in the mountains and valleys. Air currents flow down the valleys during the morning hours. As the valley walls warm up during the day, the flow generally reverses and moves up the valleys during the afternoon. More rain and snow are observed in the mountain areas than in the center of the valleys.

The average annual rainfall between December 2011 and December 2015 measured at the Giroux Wash weather station was 7.0 inches. Average wind speed and direction during the same time period was 6.4 miles per hour (mph) from the south (RNMC, 2016c). The average annual rainfall at the Ruth Overlook weather station between December 2011 and December 2015 was 10.8 inches. Average wind speed and direction during the same time period was 9.2 mph from the south (RNMC, 2016c).

4.2 Air Quality

4.2.1 Affected Environment

The EPA codifies the air quality framework and delegates the NDEP, Bureau of Air Quality Planning, and Bureau of Air Pollution Control to implement and enforce the state and federal statutes, regulations, and standards. The legal requirements applicable to the Proposed Action and alternatives include the following: Clean Air Act (CAA), as amended (42 USC 7401 et seq.), National Ambient Air Quality Standards (NAAQS), National Emission Standards for Hazardous Air Pollutants, Federal Operating Permit Program (Title V), and State of Nevada air quality regulation and standards for permits to operate under NAC 445B Air Controls.

The CAA required the EPA to establish the NAAQS for pollutants considered harmful to public health and the environment. These pollutants are referred to as criteria pollutants and include carbon monoxide, lead, nitrogen dioxide, ozone, particulate matter 10 microns in diameter or less, particulate matter 2.5 microns in diameter or less, and

sulfur dioxide. The EPA also regulates 187 hazardous air pollutants that are known or suspected to cause cancer or other serious health effects.

The EPA developed a classification system for distinct air pollution control regions pursuant to the CAA. In Nevada, the regions are based on geographical boundaries and hydrographic basins. Each region has been classified as Attainment, Non-Attainment, or Maintenance for each of the criteria air pollutants. Regions classified as Attainment are areas in which a pollutant has either not exceeded the NAAQS or there has not been sufficient ambient monitoring data to further classify the region. A Non-Attainment classification represents an area in which a pollutant has exceeded the NAAQS. The Maintenance designation is used for areas in which a pollutant has exceeded the NAAQS, but has since been reduced to attainment levels.

White Pine County (including the Plan boundary) is classified as Attainment or Unclassified for all criteria pollutants (EPA, 2016).

The CAA also required the EPA to significantly limit the deterioration of air quality in specific areas. The EPA has developed a classification system of areas for the Prevention of Significant Deterioration (PSD) regulations. The most restrictive category is the Class I Area and the least restrictive category is the Class III Area. The Class I Areas include National Parks, Wilderness Areas, which exceed 5,000 acres and were in existence prior to 1977, and areas that have been designated as Class I Areas under the PSD regulation in 40 CFR 52.21. All regions not designated as Class I Areas are considered Class II Areas. No Class III Areas have been designated.

Regional haze refers to haze that impairs visibility in all directions over a large area. The EPA's Regional Haze Regulations affect only Class I areas. There are no Class I areas within the Plan boundary or its vicinity (NDEP, 2014).

Currently, the Robinson Mine (Facility ID No. A0383) possesses a Class II Air Quality Operating Permit No. AP1021-0373.02, issued by NDEP-Bureau of Air Pollution Control. Air quality modeling and monitoring are conducted as part of the permit renewal process. The current permit was renewed in July 2016.

As required by the Class II Air Quality Permit, RNMC adheres to a Fugitive Dust Control Plan (RNMC, 2016a). The three main sources of fugitive dust at the mine include site operations, trucking activities, and material stockpiling.

Site operations include drilling, bulldozing, grading, ore and waste rock handling, and loading and unloading of materials. Site operations support the mining process and include exploring for ore, extracting ore and rock, transporting material, processing material, and staging material. Excavated ore and rock is anticipated to have a moisture content of between four and eight percent. Dust is primarily generated in material transfer and stockpiling of material.

Dust generated as a result of drilling is controlled by applying water to the drill head throughout the drilling process. Bulldozing, grading, and material handling may be

controlled through the use of pre-watering as well as active watering. If material to be handled is identified as a fugitive dust hazard, the material can be pre-watered to increase its moisture content. Material drop height to and from equipment can be reduced to control fugitive dust generation. During bulldozing and grading, water can be applied during the operation to reduce the potential to emit fugitive dust. Administrative controls also exist in the form of an on-site radio network. In the event that fugitive dust is being generated, any RNMC employee can radio their supervisor or dispatch and inform them that dust suppression is needed at a particular location.

Site roadways are a mixture of exploration, access, and haul roads. Exploration roads are limited to light traffic and drilling equipment. These roads are used to locate and assess ore deposits and are typically unpaved dirt roads. Access and haul roads are open to all forms of traffic and are used by vehicles to access key locations of the ore processing circuit including pits, WRDs, facilities, and the mill. These are a mixture of unpaved dirt roads and gravel covered road. Haul roads are primarily used as part of regular fill and dump routes for multi-ton capacity hauling equipment.

Snow cover is anticipated approximately four to six months of the year which keeps dust levels to insignificant levels. During times of the year when dry weather is present, RNMC implements a system of control measures. Roadways are evaluated for the need to apply water or dust suppression chemicals. RNMC owns and operates three water trucks used for dust suppression; one with a 2,000-gallon capacity and two with 20,000-gallon capacity.

Protecting and covering stockpiles includes strategically placing stockpiles to reduce or eliminate environmental impact on the stockpile, such as placing a stockpile next to a building, in a shaded area, or in an area protected from the wind. Stockpiles can also be graded in order to reduce the likelihood of becoming mobilized by wind. Material being staged in areas exposed to environmental factors may be covered to reduce the effects of the environment. In the event a stockpile of soil is going to be staged for an extended period of time, vegetation may be introduced to the stockpile to reduce the possibility of wind mobilizing the material. In addition, a vegetated soil stockpile retains strength and moisture, reducing the potential for fugitive dust generation.

4.2.1.1 Climate Change

On August 1, 2016, the CEQ issued guidance to assist federal agencies in their consideration of the effects of greenhouse gas (GHG) emissions and climate change when evaluating proposed federal actions in accordance with the NEPA and the CEQ Regulations Implementing the Procedural Provisions of NEPA (CEQ, 2016). Further, according to the BLM's Instruction Memorandum No. 2008-171 "Guidance on Incorporating Climate Change into Planning and NEPA Documents" dated August 19, 2008, climate change considerations should be acknowledged in EA documents. The Instruction Memorandum states that ongoing scientific research indicates that anthropogenic GHG emissions and changes in biological carbon sequestration due to land management activities potentially impact global climate. Through complex interactions on a global scale, GHG emissions and net losses of biological carbon sinks

lead to a net warming of the atmosphere. GHGs have been found to be capable of trapping heat in the atmosphere by decreasing the amount of heat radiated by the Earth out to space.

The GHG emissions are comprised of many separate chemicals, the most notable is carbon dioxide (CO_2) from fossil fuel development, large wildland fires, and activities using combustion engines. The leading causes of GHG emissions in 2010 for Nevada were attributed to electrical generation (approximately 38 percent) and transportation (approximately 34 percent). Lesser causes included resident/commercial fuel use (approximately 10 percent), industrial fuel use (approximately six percent), industrial processes (approximately five percent), agriculture (approximately three percent), waste (approximately three percent), and fossil fuel industry (approximately one percent). Nevada historical data, measured in 2010, indicated CO_2 to represent approximately 87 percent of GHG emissions with methane, nitric oxide, and hydrofluorocarbons/perfluorocarbons representing approximately eight percent, two percent, and three percent, respectively (NDEP, 2012). By 2030, transportation is expected to account for approximately 39 percent of statewide GHG emissions.

Current emissions within the vicinity of the Plan boundary include mining equipment, vehicle combustion emissions, fugitive dust from travel on unimproved roads, and wildland fire. Future actions would have incremental change in CO_2 emission; however, the tools necessary to quantify incremental climate impacts of specific actions are presently not available, and specific levels of significance have not been established.

Existing climate prediction models are global in nature; therefore, they are not at the appropriate scale to estimate potential impacts of climate change for the Proposed Action. Due to the nature and scale of the Proposed Action, effects on climate change are not further analyzed in this EA.

4.2.2 Environmental Effects

Project proponents would continue to follow all air permit requirements in the Class II Air Quality Operating Permit, including the Fugitive Dust Control Plan. With the proven effectiveness of the Fugitive Dust Control Plan, as well as other EPMs (Sections 2.1.13 and 2.2.23) and BMPs that would be employed, the direct impacts to air quality would be negligible and long term. Indirect impacts due to fugitive dust would be short term and negligible during construction activities (i.e., road construction, power line and pipeline re-routes) and during operations and reclamation due to required water applications.

Control of fugitive dust at the mine includes the EPMs listed in Section 2.1.13 and may include, but is not limited to:

- Regular use of water trucks to spray water on disturbed areas;
- Pre-watering of areas to be disturbed;

- Watering of storage piles;
- Use of chemical surfactants (e.g., magnesium chloride);
- Revegetation of agitated soils;
- Graveling of roadways, storage, staging, and parking areas;
- Berming and fencing;
- Reducing material drop heights;
- Posting and limiting speed limits;
- Enclosing or protecting stockpiles;
- Covering of stockpiles and materials; and
- Enforcement of dust control policy on contractors.

4.2.3 No Action Alternative

Impacts to air quality were analyzed in the 1994 FEIS (BLM, 1994a), and would continue under the No Action Alternative. The mine would continue operating under the authorized Plan as described in Section 2.1. Activities would continue to be subject to the Class II Air Quality Operating Permit and its associated Fugitive Dust Control Plan; impacts would be long term and negligible. As the EOML would be 2018 rather than 2022 under the Proposed Action, duration of mining operations would conclude four years earlier under the No Action Alternative.

4.3 Cultural Resources

4.3.1 Affected Environment

The National Historic Preservation Act of 1966, as amended (NHPA), the Archaeological Resources Protection Act of 1979 (ARPA), the American Indian Religious Freedom Act of 1978 (AIRFA), and the Native American Graves Protection and Repatriation Act of 1990 (NAGPRA) are the primary laws regulating preservation of cultural resources. Federal regulations obligate federal agencies to protect and manage cultural resource properties.

The NHPA sets forth procedures for considering effects to historic properties and supports and encourages the preservation of prehistoric and historic resources. It directs federal agencies to consider the impacts of their actions on historic properties. The NHPA established the Advisory Council on Historic Preservation (ACHP) and tasked the ACHP with administering and participating in the preservation review process established by Section 106. Section 106 of the NHPA, as amended, requires

federal agencies to consider any action that may adversely affect any structure or object that is, or can be, included in the NRHP. These regulations, codified at 36 CFR 60.4, provide criteria to determine if a site is eligible. Beyond that, the regulations define how those properties or sites are to be dealt with by federal agencies or other involved parties. These regulations apply to all federal undertakings and all cultural (archaeological, cultural, and historic) resources.

The purpose of ARPA is to secure the protection of archaeological resources and sites that are on public lands and Indian lands and to foster increased cooperation and exchange of information between governmental authorities, the professional archaeological community, and private individuals having collections of archaeological resources.

The AIRFA was passed in 1978 to “protect and preserve for American Indians their inherent right to freedom to believe, express, and exercise the traditional religions of the American Indian, Eskimo, Aleut, and Native Hawaiians, including but not limited to access to sites, use and possession of sacred objects, and the freedom to worship through ceremonial and traditional rites.”

NAGPRA became law in 1990; the regulations implementing the statute were completed and went into effect in January 1996. This law formally affirms the rights of Indian tribes, Native Alaskan entities, and Native Hawaiian organizations to custody of Native American human remains, funerary objects, sacred objects, and objects of cultural patrimony with which they have a relationship of cultural affiliation. In addition, the law and regulations describe procedures designed to ensure that all Americans can derive educational, historical, and scientific value from the remains and objects covered by the statute through public interpretation, documentation, and study.

Cultural resources are defined as any definite location of past human activity identifiable through field survey, historical documentation, and/or oral evidence. Cultural resources include archaeological or architectural sites, structures, or places, and places of traditional cultural or religious importance to specified groups whether or not represented by physical remains. Cultural resources have many values and provide data regarding past technologies, settlement patterns, subsistence strategies, and many other aspects of history.

A Traditional Cultural Property (TCP) is a property associated with cultural practices or beliefs of a living community that (a) are rooted in that community’s history, and (b) are important in maintaining the continuing cultural identity of the community (Parker and King, 1998); this property type may be determined eligible for the NRHP if it meets criteria found in 36 CFR 60.4.

Decisions regarding the management of cultural resources are dependent on determinations of significance in their evaluation for the NRHP. In order for a cultural resource site to be eligible for the NRHP, the site must meet certain criteria and retain aspects of integrity including location, design, setting, materials, workmanship, feeling,

and association. Cultural resource sites are evaluated for significance against the following NRHP criteria (36 CFR 60.4):

a) association with events that have made a significant contribution to the broad patterns of our history; or

b) association with the lives of persons significant in our past; or

c) embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic value, or that represent a significant and distinguishable entity whose components may lack individual distinction; or

d) have yielded, or may be likely to yield, information important to prehistory or history.

Prior to authorization of the original operations at the Robinson Mine (BLM, 1994a), the BLM, Nevada State Historic Preservation Office (SHPO), and Advisory Council on Historic Properties were signatories on a Programmatic Agreement of Historic Preservation regarding the Treatment of Historic Properties during Mineral Development associated with the Robinson Mine by RMLP executed in July 1990, which has governed all aspects of the development for the Robinson Mine in respect to cultural resources. As part of ongoing and proposed activities, the BLM, in consultation with the SHPO, entered into a new Programmatic Agreement in June 2016 (Appendix A) to set forth procedures to be followed to satisfy BLM's Section 106 responsibilities of the NHPA for the Robinson Mine.

The Programmatic Agreement (BLM and Nevada SHPO, 2016) defines the area of potential effect (APE) and stipulates guidelines for identification and treatment of historic properties in the Plan boundary to mitigate or avoid effects to the properties to the extent practicable, regardless of surface ownership.

4.3.1.1 Cultural Context

The Robinson Mine is located in the east-central portion of the Great Basin, an area that has evidenced a long history of human occupation. There is abundant evidence of both prehistoric and historic use of the area, as detailed in the Historic Context for the Robinson Mining District (WCRM, 2006).

4.3.1.2 Previous Research

Numerous cultural resource inventories and studies have been conducted at the Robinson Mine, including all areas of previous disturbance.

4.3.1.3 Cultural Resource Sites

The BLM has defined the APE as all geographic areas within which the project may have direct or indirect effects to historic properties. The APE for ground disturbance has been determined to be approximately 24,000 acres. The BLM also defined an APE for visual effects to historic properties within the viewshed of the project. The boundary of

the viewshed APE is one mile from the Proposed Action unless otherwise obstructed by natural topographic features. The viewshed APE totals approximately 40,000 acres. All cultural resources within the APE are subject to the Programmatic Agreement. The Proposed Action areas of disturbance have been inventoried for cultural resources (Riley, 2016).

Class III intensive level pedestrian inventories have been conducted within portions of the Plan boundary. As outlined in the Programmatic Agreement, all elements of the final design would be fully inventoried for cultural resources and Section 106 satisfied prior to any project related disturbance. Any disturbance proposed in areas not included in previous field investigations, would be subject to a Class III inventory as project planning proceeds and prior to any ground-disturbing activities in those locations.

No TCPs have been identified in the Plan boundary by previous studies.

4.3.2 Environmental Effects

In accordance with the Programmatic Agreement (Appendix A), BLM, in consultation with the Nevada SHPO and to the extent practicable, would ensure that effects to historic properties be avoided through project design, redesign, or relocation of facilities where feasible. When avoidance is not feasible an appropriate treatment plan would be designed, in consultation with SHPO, to lessen or mitigate project-related effects to historic properties.

Potential impacts to cultural resources include the following:

- Direct impacts to historic properties from mine activities;
- Discovery of unanticipated finds during operations; and
- Discovery of human remains during operations.

Direct impacts to NRHP-eligible historic properties, including surface or subsurface disturbance incurred during project activities would occur within the Plan boundary. These potential impacts would occur during the construction of re-routed mine facilities and/or mining operations.

As stated in the Programmatic Agreement (Appendix A), all historic properties (i.e., NRHP-eligible cultural resource sites) would be avoided where practicable by project design. If avoidance is not feasible, further mitigation must be taken by RNMC in accordance with the Programmatic Agreement. Any unanticipated cultural resources discovered would require that all work within a 100-meter area cease immediately and the BLM Authorized Officer be notified immediately. BLM would then evaluate the discovery in coordination with other consulting parties to determine and implement appropriate treatment, if necessary.

The Proposed Action would include 327.6 acres of additional disturbance (Table 2-3) that could adversely impact NRHP-eligible historic properties (i.e., NRHP-eligible cultural resource sites) if they could not be avoided. Historic properties that could not be avoided would be mitigated as prescribed in the Programmatic Agreement (BLM and Nevada SHPO, 2016). With implementation of the measures outlined in the Programmatic Agreement, impacts would be long-term and major.

4.3.3 No Action Alternative

Under the No Action alternative, the mine would continue operating under the authorized Plan as described in Section 2.1. Activities would continue to be subject to the Programmatic Agreement (BLM and Nevada SHPO, 2016) regarding cultural resources; impacts would be long-term and major depending on whether historic properties are avoided or mitigated as operations continue.

4.4 Migratory Birds

The Migratory Bird Treaty Act of 1918 (MBTA) (16 USC 703-712), which is administered by the U.S. Fish and Wildlife Service (USFWS), is the basis of migratory bird conservation and protection in the U.S. It implements four treaties that provide for international protection of migratory birds. In 1972, an amendment to the MBTA resulted in bald eagles (*Haliaeetus leucocephalus*) and other birds of prey being included in the definition of a migratory bird. The MBTA currently protects more than 800 migratory bird species, including waterfowl, shorebirds, seabirds, wading birds, raptors, and songbirds.

Under the authority of the Bald and Golden Eagle Protection Act of 1940 (as amended) (BGEPA) (16 USC 668-668d), bald eagles and golden eagles (*Aquila chrysaetos*) are provided additional legal protection. The BGEPA makes it unlawful to import, export, sell, purchase, barter, or take any bald eagle or golden eagle, their parts, products, nests, or eggs. As used in the BGEPA, “take” includes pursuing, shooting, poisoning, wounding, killing, capturing, trapping, collecting, molesting, or disturbing an eagle. USFWS guidance directs project proponents to assess the impacts of their projects on golden eagles nesting within 10 miles of a proposed project (Pagel et al., 2010).

The MBTA prohibits, unless permitted by regulations, to "pursue, hunt, take, capture, kill, attempt to take, capture or kill, possess, offer for sale, sell, offer to purchase, purchase, deliver for shipment, ship, cause to be shipped, deliver for transportation, transport, cause to be transported, carry, or cause to be carried by any means whatever, receive for shipment, transportation or carriage, or export, at any time, or in any manner, any migratory bird, included in the terms of this Convention . . . for the protection of migratory birds . . . or any part, nest, or egg of any such bird" (16 USC 703).

Direction from the USFWS regarding migratory birds on BLM lands states that, at the project level, the BLM shall “evaluate the effects of the BLM’s actions on migratory birds during the NEPA process, if any, and identify where “take” reasonably attributable to

agency actions may have a measurable negative effect on migratory bird populations, focusing first on species of concern, priority habitats, and key risk factors" (BLM, 2010). Compliance with the MBTA is achieved through evaluation of potential effects to habitats and populations to ensure they are sustained over the long term. "Take" is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect. Most birds in Nevada are protected by the MBTA, including all of Nevada's raptors.

4.4.1 Affected Environment

Migratory birds are those listed in 50 CFR 10.13 and include all native birds commonly found in the U.S., except for native resident game birds. Migratory birds include those species of birds that breed and nest in the Project Area and then migrate south prior to the onset of winter, as well as species that may use the area for migration or year-round habitat. Migratory songbirds are found in virtually every habitat in the Great Basin, and usually half or more of the breeding birds in any sampled area are migratory (Robinson, 1997). In general, avian diversity is lowest in Great Basin cold desert habitats during the winter season, with diversity increasing as migrant species arrive to nest in the area with the onset of spring.

A variety of migratory birds are found in the Plan boundary. The most commonly occupied breeding habitats for migratory birds in the Plan boundary include pinyon-juniper woodland with interspersed big sagebrush communities. The use of Plan boundary habitats by migratory birds may be influenced by disturbance associated with the existing mining operations. A non-exclusive list of migratory bird species with potential to occur within and near the Plan boundary is provided in Table 4-2.

Table 4-2 Potential Migratory Bird Species Occurring within the Vicinity of the Plan Boundary

Common Name	Scientific Name
American kestrel	*Falco sparverius*
American robin	*Turdus migratorius*
Ash-throated flycatcher	*Myiarchus cinerascens*
Bald eagle	*Haliaeetus leucocephalus*
Black-billed magpie	*Pica hudsonia*
Black-throated gray warbler	*Dendroica nigrescens*
Brewer's sparrow[1]	*Spizella breweri*
Cassin's finch	*Carpodacus cassinii*
Chipping sparrow	*Spizella passerina*
Chukar	*Alectoris chukar*
Common loon	*Gavia immer*
Common raven	*Corvus corax*
Cooper's hawk	*Accipiter cooperii*
Dark-eyed junco	*Junco hyemalis*
Dusky grouse	*Dendragapus obscurus*
Ferruginous hawk	*Buteo regalis*

Common Name	Scientific Name
Golden eagle[1]	*Aquila chrysaetos*
Great horned owl	*Bubo virginianus*
Greater roadrunner	*Geococcyx californianus*
Greater sage-grouse[1]	*Centrocercus urophasianus*
Green-tailed towhee	*Pipilo chlorurus*
Harris's sparrow	*Zonotrichia querula*
Loggerhead shrike[1]	*Lanius ludovicianus*
Long-eared owl	*Asio otus*
Merlin	*Falco columbarius*
Mountain bluebird	*Sialia currucoides*
Mountain chickadee	*Parus gambeli*
Mourning dove	*Zenaida macroura*
Northern flicker	*Colaptes auratus*
Northern goshawk[1]	*Accipiter gentilis*
Peregrine falcon[1]	*Falco peregrinus*
Pinyon jay[1]	*Gymnorhinus cyanocephalus*
Prairie falcon	*Falco mexicanus*
Red-shafted flicker	*Colaptes cafer*
Red-tailed hawk	*Buteo jamaicensis*
Rock wren	*Salpinctes obsoletus*
Rough-legged hawk	*Buteo lagopus*
Sage sparrow[1]	*Amphispiza belli*
Sandhill crane	*Antigone canadensis*
Sharp-shinned hawk	*Accipiter striatus*
Song sparrow	*Melospiza melodia*
Swainson's hawk	*Buteo swainsoni*
Turkey vulture	*Cathartes aura*
Western bluebird	*Sialia mexicana*
Western meadowlark	*Sturnella neglecta*
Western tanager	*Piranga ludoviciana*
Western wood peewee	*Contopus sordidulus*
White crowned sparrow	*Zonotrichia leucophrys*

Source: NDOW, 2016a; Stantec, 2016a; SRK, 2016a; BLM, 1994a
[1]These species are BLM SSS.

4.4.1.1 Raptors

Golden eagle nest surveys were conducted (Stantec, 2016a) on May 4, 5, and June 11, 2016. The surveys searched for golden eagle nests within a 10-mile radius of the Plan boundary (survey area); however, other raptor nests were recorded as encountered. Various rocky outcrops in the survey area serve as potential nesting areas for golden eagles and other raptors (USFWS, 2011). Trees and willow species, especially near water sources like Steptoe Creek, provide additional nesting opportunity throughout the survey area for several raptor species. The Steptoe Valley to the northeast of the Plan

boundary contains agricultural pivots, and these areas are used for foraging by raptor species. Transmission lines running throughout the survey area provide perching areas for raptors foraging as well as nesting for some species. Additionally, the survey area contains previously mined pits and exploration projects, which have left inactive highwalls and cuts in the landscape where raptors can build nests.

During the 2016 surveys, 44 nest sites (golden eagle, other raptor species, and corvid) were identified within the survey area (Table 4-3). Two golden eagle nest sites were identified within the Plan boundary, one occupied and one unoccupied. Additionally, two occupied red-tailed hawk nests, one occupied prairie falcon nest, and five unoccupied nests of unknown raptor species were located within the Plan boundary during the 2016 surveys.

Table 4-3 Raptor and Corvid Nests Identified in 2016 within a 10-Mile Radius of the Plan Boundary

Species	Occupied Nests	Unoccupied Nests	Total
Golden eagle (*Aquila chrysaetos*)	9	8	17
Red-tailed hawk (*Buteo jamaicensis*)	3	2	5
Prairie falcon (*Falco mexicanus*)	2	0	2
Northern goshawk (*Accipiter gentilis*)	0	1	1
Common raven (*Corvus corax*)	2	0	2
Unknown Species	1	16	17
Total	**17**	**27**	**44**

Source: Stantec, 2016a

4.4.2 Environmental Effects

Impacts to migratory birds within the Plan boundary could include destruction of nests and eggs if clearing activities occur during nesting seasons and those nests are not found and subsequently avoided; however, EPMs (Sections 2.1.13 and 2.2.23) would reduce this to a short term negligible to minor impact. Approximately 328 acres of land would be disturbed under the Proposed Action. However, these habitats are available outside the Plan boundary, and therefore, this impact to habitat would be long-term and negligible.

Direct mortality to birds from the Project is not likely to occur as most species are highly mobile and are able to leave the area. However, some species that feed on carrion or roadkill would be at risk of vehicle collisions along the haul road and other mine roads, although this has not been reported to have occurred at the mine.

Noise produced by mining operations would also have the potential to impact migratory birds. Noise can interfere with establishment of breeding territories for songbirds that

vocalize during breeding, or interfere with alarm calls of birds and mammals (Larkin, 1996; USDI, 2003). Noise impacts to migratory birds would be long term and minor.

Nesting raptors are often sensitive to disturbance from human related activities. Raptors may abandon nests with eggs or young, increasing the potential for mortality from nest predation or intolerance to high or low temperatures. The amount of disturbance that an individual raptor will tolerate varies among species and individuals (CPW, 2003). Impacts to nesting raptors could extend beyond the actual disturbance area, up to 0.5 miles away (CPW, 2003). The two golden eagle and eight raptor nests located within the Plan boundary would not be directly impacted by the Proposed Action. However, the indirect impacts described above could impact these nests, if construction activities occurred during the breeding and nesting season. If construction activities were to occur during the nesting season, a qualified biologist would conduct pre-construction clearance surveys, in accordance with BLM protocols. Any nests would be checked for activity status prior to their removal and if found active, they would be avoided and lawfully removed (except for golden eagle nests) after the young had fledged. These EPMs would result in negligible, long-term impacts to nesting raptors.

The operational impacts to migratory birds, including raptors, are electrocution and collision risks from power lines and their associated infrastructure. Power lines provide perching and in some cases nesting substrate for numerous avian species. Electrocution can occur when a bird completes an electric circuit by simultaneously touching two energized parts or an energized part and a grounded part of the electrical equipment. Collision can occur with hard-to-see elements (e.g., shield wires, guy wires, etc.), especially when birds are distracted during hunting or breeding activities. Collision risks vary with different species of birds, time of day, weather conditions, habitat, and type of structures. Avian electrocution and collision risks would be minimized through incorporation of Avian Power Line Interaction Committee guidance (e.g. spacing and placement of lines on the poles, shielding, and wire types) (APLIC, 2006 and 2012).

4.4.3 No Action Alternative

Under the No Action Alternative, mining operations would continue under the authorized Plan until EOML 2018. Current conditions and trends would continue. Mining and reclamation would conclude four years sooner (EOML 2018). Impacts to migratory birds would be long term and negligible.

4.5 Noxious Weeds and Non-native Invasive Species

The BLM’s policy relating to the management and coordination of noxious weed and invasive plant species is set forth in the BLM Manual 9015-Integrated Weed Management (BLM, 1992). The BLM’s primary focus is “providing adequate capability to detect and treat smaller weed infestations in high-risk areas before they have a chance to spread.” Noxious weed control would be based on a program of “…prevention, early detection, and rapid response” (BLM, 2016b).

Noxious weeds are defined in the NRS 555.005 as "any species of plant which is, or is likely to be, detrimental or destructive and difficult to control or eradicate." The current noxious weed list, designated by the State of Nevada Department of Agriculture statute, is found in NAC 555.010. Noxious weeds are classified into three categories described as:

- Category A weeds are generally not found or are limited in distribution and are subject to active exclusion and eradication wherever found;
- Category B weeds are generally established in scattered populations and are subject to active exclusion where possible; and
- Category C weeds are generally established and widespread and are subject to active eradication from the premises of a dealer of nursery stock (NDA, 2016).

4.5.1 Affected Environment

Weed occurrence data was obtained from the BLM Ely District Office (SRK, 2016b and 2016d). Noxious weed species were surveyed for in the proposed disturbance areas surrounding the TSF (SRK, 2016b). Populations of noxious weeds and non-native invasive species are known to exist within one mile of the proposed disturbance areas (SRK, 2016a, 2016b, and 2016d). Noxious weed species (NAC 55.010) include Russian knapweed (*Acroptilon repens*), spotted knapweed (*Centaurea stoebe* [*syn. C. biebersteinii*]), squarrose knapweed (*Centaurea virgata* ssp. *squarrosa*), diffuse knapweed (*Centaurea diffusa*), Dyer's woad (*Isatis tinctoria*), musk thistle (*Carduus nutans*), saltcedar (*Tamarix* sp.), scotch thistle (*Onopordum acanthium*), and hoary cress (*Cardaria draba*). Bull thistle, a non-native invasive species, was also identified within one mile of the proposed disturbance (SRK, 2016d). Cheatgrass (*Bromus tectorum*), a non-native invasive species, was observed throughout the vegetation communities surveyed around the TSF (SRK, 2016a); it is likely that this species occurs throughout the Plan boundary. Russian thistle (*Salsola kali*), non-native, was also observed around the TSF (SRK, 2016b) and likely occurs throughout the Project Area.

Russian knapweed is a perennial forb species that reproduces by roots and seed. Flowers are purple, pink, or white and located at the tip of a branch. Leaves are covered with wooly gray hair and can have wavy or lobed edges on the lower leaves and smooth or toothed edges on the upper leaves. This species often infests rangelands, roadsides, and waterways. Russian knapweed is a Nevada Category B noxious species (NDA, 2016).

Spotted knapweed is a biennial species that reproduces by seed and rhizomes and can grow up to four feet in height. Flowers are vase-shaped, white to purple in color, and located at the tip of the branch. Leaves are alternate, gray-green in color, pinnate-divided, and dotted with resin. This species grows best on dry, well-drained soils and infests rangelands and roadsides. Spotted knapweed is a Category A noxious species (NDA, 2016).

Squarrose knapweed is a perennial species that reproduces by seed and grows up to two feet in height. The flowers are pink to purple in color, located at the tip of the branch, and shaped like a narrow vase. Leaves are alternate with lower leaves pinnate-divided and upper leaves strap-like. This species infests rangelands and roadsides. Squarrose knapweed is a Category A noxious species (NDA, 2016).

Diffuse knapweed is generally a biennial species that reproduces by seed and grows up to two feet in height. Flowers are white to purple in color, vase-shaped, and located at tip of the branch. Leaves are alternate with lower leaves pinnate-divided and upper leaves strap-like. This species grows best in dry, well-drained soils and infests rangelands and roadsides (Creech et al., 2010). Diffuse knapweed is a Category B noxious species (NDA, 2016).

Dyer's woad is generally a biennial species that reproduces by seed and grows up to four feet in height. Flowers are yellow, four petaled, and occur in clusters giving the plant a flat-topped appearance. Leave are lance shaped, bluish-green in color, and have a distinct whitish mid-vein. This species grows well on a broad range of sites and infests roadsides, rangeland, pastures, and crop fields (Creech et al., 2010). Dyer's woad is a Category A noxious species (NDA, 2016).

Musk thistle is a biennial forb species that reproduces by seed and grows up to six feet in height. Flowers are pink to purple and located at the tip of a stem; heads often nod or droop. Foliage is a dark green with a light-green mid-vein with deeply lobed and spiny leaf margins. This species infests roadsides, pastures, and waste areas (Creech et al., 2010). Musk thistle is a Nevada Category B noxious species (NDA, 2016).

Salt cedar, also known as tamarisk, is a perennial shrub or small tree with multiple large stems arising from the root crown. The bark is reddish-brown, with deciduous green to blue-green oval to lance-shaped leaves that turn yellow to red in the fall. The flowers are small with five white to pink petals, arranged in clusters at the tips of branches. Salt cedar reproduces by seed, roots, and stem fragments and is generally found along the edges of waterways, lakes, and ponds (Creech et al., 2010). Salt cedar is a Nevada Category C noxious species (NDA, 2016).

Scotch thistle is a biennial species that reproduces by seed and often infests pastures, rangelands, roadsides, and wastes areas. This species can grow up to 12 feet tall and is branched with spiny wings along the stems. Leaves are alternate and covered with wooly, gray hairs, and lobed or toothed margins with stiff spines (Creech et al., 2010). Scotch thistle is a Nevada Category B noxious species (NDA, 2016).

Hoary cress (aka whitetop) is a perennial forb species that reproduces from seed and rhizomes and is generally less than two feet tall. Flowers are white and produce small heart to ovate shaped seed pods. Leaves are gray-green and vary in shape. The lower leaves have short stalks, while the upper leaves clasp the stem (DiTomaso et al., 2013). This species grows best in disturbed soils and is common in pastures, fields, roadsides, rangelands, waste areas, and waterways (Creech et al., 2010). White top is a Nevada Category C noxious species (NDA, 2016).

Bull thistle is a biennial forb species that reproduces by seed. Flowers are dark purple and clustered at the ends of branches (Whitson et al., 2004). Leaves form a rosette in the first year while second year stem leaves are pinnately lobed, hairy, and prickly on the upper side and cottony on the underneath (Whitson et al., 2004). Stems are sparsely hairy and are irregularly and spiny winged.

Cheatgrass, also known as downy brome, is an annual grass species that reproduces from seed. The leaves are covered with soft hairs. The spikelets are nodding or drooping at maturity, with awns turning purple at maturity. This species competes for moisture with perennial plants due to its winter and early spring growth habitat (Whitson et al., 2004). This species readily invades intact vegetation communities and increases fire hazard because it is a fine fuel.

Russian thistle is a bushy annual forb that reproduces from seed. Stems are usually red or purple striped. Seeds are spread as mature plants break off at ground level and tumble with the wind. One plant typically produces about 250,000 seeds, which may remain viable for one year. Rapid germination and seedling establishment can occur with very limited amounts of precipitation (USU, 2016). It is often found in dryland agriculture fields, but is also common on disturbed and overgrazed rangeland.

4.5.2 Environmental Effects

Under the Proposed Action, an additional 327.6 acres would be newly disturbed (Table 2-3), increasing the potential for the spread and establishment of noxious weeds and non-native invasive species. However, the Robinson Mine currently controls noxious weed infestations in disturbed and revegetated areas through the application of BMPs and EPMs (Section 2.1.23), such as proper reclamation, judicious use of herbicides, and monitoring to identify potential problems, as outlined in the *Robinson Operation Noxious Weed Management Plan* (SRK, 2016c).

During the life of the project, concurrent reclamation and interim reclamation would be performed as practicable to reduce invasive non-native species and noxious weed establishment. RNMC would continue to adhere to their Noxious Weed Management Plan (SRK, 2016c), thereby minimizing potential for spread and establishment of noxious weeds and non-native invasive species. Impacts from noxious and non-native invasive species would be long term and negligible.

4.5.3 No Action Alternative

Under the No Action Alternative, mining operations would continue under the authorized Plan until EOML 2018. Current conditions and trends would continue. Mining and reclamation would conclude four years sooner (EOML 2018). RNMC would continue to adhere to their Noxious Weed Management Plan (SRK, 2016c), thereby minimizing potential for spread and establishment of noxious weeds and invasive species. Impacts would be long-term and negligible.

4.6 Water Resources and Geochemistry

4.6.1 Affected Environment

The Proposed Action involves the continued use and expansion of the existing Robinson Mine. Affected Environment for Water Resources and Geochemistry has many components in common with the 1994 FEIS (BLM, 1994a). Important changes to the water resources and geochemistry of the mine involve changes since 1994 due to mining, dewatering, waste rock geochemical characterization, and hydrogeologic monitoring and conceptualization. This section will incorporate aspects of the 1994 FEIS with key changes and alterations due to mining and dewatering since 1994.

4.6.1.1 Surface Water Resources

The Robinson Mining District is located along a ridge crest in the Egan Range and between this ridge crest and Robinson Canyon (Figure 4-1). Robinson Canyon is drained by Gleason Creek and trends northwesterly through the northern part of the Egan Range, starting approximately at the west edge of the city of Ely, Nevada. Gleason Creek is an intermittent stream that flows in response to heavy snowmelt or high precipitation storm events. Water in the stream comes mainly from surface runoff, and groundwater base flow has not been observed for many years. Most of the year, Gleason Creek is dry and commonly does not flow for months. The Robinson Mine holds a permit to discharge water from mine dewatering to Gleason Creek as needed. Historically, water in Gleason Creek from mine dewatering discharge came from wells RW-4P, RW-5P, RW-8P, and RW-9P.

Steptoe Valley Basin, which lies to the east of the Robinson Mining District, has a drainage area of approximately 1,975 square miles and extends roughly 110 miles northward from the southern end of White Pine County to the southern part of Elko County. Evaporation and transpiration by plants generally exceed precipitation, leading to a net loss of water from the basin. Flow into Steptoe Valley Basin comes from the adjacent mountain ranges both as surface and subsurface flow, primarily in the late spring. Most of the Robinson Mining District drains into Steptoe Valley via Gleason Creek. Flow measurements from 1966 to 1990 show an average monthly flow rate of 7.5 cfs with a range of 2.8 cfs to 19.0 cfs (BLM, 1994a). Gleason Creek is intermittent and the U.S. Geological Survey gaging station was discontinued in 1982. Prior to that date, flows as high as 165 cfs had been recorded (BLM, 1994a).

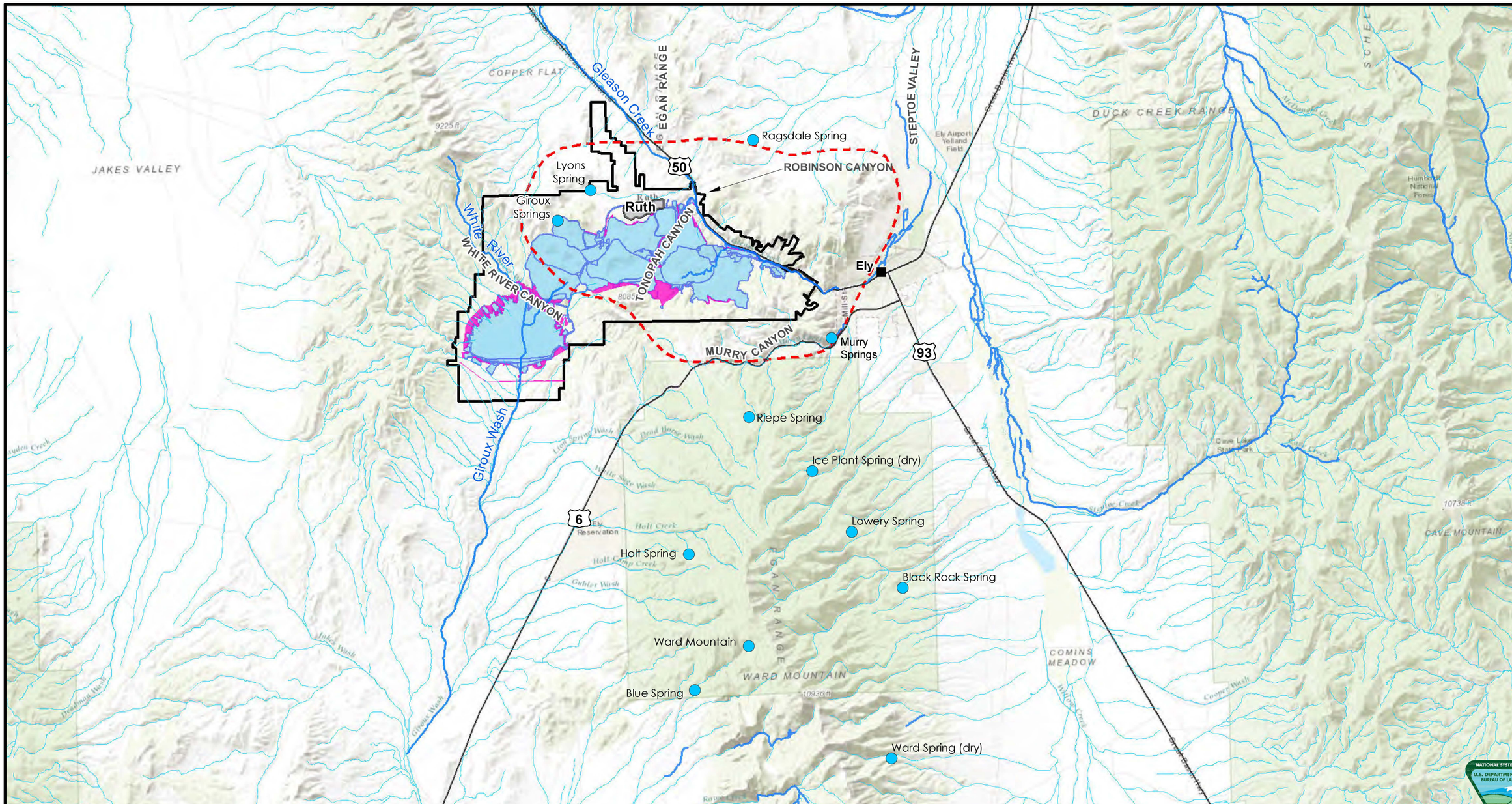
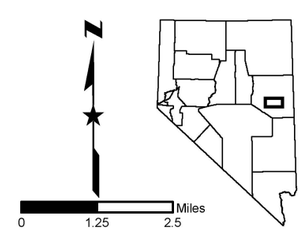


FIGURE 4-1 WATER RESOURCES

KGHM
ROBINSON MINE EA PROJECT

- Plan Boundary
- Springs
- Perennial Stream
- Intermittent Stream
- Proposed Disturbance
- Authorized Disturbance
- Robinson Mining District

MAP LOCATION



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The White River Valley, which lies to the south and west of the mine area, includes approximately 1,620 square miles of the upper part of the Colorado River Basin. This valley is 70 miles long, 20 to 30 miles wide, and like Steptoe Valley, evaporation and transpiration exceed precipitation (Maxey and Eakin, 1949). The mine area to the south and west of Tripp/Veteran Pit drains into Giroux Wash and into the White River Valley. Giroux Wash contains an intermittent stream that flows primarily in response to storm runoff from precipitation. This flow sinks into the valley alluvium and rarely reaches the White River Valley. Upper Giroux Wash has been dammed as part of the authorized Giroux Wash TSF impoundment and storm water is diverted around this facility in a permanent constructed channel. Within and below the TSF, collected water is managed with collection ponds, earthen paddocks, and a pumpback system (Section 2.1.4), so there is no release to the wash. The remainder of the Plan boundary lies within small closed basins draining into existing mine pits. None of the proposed disturbance lies within the Murry Creek drainage and its tributary valley, Tonopah Canyon (Figure 4-1).

Water collected within the TSF is either meteoric or is supernatant from the tailings slurry deposited in the facility. That water is managed in the BOC located in the northern end of the facility. A barge with pumps operates within the BOC to return collected water to the mill and back into the process solution. Water collected below the TSF results from drainage from the facility that is collected via a drain blanket and routed to the tailings seepage collection pond south of the facility. Water collected within the pond is pumped back to the tailings impoundment. There is a permit limit of two feet of impounded water within the pond.

Six natural springs occur in the vicinity of the Robinson Mine that are monitored by RNMC as part of the BLM's regional groundwater monitoring plan for the NDWR (Figure 4-1). These are Blue, Holt, Ice Plant, Riepe, Lowery, and Ward springs. Murry Springs, which formerly provided water to the city of Ely, no longer flows. Ely has replaced Murry Springs water with groundwater from wells RW-6P and RW-7P drilled and managed by the Robinson Mine. Ward Spring and Ice Plant Spring are dry. Blue Spring had ponded water in May 2015 that was dry by September. Holt Spring, Lowery Spring, and Riepe Spring had measured flow rates in 2015 of 0.001 cfs or less (Schlumberger, 2016b).

4.6.1.2 Surface Water Quality

Surface water quality sampling has been conducted by past mining companies and is currently conducted by RNMC as required by its NDEP WPCP. Historic sampling of Murry Springs and Ward Mountain Spring has shown water quality within Nevada drinking water standards (Table 4-4). Both springs were dry (Schlumberger, 2016b). Historic flow to these springs has been from carbonate bedrock with pH values between 7.0 and 8.0, l total dissolved solids (TDS) and sulfate within Nevada drinking water standards, and water quality dominated by calcium/magnesium bicarbonate. Murry Springs had pH values of 7.38 and 7.77 with sulfate below 15 mg/L and TDS under 250 mg/L in 1994 (BLM, 1994a). The water was dominated by calcium/magnesium bicarbonate and metal values were within Nevada drinking water standards. Ward Mountain Springs had water chemistry similar to Murry Springs.

Table 4-4 Nevada Water Quality Standards

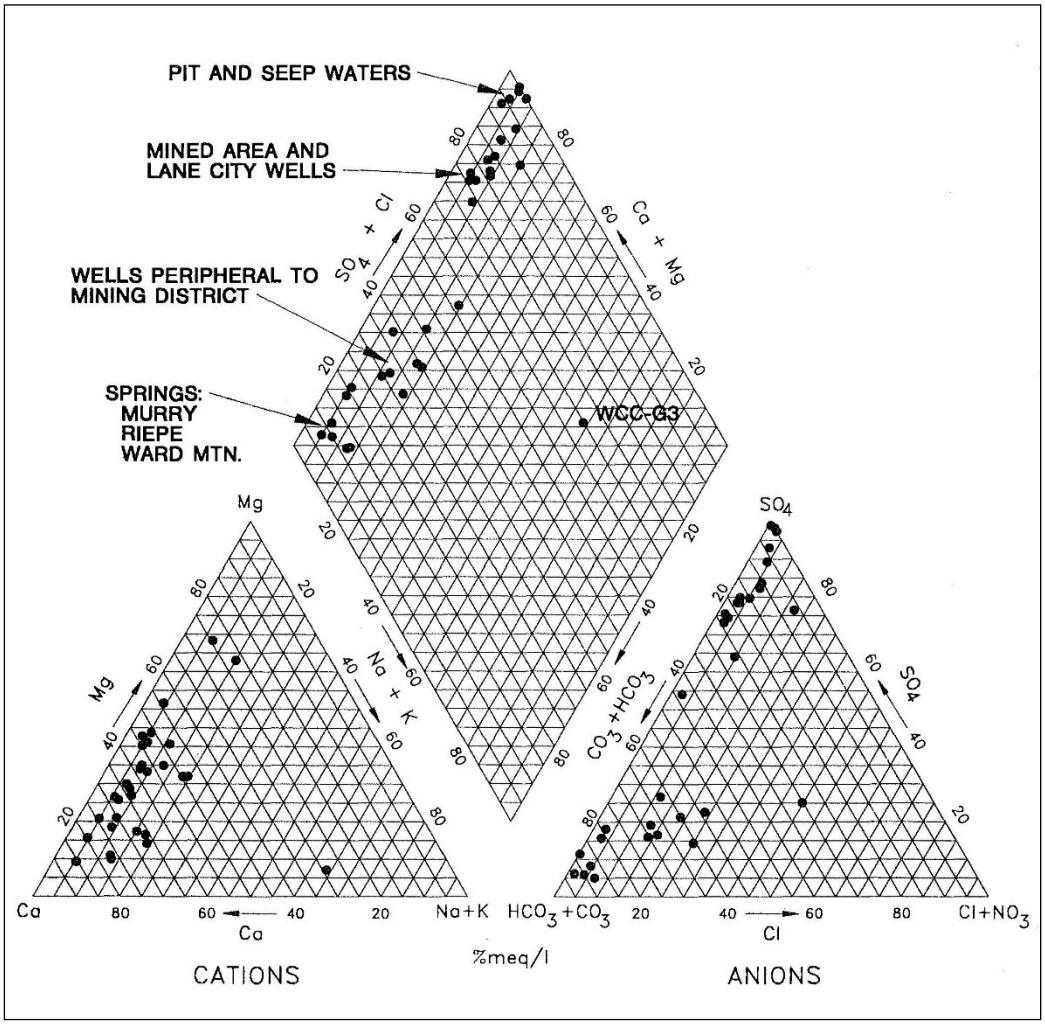
Constituent (mg/L)[1]	Groundwater		Surface Water			
	Nevada Drinking Water Standards		Municipal or Domestic Supply	Nevada Agriculture		Aquatic Life
	Primary MCL	Secondary MCL		Irrigation	Livestock Watering	
Physical Properties						
Dissolved Oxygen	--	--	Aerobic	--	Aerobic	5.0
Color (color units)	--	15[3]	75	--	--	--
TDS (at 180°C)	--	500[4]; 1,000[3]	500[4]; 1,000[3]	--	3,000	--
Turbidity (NTU)*	--	--	--	--	--	--
Inorganic Nonmetals						
Ammonia (unionized) (Total NH3 as N)	--	--	0.5	--	--	--
Chloride	--	250[4]; 400[3]	250[4]; 400[3]	--	1,500	--
Cyanide (as CN)	0.2	--	0.2	--	--	--
Fluoride	4.0	2.0[4]	--	1.0	2.0	0.0052[5]
Nitrate (as N)	10	--	10	--	100	--
Nitrite (as N)	1.0	--	1.0	--	10	--
pH (standard units)	--	6.5-8.5[3]	5.0-9.0	4.5-9.0	6.5-9.0	6.5-9.0
Sulfate	--	250[4]; 500[3]	250[4]; 500[3]	--	--	--
Metals[6]/Elements						
Aluminum	--	0.05[3]-0.2[4]	---	--	--	--
Antimony	0.006	--	0.006	--	--	--
Arsenic (total)	0.01	--	0.01	0.10	0.20	0.18[5,7]
Barium	2.0	--	2.0	--	--	--
Beryllium	0.004	--	--	0.10	--	--
Boron	--	--	--	0.75	5.0	--
Cadmium	0.005	--	0.005	0.01	0.05	0.0006[5,8]
Chromium (total)	0.1	--	0.1	0.10	1.0	0.015[5,8]
Copper	1.3[9]	1.0[3]	--	0.20	0.50	0.0065[5,8]
Iron	--	0.3[4]; 0.6[3]	--	5.0	--	1.0
Lead	0.015[9]	--	0.05	5.0	0.10	0.0004[5,8]
Magnesium	--	125[4]; 150[3]	--	--	--	--
Manganese	--	0.05[4]; 0.1[3]	--	0.2	--	--
Mercury	0.002	--	0.002	--	0.01	0.00012[5]

Constituent (mg/L)[1]	Groundwater		Surface Water			
	Nevada Drinking Water Standards		Municipal or Domestic Supply	Nevada Agriculture		Aquatic Life
	Primary MCL	Secondary MCL		Irrigation	Livestock Watering	
Nickel	0.1	--	0.134	0.20	--	0.087[5,8]
Selenium	0.05	--	0.05	0.02	0.05	0.005[5]
Aluminum	--	0.05[3]-0.2[4]	---	--	--	--
Antimony	0.006	--	0.006	--	--	--
Silver	--	0.1[3]	--	--	--	0.0014[5,8]
Thallium	0.002	--	0.013	--	--	--
Zinc	--	5.0[4]	--	2.0	25	0.584[5,8]

[1]Units are milligrams per liter (mg/L) unless otherwise noted.
[2]MCL = Maximum contaminant level. Federal primary standards that existed as of July 1, 2009 are incorporated by reference in NAC 445A.4525.
[3]Nevada secondary MCLs.
[4]Federal secondary MCLs.
[5]96-hour average.
[6]The standards for metals are expressed as total recoverable unless otherwise noted.
[7]Standard for arsenic (III).
[8]Standard is dependent on site-specific hardness; displayed value is based on a hardness of 60 mg/L as calcium carbonate (CaCO3). (See NAC 445A.144 for equations.)
[9]Value is action level for treatment technique for lead and copper.
*NTU = nephelometric turbidity units.
Sources: 40 CFR 141.51; 40 CFR 143.3; NAC 445A.119, 445A.144, 445A.453, and 445A.455.

Reipe and Lyons springs are within Nevada drinking water standards. Lyons Springs has pH values from 6.5 to 7.64, with TDS below 300 mg/L and sulfate below 15 mg/L. Similar to historic flow from Murry Springs, the water is calcium/magnesium bicarbonate water with low metal values. Riepe Springs is similar to Lyons Springs with pH in the 7.35 to 7.8 range and TDS below 200 mg/L and sulfate below 10 mg/L. Ragsdale and Giroux Springs have no historic data. A hand-dug well near Giroux Springs exceeds Nevada drinking water standards for iron and has a pH value around 9.0 (BLM, 1994a). RNMC currently samples process waters, tailings and pit lake waters, and groundwater in compliance with its NDEP WPCP requirements and provides quarterly reports with sampling results to NDEP to ensure compliance with WPCP standards. Spring water quality for major elements is presented graphically in Diagram 4-1**.**

Diagram 4-1 Piper Diagram of Baseline Water Chemistry for Wells and Springs near the Robinson Mine



Source: BLM, 1994a – Appendix B, Figure B-1

4.6.1.3 Groundwater Resources

4.6.1.3.1 Regional Groundwater System

Groundwater in the Egan Range, the Robinson Mining District, and the Plan boundary occurs primarily in Paleozoic limestone and secondarily in the alluvial gravels of the stream valleys. Groundwater in the alluvial valleys, such as Robinson Canyon (Gleason Creek) and Giroux Wash, is unconfined and found at varying depths in the gravels depending on topography, the permeability of the gravels, and existing mine-related water management. Groundwater in the carbonate rock (limestone) is both confined and unconfined.

The Plan boundary falls within the Carbonate-Rock Province of the Great Basin Aquifer System (Prudic et al., 1995). Groundwater flow is controlled by two main hydrologic regimes: 1) thick alluvial sediments filling the basins or valleys between the high ranges, and 2) Paleozoic carbonate rocks (limestone) that are exposed within the mountain

ranges and lie beneath the alluvial sediments of the basins. Recharge to these two main hydrologic regimes comes principally from precipitation in the mountain ranges. Snowmelt recharges the carbonate aquifers directly, and surface flow down mountain streams reaches the alluvial valleys and descends into the coarse alluvium along the mountain fronts to recharge the alluvial aquifers. Rainfall also contributes to recharge in both aquifer systems. Within the carbonate rocks, there is a deep groundwater flow system that transfers water between basins and occasionally surfaces along major faults.

Water is lost from the mountain ranges by surface flow in streams, evaporation, plant transpiration, and especially by subsurface flow through the carbonate aquifers. Faults, karst topography (open cavities and caves within the limestone), and solution cavities along bedding planes allow fluid flow. Water is lost from the basins mainly by evaporation and plant transpiration. Water is also lost by deep subsurface flow in the carbonate rocks out of one region and into another. Although some basins are closed and thus do not allow flow out of the basin hydrologic system, many basins in eastern Nevada are at least partially open and participate in the general deep subsurface flow of water from north to south across southeastern Nevada (Prudic et al., 1995).

The pre-mining (pre-1994) local groundwater flow system in the Robinson Mining District was dominated by two main components: 1) a groundwater mound or high beneath Saxton Peak, and 2) a shallow groundwater flow divide that follows the ridge crest south of Ruth that contains the Tripp/Veteran Pit (Figure 4-2). Shallow groundwater south of this divide, including the Giroux Wash area, would flow to the south. Shallow groundwater north of the divide would flow to Robinson Canyon. Similarly, shallow groundwater would flow from Saxton Peak toward the Kimbley and Wedge pits (both of which have been largely backfilled) and then toward the north and Robinson Canyon. The Jupiter fault acts as a barrier to flow and thus prohibits flow from Saxton Peak into Liberty and Ruth pits. Groundwater also flows from Saxton Peak to Murry Springs.

4.6.1.3.2 Local Groundwater System

Within the Robinson Mining District, groundwater can be found in the Paleozoic limestone (carbonate aquifer) and in the alluvium of Giroux Wash and Gleason Creek (alluvial aquifer). Groundwater in the alluvial aquifer is unconfined and flow is controlled by elevation of the water table and permeability differences within the alluvial sediments. Groundwater in the carbonate aquifer can be confined (under pressure) or unconfined, and flow is controlled by permeability variations within the Paleozoic limestone, faults, mineralization and alteration, and intrusion of the late Cretaceous stocks. The hydrostratigraphic units in the Robinson Mining District parallel lithology rather closely. Besides the alluvium, the main units controlling groundwater flow are limestone, shale, and sandstone along with the intrusive quartz monzonite stocks.

<u>Carbonate rocks</u>: located throughout the entire Robinson Mining District and extending southward and northward from the district. These are the primary water-bearing units in the district and have substantial capacity to transmit groundwater, but generally low

storage capacity (Schlumberger, 2014). Key carbonate units are the Ely limestone (main aquifer in South Hydrogeologic Block), Guillemette limestone, Riepe Springs Formation, and portions of the Arcturus Formation. Carbonate rocks have good water quality that meets Nevada drinking water standards.

Sedimentary rocks: these include the sandstone and shale of the Arcturus Formation, the Rib Hill Sandstone, and the Chainman Shale. Sedimentary rocks are sandstone, shale, and siltstone with minor limestone units. Interbedding is common and results in local perched water zones. Permeability is generally low and the Chainman Shale acts as an aquitard.

Mineralized and intrusive rocks: these include stocks, rhyolite flows, hornfels, and skarn produced by heating and mineralization of shale (hornfels) and carbonate rock (skarn) adjacent to intrusive stocks and mineralized areas. These units are impermeable and transmit water only along faults and fractures (secondary permeability).

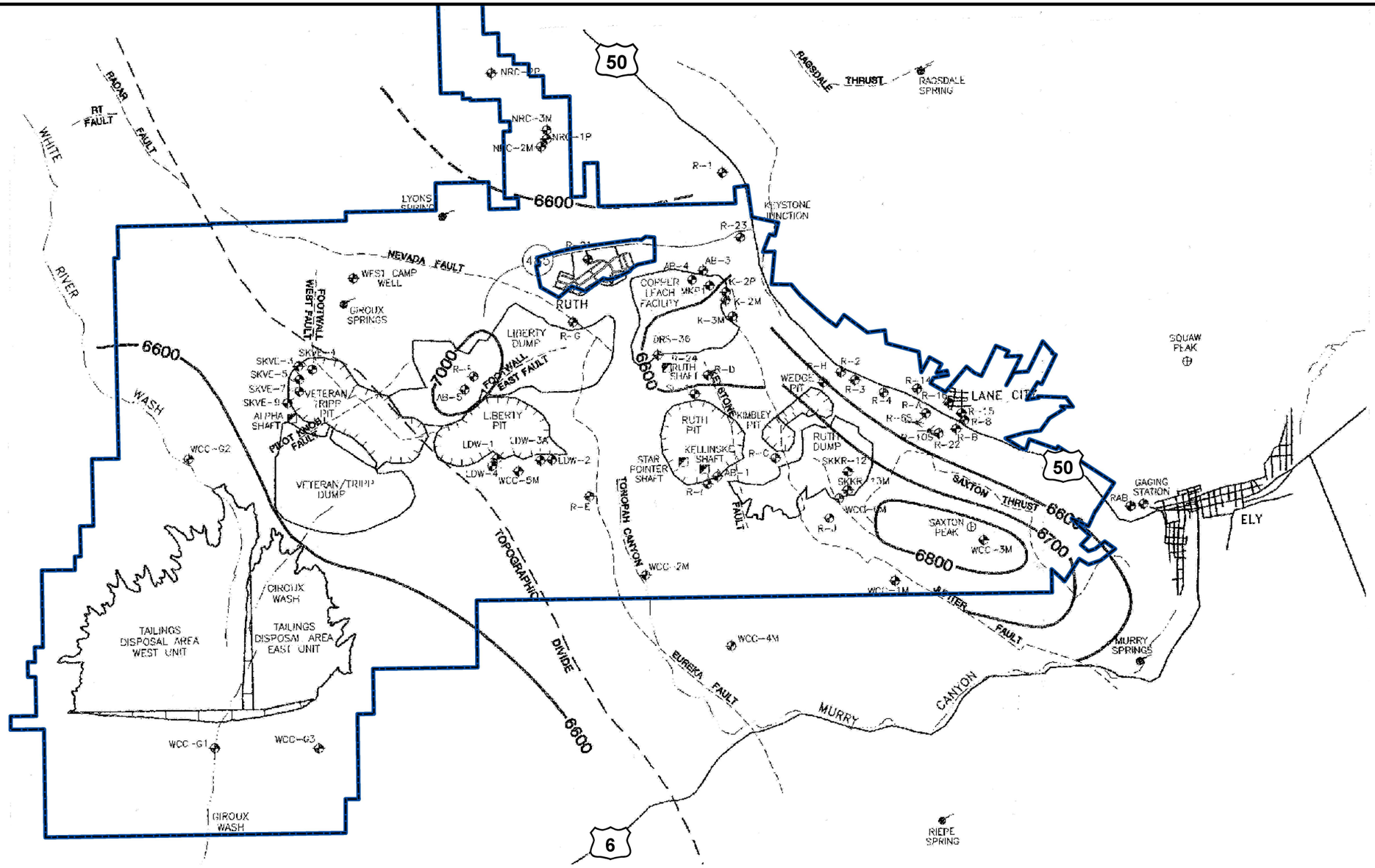
Alluvial units: in contrast to the basin sediments of Steptoe Valley, White River Valley, Robinson Canyon, and Giroux Wash, alluvial units within and surrounding the mine area are generally discontinuous (e.g., Copper Flats/Lane City area) and have varying permeability. Depending on topography and geologic structure, some of these alluvial units receive discharge from bedrock units and others represent recharge pathways to bedrock units.

The groundwater system within the Robinson Mining District can be divided into discrete hydrochemical compartments, referred to as hydrogeologic blocks, based on groundwater levels, flow patterns, water chemistry, and bounding geologic structures. Geomega (1997) delineated 12 hydrogeologic blocks which have formed the basis for permitting with the NDEP (Schlumberger, 2014). Water quality samples from these hydrogeologic blocks prior to commencement of mining in 1994 serve as the basis for determining background water quality and estimating groundwater degradation due to mining as required by RNMC's WPCP. These 12 hydrogeologic blocks are shown in Figure 4-5 along with current groundwater levels in the district.

4.6.1.3.3 Hydraulic Properties

The hydraulic properties of rock in the Robinson Mining District have been evaluated through pumping tests by various investigators and reported in the 1994 FEIS (BLM, 1994a). Hydraulic properties vary within the carbonate rocks due to alteration, mineralization, and faults. Limestone, such as the Ely and Arcturus, have transmissivities of 100,000 to 150,000 gallons per day per foot in the Keystone area, which is to the north of the mineralized area. Hydraulic conductivities range from 18 to 25 feet per day. Altered and mineralized limestone rocks have hydraulic conductivities as low as 0.1 to 0.3 feet per day (silicified Ely and Arcturus limestones).

The hydraulic conductivity of alluvium in Gleason Creek varies depending on lithology from 0.08 to 3.1 feet per day. The unfractured monzonite porphyry is very tight and of low permeability, with a hydraulic conductivity of 0.05 feet per day. The alluvium of Giroux Wash has a hydraulic conductivity in the range of 0.02 to 3.7 feet per day.



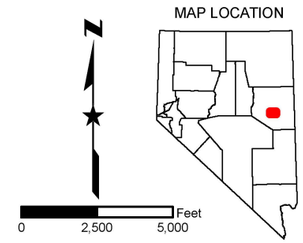
Source: BLM, 1994

FIGURE 4-2 EXISTING GROUNDWATER LEVELS

KGHM
ROBINSON MINE EXPANSION PROJECT

- Plan Boundary
- Well
- Spring
- Adit Seep

MAP LOCATION



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Hydraulic conductivities of the alluvium in Steptoe Valley range from 400 feet per day in the coarser alluvium to as low as 0.1 foot per day near the edges of alluvial fans. Thus, the ability of rocks in the Plan boundary to transmit water varies considerably and is dependent in part on fracturing and proximity to mineralization. Pit walls and mineralized/altered rock in the Robinson Mining District generally have low hydraulic permeabilities, while faults and underground mine workings can carry considerable quantities of water.

4.6.1.3.4 Groundwater in the Mine Pit Areas

The geology of the open pit areas is complicated by many intersecting faults, and fluid flow in the subsurface is further complicated by an extensive network of interconnected underground workings totaling many miles (Kennecott mine records). For example, during construction of the Deep Ruth Shaft, pumping at a rate of only 15 gpm in unmineralized and unfractured rock was required to reach an elevation of 6,554 feet AMSL. Pumping had to be increased to 1,400 gpm as the shaft was driven through fractured monzonite porphyry. At an elevation of 6,383 feet AMSL, a fault was encountered that flooded the shaft at rates up to 10,000 gpm. In contrast, the Star Pointer Shaft, which is adjacent to the Ruth Shaft, was completed in mineralized rock with only minor dewatering (BLM, 1994a). A similar situation was encountered with the Kellinske Shaft, located south of the Ruth Shaft. Construction in unmineralized and unfractured rock required 300 to 500 gpm for dewatering. When a fault was encountered at 6,400 feet AMSL, pumping had to be increased to 1,200 to 1,400 gpm.

Alteration, in the form of skarn and hornfels, and mineralization adjacent to mine pits tend to limit the permeability of rock within and around mine pits through deposition of fine-grained, chemically weathered material in pores and fractures. Faults and underground mine workings often offset this low permeability and allow for groundwater movement into pits as these old workings or structures are encountered. For example, historic mine records indicate that the Deep Ruth Shaft and the Kellinske Shaft are connected beneath the Ruth Pit at the 6,105 foot AMSL level (BLM, 1994a). The hydraulic conductivity of altered and mineralized rocks adjacent to the Ruth Pit is low, suggesting that much of the groundwater flow into this pit is through faults and intercepted historic underground workings. Thus, groundwater flow into mine pits during mining is dependent on the static water level relative to the mine pit depth and the permeability of the surrounding rock. Faults and historic working affect this groundwater inflow. After cessation of mining, the pits with pit bottoms below the pre-mining static water level will eventually fill with water and groundwater inflow will once again be controlled by faults, any remaining historic workings, and the permeability of the remaining wall rock in the pits.

4.6.1.3.5 Groundwater Quality

Groundwater quality in the Robinson Mining District has been characterized by a number of investigators over the years, beginning with Dames and Moore (1990) and then more detailed investigations by PTI (1994) and Geomega (1997). Groundwater quality data available in 1993 were summarized in the 1994 FEIS (BLM, 1994a). The studies completed by Geomega (1997) provide the most detailed evaluation of

groundwater quality for major and minor elements and the stable isotopes of oxygen and deuterium. This section will summarize the findings of older groundwater quality studies and focus on the geochemical evaluation of Geomega (1997).

Groundwater quality studies available in 1994 and summarized in the 1994 FEIS (BLM, 1994a) show that groundwater in the Robinson Mining District ranges from calcium sulfate to calcium bicarbonate dominated water, depending on whether the sampling wells are screened in mineralized and altered rock, leading to calcium sulfate water, or screened in unmineralized limestone units, leading to calcium bicarbonate water with generally low metal contents.

Pit water chemistry showed a range of pH, TDS, and sulfate values. The Liberty Pit had pH values from 2.9 to 5.6 with TDS ranging from 4,100 to 6,400 mg/L and sulfate from 3,000 to 3,900 mg/L. The Ruth and Veteran Pits showed similar low pH values and elevated TDS and sulfate, with TDS up to 11,400 mg/L and sulfate up to 5,800 mg/L. The Kimbley Pit had circum-neutral pH values with TDS in the 1,800 mg/L range and sulfate in the range of 3,500 mg/L.

Historic water quality in the mining district has reflected the mineralogy of WRDs, mining practices such as copper leaching of waste rock, and pit inflow water. Pit water chemistry in the Liberty, Veteran, Ruth, and Kimbley pits prior to transfer of water from the Liberty Pit to the Ruth Pit in 1993 was acidic and exceeded Nevada drinking water standards for TDS, sulfate, and metals such as cadmium, chromium, copper, iron, manganese, mercury, and zinc. These waters were dominated by calcium sulfate and reflected the reaction of surface and groundwater with mineralized wall rocks and waste rock in the pits. Most of the pit lake waters were within Nevada agricultural standards, except for fluoride. Mining since 1993 has removed much of the waste rock from pits and improved water quality. Pit water in the Ruth pit for April-June of 2016 (RNMC, 2016d) showed TDS values from 880 to 2,300 mg/L with sulfate in the range of 560 to 1,500 mg/L. The pH ranged from 6.5 to 7.25. Metal values were low and within Nevada agricultural water standards and fluoride ranged from 1.9 mg/L to 3.8 mg/L.

Wells screened in unmineralized bedrock units generally had circum-neutral pH values with TDS below 1,000 mg/L and sulfate below 500 mg/L. Metal values were low in these waters. Wells screened in mineralized areas had pH values as low as 2.3, but generally in the range of 5.0 to 7.0 with TDS in the range of 500 to 3,000 mg/L and sulfate in the range of 500 mg/L to 2,000 mg/L. Metal values increase in high sulfate waters with low pH values.

The studies of Geomega (1997) differentiated waters in the Robinson Mining District and led to the identification of 12 separate hydrogeological blocks based partially on groundwater chemistry, as discussed in Section 4.6.1.3.2 Local Groundwater System, above. Geomega (1997) showed that, based on major ions, groundwater could be differentiated into three main groups based on sulfate content and calcium and sodium content. Using stable isotopes, Geomega (1997) was able to further separate waters in the Robinson Mining District based the level of evaporation and whether they were the result of meteoric water recharge. The differentiation of groundwater regimes in the

Robinson Mining District and the segregation of groundwater chemistry into 12 hydrogeologic blocks becomes important when mine pits begin to refill after the cessation of mining. The hydrogeologic blocks and their respective water types that are connected to an individual pit will determine the final pit lake chemistry.

4.6.1.4 Robinson Mining District Geochemistry

The NDEP WPCP requires RNMC to identify anticipated quality of waters to be impounded in the pits at closure of the facility, and the potential of the impoundments to degrade the waters of the State over time. To comply with the requirements of the NDEP WPCP, RNMC contracted with Schlumberger Water Services (Schlumberger) to develop a groundwater flow and pit lake geochemical model for the expected pit configurations at the end of mining under the Proposed Action.

As part of the requirement to develop pit lake geochemical models for pits that will have pit lakes as a result of the proposed mining at Robinson, Schlumberger (2014) completed 152 new static acid-base accounting (ABA) studies of rocks expected to form the pit walls of the future post-mining pits and also completed 29 humidity cell tests (HCTs) and 24 Nevada meteoric water mobility procedure (MWMP) tests. They also installed three new wells at the request of the NDEP (Schlumberger, 2014). The results of the ABA tests are summarized below. Table 4-5 and Table 4-6 show the ABA results from Schlumberger (2014).

Table 4-5 Site-wide ABA Characterization by Lithology

Row Labels	Number of Samples	ANP : AGP Geometric Mean	ANP : AGP Maximum	ANP : AGP Minimum
Kmp	75	0.16	5.6	0.001
Liberty East Dump	22	1.11	223	0.005
Liberty Buttress, Dump Rubble, and Watson Slide	11	1.28	452	0.013
Mc	117	0.49	61.8	0.001
Pel	30	32.0	3,210	0.012
Skarn	60	1.15	2,533	0.000
Prh	64	95.8	2,819	0.029
Ruth Dumps	6	0.62	162	0.002
Tr	14	1.54	52	0.200
Vet Dumps	1	223	-	-
Kimbley Dumps	6	0.18	442	0.009

Source: Schlumberger, 2014

Table 4-6 Pit-Specific ABA Characterization by Lithology

Row Labels	Number of Samples	ANP : AGP Geometric Mean	ANP : AGP Maximum	ANP : AGP Minimum
Liberty				
Kmp	7	0.17	2.5	0.002
Liberty East Dump	22	1.11	223	0.005
Liberty Buttress, Dump Rubble, and Watson Slide	11	1.28	452	0.013
Mc	18	0.76	62	0.002
Pel	5	1.97	15	0.03
Skarn	16	0.31	2.5	0.002
Prh	5	559	2,819	7.3
Tr	6	2.33	52	0.4
Ruth and Kimbley				
Kmp	62	0.14	3.6	0.001
Mc	93	0.45	4.4	0.001
Pel	20	29	3,210	0.012
Skarn	35	1.50	2,533	0.00
Prh	58	95	2,123	0.10
Ruth Dumps	6	0.62	162	0.002
Tripp/Veteran				
Kmp	6	0.79	5.6	0.05
Mc	6	0.67	5.4	0.27
Pel	5	732	1,177	362
Skarn	9	4.37	252	0.012
Prh	1	0.03	-	-
Vet Dumps	1	223	-	-

Source: Schlumberger, 2014

HCT results after 20 weeks for the Chainman Shale and the Skarn rocks (Schlumberger 2014) are summarized in Table 4-7.

The geochemical characterization test results suggest that the Chainman Shale (Mc), the Skarn rocks (Skarn), and the mineralized Cretaceous monzonite porphyry (Kmp) have the potential to be acid generating. The HCT tests on the Chainman Shale and the Skarn rocks suggest that rocks that fall in the ABA Uncertain range may be mildly acid generating and not yield effluent with elevated metals. Rocks that fall in the ABA PAG range appear to be acid generating and have the potential for effluent elevated in metals such as iron and copper as wells as sulfate and TDS.

Table 4-7 PAG and Uncertain HCT Summary (Week 20)

Sample ID	Rock Type	Week	pH (s.u.)	Aluminum (mg/L)	Copper (mg/L)	Iron (mg/L)	Sulfate (mg/L)	TDS (mg/L)	Classification
LPR-7	Mc	0-20**	2.9*	119	36.8	230	1,736*	2,390*	PAG
MLP-6	Mc	0-20**	5.6*	0.694	0.241	0.389	530*	793*	Uncertain
QC07-012 358.7-385.9	Skarn	20	3.23	0.55	0.85	0.76	35	41	Uncertain
QC07-12 260.8-280.6	Skarn	20	3.7	0.28	0.55	0.15	9	21	Uncertain
QR08-001 515-535	Skarn	20	4.04	0.13	95	5.6	610	900	PAG
QR08-032 670-700	Mc	20	2.72	41.1	0.408	222	1690	2280	PAG
QR11-116 40-60	Mc	20	4.68	1.3	1.7	0.18	150	180	Uncertain
QR11-226 90-110	Liberty Dump	20	4.39	0.1	0.065	0.21	14	30	Uncertain

Source: Schlumberger, 2014
*Calculated values to create electrically neutral water sample
**Composite cumulative week 0-20 sample

Carbonate Rocks

The primary carbonate rocks that will form pit walls in the post-mining pits or comprise the hydrogeologic blocks that will provide water to the post-mining pits are the Ely limestone, the Guillemette limestone, Riepe Springs limestone, and the Arcturus Formation.

Ely limestone (Pel): The Ely limestone is the primary water-bearing carbonate rock in the Robinson Mining District and the main lithologic component in the South Block aquifer. The Ely limestone is up to 2,000 feet thick and has groundwater elevations in the range of 6,630 to 6,645 feet AMSL. The aquifer in the Ely limestone is very permeable and dominated by calcium bicarbonate water that meets Nevada drinking water standards. Wells RW-6P and RW-7P supply water to the town of Ely at an annual rate of approximately 989 million gallons/year (Schlumberger, 2016b). Geochemical tests show that the Ely limestone is acid-neutralizing with an average acid neutralizing potential (ANP): acid generating potential (AGP) ratio of 32, which places it well above the BLM recommended ratio of 3:1 for classifying a rock as non-PAG. Only when the Ely limestone is altered to a silica-pyrite skarn (Skarn) is the unit acid generating and classified as PAG. The skarn is found in the pit walls of some of the existing pits.

Arcturus Formation (Pau and Pal): This unit is found between the Liberty and Ruth pits and contains both limestone units as well as sandstone and siltstone units. The Arcturus is often treated as a Sedimentary Rock in the classification of units at Robinson (Schlumberger, 2014). The Arcturus Formation is 2,700 feet thick with the upper Arcturus (Pau) being 1,500 feet thick and the lower Arcturus (Pal) being 1,200 feet thick. Interbedded sandstone, siltstone, and limestone beds create perched aquifers within this unit (Schlumberger, 2014). Limestone is found mainly in the lower Arcturus (Pal). This unit is not well exposed in mine pits and is characterized as non-PAG.

Sedimentary Rocks

The main sedimentary rocks found between pits and within pit walls at Robinson are the Chainman Shale (Mc) and the Rib Hill Sandstone (Prh).

Chainman Shale (Mc): This unit composes the wall rock on the north walls of the Ruth Pit, Liberty Pit, and the Tripp/Veteran Pit. The unit is a black, fissile shale 400 to 1,500 feet thick. The Chainman shale is considered PAG material under BLM (2010b) criteria, with a site-wide ANP:AGP ratio of 0.58. In 2015, the NDEP approved an ANP:AGP ratio of 0.3, instead of their standard ratio of 1.2, for the Chainman Shale based on pit lake studies reported in Schlumberger (2014). Under this revised criteria, the Chainman Shale would not be classified as PAG by the NDEP. When altered to hornfels due to heat from the intrusive stocks, or altered with pyrite, the Chainman Shale can be a major source of acid rock drainage (ARD) producing acid leachate with elevated metals (Table 4-7).

Rib Hill Sandstone (Prh): This unit is found in the South Block and in the pit walls of the Ruth and Tripp/Veteran Pits. It is a fine-grained sandstone about 1,100 feet thick. The unit is characterized as non-PAG with a site-wide ANP:AGP ratio of 96.

Rib Hill Sandstone (Prh): This unit is found in the South Block and in the pit walls of the Ruth and Tripp/Veteran pits. It is a fine-grained sandstone about 1,100 feet thick. The unit is characterized as non-PAG with a site-wide ANP:AGP ratio of 96.

Mineralized and Intrusive Rocks

Four mineralized units in the Robinson Mining District have the potential to influence post-mining pit lake water quality. These are the intrusive quartz monzonite that forms the mineralized stocks that host the copper ore bodies, the mineralized skarn formed near the intrusive stocks by alteration of the Ely limestone, the hornfels units formed by baking and mineralization of the Chainman Shale, and the intrusive rhyolites.

Mineralized bedrock is hydraulically characterized by variable water elevations and compartmentalization of groundwater due to intense faulting and fracturing. Groundwater in mineralized bedrock flows along fractures and faults and thus enters post-mining pits along these structures. Water levels are variable and range from 6,800 to 7,030 feet AMSL near the Liberty Pit and from 6,550 to 6,700 feet AMSL near the Ruth Pit (Schlumberger, 2014).

Quartz Monzonite Porphyry (Kmp): This unit hosts the copper ore bodies and is responsible for the alteration and mineralization in the district (Schlumberger, 2014). The intrusive is usually altered and mineralized, highly fractured, and often faulted, leading to increased secondary permeability and thus transmission of groundwater. The unit is considered PAG material with a site-wide ANP:AGP ratio of 0.16. The ARD potential of the quartz monzonite, based on HCT studies, is highly variable and most samples tested by Schlumberger (2014) did not generate acid leachate.

Skarn and Hornfels: Skarn is generated by the alteration and mineralization of the Ely limestone by the intrusive quartz monzonite; hornfels is formed by the baking and mineralization of the Chainman Shale. Both have low permeability and both can be considered PAG material under BLM (2010b) criteria. Under revised NDEP criteria, the skarn and the hornfels would fall in the uncertain category and not be classified as PAG because their average ANP:AGP ratio is greater than 0.3. The skarn has an average site-wide ANP:AGP ratio of 1.2 and the hornfels a site-wide ratio of 0.58. Skarns with silica-pyrite alteration will generate ARD with elevated metals. Non-silica/pyrite altered skarn did not generate ARD in the HCT tests (Schlumberger, 2014). Hornfels will generate ARD with elevated metals and the hornfels is considered to have the highest potential for ARD generation in the Robinson Mining District (Schlumberger, 2014).

Rhyolite (Tr): The rhyolite occurs as both intrusive dikes and plugs and as extrusive flows in the Robinson Mining District. The rhyolite is found discontinuously throughout the district, occasionally in pit walls, and is classified as PAG material based on the ABA tests. The HCT and MWMP tests did not show ARD generation.

Alluvial Units

There are two main alluvial units in the Robinson Mining District, the Giroux Wash Alluvium and the Lane City Alluvium. Both contain groundwater and both are non-PAG and not found in pit walls.

Thus, mineralized and altered rocks within the Robinson Mining District have the potential to generate ARD metal leaching when exposed in post-mining pit walls or placed in WRDs. The bulk of the rock in the Robinson Mining District is unaltered limestone and this limestone, particularly the Ely limestone, has the capacity to neutralize ARD and minimize the leaching of metals from pit walls and waste rock. The key element for any given pit or waste rock facility is the balance between acid neutralizing limestones and the potentially acid generating altered and mineralized rocks.

4.6.2 Environmental Effects

4.6.2.1 Proposed Action

Mining at the Ruth Pit complex is currently ongoing (Ruth West and Ruth East pits). Under the Proposed Action, the pits of this complex would be combined into a single large pit above the 6,550 feet AMSL elevation. Formation of a single large post-mining pit will allow groundwater entering the Ruth East Pit to overflow and enter the backfilled Kimbley Pit. Mining of these pits and formation of a single large post-mining pit will result in: (1) removal of waste rock and tailings material that was used to backfill the historic Ruth Pit; and (2) allow groundwater from the South Block to enter the enlarged Ruth Pit complex and provide acid-neutralizing water to offset the PAG material in the post-mining pit walls.

4.6.2.1.1 Surface Water

The Proposed Action would have negligible effects on surface waters beyond those under the authorized Plan. During operations, mine-impacted waters would continue to be managed in accordance with the current NDEP WPCP, and ponds and diversions would remain in place and functional. During reclamation, the same techniques as are currently proposed would be implemented. For example, runoff would continue to be diverted around the Giroux Wash TSF and runoff from WRDs would be directed to storm water ponds.

With implementation of the Proposed Action, there would likely be an increased need to discharge mine-intercepted water to Gleason Creek because the proposed Ruth Pit expansion would collect more water than authorized operations collect. A discharge permit for this release has been in place since 2012; discharge has recently resumed after being out of service for a few years. All NDEP requirements, including any limits on flow rate, constituent loading, and effluent concentrations, would be met for any future discharge. Thus, there would be no impact to Gleason Creek, except in the unlikely event of a release that does not meet these requirements.

Overall, impacts to surface waters and springs are predicted to be negligible to minor and long-term.

4.6.2.1.2 Groundwater (Pit Lake Water)

Mining at the Ruth Pit complex is authorized as three smaller, separate pits; Ruth West, Ruth East, and Kimbley (now backfilled), as shown on Figures 1.1, 1.2, 1.3, and 1.4 of Schlumberger (2016a; Appendix B). Ruth West Pit is the largest of the three pits and is

located where the historic Ruth pit lake had previously been located. Recently renewed mining has removed the tailings disposed of in the historic Ruth Pit, and greatly altered the hydrologic and geochemical regimes by intersecting the open pit with the South Block, which has alkaline groundwater in contact with the Ely limestone. Under the authorized Plan, the final pit floor elevation at Ruth West is planned at 6,050 feet AMSL and the intersection of the southern pit wall with the South Block is estimated to be at an elevation of approximately 6,450 feet AMSL, which is about 190 feet below the natural water table in the South Block (6,641 feet AMSL). Upon cessation of mining and pit dewatering under the authorized Plan, groundwater from the South Block would flow into the Ruth Pit complex and contribute to filling the Ruth West and East pits. Groundwater from the South Block would comprise about 80 percent of the water entering the Ruth West Pit (Schlumberger, 2014). Once the Ruth West pit lake recovers to the 6,550 feet AMSL elevation, it is predicted to flow into the Ruth East Pit to form a unified pit lake.

Mining at the Ruth East Pit is authorized to lower the final pit floor elevation to 6,150 feet AMSL. The southern pit wall is authorized to penetrate the South Block at an elevation of approximately 6,350 to 6,500 feet AMSL, which is about 140 to 290 feet below the natural water table in the South Block (6,641 feet AMSL). Groundwater derived from the South Block would be the major contributor to filling Ruth East from the South Block itself or via overflow from Ruth West. The combined Ruth West and Ruth East pits would flow into and fill the Kimbley Pit (now backfilled) upon recovery above 6,550 feet AMSL.

The Kimbley Pit was mined to 6,400 feet AMSL. The septum dividing Kimbley Pit from the Ruth East Pit was lowered to 6,550 feet AMSL elevation. Mining removed the old Kimbley WRD, which had been identified as a source of ARD. The WRD resided in the northwest corner of the pit extending to a depth of 6,450 feet AMSL. The waste rock material that was excavated was relocated to WRDs that will be further encapsulated with non-PAG material above the water table, in accordance with the approved CWRMP (RNMC, 2014b). The Kimbley Pit is now backfilled.

RNMC contracted with Schlumberger to develop models for post-mining pit lake water quality for the proposed Ruth Pit complex and the other pits in the Robinson Mining District. Schlumberger (2014 and 2016a) used Goldsim (2010), MODFLOW-SURFACT (HGL, 2011), and PHREEQC (Parkhurst, 1995) to model the Proposed Action and associated pit backfill alternatives and predict the post-mining pit lake water quality in mine pits that would have pit lakes after cessation of mining.

Ruth Pit Complex: The proposed expansion of Ruth West and Ruth East pits was identified as the Ruth West Phase 4 (Ruth West 4) and Ruth East Phase 3 (Ruth East 3) mining phases, respectively. Mine expansion would be confined to the Ruth East and Ruth West pits and would extend the mine life through the EOML 2022. The Kimbley Pit has been backfilled to the 6,900 feet AMSL elevation and is continuing to receive waste rock. Non-PAG material was used to backfill 50 feet above the predicted recovery elevation (6,633 feet AMSL). Material above the 50 feet recovery elevation is composed

of PAG and non-PAG materials in accordance with NDEP-BMRR approval (NDEP-BMRR, 2015).

The proposed Ruth West 4 mine plan would deepen the pit floor to the 5,950 feet AMSL elevation. Mining would occur primarily in the western hemisphere of Ruth West with up to an additional 550 feet of mining in the pit's northwest sector. The south wall of Ruth West would also be deepened approximately 150 to 250 feet and extended to the south, as shown on Figure 1.1 of Schlumberger (2016a; Appendix B). A cross-section comparing the proposed mine expansion pit shell to the current (March 2016) configuration and previously approved life of mine (LOM) pit shell is shown on Figure 1.2 of Schlumberger (2016a; Appendix B). Ruth West 4 layback would expose additional bedrock and dump materials in the north-west sector. The Mollie Gibson WRD (an historic WRD) would be intersected during the layback, removing approximately 40 percent of the material, and exposing ALM below the Mollie Gibson WRD in the pit wall. A comparison between Ruth West 4 and previously permitted LOM pit shell lithologies is shown on Figure 1.3 of in Schlumberger (2016a; Appendix B).

Ruth East 3 mining would deepen the pit floor to the 6,100 feet AMSL elevation. Mining would occur exclusively in the east and south walls of Ruth East Pit. An east wall step out would deepen the pit by approximately 300 to 450 feet. The south wall would also be deepened 150 to 250 feet and extended, as shown in Figure 1.1 of Schlumberger (2016a; Appendix B). The Ruth East 3 layback would expose additional Ely limestone in the south wall. Non-PAG Kimbley backfill would also compose a significant portion of the exposed pit wall surface, approximately 13 percent. Relative abundances of other lithologies would be slightly reduced. A comparison between Ruth East 3 and the previously permitted LOM pit shell lithologies are provided in Figure 1.4 of Schlumberger (2016a; Appendix B).

The Ruth Pits were modeled separately with the following results (Schlumberger, 2014):

- The Ruth West base case scenario of pit lake chemistry indicates there would be no exceedances of constituents for Profile III (biological receptors) or Permit MCLs (groundwater) in Ruth West pit lake. Mining the Ruth West Pit greatly alters the hydrologic and geochemical regimes by removing the AGT disposed of in the historic Ruth Pit, and intercepting the South Block aquifer which is the dominant source of water composing the new pit lake. Based on the modeling, the effects of these two mechanisms greatly improves the water quality of the Ruth pit lake compared to the historic ephemeral pit lake present prior to the onset of recent mining.

- The Ruth East base case scenario of pit lake chemistry indicates there would be no exceedances of constituents for Profile III (biological receptors) or Permit MCLs (groundwater) in Ruth East Pit Lake. Simulated PHREEQC results are provided in Table 4-8. The pH of the base case modeled pit lake water would be around 7.8, with sulfate decreasing over time from 425 mg/L to 203 mg/L. TDS would also decrease over time from 788 to 531 mg/L. The water would be dominated by calcium sulfate, but have elevated alkalinity. The Ruth East Pit

would have a pit lake elevation of 6,633 feet AMSL after 28 years. Average annual water inflow rates would be precipitation (58 gpm), runoff (33 gpm), South Block groundwater (96 gpm), mineralized groundwater inflow (6 gpm), and Ruth West inflow (50 gpm). Outflow would be evaporation (195 gpm) and flow to the Kimbley Pit (49 gpm). No permit MCLs would be exceeded.

Table 4-8 Ruth East Pit Base Case PHREEQC Modeling Results at 10, 50, and 100 Years

Concentration (mg/L)	Profile III Reference Value	Permit MCL (Ruth Mineralized)	Ruth East – 10 Year	Ruth Combined – 50 Year	Ruth Combined – 100 Year
Ph (standard units)	6.5-8.5	6.5-8.5	7.72	7.86	7.87
Pe (oxidation potential)	--	--	4.00	1.00	-4.00
Alkalinity Total	--	--	138	183	188
Aluminum	4.47	0.2	0.00	0.00	0.00
Antimony	0.29	--	0.000	0.000	0.000
Arsenic	0.2	0.063	0.000	0.000	0.002
Barium	23.1	2	0.03	0.04	0.04
Beryllium	2.83	0.004	0.000	0.000	0.000
Boron	5	--	0.023	0.003	0.003
Cadmium	0.05	0.005	0.001	0.001	0.001
Calcium	--	--	137	64	64
Chloride	--	400	14	7	8
Chromium	1	0.1	0.00	0.00	0.00
Copper	0.5	1	0.000	0.000	0.000
Fluoride	2	4	0.63	0.45	0.52
Iron	--	10.31	0.00	0.00	1.10
Lead	0.1	0.015	0.000	0.000	0.001
Lithium	40.3	--	0.00	0.00	0.00
Magnesium	--	150	42	34	39
Manganese	377	1.375	0.5	0.2	0.2
Mercury	0.10	0.002	0.0000	0.0001	0.0001
Molybdenum	0.60	--	0.00	0.00	0.00
Nickel	171	0.1	0.01	0.01	0.02
Total Nitrogen	100	--	0.45	0.69	0.82
Phosphorus	--	--	0.02	0.00	0.01
Potassium	--	--	3.7	2.4	2.7
Selenium	0.05	0.05	0.002	0.002	0.003
Silver	--	0.1	0.000	0.000	0.000
Sodium	2000	--	25	19	22
Strontium	1127	--	0.4	0.0	0.0
Sulfate	--	709.3	425	179	203

Concentration (mg/L)	Profile III Reference Value	Permit MCL (Ruth Mineralized)	Ruth East – 10 Year	Ruth Combined – 50 Year	Ruth Combined – 100 Year
Thallium	0.032	--	0.0009	0.0003	0.0002
Tin	29.2	--	0.00	0.00	0.00
TDS	7000	1227	788	490	531
TSS	--	--	NS	NS	NS
Uranium	6.995	0.02	0.001	0.000	0.000
Vanadium	0.1	--	0.000	0.000	0.000
Zinc	25	5	0.51	0.21	0.23

Source: Schlumberger, 2014
NS indicates element was not simulated
TSS = total suspended solids

- The Ruth West Pit would have a pit lake elevation of 6,633 feet AMSL at 28 years after mining. Ruth West begins overflow to Ruth East at year 19. Water inflow to Ruth West, on an average annual basis, is precipitation (92 gpm), runoff (45 gpm), and South Block groundwater (345 gpm). Outflow is evaporation (309 gpm), overflow to Ruth East (50 gpm), and discharge to groundwater (123 gpm). No permit MCLs would be exceeded. PHREEQC base case modeling results show a pH around 7.8, sulfate increasing with time from 134 to 203 mg/L, and TDS increasing with time from 422 to 531 mg/L. The water would be dominated by calcium bicarbonate/sulfate with an approximate equal mix of bicarbonate and sulfate. The base case modeling results are provided in Table 4-9.

Table 4-9 Ruth West Pit Base Case PHREEQC Modeling Results at 10, 50, and 100 Years

Concentration (mg/L)	Profile III Reference Value	Permit MCL (Ruth Mineralized)	Ruth West – 10 Year	Ruth Combined – 50 Year	Ruth Combined – 100 Year
pH (standard unit)	6.5-8.5	6.5-8.5	7.86	7.86	7.87
pe (oxidation potential)	--	--	4.00	1.00	-4.00
Alkalinity Total	--	--	180	183	188
Aluminum	4.47	0.2	0.00	0.00	0.00
Antimony	0.29	--	0.000	0.000	0.000
Arsenic	0.2	0.063	0.000	0.000	0.002
Barium	23.1	2	0.04	0.04	0.04
Beryllium	2.83	0.004	0.000	0.000	0.000
Boron	5	--	0.001	0.003	0.003
Cadmium	0.05	0.005	0.001	0.001	0.001
Calcium	--	--	59	64	64
Chloride	--	400	5	7	8
Chromium	1	0.1	0.00	0.00	0.00
Copper	0.5	1	0.000	0.000	0.000

Concentration (mg/L)	Profile III Reference Value	Permit MCL (Ruth Mineralized)	Ruth West – 10 Year	Ruth Combined – 50 Year	Ruth Combined – 100 Year
Fluoride	2	4	0.41	0.45	0.52
Iron	--	10.31	0.00	0.00	1.10
Lead	0.1	0.015	0.001	0.000	0.001
Lithium	40.3	--	0.00	0.00	0.00
Magnesium	--	150	28	34	39
Manganese	377	1.375	0.4	0.2	0.2
Mercury	0.10	0.002	0.0000	0.0001	0.0001
Molybdenum	0.60	--	0.00	0.00	0.00
Nickel	171	0.1	0.01	0.01	0.02
Total Nitrogen	100	--	0.56	0.69	0.82
Phosphorus	--	--	0.00	0.00	0.01
Potassium	--	--	1.8	2.4	2.7
Selenium	0.05	0.05	0.003	0.002	0.003
Silver	--	0.1	0.000	0.000	0.000
Sodium	2000	--	13	19	22
Strontium	1127	--	0.0	0.0	0.0
Sulfate	--	709.3	134	179	203
Thallium	0.032	--	0.0005	0.0003	0.0002
Tin	29.2	--	0.00	0.00	0.00
TDS	7000	1227	422	490	531
TSS	--	--	NS	NS	NS
Uranium	6.995	0.02	0.000	0.000	0.000
Vanadium	0.1	--	0.000	0.000	0.000
Zinc	25	5	0.26	0.21	0.23

Source: Schlumberger, 2014
NS indicates element was not simulated

- RNMC has currently backfilled the Kimbley Pit with non-PAG material to an elevation of at least 6,683 feet AMSL, with total backfill at 6,900 feet AMSL. PAG and non-PAG material are used in the backfill above 6,683 feet AMSL and encapsulated in accordance with existing NDEP permit requirements. Only non-PAG material would be in contact with pit lake water. As a backfilled pit, the final water level in the Kimbley Pit would be at 6,633 feet AMSL and would be reached at year 32. Equilibrium inflow rates would be infiltration (2.4 gpm) and groundwater (0.2 gpm). Outflow to Ruth combined pits would be pit lake discharge (2.6 gpm). Only manganese would exceed permitted MCLs.

RNMC also ran sensitivity scenarios for an extended damage rock zone (DRZ) to evaluate the impact on pit lake water quality in the Ruth Pit complex (Schlumberger, 2016). The extended DRZ sensitivity scenario evaluates pit lake chemistry under the assumption that the DRZ thickness is increased to 50 feet. The water balance is modified to incorporate the additional volume of water rinsing a thicker DRZ. A total of

10 pore volumes is flushed from the extended DRZ. Otherwise, the simulation is identical to the Base Case scenario.

- For the Ruth West extended DRZ sensitivity case, modeling indicates there would be no exceedances of constituents for Profile III (biological receptors) or Permit MCLs (groundwater) in Ruth West pit lake. Concentrations are predicted to be slightly higher than the base case scenario for most constituents, which is expected with the additional mass loading from the extended DRZ. Results are shown in Table 3-10 of Schlumberger (2016a; Appendix B). For the Ruth East extended DRZ sensitivity case, modeling indicates there would be no exceedances of constituents for Profile III or Permit MCLs (groundwater) in Ruth East pit lake. Concentrations are slightly higher than the Base Case scenario for most constituents, which are expected with the additional mass loading from the extended DRZ. Results are shown in Table 3-11 of the Schlumberger (2016a; Appendix B).

The sensitivity analysis indicates that flushing from the DRZ using the given geochemical profiles for rock lithologies does not meaningfully change predicted pit lake chemistry. Pit lake water quality is still predicted to meet Permit and Profile III standards. Water in the pit lake is mainly composed of South Block groundwater, which is high in alkalinity and low in dissolved solids. South Block water composes 60 to 85 percent of the Ruth pit lakes, whereas that contributed by DRZ is 1.5 to 3.5 percent. The additional mass contributed by the DRZ, regular or extended thicknesses, comprises a small fraction of pit lake mass and minimally affects predicted water chemistry.

RNMC also had Schlumberger (2016a) evaluate the sensitivity of pit lake water quality to ALM in the Ruth Pit complex. The ALM sensitivity scenario evaluates pit lake chemistry under the hypothetical condition that all dump material in the Ruth West pit wall, including Mollie Gibson material and Star Pointer dumps, is acid-generating. An appropriate geochemical profile was used as a surrogate for ALM leachate. A DRZ thickness of 50 feet was used, building upon the DRZ sensitivity scenario in terms of mass loading from pit wall material. ALM chemistry would be updated in the comprehensive, final pit lake study, following completion of geochemical testing.

- For Ruth West, the ALM sensitivity indicates there would be no exceedances of constituents for Profile III or Permit MCLs (groundwater) in Ruth West pit lake. Simulated PHREEQC results are provided in Table 3-12 (Schlumberger, 2016a; Appendix B). The sensitivity scenario indicates that the contribution of mass from ALM material in Ruth West has a minor effect on pit lake chemistry. The model anticipates that leachate from ALM material would be low pH, but would also possess lower concentrations of metals and constituents because previous leaching episodes would have removed most of the leachable mass from the material. Under this situation, the impact of ALM material in terms of potential degradation of pit lake chemistry would be less than currently predicted. ALM material is being tested using HCTs, the results of which will be used to improve geochemical predictions in the comprehensive, final pit lake study.

The ALM material has a minor impact to pit lake water quality because the percentage of ALM leachate in the pit lake mass balance is small. South Block water is the major control on pit lake chemistry, composing 60 to 85 percent of the Ruth pit lakes, whereas the contribution from exposed ALM material is less than 0.5 percent.

- For Ruth East, the ALM sensitivity model indicates there would be no exceedances of constituents for Profile III (biological receptors) or Permit MCLs (groundwater) in Ruth East pit lake. Simulated PHREEQC results are provided in Table 3-12 of the Schlumberger (2016a; Appendix B).

The interim pit lake study completed by Schlumberger (2016) predicts Ruth Pit water quality for three scenarios, all of which indicate no constituent exceedances, would occur under RNMC's NDEP WPCP permit or Profile III MCLs. Thus, no water quality impacts are anticipated to the Ruth pit complex water system or to biological receptors in this assessment.

The impact of the Proposed Action on Ruth Pit complex post-mining pit lake water quality would be considered a long term and negligible to minor beneficial impact. A comprehensive pit lake study would be initiated upon the completion of ongoing HCTs or when sufficient data have been collected, in coordination with NDEP-BMRR. The final study is expected to be complete by April 30, 2017. Potential mitigation plans, which may be required based on the results of the comprehensive pit lake study, would be addressed by RNMC, as necessary.

Liberty, Wedge, and Tripp/Veteran Pits: Other mine pits in the Robinson Mining District would potentially fill with groundwater when mining and dewatering of the district cease. These other pits, although not an integral part of the Proposed Action like the Ruth Pit complex, could have pit lakes with potential water quality issues. Groundwater flow to these other pits and thus the resulting pit water quality would potentially be affected by the Proposed Action enlargement of the Ruth Pit complex. Schlumberger (2014) modeled all pits that could potentially have pit lakes to determine the probable pit lake water quality. These pits are shown on Figure 1.1 from Schlumberger (2014). Their results, along with some pit backfill alternatives, are summarized in Table 4-10 and discussed briefly below.

<u>Liberty Main Pit</u>: The final pit lake elevation would be 6,550 feet AMSL and would be reached 115 years after end of mining (2136). The pit would be a permanent groundwater sink receiving water from both mineralized bedrock and the South Block aquifer. Water inflow to the pit would be from precipitation (18 gpm), runoff (54 gpm), and groundwater inflow (3 gpm). Outflow would be pit lake evaporation (63 gpm) and seepage to the Liberty East Pit (12 gpm). Water quality would be circum-neutral with exceedances of fluoride, manganese, nickel, sulfate, and TDS at year 10 and antimony, cadmium, and lead by year 50.

Table 4-10 Summary of Predicted Pit Lake and Alternative Scenario Exceedances of Permit Maximum Contaminant Levels

Area	Units	As (mg/L)	Be (mg/L)	Cd (mg/L)	F (mg/L)	Pb (mg/L)	Mg (mg/L)	Mn (mg/L)	Ni (mg/L)	Sulfate (mg/L)	Sb (mg/L)	Zn (mg/L)	TDS (mg/L)
Liberty Main Pit Lake	10 yr	-	-	-	4.3	-	-	5.77	0.14	1,514	-	-	2,315
	50 yr	-	-	0.005	4.23	-	-	6.34	0.14	1,635	0.014	-	2,491
	100 yr	-	-	0.006	4.18	0.017	-	6.51	0.12	1,654	0.029	-	2,518
	200 yr	-	-	0.007	4.13	0.025	-	6.86	-	1,672	0.048	-	2,542
Liberty East Pit Lake	10 yr	-	0.005	0.016	4.29	-	-	12.21	0.4	1,776	0.016	5.68	2,658
	50 yr	-	0.006	0.021	4.31	0.023	-	5.14	0.44	2,031	0.028	6.39	3,089
	100 yr	-	0.008	0.027	4.54	0.042	-	2.32	0.47	2,167	0.055	7.29	3,384
	200 yr	0.084	0.011	0.034	4.16	0.102	164.7	2.29	0.28	2,420	0.140	6.41	3,820
Ruth West Pit Lake	10 yr	No Exceedances Predicted											
	50 yr												
	100 yr												
Ruth East Pit Lake	10 yr	No Exceedances Predicted											
	50 yr												
	100 yr												
Kimbley Backfill	10 yr	-	-	-	-	-	-	0.91	-	1,160	-	-	1,821
	50 yr	-	-	-	-	-	-	0.24	-	-	-	-	-
	100 yr	-	-	-	-	-	-	0.22	-	-	-	-	-
Wedge Backfill	10 yr	No Exceedances Predicted											
	25 yr												
	50 yr												
Tripp/Veteran Pit Lake	10 yr	No Exceedances Predicted											
	25 yr												
	50 yr												

Source: Schlumberger, 2014

Liberty East Pit: RNMC is planning to reactivate mining at this pit, strip the East Dump in order to lower the pit floor to 6,400 feet AMSL, and widen the pit. The final pit lake elevation would be 6,468 feet AMSL and would be reached 150 years after end of mining. The Liberty East Pit would be a permanent groundwater sink and would receive water from mineralized bedrock and the South Block aquifer. Water inflow would consist of precipitation (25 gpm), runoff (46 gpm), groundwater (4 gpm), and inflow from the Liberty Main Pit (12 gpm). Outflow would be pit lake evaporation (87 gpm). Pit water quality would have a circum-neutral pH with antimony, lead, arsenic, magnesium, beryllium, cadmium, fluoride, manganese, nickel, sulfate, zinc, and TDS exceeding RNMC permit MCLs.

Wedge Pit: Mining of the Wedge Pit was completed in 2010. Pit floor elevation is 6,500 feet AMSL. The bedrock aquifer at the Wedge Pit is believed to be connected to the Robinson Canyon Block via the Ely limestone.

RNMC has backfilled the Wedge Pit with non-PAG waste rock to an elevation of 6,850 feet AMSL as part of its closure and reclamation plan. Waste rock above the pit lake elevation of 6,566 feet AMSL has been encapsulated in accordance with the approved CWRMP. Under this pit backfill scenario, the water level in the pit backfill is expected to reach a final elevation of 6,566 feet AMSL at 18 years after mining. Infiltration into the backfill of 1.6 gpm would be the only source of water inflow; outflow to groundwater equals the inflow rate at equilibrium. The pore water quality in the pit backfill is expected to meet permitted MCLs.

Tripp/Veteran Pit: RNMC plans to reactivate mining of the Tripp/Veteran Pit. The pit floor would be lowered to 6,000 feet AMSL. The final stage of the pit lake formed in the post-mining pit would be at an elevation of 6,102 feet AMSL at 23 years after mining. Water inflow rates would be precipitation (11 gpm) and runoff (90 gpm). Outlflow would be evaporation (35 gpm) and discharge to groundwater (66 gpm). The pit lake water quality is expected to meet permitted MCLs.

Mine Waste Rock, Tailings, and Operational Facilities: Under the Proposed Action, the Giroux Wash TSF would have the embankment raised, as discussed in Section 2.0. The Jupiter, Liberty, and Ruth WRDs would be expanded. Mine operations in general would be modified to accommodate the proposed increase in mining. The Giroux Wash TSF and all WRDs would be managed and reclaimed in accordance with the existing mine Plan, as discussed in Section 2.0. Therefore, no adverse impacts to surface or groundwater would be expected.

The Proposed Action, therefore, would be expected to result in long-term, minor impacts to groundwater (pit lake water), with the impacts being mostly due to exceedances in some metal values above permitted MCLs as mine pits refill with water and reach a steady-state or equilibrium water level

4.6.3 No Action Alternative

Under the No Action Alternative, mining operations and reclamation would continue under the authorized Plan. The No Action Alternative and its expected effects are summarized in the 1994 FEIS (BLM, 1994a) and ROD (BLM, 1994b). The main difference between the No Action Alternative and the Proposed Action involves the mining of the Ruth Pit complex. Under the No Action Alternative, the Ruth Pit complex would consist of three separate pits that would have limited connection to the South Block aquifer. Groundwater flowing into these three pits after cessation of mining would not benefit as greatly from the alkaline water of the South Block aquifer and would, therefore, most likely be acidic and have some metal values elevated above permitted MCLs.

The No Action Alternative, therefore, would most likely not have pit lake water quality in the Ruth Pit complex that is alkaline and within permitted MCLs. The No Action Alternative would result in long-term, moderate impacts to groundwater (pit lake water) in the Ruth Pit complex.

4.7 Lands and Realty

4.7.1 Affected Environment

Land use within the Plan boundary is characterized by historic and present mining activities. There are numerous land use authorizations that have been granted on public lands within the Plan boundary. Details of the existing land use authorizations within the Plan boundary are provided in Table 4-11.

Table 4-11 Land Use Authorizations

Holder	Serial Number	Case Type	Location[1]
American Tower Corp.	NVN 0060360	ROW for a communications site	T16N, R62E, Section 24; T16N, R63E, Sections 18, 19
AT & T	NVN 066394	ROW for telephone cables	T16N, R62E, Sections 2, 11, 12; T16N, R63E, Section 17
BLM	NVN 006004	CL-Multiple Use Management	T16N, R62E, Sections 2, 12
BLM	NVN 007658	ROW for federal facility	T16N, R63E, Section 19
Coates BCST Inc.	NVN 041039	ROW for power transmission line	T16N, R63E, Section 18
KCC	NVCC 0000171	ROW for water pipeline	T16N, R62E, Sections 7, 8, 9, 15, 16, 22
KCC	NVCC 0017862	ROW for water pipeline	T16N, R62E, Sections 22, 23
Los Angeles Department of Water and Power	NVN 031630C	ROW for a communications site	T16N, R63E, Section 19
McGill Ruth Con. Dist.	NVN 042790	ROW for water facility	T16N, R62E, Section 4
McGill Ruth Con. Dist.	NVN 076901	ROW for road	T16N, R62E, Section 3
McGill Ruth Con. Dist.	NVN 047153	ROW for irrigation facility	T16N, R62E, Sections 15, 22

Holder	Serial Number	Case Type	Location[1]
Mt. Wheeler Power Inc.	NVN 005638	ROW for power transmission line	T16N, R62E, Sections 2, 4
Mt. Wheeler Power Inc.	NVN 049540	ROW for power transmission line	T16N, R62E, Sections 15, 22
Mt. Wheeler Power Inc.	NVN 017924	ROW for power transmission line	T16N, R62E, Sections 23, 24; T16N, R63E, Section 19
Mt. Wheeler Power Inc.	NVN 062119	ROW for power transmission line	T16N, R62E, Sections 21, 22
Mt. Wheeler Power Inc.	NVN 0063856	ROW for power facilities	T16N, R62E, Sections 21, 22
Mt. Wheeler Power Inc.	NVN 0061326	ROW for power transmission line	T16N, R62E, Section 29; T16N, R63E, Sections 18, 19, 20
NASA	NVN 007244	ROW for a communications site	T16N, R63E, Section 18
NV Department of Transportation	NVCC 0020724	Land appropriation for federal aid highway; U.S. Highway 50 ROW	T16N, R62E, Sections 2
NV Department of Transportation	NVCC 0020924	Land appropriation for federal aid highway; U.S. Highway 44A ROW	T16N, R62E, Sections 3, 10
NV Department of Transportation	NVCC 0020925	Land appropriation for federal aid highway; State Route 267 ROW	T16N, R62E, Sections 2, 3, 4, 9
NV Department of Transportation	NVN 0004896	Land appropriation for federal aid highway	T16N, R62E, Section 2
NV Department of Transportation	NVN 0023697	Land appropriation for federal aid highway	T16N, R62E, Section 2
Robinson Nevada Mining Company	NVN 056525	ROW for railroad	T16N, R62E, Sections 2, 4, 9, 11, 12; T16N, R63E, Sections 12, 13, 17; T16N, R64E, Sections 6, 7, 8, 17, 19, 30, 31
Robinson Nevada Mining Company	NVN 078804	ROW for road to monitoring well	T16N, R62E, Sections 22, 23, 26
Robinson Nevada Mining Company	NVN 083971	ROW for water facility	T16N, R62E, Section 15; T16N, R63E, Section 19
Robinson Nevada Mining Company	NVN 094666	ROW application for access road	T16N, R63E, Sections 5, 7, 8
Robinson Nevada Mining Company	NVN 094708	ROW for weather station	T16N, R62E, Section 15
SBC/NV Bell	NVCC 0023185	ROW for telephone cables	T16N, R62E, Sections 2, 12
SBC/NV Bell	NVN 059498	ROW for telephone cables	T16N, R62E, Sections 4, 9
SBC/NV Bell	NVN 066126	ROW for telephone cables	T16N, R62E, Section 4
SBC/NV Bell	NVN 066758	ROW for telephone cables	T16N, R62E, Sections 23, 24; T16N, R63E, Section 19, 20
SBC/NV Bell	NVN 0058634	ROW for telephone cables	T16N, R62E, Sections 21, 22, 23
Sierra Pacific Power Company	NVN 076179	ROW for telephone cables	T16N, R62E, Sections 2, 11, 12; T16N, R63E, Section 17

Holder	Serial Number	Case Type	Location[1]
U.S. Army Corps of Engineers	NVN 0044441	ROW for road	T16N, R61E, Section 1; T16N, R62E, Sections 6, 7
U.S. Forest Service (USFS)	NVN 007788	ROW for road	T16N, R63E, Sections 18, 19, 30
U.S. Forest Service (USFS)	NVN 0065884	ROW for a communications site	T16N, R63E, Section 18
White Pine Historic Railroad Foundation	NVN 048052	ROW for access road	T16N, R62E, Section 2
White Pine Historic Railroad Foundation	NVN 0043234A	ROW for railroad	T16N, R62E, Sections 2, 11, 12; T16N, R63E, Sections 17, 18
White Pine Television District #1	NVN 092226	ROW for a communications site	T16N, R62E, Section 4

[1]Locations based on BLM LR2000 database and Master Title Plats. Some authorizations have likely been relocated but not revised on Master Title Plats due to existing mining activities in the Plan boundary.

4.7.2 Environmental Effects

The Proposed Action would not impact the existing land use authorizations within the Plan boundary. The existing land use authorizations within the Plan boundary would continue. However, the ROW acquired to relocate the weather station (NVN 094708) would be relinquished/terminated as it would be incorporated into the Plan Amendment. A section of CR 44A would be relocated to allow traffic to travel between CR 44 and U.S. Highway 6. Currently, CR 44A is closed to public travel. Relocating and opening the road to public travel after mine closure would effectively restore public use of the road and County maintenance. The BLM would notify all ROW holders in the area of the proposed Project and ensure that the proposed Project does not negate rights granted to them. No impacts from the Proposed Action are anticipated to land use authorizations (i.e., ROWs) or access to authorized rights within the Plan boundary.

4.7.3 No Action Alternative

The No Action Alternative would not impact any existing land use authorizations within the Plan boundary. The existing land use authorizations within the Plan boundary would continue, including the ROW (NVN-094708) for the weather station relocation. The current land use of mining would continue with authorized mining activities.

4.8 Minerals

4.8.1 Affected Environment

The porphyry copper deposits of the Robinson Mining District are located between Ely and Ruth in the Egan Range and are centered on the late Cretaceous quartz monzonite intrusives that form an east-west trend across the Egan Range and the Mining District.

There are four principal types of ore deposits in the Robinson Mining District:

- Disseminated copper deposits within altered quartz monzonite porphyries;
- Replacement deposits in altered sedimentary rocks around the intrusives;
- Vein deposits within the monzonite intrusive and the sedimentary rocks; and
- Supergene copper deposits formed by groundwater percolating through the above three types of deposits.

The principal copper sulfide mineral is chalcopyrite (NBMG, 1976). Lead, zinc, and silver sulfide deposits, along with gold, manganese, and iron deposits, are peripheral to the copper deposits and are crudely zoned outward from the mineralizing monzonite plutons. Sedimentary rocks adjacent to the plutons are often replaced by high-temperature silicates and sulfides to form mineralized skarns (altered limestone with silica and sulfides replacing the original rock).

Nevada produced 56,100 metric tons of copper in 2011, a decrease of 3.0 percent from 2010 and 58,000 metric tons of copper in 2010, which itself was a decline of 12.1 percent from 2009. The Robinson Mine produced 81 percent of the total copper in 2011 and 85 percent of the total in 2010 (USGS, 2015). Further, the Robinson Mine produced 572 metric tons of molybdenum in 2011 and 103 metric tons in 2010.

4.8.2 Environmental Effects

Direct impacts from the Proposed Action would include expanding the Ruth Pit, the generation of waste rock that would be left on site in reclaimed waste rock disposal areas on existing WRDs; and the generation and disposal of additional tailings in the Giroux Wash TSF. Approximately 106.2 MT of ore would be extracted from the Ruth Pit and 282.7 MT of waste rock would be generated.

Impacts to mineral resources would be long term and irreversible because the ore would be permanently removed during the mining process. However, the removal of 106.2 MT of ore would represent a minor impact considering the prevalence of mineral-bearing rock in the region. The increase in available supply of copper minerals would be a beneficial impact.

The disturbance from the associated road construction, pipeline and power line re-routes, and other improvements (Table 2-3) would be surficial and would not impact mineral resources. Reclamation efforts would not impact mineral resources.

4.8.3 No Action Alternative

Under the No Action Alternative, mining operations would continue under the authorized Plan until EOML 2018. Impacts to mineral resources would be minor, long term, and irreversible because the ore would be permanently removed during the mining process. Current conditions and trends would continue. Mining operations would conclude four years sooner (EOML 2018) than the Proposed Action.

4.9 Socioeconomics

4.9.1 Affected Environment

The Plan boundary is adjacent to the town of Ruth and seven miles west of Ely, Nevada. In general, these communities and White Pine County are the most likely to be affected by mining in the Plan boundary. Ruth is a census-designated place in White Pine County, Nevada. Founded in 1903, it had a population of 440 at the 2010 census. Ruth was built as a company town for the adjacent Robinson Mine. Ely was founded as a stagecoach station along the Pony Express and Central Overland Route. Ely's mining boom came later than the other towns along U.S. Highway 50, with the discovery of copper in 1906. The 2010 census noted a population of 4,255 in Ely (Table 4-12). The community of Ely is the county seat and population center of White Pine County.

Table 4-12 Population

Community	2010 Census	2015 Estimate	Percent Change
Ruth	440	500*	13.6
Ely	4,255	4,134	-2.8
White Pine County	10,030	9,811	-2.2

Source: U.S. Bureau of the Census, 2016b
*2014 American Community Survey estimate (American Factfinder, 2016).

Per capita income for White Pine County has risen 17.3 percent between 2010 and 2014 while throughout the State of Nevada it has risen 3.5 percent (Table 4-13). The median household income for White Pine County has risen 15.9 percent between 2010 and 2014, while throughout the State of Nevada it has declined 10.3 percent (Table 4-14).

Table 4-13 Per Capita Personal Income

Place	2010 Estimate	2014 Estimate	Percent Change
White Pine County	$34,017	$ 39,908	17.3
State of Nevada	$40,742	$42,185	3.5

Source: BEA 2016a and 2016b

Table 4-14 Median Household Income

Place	2010 Estimate	2014 Estimate	Percent Change
White Pine County	$49,376	$57,243	15.9
State of Nevada	$55,596	$49,875	-10.3

Source: U.S. Bureau of the Census 2016a and 2016b

In 2014, the largest employment industries for White Pine County were Agriculture, Forestry, Fishing, Hunting, and Mining (26 percent); Educational Services, Health Care, and Social Assistance (17.0 percent); Public Administration (13.8 percent); and Arts, Entertainment, Recreation, Accommodation, and Food Services (11.5 percent) (NV Energy, 2016). For comparison, in Nevada the largest employment industries are

Leisure and Hospitality (26.9 percent); Trade, Transportation, and Utilities (19.4 percent); Professional and Business Services (13.2 percent); and Government (11.9 percent) (Bureau of Labor Statistics, 2016).

In July 2016, the unemployment rate for White Pine County was 4.9 percent (DETR, 2016a), while the unemployment rate for Nevada was 6.5 percent (DETR, 2016a). Unemployment rates for both White Pine County and the State of Nevada are down from the 2010 rates of 8.8 and 13.7 percent, respectively (DETR, 2016a).

According to a study conducted by University of Nevada Reno's Center for Economic Development (UCED), there were three active mining sectors in White Pine County in 2007, which included copper mining, gold mining, and the support activities for other mining sector, which employed, respectively, 423, 139 and 23 people in 2007 (UCED, 2010). While all three sectors increased in employment, the majority of the job growth occurred in the copper mining, which in 2007 employed 423 people and accounted for 9 percent of the county's total employment. The copper mining sector and the gold mining sector experienced substantial job growth between 2001 and 2007; 1,013 percent and 162 percent, respectively (UCED, 2010).

According to the UCED (2010), the White Pine County employment figures indicate that the mining industry is a very important part of the county's economy with the mining industry growing at a faster rate than the county as a whole. Also, it notes the impact of the natural resource industries on the White Pine County economy that are often characterized by "boom-bust" economic cycles. The copper mining sector was the leading economic sector in White Pine County accounting for approximately 25 percent of total county value of output. As of July 2016, there are 13,700 persons employed in the mining and logging industry (DETR, 2016b), up from 12,700 in 2010, a 7.9 percent increase.

In 2013, the Nevada mining industry accounted for $254 million in benefits paid to workers, including $63 million in 401k/pension/retirement benefits, $130 million in health/dental/vision benefits, and $61 million in life insurance/accident insurance/FICA/unemployment insurance (Nevada Mining Association, 2014). In fiscal year 2014, the Robinson Mine was second highest assessed taxpayer in White Pine County at $64.4 million (Nevada Mining Association, 2015).

4.9.2 Environmental Effects

Under the Proposed Action, mining is anticipated to continue with approximately the same number of personnel (550), the same mining rate, and the same equipment as is currently being used for the existing mining operation. No additional demand for housing or municipal services would be anticipated. Mining operations would be extended throughout EOML 2022; therefore, the current socioeconomic conditions would extend to 2022. The extension of mining operations would extend the annual payroll, insurance, and retirement contributions; local expenditures; taxes; and royalty payments to White Pine County. This would be a moderate, short-term, beneficial impact.

For the relatively small communities near the Plan boundary, the sources of revenue directly related to the mining operation at the Robinson Mine represent a large portion of the revenue coming into the area and White Pine County. Indirectly, it also impacts mining industry suppliers and vendors. Induced economic impacts to secondary businesses such as grocery stores, retail shops, restaurants, and hotels accrue as a result of employees spending in the local economy.

These effects would be moderate to major, short-term, beneficial impacts on socioeconomics. These increased economic contributions to the communities of Ruth and Ely, as well as White Pine County would extend to EOML 2022, when the mine is estimated to cease operations under the Proposed Action. After closure begins, the economic contribution directly or indirectly related to the Project would be much less than during active mining operations. The area has become relatively dependent on the economic contribution of the mine, so the loss of this portion of the economy would be acute and adverse unless RNMC expands to an area outside the Proposed Action. Once all active mining operations at the Robinson Mine have ceased, this same level of services would not be needed, leaving an excess of housing and likely cuts to social services such as police, fire, and health care.

4.9.3 No Action Alternative

Under the No Action Alternative, mining would continue under the authorized Plan until EOML 2018. These effects would be moderate to major, short-term, beneficial impacts on socioeconomics but would end sooner than the Proposed Action. Under the No Action Alternative, there would be a substantial decrease in economic contributions to the area sooner, if no additional mine expansions are permitted and approved. With mine operations concluding four years earlier under the No Action Alternative, socioeconomic changes would occur earlier and the economic loss to the local community would include the loss of up to 550 direct jobs and associated payroll, insurance, and retirement contributions. The loss of 550 jobs represents four percent of those currently employed in the mining and logging industry in the State of Nevada. These would be major, long-term impacts to the socioeconomics of Ruth, Ely, and White Pine County and minor impacts to the State of Nevada.

4.10 Soils

4.10.1 Affected Environment

Twenty-two soil associations have been mapped within the Plan boundary (Figure 4-3). Soils within the Project Area have low salinity, a low percentage of organic matter, and moderate to strong alkalinity (BLM, 1994a; NRCS, 2015). Soils vary in depth, quality, and quantity across the mine area. The main soil associations include Pookaloo-Cavehill-Rock outcrop, Pookaloo-Cavehill-Lodar, Pits-Dumps, Grink-Onekeyo-Xine, Biken-Orr, and Urmafot. Acreage totals for each soil association located within the Plan boundary are provided in Table 4-15. Current operations are authorized to disturb 8,204.5 acres (40.7 percent) within the Plan boundary.

Table 4-15 Soil Map Units within the Plan Boundary

Map Unit Symbol	Map Unit Name	Acres
W	Water	41
100	Pookaloo-Cavehill-Rock outcrop association	4,178
108	Pookaloo-Tecomar-Rock outcrop association	402
109	Hyzen-Cavehill association	139
119	Zimbob-Palinor association	240
124	Tecomar-Pookaloo association	1,068
179	Tulase-Pern association	252
185	Pyrat-Heist-Tulase association	120
271	Atlow association	38
286	Palinor-Shabliss association	424
321	Palinor association	706
411	Cassiro association	135
436	Pookaloo-Cavehill-Lodar association	1,841
480	Pioche-Cropper association	26
484	Pioche-Birchcreek-Cropper association	431
486	Pioche-Cropper-Upatad association	53
822	Pits-Dumps complex	3,656
851	Grink-Onkeyo-Xine association	1,461
874	Amelar-Pookaloo-Tulase association	210
1201	Biken-Orr association	1,145
1202	Biken-Urmafot association	107
1260	Urmafot association	3,055
1800	Pookaloo-Onkeyo-Cavehill association	410
	Total Acres	**20,137**

Source: NRCS, 2015

4.10.2 Environmental Consequences

Under the Proposed Action, there would be minor, long-term impacts to soil resources including erosion and fertility losses because of mining operations and reclamation activities. Direct impacts would occur on approximately 327.6 acres (Table 2-3), increasing soil disturbance in the Plan boundary by 1.6 percent. Topsoil would be removed prior to mining operation or facility disturbance and used to rehabilitate existing disturbed sites or stockpiled for future need in accordance with federal and state regulations. Areas where topsoil would be removed include facility areas, access roads, and the Ruth Pit expansion area.

Salvaged topsoil would be stockpiled for later use to reclaim disturbed sites. Stockpiled topsoil would be placed in locations on stable sites and protected from compaction,

wind and water erosion, and contaminants. Topsoil stockpiles would be seeded to minimize erosion. The availability of suitable topsoil and erosion control are important factors in the overall reclamation success. Topsoil removal and stockpiling may reduce soil attributes desirable for plant growth, such as soil microbial activity, organic matter content, fertility, and water holding capacity.

Topsoil used during the reclamation process would follow the methods outlined in the approved Reclamation Plan (RNMC, 2015). Impacts would be long-term and negligible to minor.

Across the Project Area, impacts to soils may occur from accidental spills or leaks of petroleum products and hazardous materials used during construction, mining activities, and long-term operation of the mine. These events would cause soil contamination and may decrease the soil fertility and revegetation potential. The SPCC Plan would reduce the frequency and impacts related to these events to a negligible effect.

4.10.3 No Action Alternative

Under the No Action Alternative, mining operations would continue under the authorized Plan until EOML 2018. Impacts to soil resources from mining operations would be similar to impacts under the Proposed Action. However, under this alternative, the Ruth Pit would not be expanded and the TSF embankment would not be raised. Other impacts to soils from road realignment, power line re-route, and pipeline re-route would not occur. Current conditions and trends would continue. Mining and reclamation would conclude four years sooner (EOML 2018). Impacts would be long-term and negligible to minor.

4.11 Special Status Species

4.11.1 Affected Environment

4.11.1.1 Migratory Birds

Several migratory bird species are considered SSS in Nevada. Migratory birds, including those listed as special status below, are discussed in Section 4.4:

- Northern goshawk;
- Golden and bald eagles;
- Ferruginous hawk;
- Pinyon jay;
- Loggerhead shrike;
- Sage sparrow; and
- Brewer’s sparrow.

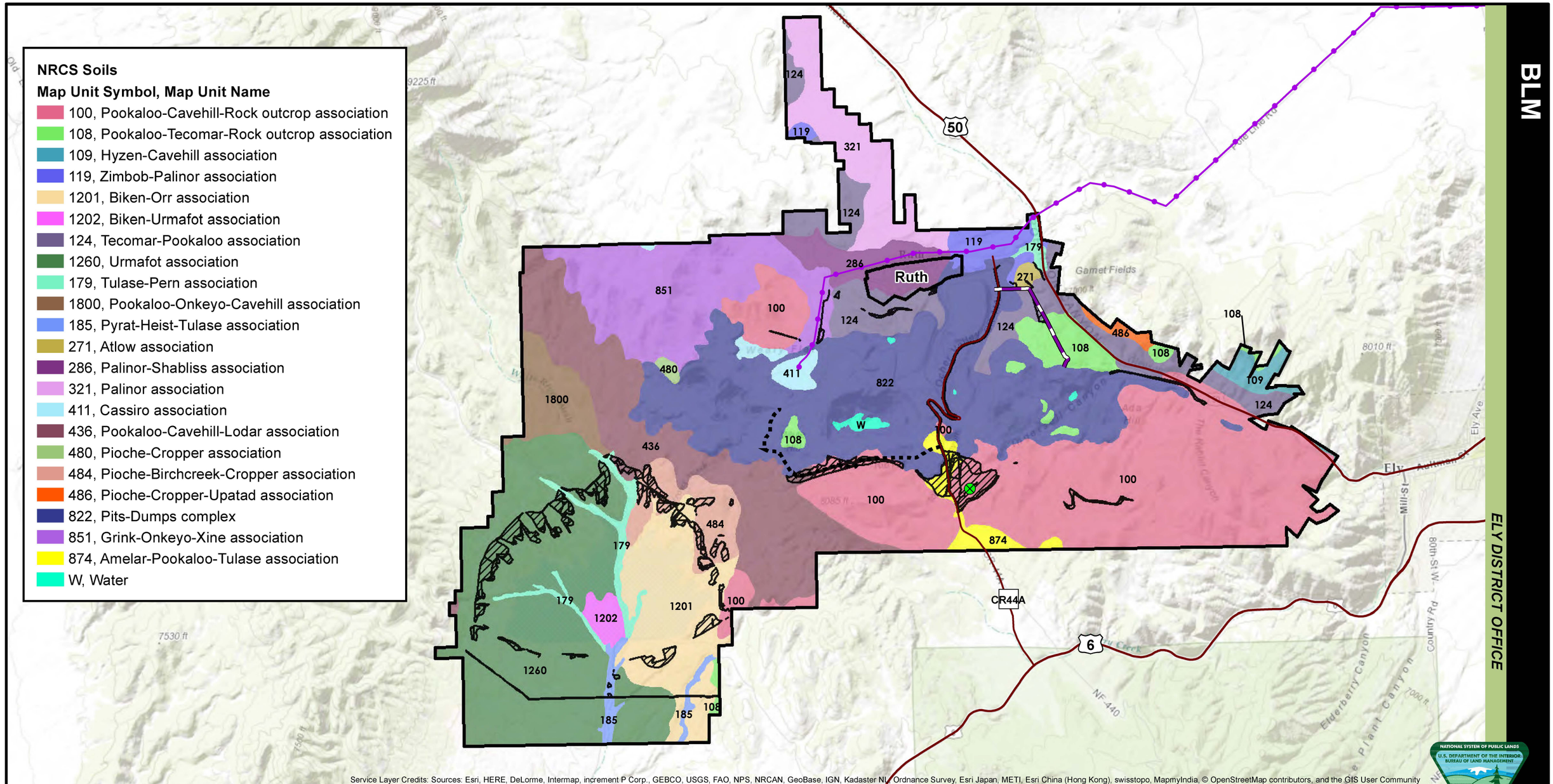

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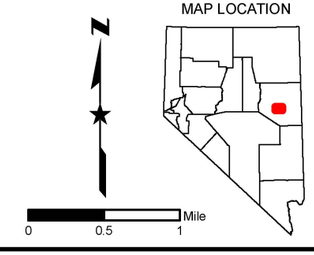
FIGURE 4-3 SOILS

KGHM
ROBINSON MINE EXPANSION PROJECT

- Plan Boundary
- Proposed Weather Station
- Transmission Line
- Proposed Ruth East Powerline Reroute
- County Road 44A Realignment
- Proposed Disturbances

MAP LOCATION



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4.11.1.2 Greater Sage-grouse

Greater sage-grouse are a landscape species that utilize vegetation communities of sagebrush, mixtures of sagebrush, and meadows from valley bottoms to upper montane zones. Greater sage-grouse are sagebrush obligate species because they use sagebrush in all stages of life and reproduction. The males use areas called leks to strut and attract females during mating season. Their nesting and brooding habitat is generally located within sagebrush or shrub dominated habitat adjacent to or near leks.

The USFWS determined that greater sage-grouse warranted protection under the Endangered Species Act (ESA) in 2010 and through legal settlements was mandated to consider the bird for listing by the end of the 2015 fiscal year. This finding prompted federal agencies, states and counties to initiate a multitude of planning processes to implement new conservation measures to protect greater sage-grouse habitat on millions of acres in the west, with the hope of averting the need to list the species. On September 22, 2015, the USFWS determined that the greater sage-grouse did not warrant protection under the ESA. The 2015 USFWS decision not to list this species was partially based on the implementation of the aforementioned plans.

The BLM is committed to continued research and use of best available science. As additional important habitats are identified (e.g., winter habitat and key connectivity areas), the BLM will map and incorporate these habitats for greater sage-grouse, consistent with best available science, through subsequent plan maintenance, revision, or amendment, as appropriate. Priority should be given to ensuring that wintering habitat is identified and captured in all changes in habitat maps subsequent to this decision. In the interim, the BLM will use the existing maps included in the Approved Resource Management Plan Amendment for all decisions.

The BLM is committed to continuing working with individuals and institutions with expertise in relevant fields to ensure that land and resource management affecting conservation of the greater sage-grouse and the sagebrush ecosystem continues to be guided by sound peer-reviewed research and the best available science.

According to the December 2015 mapping (Coates et al., 2014), GHMA and OHMA are present within the Plan boundary (Table 4-16; Figure 4-4). GHMA is habitat that is occupied seasonally or year-round and is outside of PHMAs. OHMA generally contains seasonal or connectivity habitat. No PHMA, or habitat having the highest value for maintaining sustainable populations, is located within the Plan boundary. No greater sage-grouse or their sign was observed during the 2015 surveys (SRK, 2016a).

Table 4-16 Greater Sage-grouse Habitat Mapping within Plan Boundary

Category	Acres
General Habitat Management Area	2,091
Other Habitat Management Area	3,877

Source: Coates et al., 2014

No known leks occur within four miles of the Plan boundary. The closest active lek is, located approximately 5.25 miles east of the Plan boundary (Figure 4-4). Nesting habitat is not present within the Plan boundary, but occurs within two miles of the Plan boundary (Figure 4-4).

4.11.1.3 Pygmy Rabbit

Pygmy rabbits (*Brachylagus idahoensis*) are a SSS, and identified by the USFWS as threatened, but only in the state of Washington. Pygmy rabbits are considered a species of special concern within the state of Nevada (NDOW, 2016c). A pre-field habitat assessment indicated potential pygmy rabbit habitat exists within the Plan boundary (SRK, 2016a). The Plan boundary is approximately 6,700 feet AMSL to 7,600 feet AMSL. This elevation is within the typical elevation range for pygmy rabbit habitat. The sagebrush within the Plan boundary varies in height, cover, structure, and live/decadent brush. Interspersed portions of the big sagebrush communities are potential pygmy rabbit habitat, while parts are not potential pygmy rabbit habitat. The areas that are not potential pygmy rabbit habitat had a combination of one or more attributes such as decadent sagebrush, short statured sagebrush, large areas of open ground between sagebrush, or area encroached by pinyon-juniper, rocky soils, and disturbance.

Potential pygmy rabbit habitat exists within the Plan boundary and areas of proposed disturbance (SRK, 2016a, 2016b, and 2016d). However, no pygmy rabbits or their sign (i.e., burrows, droppings, carcasses, etc.) were observed during the 2015 survey conducted within the potential habitat in the proposed TSF disturbance areas (SRK, 2016a).

4.11.1.4 Bats

According to NDOW, the Plan boundary is in the vicinity of abandoned mine workings, which may provide habitat for bat species (SRK, 2016a, 2016b, and 2016d). Specifically, the little brown bat (*Myotis lucifugus*), pallid bat (*Antrozous pallidus*), big brown bat (*Eptesicus fuscus*), silver-haired bat (*Lasionycteris noctivagans*), hoary bat (*Lasiurus cinereus*), Townsend's big-eared bat (*Corynorhinus townsendii*), canyon bat (*Parastrellus hesperus)*, California myotis (*Myotis californicus*), long-eared myotis (*Myotis evotis*), and long-legged myotis (*Myotis volans*) may occur in the region (BLM, 1994a).

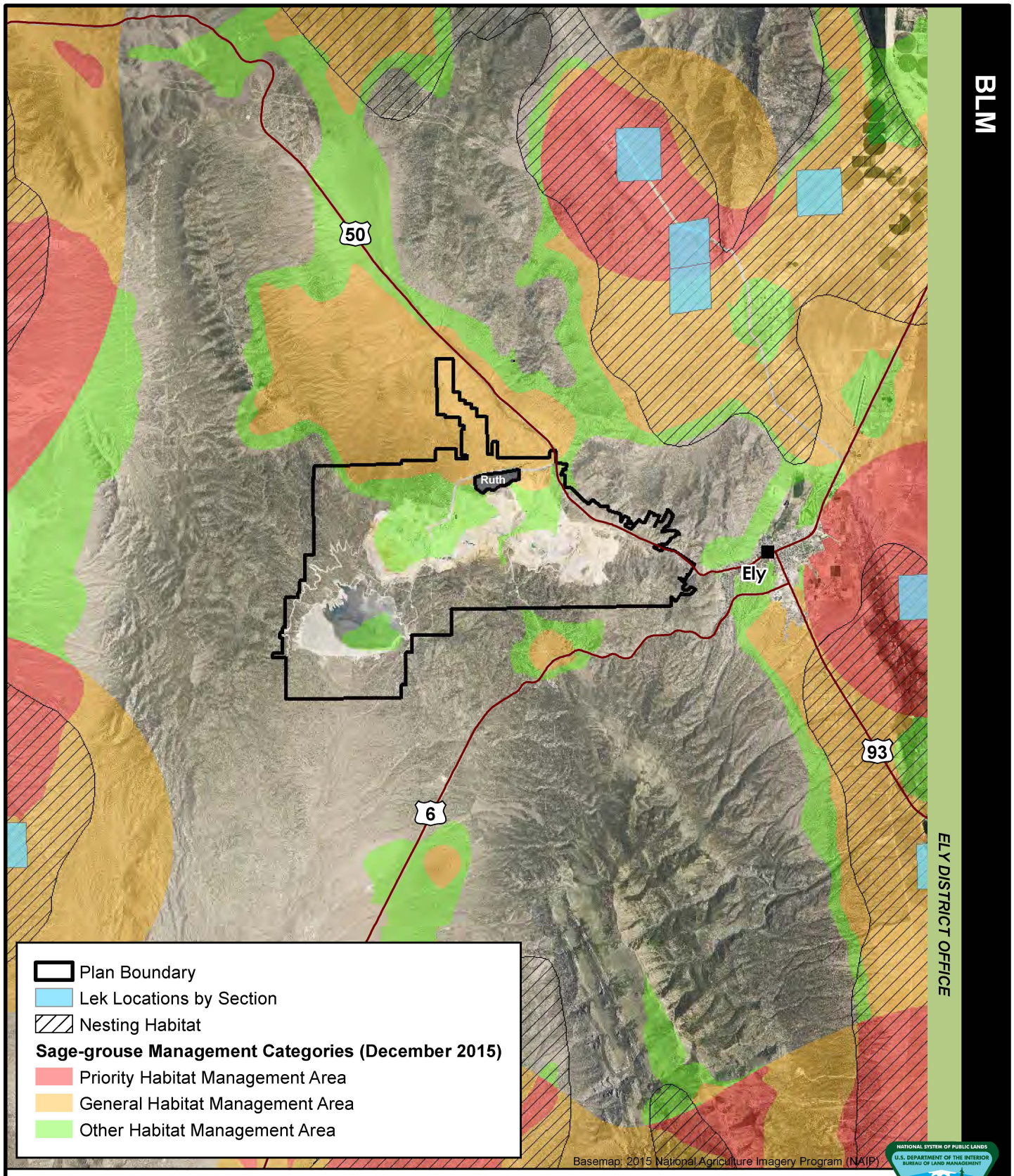

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FIGURE 4-4 SAGE-GROUSE HABITAT AND LEKS

KGHM
ROBINSON MINE EXPANSION PROJECT

0 3 6 Miles
1 inch = 3 miles

MAP LOCATION

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Six adit locations were identified by the Nevada Division of Minerals (NDOM) as occurring within or near the proposed disturbance. NDOW had previously surveyed four of these locations and then surveyed the last two sites in July 2016 (NDOW, 2016b). At two locations there was no sign of a portal, one location had been bull-dozed closed, and the other three locations were recommended for closure by any means after confirming bat vacancy.

4.11.2 Environmental Effects

4.11.2.1 Migratory Birds

Several migratory bird species are considered SSS in Nevada. Environmental Effects to migratory birds, including those listed as SSS, are discussed in Section 2.4.

4.11.2.2 Greater Sage-grouse

No greater sage-grouse or their sign were observed during the 2015 field survey (SRK, 2016a). RNMC has voluntarily committed to numerous RDFs, which are intended to reduce potential impacts to sage-grouse and their habitat from various land use projects. The voluntarily applicant committed RDFs are detailed in Appendix C. The Proposed Action would disturb 3.4 acres of GHMA and 215.1 acres of OHMA (using the December 2015 mapping). The power line re-route would occur within mapped sage-grouse habitat (0.3 miles in GHMA and 1.0 miles in OHMA), although the proposed route would occur within existing disturbance. The majority of GHMA within the Plan boundary is already disturbed or dominated by pinyon-juniper woodland, neither of which would be considered quality sage-grouse habitat. The OHMA in the northern part of the Plan boundary is dominated by pinyon-juniper woodland and sagebrush, of which a small portion is considered for disturbance. Furthermore, with no known leks present within four miles of the Plan boundary, noise from the mining operation and proposed disturbances would not be anticipated to impact male vocalization during the breeding season. Noise impacts would also be minimized in nesting habitat due to topographical features (e.g., mountains) surrounding the Plan boundary and Proposed Action. Impacts to greater sage-grouse and their habitat from the Proposed Action would be long-term and minor.

4.11.2.3 Pygmy Rabbit

No pygmy rabbits or their sign were observed during field surveys. Potential habitat for the pygmy rabbit would be affected by the proposed project. However, impacts would be negligible and long term, since available habitat is widespread in the region.

4.11.2.4 Bats

No bats were observed during the NDOW surveys conducted in the three open mine workings identified by NDOM as occurring near the proposed disturbance. NDOW has recommended that these three mine workings be closed by any means after confirming vacancy. Additionally, any bats located near the Proposed Action would be able to fly away from the area. Therefore, the Proposed Action would not be anticipated to have any impacts to bats.

4.11.3 No Action Alternative

Under the No Action Alternative, mining operations would continue as approved under the authorized Plan until EOML 2018. Impacts to sensitive species would be negligible and long-term, similar to those described under the Proposed Action but to a lesser degree as less area would be impacted. Current conditions and trends would continue. Mining would conclude four years sooner (EOML 2018) than the Proposed Action.

4.12 Vegetation

4.12.1 Affected Environment

Surveys of the Project Area were performed to investigate all major plant habitats and topographic features, while recording the vegetation communities encountered (SRK, 2016a, 2016b, and 2016d). The majority of the Project Area consists of pinyon-juniper and big sagebrush (*Artemisia tridentata*) vegetation communities (Figure 4-5). The pinyon-juniper vegetation community type occurs on hillsides and mountaintops, and is characterized by a dominant overstory consisting of singleleaf pinyon pine (*Pinus monophylla*) and Utah juniper (*Juniperus osteosperma*), and a subdominant understory consisting of various shrub and herbaceous species. Shrub species associated with this vegetation type include curl-leaf mountain mahogany (*Cercocarpus ledifolius*), antelope bitterbrush (*Purshia tridentata*), snowberry (*Symphoricarpos* sp.), Mexican cliffrose (*Purshia mexicana*), Utah serviceberry (*Amelanchier utahensis*), and rubber rabbitbrush (*Ericameria nauseosa*). Within the pinyon-juniper type, big sagebrush is more abundant in the understory where soils are deeper, where black sagebrush (*Artemisia nova*) is more abundant in areas with shallower soils. Herbaceous understory species include Sandberg bluegrass (*Poa secunda*), Idaho fescue (*Festuca idahoensis*), bluebunch wheatgrass (*Pseudoroegneria spicata*), thickspike wheatgrass (*Elymus lanceolatus*), basin wildrye (*Leymus cinereus*), needle and thread (*Hesperostipa comata*), Indian ricegrass (*Achnatherum hymenoides*), squirreltail (*Elymus elymoides*), scarlet globemallow (*Sphaeralcea coccinea*), beardtongue (*Penstemon* sp.), and Indian paintbrush (*Castilleja* sp.).

The big sagebrush vegetation community typically occurs in valley bottoms and alluvial fans adjacent to washes. Big sagebrush is dominant on deeper soils and may be accompanied by winterfat (*Krascheninnikovia lanata*), four-wing saltbush (*Atriplex canescens*), and rabbitbrush (*Chrysothamnus* sp.). Additional understory species common to all soils are needle and thread, basin wildrye, squirreltail, Sandberg bluegrass, Indian ricegrass, scarlet globemallow, and several penstemon species.

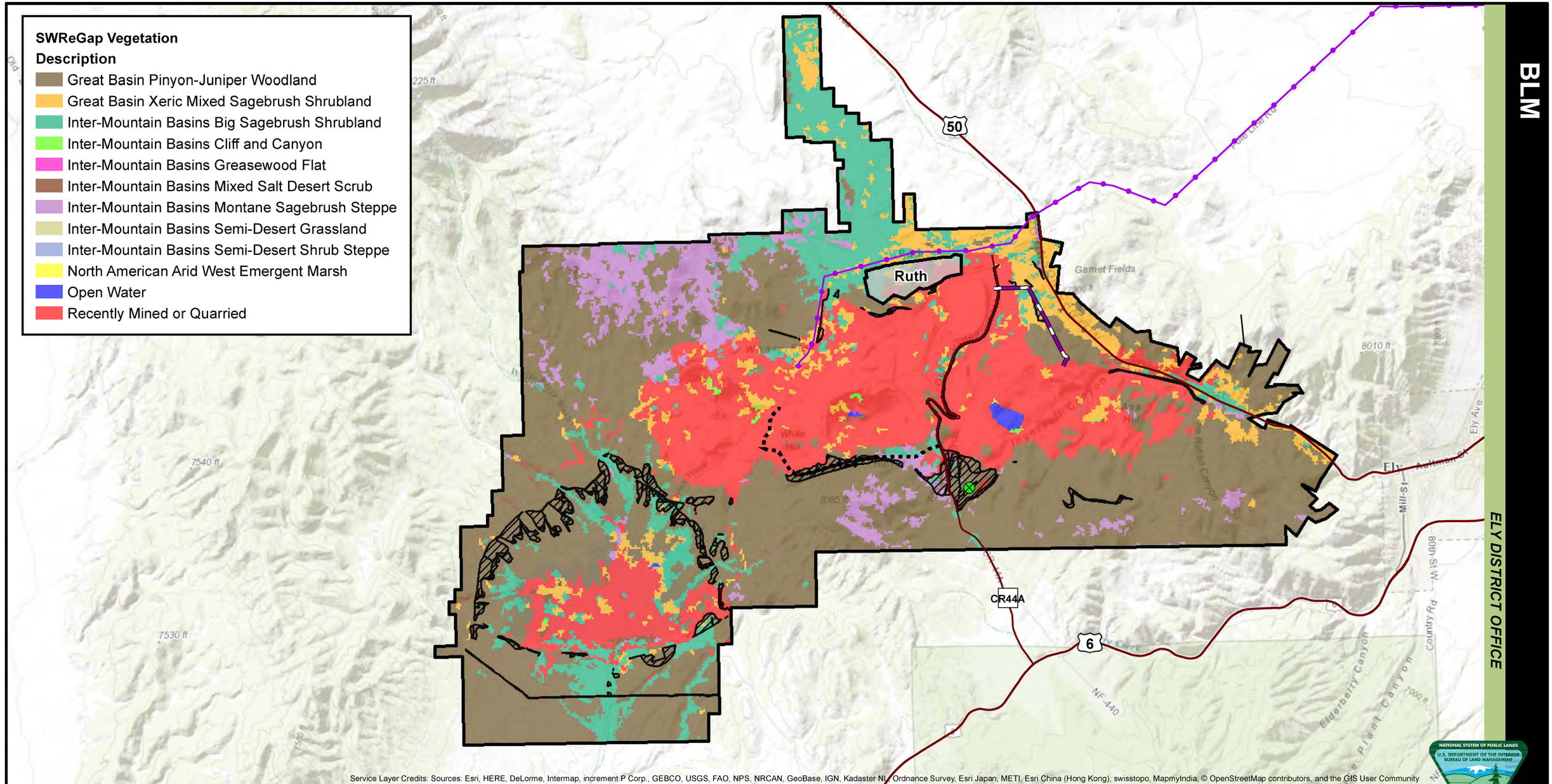

FIGURE 4-5 VEGETATION COMMUNITIES

KGHM
ROBINSON MINE EXPANSION PROJECT

- Plan Boundary
- Proposed Weather Station
- Transmission Line
- Proposed Ruth East Powerline Reroute
- County Road 44A Realignment
- Proposed Disturbances

MAP LOCATION

N

0 0.5 1 Mile

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No riparian or mesic areas were identified within the Project Area.

Table 4-17 lists the vegetation communities and acres within the Plan boundary.

Table 4-17 Vegetation Communities within the Plan Boundary

Vegetation Community	Acres	Percentage
Great Basin Pinyon-Juniper Woodland	10,087	50.1
Great Basin Xeric Mixed Sagebrush Shrubland	1,390	6.9
Intermountain Basins Big Sagebrush Shrubland	2,265	11.3
Intermountain Basins Cliff and Canyon	20	0.1
Intermountain Basins Greasewood Flat	17	0.1
Intermountain Basins Mixed Salt Desert Scrub	70	0.4
Intermountain Basins Montane Sagebrush Steppe	1,191	5.9
Intermountain Basins Semi-desert grassland	3	<0.1
Intermountain Basins Semi-desert Shrub Steppe	3	<0.1
North American Arid West Emergent Marsh	1	<0.1
Open Water	46	0.2
Recently Mined or Quarried	5,043	25.0
Total	**20,137**	**100.0**

Source: USGS, 2011

4.12.2 Environmental Consequences

Under the Proposed Action, the removal of topsoil and overburden would result in the gradual loss of plant communities, mostly pinyon-juniper woodland, on 327.6 acres (Table 2-3) associated with clearing for the pit expansion, temporary overburden stockpile, mine facilities, and along the CR44A re-route. During the life of the project, concurrent reclamation and interim reclamation would be performed as practicable to restore vegetation. Impacts would be short- and long-term and would range from negligible to minor until reclamation replaced vegetation to approved reclamation plan conditions.

Impacts to vegetation would be lessened by the implementation of EPMs (Section 2.1.13). These measures would include restoration of disturbed areas to the approved reclamation plan conditions. Several growing seasons would be needed for revegetated areas to be restored to the vegetation standards. RNMC would continue to monitor reclaimed areas until they are released from bond liability.

4.12.3 No Action Alternative

Under the No Action Alternative, mining operations would continue under the authorized Plan until EOML 2018. Impacts to vegetation resources from mining operations would be similar to impacts under the Proposed Action. However, under this alternative, the Ruth Pit would not be expanded and the TSF embankment would not be raised. Other impacts to vegetation from road realignment, power line re-route, and pipeline re-route

would not occur. Current conditions and trends would continue. Mining and reclamation would conclude four years sooner (EOML 2018). Impacts would be long-term and negligible.

4.13 Visual Resources

Section 102(8) of the FLPMA declares that public land will be managed to protect the quality of scenic values and, where appropriate, to preserve and protect certain public land in its natural condition. Section 101(b) of the NEPA requires federal agencies to "...assure for all Americans safe, healthful, productive, and aesthetically and culturally pleasing surroundings." Section 102 of the NEPA requires agencies to "...utilize a systematic, interdisciplinary approach which will ensure the integrated use of the natural and social sciences and the environmental design arts in the planning and in decision making which may have an impact on man's environment".

BLM-administered lands associated with the project are managed for multiple uses, which includes ensuring that the scenic values of these public lands are considered before authorizing uses that may have negative visual impacts. The BLM uses the Visual Resource Management (VRM) system to manage the human concern for scenery and public acceptance to visible change of the natural landscape. The VRM system provides the BLM with an objective means of measuring the scenic value of the visual resources in an area.

The BLM is required to designate VRM classes for all areas of BLM-administered lands as part of the resource management plan process. Establishment of the VRM classes is based on an inventory of three key elements: scenic quality, sensitivity level, and distance zones. These management classes identify various permissible levels of landscape alteration, while protecting the overall visual quality of the regions (BLM, 1986a and 1986b). There are four VRM classes (Classes I through IV), with Class I being the most conservative of the visual resources. Objectives for these classes vary from very limited modification of the landscape to major landscape modification. Short term (3 to 5 years) exceptions are allowed if the objectives of the VRM class or classes are met in the long term (10 to 20 years). VRM classes and their objectives are provided in Table 4-18.

Table 4-18 BLM Visual Resource Management Class Descriptions

Class	Visual Resource Management Class Description/Characteristics
I	The objective of this class is to preserve the existing character of the landscape. The level of change to the characteristic landscape should be very low and should not attract attention.
II	The objective of this class is to retain the existing character of the landscape. The level of change to the characteristic landscape should be low. Management activities may be seen but should not attract the attention of the casual observer. Any changes must repeat the basic elements of form, line, color, and texture found in the predominant natural features of the characteristic landscape.

Class	Visual Resource Management Class Description/Characteristics
III	The objective of this class is to partially retain the existing character of the landscape. The level of change to the characteristic landscape should be moderate. Management activities may attract attention but should not dominate the view of the casual observer. Changes should repeat the basic elements found in the predominant natural features of the characteristic landscape.
IV	The objective of this class is to provide for management activities that require major modification of the existing character of the landscape. The level of change to the characteristic landscape can be high. These management activities may dominate the view and be the major focus of viewer attention. However, every attempt should be made to minimize the impact of these activities through careful location, minimal disturbance, and repeating the basic elements of the landscape.

Source: BLM, 1986

The visual contrast rating process, a component of the VRM system, is used to analyze the potential visual impacts of proposed projects and activities. According to the BLM (1986b), the basic philosophy underlying the rating system is: “The degree to which a management activity affects the visual quality of a landscape depends on the visual contrast created between a project and the existing landscape.” Degree of visual contrast is measured by comparing the features of a project with the major features in the existing landscape. The basic design elements of form, line, color, and texture are used for this comparison and to describe the visual contrast created by a project. The comparison is conducted from one or more KOPs, which are locations with critical views of a project or locations providing typical views encountered in the landscape (BLM, 1986b). Typically, KOPs are selected along well-used roadways and trails, recreation sites, and near communities, as these are areas where the greatest number of people would see a project for the longest period of time.

The RMP (BLM, 2008a) states that the goal for visual resources is to “manage public land actions and activities in a manner consistent with Ely District Office visual resource management class objectives.” The BLM’s objective for visual resources is “to implement multiple use activities within the planning area with mitigation measures consistent with the visual resource management classes” (BLM, 2008a).

The Proposed Action is in conformance with the following specific goal, objective, and management action from the RMP (BLM, 2008a):

- Goal: Manage public land actions and activities in a manner consistent with BLM Ely District Office visual resource management class objectives;
- Objective: To implement multiple use activities within the planning area with mitigation measures consistent with the visual resource management classes; and
- Management Action VR-3: Manage visual resources in accordance with the following visual resource management classes (approximate acreages). Class I: 1,138,730 acres, Class II: 1,966,212 acres, Class III: 5,205,134 acres, and Class IV: 3,146,526 acres.

RNMC has also committed to EPMs related to visual resources in their 1994 FEIS (BLM, 1994a) as well as their proposed Plan Amendment.

4.13.1 Affected Environment

The area of analysis for visual resources includes all BLM land within the Plan boundary and visible from each KOP location.

The Project is located in the Egan Range in a setting that is characteristic of Nevada's basin and range topography and vegetation. The areas surrounding the Plan boundary consist of flat valleys, rolling foothills, and pyramidal mountains. Open skies and long valleys allow for large viewing distances. Vegetation in the area alters between sagebrush and pinyon-juniper woodland. The surrounding areas are generally undisturbed except for occasional power lines, paved and dirt roads, ranches, and the towns of Ely and Ruth. The Robinson Mine itself if located within an extensively disturbed area resulting from long-term, historical mining activities. The majority of the BLM regulated land within the Plan boundary is located in VRM Class II with a portion of Class III located at the southwest corner (Figure 4-6). VRM classes are not designated on private land. Existing visual contrasts from various locations throughout the Plan boundary are created by WRDs, open pits, leach piles, tailings, and ancillary facilities.

Four KOPs were selected for analysis of the Proposed Action due to its proximity to main highways and recreational opportunities. Prior to the survey, KOP locations were verified and coordinated with local BLM representatives. KOP locations and corresponding VRM Classifications are shown on Figure 4-6, listed in Table 4-19, and described in detail below. Visual resource contrast rating worksheets and representative photographs of the characteristic landscape were completed from each KOP (Stantec, 2016b).

Table 4-19 Key Observation Points

KOP Number	KOP Location		KOP Site
	Northing*	Easting*	
KOP 1	4350377	675571	U.S. Highway 50 near the turn toward the town of Ruth
KOP 2	4342283	675470	USFS Ward Recreation Area and Campground
KOP 3	4334363	669435	Highway 6 pulloff – south
KOP 4	4338856	671591	Highway 6 pulloff – north

*Provided in North American Datum of 1983, Universal Transverse Mercator, Zone 11 North, meters.

4.13.1.1 KOP 1 – Highway 50

KOP 1 is located at a paved pulloff on U.S. Highway 50 near the turn toward the town of Ruth. The KOP is located in VRM Class II, and Class II is visible in all directions from the KOP. The majority of common users at this KOP include those that stop to read an informational kiosk about Copper Country, those driving by at approximately 70 mph, and those who slow to turn toward Ruth. For those stopping at the informational sign,

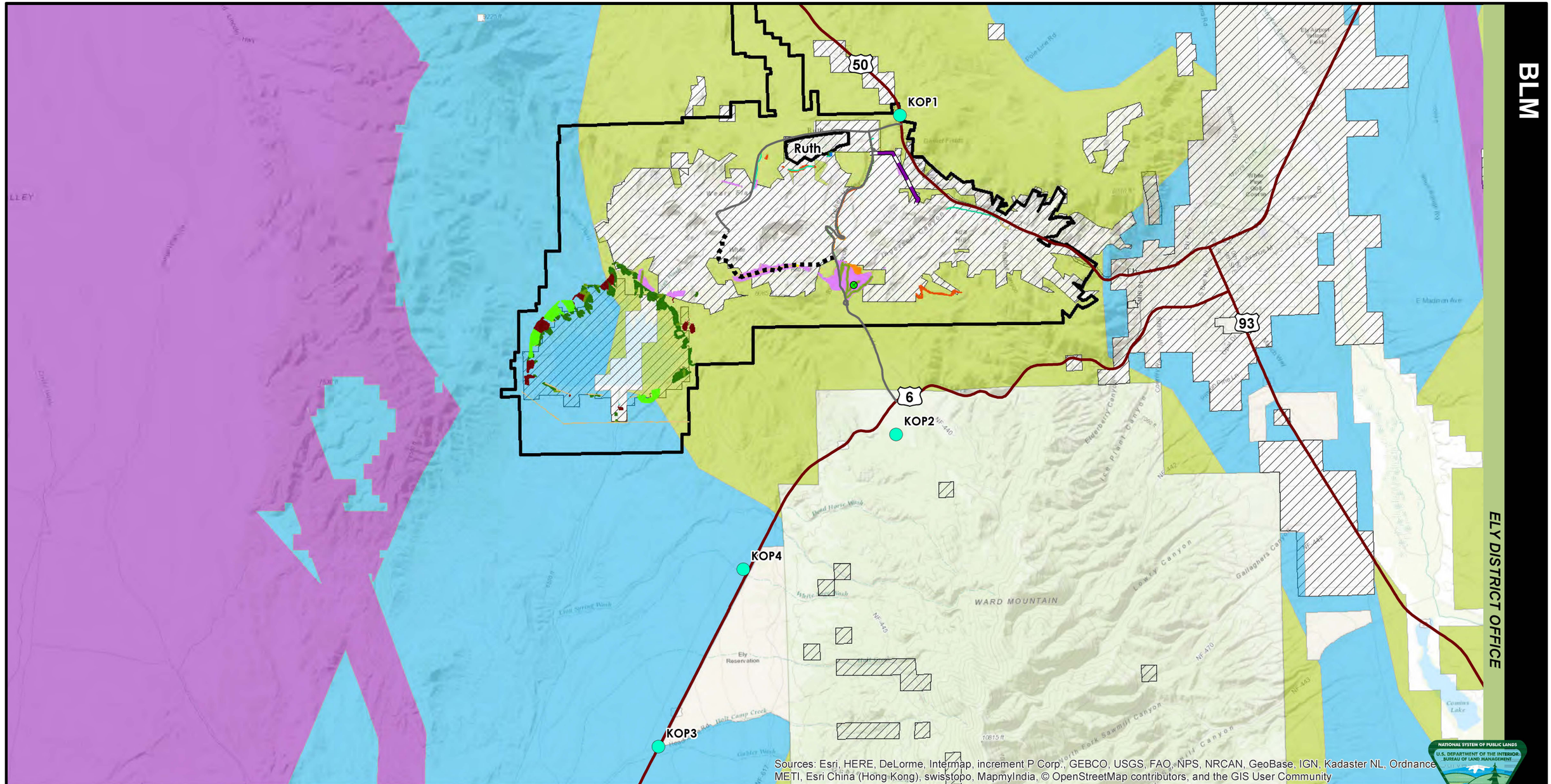

FIGURE 4-6 LOCATIONS OF KOPS AND VRM CLASSES

KGHM
ROBINSON MINE EA PROJECT

- Plan Boundary
- Visual Resource KOP Locations
- Proposed Weather Station
- County Road 44A Realignment

Proposed Disturbances

- Roads
- Drainage Control; Ponds and E-Cells
- Dump
- Interfacility
- Ruth Pit
- TSF Cover Borrow
- TSF Growth Media Stockpiles
- Waste Rock Cover
- Yards

VRM Classes

- Class II
- Class III
- Class IV
- Private Land

MAP LOCATION

N

0 4,000 8,000 Feet

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their attention is directed to the west and southwest to observe the mine, as the kiosk provides historic information about mining in the area. For those driving, their attention is directed toward the road within their cone of vision.

The view from KOP 1 is of a panoramic landscape with a focal point to the south where U.S. Highway 50 carves through Robinson Canyon. The existing environment is described herein from the KOP looking toward the Proposed Action to the south, southwest, and west.

The foreground and middleground distance zones consist primarily of the nearly flat valley floor with flat topped rocky outcrop hills to the south, flat topped trapezoidal WRDs to the south and southwest, and reclaimed flat topped WRDs to the west. The background contains one pyramidal mountain. These features are dominated by horizontal lines that slope gradually toward Robinson Canyon. The color of the land is light tan with grey undertones. The WRD is a mixture of patches of burnt orange, grey, and tan. Some chalky grey/white disturbance is visible to the north of the WRD. Texture of the land throughout is medium to smooth.

Vegetation cover in the foreground and middleground is dominated by sagebrush that creates a low, uniform mat. Pinyon-juniper in the middleground and background consists of solid patches of vegetation. The sagebrush is characterized by light green and grey hues. The pinyon-juniper is dark green to black. Lines associated with the vegetation cover are irregular to indistinct, and the texture is coarse to medium in the foreground and smooth in the background.

Structures visible consist of existing mining activity, which is abundant from this KOP. Existing activity includes WRDs, gravel roads, exploration activity, and power poles. U.S. Highway 50 is a paved road, as well as the road that leads to Ruth, both of which are accompanied by reflectors, road signs, and streetlamps. The roads themselves create straight and sinuous, flat lines on the landscape, and the texture is smooth. The paved roads are black, grey, and silver, and the dirt roads are tan from exposed soils. Road accompaniments are vertical and thin. The power poles and road reflectors are located in evenly spaced vertical lines. The historical information kiosk is rectangular and tan/grey. Textures of these structures are, for the most part, smooth. The existing WRDs create trapezoidal shapes in the middle and background distance zones. Lines formed by these shapes are predominately horizontal, as the trapezoids are wider than they are tall and flat topped on the skyline. Sideslopes are at the angle of repose, and the texture is smooth and streaky from where larger rocks have rolled down the slope. The WRDs are mostly tan, brown, and grey.

4.13.1.2 KOP 2 – Ward Recreation Area

KOP 2 is located on USFS land at the Ward Mountain Recreation Area and Campground. The area is developed with potable water, pit toilets, and accessible ground shelters. The camping areas are accessible for tent, trailer, or camper use. While the KOP is located on USFS land, BLM VRM Class II is visible to the northwest, north, and northeast. For those stopping at the recreation area, their view is not directed in any particular direction.

The view from KOP 2 is panoramic. The existing environment is described herein from the KOP looking toward the Proposed Action to the northwest and north.

The land in the foreground is flat and the background is gently rolling. Two faint pyramidal mountain peaks are visible in the far background. The landform line is predominately horizontal. Soils are light tan/grey, and the exposed gravel is grey, white, and black. Texture is medium to smooth.

Vegetation is a uniform low patch of sagebrush in the foreground, a narrow strip of multiple oval shaped pinyon and juniper in the middleground, and an indistinct block of pinyon and juniper in the background. The vegetation in the foreground is silver, grey and green sagebrush, dark green to black in the middleground from pinyon and juniper, and black in the background. The sagebrush in the foreground appears stippled while the pinyon and juniper in the middleground are clumped, rough, and pointy. The indistinct pinyon and juniper trees in the background look smooth due to distance from the KOP.

Structures in the area include the immediate foreground that has been cleared of vegetation, bladed, and covered with gravel. There are numerous large barrier rocks breaking up the line between the cleared area and the intact vegetation to prevent off road travel. Lines from these structures are predominately diagonal and horizontal. The gravel is grey and silver, while the barrier rocks are tan, grey, and pink. The gravel is a uniform rough texture, and the barrier rocks appear smooth. Existing authorized disturbance associated with the Robinson Mine is not visible from this KOP.

4.13.1.3 KOP 3 – Highway 6 (south)

KOP 3 is located at a gravel pulloff on Highway 6. The KOP is located in VRM Class III. Class III is visible in the foreground, and Class II and IV are visible in the distant background. The majority of common users at this KOP include those that stop to rest while traveling on U.S. Highway 6, or those traveling on U.S. Highway 6 at approximately 70 mph. For those stopping to rest, their attention is not directed in any particular direction. For those driving, their attention is directed toward the road within their cone of vision.

The view from KOP 3 is of a panoramic landscape. The existing environment is described herein from the KOP looking toward the Proposed Action to the north.

The foreground and middleground distance zones consist of the nearly flat valley floor. The background appears gently rolling. The landscape is dominated by horizontal lines. Soils in the foreground are tan and grey, while the background appears black. Texture is medium to smooth in the foreground and smooth in the background due to its distance from the KOP.

Vegetation cover in the foreground is dominated by uniform mounds of sagebrush that create a low, uniform mat. Pinyon and juniper in the middleground creating patches of vegetation, and in the background the pinyon and juniper appear to be one solid sheet covering the hillsides. The sagebrush in the foreground is characterized by light green

and grey hues. The pinyon-juniper in the middleground and background is dark green to black. Lines associated with the vegetation cover are irregular to indistinct, and the texture is coarse to medium in the foreground and middleground, and smooth in the background.

Structures visible consist of existing mining activity in the distant background. The existing mining activity is the tailings facility, which is a long and narrow horizontal strip; however, due to its distance from the KOP, and tall pinyon and juniper partially blocking the view, it's difficult to distinguish. The dominate lines from the disturbance are primarily horizontal, and the color is a uniform desert tan. Texture of the tailings is smooth, and due to winds, dust from the tailings appears wispy.

4.13.1.4 KOP 4 – Highway 6 (north)

KOP 4 is located at a gravel pulloff on U.S. Highway 6 a few miles north of KOP 3. The KOP is located in VRM Class III. Class III is visible in the foreground, and Class II and IV are visible in the distant background. The majority of common users at this KOP include those that stop to rest while traveling on U.S. Highway 6 or those traveling on U.S. Highway 6 at approximately 70 mph. For those stopping to rest, their attention is not directed in any particular direction. For those driving, their attention is directed toward the road within their cone of vision.

The view from KOP 4 is of a panoramic landscape. The existing environment is described herein from the KOP looking toward the Proposed Action to the north.

The foreground and middleground distance zones consist of the nearly flat valley floor. The background is gently rolling. The landscape is dominated by horizontal lines. Soils in the foreground are tan and grey, while the background appears black. Texture is medium to smooth in the foreground and smooth in the background due to its distance from the KOP.

Vegetation cover in the foreground is dominated by uniform mounds of sagebrush that create a low, uniform mat. Pinyon and juniper in the middleground creates a patchy strip of vegetation, and in the background the pinyon and juniper appear to be one solid sheet covering the hillsides. The sagebrush in the foreground is characterized by light green and grey hues. The pinyon-juniper in the middleground and background are dark green to black. Lines associated with the vegetation cover are irregular to indistinct, and the texture is coarse to medium in the foreground and middleground, and smooth in the background.

Structures visible in the foreground consist of a gravel road lined with power poles. In the background there is existing mining. The power poles are tall, thin vertical features that dot the landscape, and the gravel road is a linear, grey colored feature that trails off into the background. Texture of the road is rough in the foreground and smooth in the middle and background distance zones. The power poles are matte tan and smooth. The existing mining activity is the tailings facility, which is a long and narrow horizontal strip; however, due to its distance from the KOP and tall pinyon and juniper partially blocking the view, it's difficult to distinguish. The dominate lines from the disturbance

are primarily horizontal, and the color is a uniform desert tan. Texture of the tailings is smooth, and due to winds, dust from the tailings appears wispy.

4.13.2 Environmental Effects

This section describes the potential direct and indirect effects on visual resources that would result from implementation of each alternative, and whether those effects would be short-term or long-term.

The assessment of potential impacts on visual resources resulting from the Proposed Action was completed using the BLM Visual Contrast Rating System. Under the BLM Visual Contrast Rating System, the extent of an alternative's impact is dependent on the degree of visual contrast the proposed project would have with the existing landscape features in terms of the basic design elements of form, line, color, and texture. A detailed description of the BLM Visual Contrast Rating System is provided in BLM Manual H-8431: Visual Resource Contrast Rating (BLM, 1986b).

The analysis was performed from KOPs 1 through 4 (Figure 4-6). Visual contrast rating worksheets were completed at each KOP to identify the form, line, color, and texture elements that characterize the existing landscape and how these would be expected to change from implementation of the Proposed Action and No Action Alternative (Stantec, 2016b). Descriptions of these elements were documented on a worksheet for each KOP. The form, line, color, and texture elements of the existing landscape and of the Proposed Action elements were then compared in order to quantify the degree of contrast that the Proposed Action would be expected to have at each KOP. The results of this comparison and expected degree of contrast were applied to the effect indicators listed below to determine the potential to impact visual resources.

The following indicators were considered when analyzing the potential effects that each alternative would have on visual resources:

- Degree of contrast or conflicts with established BLM VRM Class objectives; and
- Change in the scenic quality of the existing characteristic landscape from KOPs.

The impact evaluation considers landscape character, scenic quality, distance zones, visual contrast, viewer sensitivity, and duration (temporary, short-term, long-term). Impact criteria were applied to the proposed project treatments and the projected effects, and then were compared to the existing environment to determine the severity of impacts on visual resources.

Table 4-20 summarizes a list of the Proposed Action elements, and whether they may be visible from each KOP. Each Proposed Action element visible from each KOP is described in further detail below, under each KOP environmental consequences description.

Table 4-20 Proposed Action Element and Visibility from Each KOP

Proposed Action Element	Is the Proposed Action Element Visible from the KOP?			
	KOP 1	KOP 2	KOP 3	KOP 4
Expand the existing Ruth Pit	No	No	No	No
Expand the existing Jupiter WRD, Liberty/TS WRD, and Ruth WRD onto previously undisturbed areas	Yes (Ruth WRD)	No	No	No
Construct a new segment of CR 44A/1146	No	No	No	No
Increase the total yard and inter-facility disturbances adjacent to existing facilities	Yes	No	No	Yes (Yard)
Relocate the existing and create new growth media stockpiles adjacent to the Giroux Wash TSF	No	No	No	Yes
Raise the existing Giroux Wash TSF embankment and construct a perimeter berm around the remainder of the facility to increase storage capacity by vertically expanding the impoundment area	No	No	Yes	Yes
Expand the Giroux Wash TSF borrow areas for perimeter berm construction and obtaining future reclamation cover material (i.e., growth media);	No	No	No	Yes
Re-route the Ruth Pit dewatering pipeline;	No	No	No	No
Re-route Ruth East power line	Yes	No	No	No
Reclassify and/or reduce acres of disturbance for several authorized mine components; and	No	No	No	No

Source: Stantec, 2016b

4.13.2.1 KOP 1 – Highway 50

The elements of the Proposed Action that would be potentially visible from this KOP (Figure 4-6 and Table 4-20) include:

- Interfacility: No specific construction is proposed within interfacility disturbance areas. The areas would be reserved for auxiliary, non-mining uses as necessary (i.e., turnouts, parking areas, etc.). A portion of proposed interfacility would be visible from in the foreground to middleground from this KOP.

- Ruth WRD Addition: approximately 7.5 acres of disturbance is proposed to be added to the Ruth WRD, which a small portion of this may be visible in the middleground to background from this KOP.

- Ruth East Power Line Re-route: the re-route would skirt the existing Ruth WRD and be visible from this KOP in the foreground to middleground.

All other elements of the Proposed Action would not be visible from KOP 1.

Interfacility disturbances could remove existing vegetation, with the potential to expose more land than previously visible from the KOP. Grey/green sagebrush and black pinyon and juniper would be removed and more light tan soils exposed. Additional

sinuous and straight, smooth and flat blocks of tan would be visible. This is expected to have a weak degree of contrast to: existing land color from additional exposed soils; existing vegetation line and color from dissection of a uniform strip of vegetation and removal of green/grey color; and existing structure form, line, color, and texture from the addition of interfacility associated disturbance. However, the addition of interfacility disturbances is not expected to be a noticeable change to the casual observer due the extent of similar disturbances in the foreground and middleground in this area.

Addition of waste rock to the Ruth WRD would be consistent with what is currently visible from this KOP, which includes trapezoidal blocks flat topped on the skyline dominated by horizontal lines. The additions are proposed in the northwest portion of the existing Ruth WRD, which is the area visible to the southwest from this KOP. There is a break in the existing Ruth and Keystone WRDs where the existing CR44 route traverses through, and the proposed additional waste rock on the Ruth WRD in this area may be visible through this existing slit in the already disturbed landscape. The addition would extend out, not up; therefore, a contrasting change to existing land/water and structure elements are not expected. The color of the WRD would continue to consist of smooth patches of grey, silver, and tan. Due to topography, no vegetation is visible at the location of the proposed additional disturbance; therefore, vegetation color change would not be visible to the casual observer. The addition of additional waste rock is not expected to be a noticeable change to the casual observer from this KOP.

The Ruth East Power Line Re-route would be visible from this KOP to the south. The re-route would skirt the base of the existing Ruth WRD and proposed interfacility area to the northeast of the existing Ruth WRD. New tall, linear, likely wood structures would be dotted on the landscape. These would be dull brown, thin, linear features, would dot the landscape. Texture of the power poles would be matte tan and smooth. The power line would not be skylined, and would be back dropped by the existing Ruth WRD that appears tan, grey, silver, and taupe. These characteristic landscape descriptions would be in additional to those transmission lines currently visible from this KOP, and consistent with the appearance of the existing landscape.

The Proposed Action would result in weak contrasts to the landscape. Disturbance associated with the Proposed Action would be consistent with surface disturbances already visible, and would be minor in magnitude such that visual contrast may be detected from changes to the existing conditions; however, the changes would be slight and generally indistinguishable to the casual observer. The duration of the change would be long term.

This meets the BLM Class II objective which is “To retain the existing character of the landscape. The level of change to the characteristic landscape should be low.”

4.13.2.2 KOP 2 – Ward Recreation Area and Campground

No elements associated with the Proposed Action would be visible from this KOP (Figure 4-6 and Table 4-20); therefore, this meets the BLM Class II objective which is “To retain the existing character of the landscape. The level of change to the characteristic landscape should be low.”

4.13.2.3 KOP 3 – Highway 6 (South)

The elements of the Proposed Action that would be visible from this KOP (Figure 4-6 and Table 4-20) include:

- Raise the existing Giroux Wash TSF embankment and construct a perimeter berm around the remainder of the facility to increase storage capacity by vertically expanding the impoundment area. The vertical lift would be visible from this KOP.

All other elements of the Proposed Action would not be visible from KOP 2.

The existing tailings facility is visible approximately 5.75 miles to the north from this KOP. The Proposed Action would raise the tailings embankment to approximately 6,880 feet above mean sea level from the currently permitted 6,820 feet AMSL. This would result in an approximate 60 vertical foot increase in the tailings embankment. The Proposed Action would result in the same visual appearance as what currently exists for the tailings facility including: the line would be predominately horizontal, the form would remain as a long narrow, horizontal strip, the color would be tan, and texture would be smooth. Additionally, tall vertical pinyon and juniper block much of the casual observer's view of the existing disturbance and the Proposed Action from this KOP. Due to the distance from the KOP to the proposed disturbance (over five miles), and the fact that the disturbance would be an addition to what already exists, it is not anticipated to be a noticeable change to the casual observer.

The Proposed Action would result in a negligible, long term change to the vegetation, landform, and structures noticeable by the casual observer from this KOP. Disturbance associated with the Proposed Action would be consistent with surface disturbances already visible. The additional disturbance to the tailings would not diminish the scenic quality of the existing landscape.

This meets the BLM Class III objective which is "To partially retain the existing character of the landscape. The level of change to the characteristic landscape should be moderate. Management activities may attract attention but should not dominate the view of the casual observer. Changes should repeat the basic elements found in the predominant natural features of the characteristic landscape."

4.13.2.4 KOP 4 – Highway 6 (North)

The elements of the Proposed Action visible that would be from this KOP (Figure 4-6 and Table 4-20) include:

- Increase the total yard and inter-facility disturbances adjacent to existing facilities. A small amount of disturbance associated with the yards may be visible in the far distant background.

- Relocate the existing and create new growth media stockpiles adjacent to the Giroux Wash TSF to support the expansion. A small amount of disturbance

associated with growth media stockpiles may be visible in the far distant background.

- Raise the existing Giroux Wash TSF embankment and construct a perimeter berm around the remainder of the facility to increase storage capacity by vertically expanding the impoundment area. The vertical lift would be visible from this KOP. The raising of the embankment would be visible in the far distant background.

- Expand the Giroux Wash TSF borrow areas for perimeter berm construction and obtaining future reclamation cover material (i.e., growth media). Borrow area disturbance may be visible in the far distant background.

All other elements of the Proposed Action would not be visible from KOP 4.

The existing tailings facility is visible approximately 3.0 miles to the north/northwest from this KOP. The Proposed Action would raise the tailings embankment to approximately 6,880 feet above mean sea level from the currently permitted 6,820 feet AMSL. This would result in an approximate 60 vertical foot increase in the tailings embankment. The Proposed Action would result in the same visual appearance as what currently exists for the tailings facility including: the line would be predominately horizontal, the form would remain as a long narrow, horizontal strip, the color would be tan, and texture would be smooth. Due to the distance from the KOP to the proposed disturbance (approximately three miles), and the fact that the disturbance would be an addition to what already exists, it is not anticipated to be a noticeable change to the casual observer.

Yard, growth media stockpile, and borrow area disturbance would occur around the existing tailings facility disturbance. Removal of vegetation from around the existing tailings facility would result in a reduced amount of grey/grey/black from sagebrush and pinyon and juniper species located at the base of facility. Lines would be predominately horizontal, color of exposed soils would result in more tan and grey appearing, and texture of the exposed soils would be smooth. These disturbances would occur against an already disturbed backdrop, and would be in the far background distance zones. Due to the distance of the Proposed Action elements from this KOP (approximately three miles over flat valley terrain), it is not expected that the casual observer would be able to distinguish between what is already disturbed and what is a result of Proposed Action disturbances associated with the yards, growth media stockpiles, or the borrow areas.

The Proposed Action would result in a negligible, long term change to the vegetation, landform, and structures noticeable by the casual observer from this KOP. Disturbance associated with the Proposed Action would be consistent with surface disturbances already visible. The additional disturbance to the tailings would not diminish the scenic quality of the existing landscape.

This meets the BLM Class III objective which is “To partially retain the existing character of the landscape. The level of change to the characteristic landscape should be moderate. Management activities may attract attention but should not dominate the view

of the casual observer. Changes should repeat the basic elements found in the predominant natural features of the characteristic landscape."

Effects from the Proposed Action to visual resources would meet BLM VRM Class objectives in their respected areas and are considered to be negligible to minor because there would not be:

- A substantial adverse effect on a scenic vista;
- Degradation to the exiting visual character; or
- Significant damage to scenic resources, including, but not limited to trees, rock outcroppings, and historic buildings within a state scenic highway.

Overall, the Proposed Action would result in negligible to minor, long-term surface disturbances that repeat the existing form, line, texture, and color of the existing landscape.

4.13.3 No Action Alternative

Under the No Action Alternative, elements (i.e., form, line, color, and texture) of the existing vegetative character would remain the same as what's described in the existing environment section above for each of the KOPs. Disturbance associated with the No Action Alternative would be consistent with surface disturbances already visible, and would be minor in magnitude such that visual contrast may be detected from changes to the existing conditions; however, the changes would be slight and generally indistinguishable to the casual observer. The duration of the change would be long-term. Effects from the No Action Alternative to visual resources would meet BLM VRM Class objectives in their respected areas and would be negligible to minor and long-term.

4.14 Wildlife

4.14.1 Affected Environment

The wildlife habitat surrounding the Robinson Mine is dominated by pinyon-juniper woodland with interspersed big sagebrush communities. Rocky outcrops are scattered throughout the area, and intermittent drainages with small, natural springs provide limited surface water in the area.

The big sagebrush and pinyon-juniper habitat within the Plan boundary supports a variety of wildlife resources. Big sagebrush provides potential habitat for a number of wildlife species dependent on these communities such as sagebrush voles (*Lemmiscus curtatus*), mule deer, (*Odocoileus hemionus*), elk (*Cervus canadensis*), pronghorn antelope (*Antilocapra americana*), reptile species, and other mammal and avian species. The pinyon-juniper community provides structural diversity for wildlife species as both thermal cover and food sources, particularly during the winter season.

Major wildlife species with potential to occur within the Plan boundary are discussed below. Where practical, several species are discussed as a group, rather than as individual species. Migratory birds (including raptors) are discussed separately in Section 4.4. Greater sage-grouse and pygmy rabbits are discussed as SSS in Section 4.10.

4.14.1.1 Rocky Mountain Elk

Rocky Mountain elk (*Cervus canadensis nelsoni*) are big game species common in the western portion of North America. Elk occupy forested and surrounding habitats; they migrate to mountains in early summer to calve, mate in late summer, and migrate to lower valley pastures in winter.

Elk are known to exist in the vicinity of and occur within the Plan boundary. The Plan boundary is within year-round elk habitat (Figure 4-7). Summer range exists approximately four miles to the north of the Plan boundary. Crucial summer habitat exists both south and east of the Plan boundary, approximately five and eight miles away, respectively. Winter ranges exist approximately six miles to the east-southeast of the Plan boundary.

No elk were observed in the Plan boundary during the field surveys. However, elk sign (i.e., droppings, rubs, and bedded areas) were observed throughout the survey area (SRK, 2016a).

4.14.1.2 Mule Deer

Mule deer are a big game species known to occur in the vicinity of and within the Plan boundary. Mule deer occupy many types of habitats in mountains and lowlands, including various forests and woodlands, forest edges, shrublands, grasslands with shrubs, and residential areas. They are often associated with successional vegetation, especially near agricultural lands. In winter, mule deer tend to be on warmer slopes or other areas with minimal snow cover (NatureServe, 2015). Year-round habitat exists in the western half of the Plan boundary. Summer range exists in the east portion of the Plan boundary. Winter range exists approximately five miles south of the Plan boundary (Figure 4-8). Crucial winter habitat exists within a small portion of Plan boundary, north of U.S. Highway 50.

One individual mule deer was observed during the surveys. Mule deer sign (i.e., droppings, rubs, and bedded areas) were observed throughout the survey area (SRK, 2016a).

4.14.1.3 Pronghorn Antelope

Pronghorn antelope are a big game species occurring in the vicinity of the Plan boundary (Figure 4-9). Pronghorn antelope prefer gentle rolling topography and flat prairie or tablelands. In some areas they are found utilizing the more mountainous terrain.

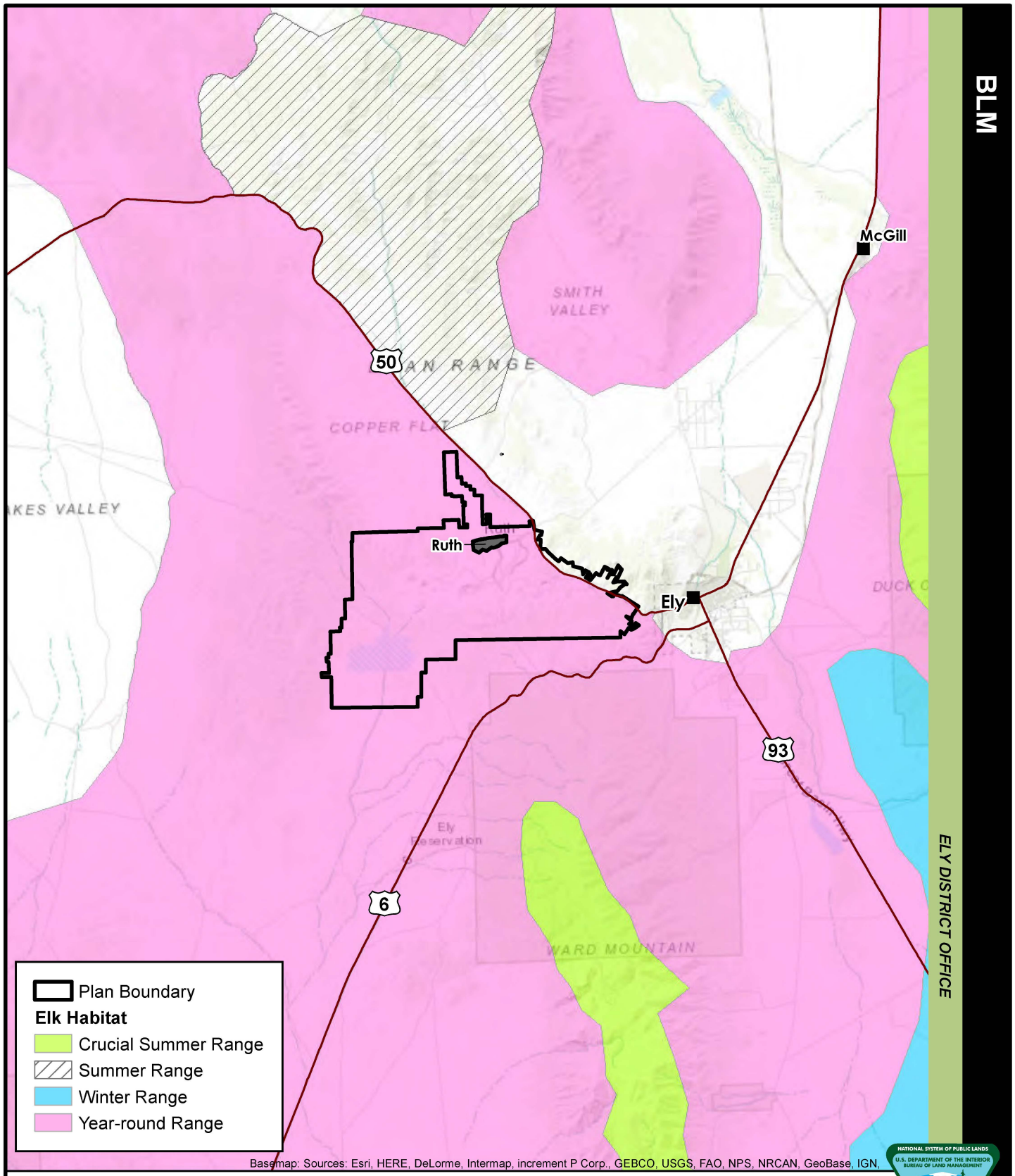

FIGURE 4-7 ELK HABITAT

KGHM
ROBINSON MINE EXPANSION PROJECT

0 4 8 Miles
1 inch = 4 miles

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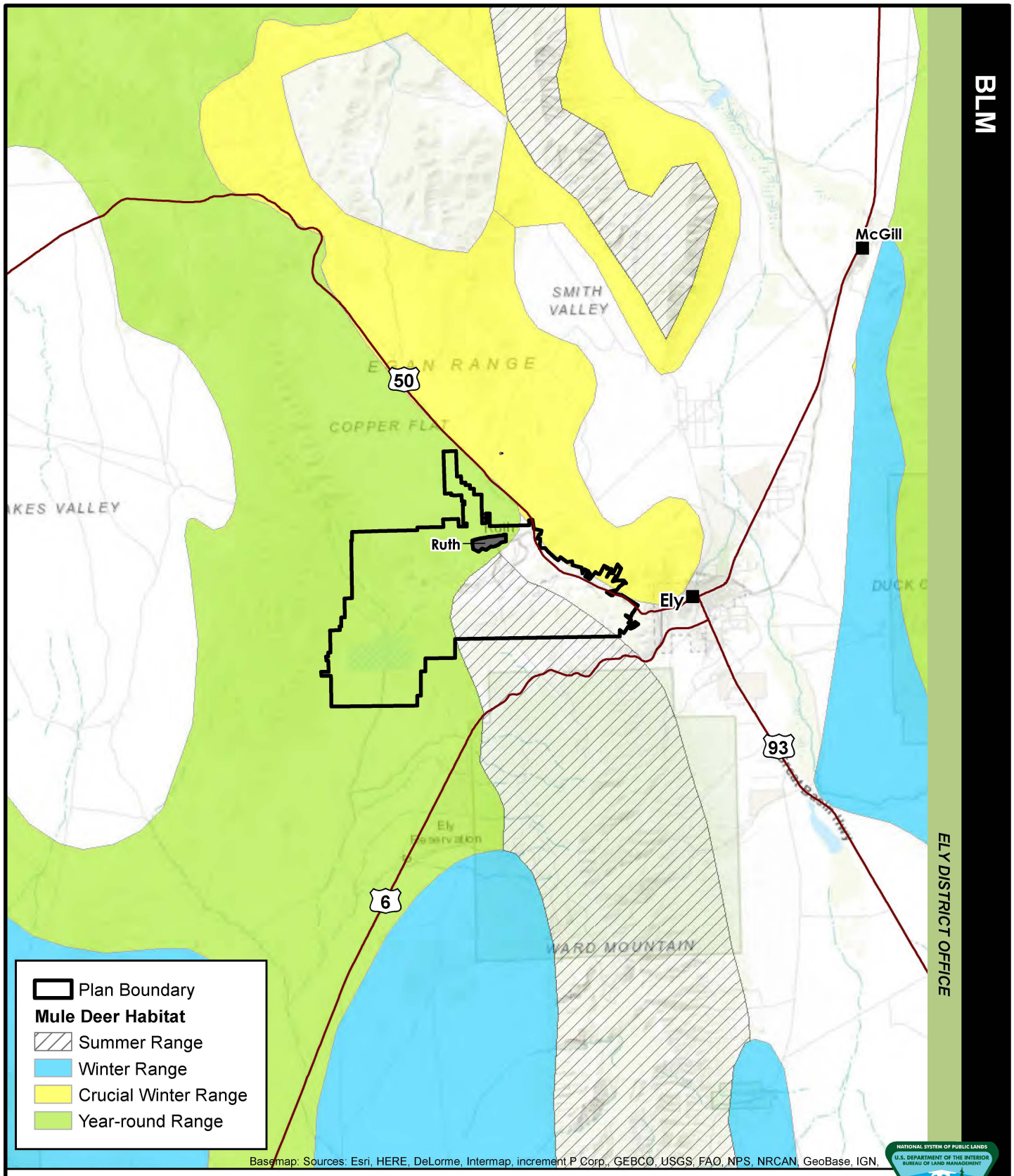

FIGURE 4-8 MULE DEER HABITAT

KGHM
ROBINSON MINE EXPANSION PROJECT

0 4 8 Miles
1 inch = 4 miles

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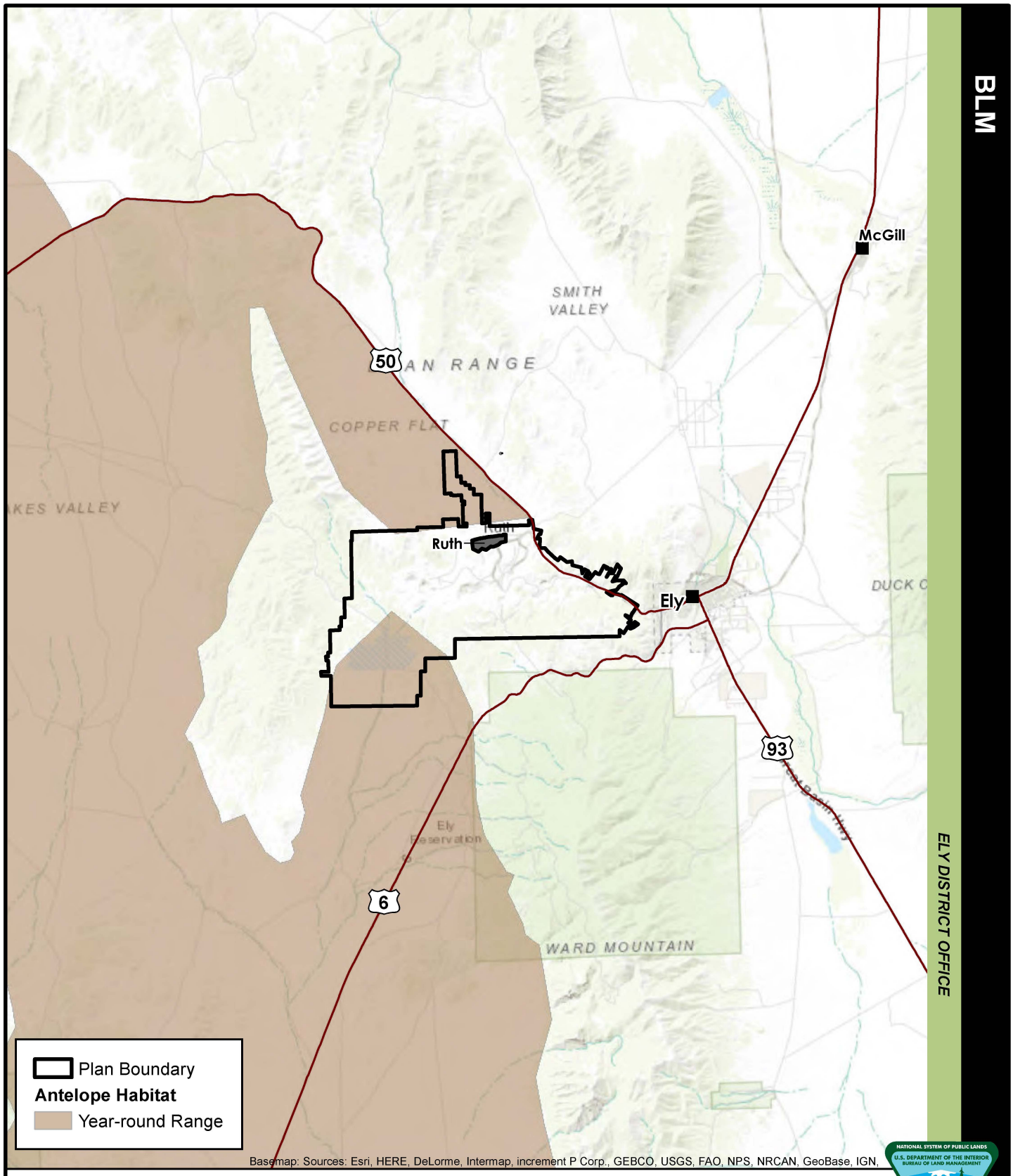

Basemap: Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN,

FIGURE 4-9 ANTELOPE HABITAT

KGHM
ROBINSON MINE EXPANSION PROJECT

0 4 8 Miles
1 inch = 4 miles

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The majority of Nevada's pronghorn antelope inhabit the cold desert shrublands and the Great Basin sagebrush/grasslands habitat types. Year-round pronghorn antelope habitat exists within the southwestern and northernmost portions of the Plan boundary.

Pronghorn antelope were not observed within the Plan boundary during the surveys. However, pronghorn antelope sign was observed in the eastern and southern big sagebrush communities within the survey area (SRK, 2016a).

4.14.1.4 Predators

A variety of mammalian predators inhabit the area. Coyote (*Canis latrans*), bobcat (*Lynx rufus*), mountain lion (*Felix concolor*), gray fox (*Urocyon cinereoargenteus*), and badger (*Taxidea taxis*) are the primary predators in the vicinity of the Plan boundary (SRK, 2016a; BLM, 1994a). These species seek out a variety of prey from small rodents to large mammals. The bobcat and mountain lion are generally associated with rugged, rocky areas, but are known to occur in a variety of habitats. Badgers, gray fox, and coyotes are more closely associated with the sagebrush communities. Predator scat was observed within the survey area (SRK, 2016a).

4.14.1.5 Small Mammals

Rodents, rabbits, and hares are small mammals that inhabit the Plan boundary. The rodents, such as chipmunks (*Tamias* sp.) and mice (*Peromyscus* sp.) are found where grasses, forbs, and seeds are abundant. Black-tailed jackrabbit (*Lepus californicus*) is common in the big sagebrush and pinyon juniper woodlands. Mountain cottontail (*Sylvilagus nuttallii*) is common throughout the foothills and in mixed pinyon-juniper with a shrub component. Additionally, the Townsend's ground squirrel (*Urocitellus townsendii*), least chipmunk (*Tamias minimus*), and Great Basin pocket mouse (*Perognathus parvus*) are known to occupy the region surrounding the Plan boundary (BLM, 1994a).

4.14.1.6 Upland Game Birds

Upland game birds that may occur in the area include greater sage-grouse, chukar, mourning dove, and dusky grouse (BLM, 1994a; SRK, 2016a). Greater sage-grouse is discussed in Section 4.11.1.2.

Chukar are typically associated with perennial water sources, mesic areas, and rugged slopes or rock outcrops. Mourning doves are common throughout Nevada, occupying a variety of habitat types. Important habitats for this species are riparian zones, which they visit daily for water, and woodlands where they can build their nests. While chukar are year-round residents, mourning doves leave the area in the fall for warmer climates. Dusky grouse can be found in dry grasslands and shrublands as well as dry mountainous forests and subalpine habitats. Due to the lack of water sources and riparian areas, the occurrence of these species is likely limited within the Plan boundary.

4.14.1.7 Other Species

In addition to the species already discussed, there are reptiles, such as snakes and lizards, which can be found in the sagebrush and pinyon-juniper communities.

NDOW reported that the Great Basin fence lizard (*Sceloporus occidentalis longipes*), common sagebrush lizard (*Sceloporus graciosus*), and western fence lizard (*Sceloporus occidentalis*) have been observed in the vicinity of the Plan boundary (SRK, 2016a).

4.14.2 Environmental Effects

Direct impacts to wildlife would include disturbance of approximately 328 acres, which would have minor, long-term impacts to wildlife habitat; however adjacent suitable habitat exists. Indirect impacts to all wildlife during project development and operation would result from continued human presence and activities in the overall project region. Additional road construction, mine development, and pipeline and power line re-route construction would generate increased traffic and noise in some areas, potentially resulting in increased vehicle-related mortalities and wildlife harassment.

Effects from the Proposed Action to big game and upland game birds are expected to be negligible. These species would be able to leave the construction and operation areas prior to disturbance. The lack of water sources and riparian habitat at the mine area limits use by chukar, dusky grouse, and mourning dove. The proposed disturbances are not located within any crucial habitat for big game species, and similarly designated habitat is abundant outside of the Plan boundary. Additionally, hunting is not permitted within the Plan boundary.

4.14.3 No Action Alternative

Under the No Action Alternative, mining operations would continue as approved under the authorized Plan until EOML 2018. Impacts to wildlife would be long-term and minor, similar to those described under the Proposed Action but to a lesser degree as less area would be impacted. Current conditions and trends would continue. Mining operations would conclude four years sooner (EOML 2018) than the Proposed Action.

Chapter 5 Cumulative Impacts

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5.1 Introduction

Cumulative effects (i.e. cumulative impacts) are defined in 40 CFR 1508.7 as “the impact which results from the incremental impact of the action, decision, or project when added to the other past, present, and reasonably foreseeable future actions (RFFA), regardless of what agency (Federal or non-Federal) or person undertakes such actions. Cumulative impacts can result from individually minor, but collectively significant actions taking place over a period of time”. In accordance with this definition, this section addresses the potential cumulative effects that would result from the implementation of the Proposed Action and the No Action Alternative when added to the other past, present, and RFFAs within the cumulative effects study areas (CESAs).

These cumulative impacts would include both direct and indirect impacts resulting from the Proposed Action. These impacts are additive and may compound the degree of effect when combined with past, present, and RFFAs. The significance of effects was determined based on context (i.e., the setting of the CESAs) and intensity (i.e., severity of the effect). Significance exists if it is reasonable to anticipate a cumulatively significant impact on the environment (40 CFR 1508.27(b)(7)). Factors that could be used to define the intensity of effects include the magnitude (relative size or amount of an effect), geographic extent, temporal extent, and frequency of the effects. The Proposed Action would be implemented over a six-year period, and the majority of adverse impacts would dissipate within several years after implementation. Thus, a temporal extent of 15 years was used for this cumulative effects analysis.

Information utilized in the cumulative impacts assessment was gathered from the following sources: BLM’s Land and Mineral Legacy Rehost 2000 System (LR2000); the Nevada Atlas and Gazetteer; GIS shapefiles provided by the BLM and Nevada Bureau of Mines and Geology (NBMG, 1976); and aerial photography. The BLM LR2000 database was queried for authorized multiple land use activities, pending ROW grants, mineral and non-mineral exploration, and mining permits.

Table 5-1 lists the analyzed resources and the name and size of each CESA. Both the Proposed Action and No Action Alternative would have negligible impacts on air quality and lands & realty; therefore, cumulative effects to these resources would not be expected and these resources have not been carried through the cumulative analysis section. Actions are defined for the cumulative analysis in this EA as projects or other activities that could interact with the Proposed Action or No Action Alternative in a manner that would result in a cumulative increase in impacts. Actions have been grouped as past, present, and RFFAs. The term “overall CESA boundary” is used in this section, which is defined as the total boundary of all the CESAs combined. The overall CESA boundary would generally follow the socioeconomics CESA, but would include the portion of the big game CESA outside of White Pine County (Figure 5-1).

Table 5-1 Cumulative Effects Study Areas

Resource	Cumulative Effects Study Areas		
	Acres	Description	Explanation
Cultural Resources	42,365	One mile buffer surrounding the Plan boundary.	This CESA boundary was chosen because it encompasses the Plan boundary as well as the area of historic activities associated with the historic properties in and around the Plan boundary.
Migratory Birds	162,117	Five-mile buffer surrounding the Plan boundary.	A 5-mile buffer was used for the migratory bird CESA because it incorporates habitat within and adjacent to the Plan boundary where most of the impacts to migratory birds would occur.
Noxious Weeds and Non-Native Invasive Species	204,116	Watershed	This CESA was used because this is the area where vegetation resources have the potential to be affected by Project activities and non-native, invasive and noxious species.
Water Quality	204,116	Watershed	This CESA was used because this is the area where water resources have the potential to be affected by Project activities.
Minerals	42,365	One mile buffer surrounding the Plan boundary.	This CESA was used because this is the area where mineral resources have the potential to be affected by Project activities.
Socioeconomics	5,694,051	White Pine County	The individuals and businesses that would be affected by the Project would be primarily in White Pine County.
Greater Sage-grouse	1,977,525	The Greater sage-grouse CESA encompasses the White Pine Range on the west and extends to the Schell Creek Range on the east.	This CESA boundary was chosen to encompass habitat and populations of greater sage-grouse that may be impacted by the Proposed Action. This area includes portions of two Population Management Units.
Visual Resources	162,117	The visual resource CESA includes the visible areas within 5-mile buffer.	This CESA boundary was chosen because it encompasses the viewshed of the Project as represented by the KOPs, and it is the area where the effects of the Project could be viewed relative to other actions that have impacted or would be anticipated to impact visual resources.
General Wildlife and Pygmy Rabbit	162,117 General Wildlife and Pygmy Rabbit; 1,977,525 Big Game	General wildlife and pygmy rabbit CESA is a 5-mile buffer. Big Game CESA encompasses the White Pine Range on the west and extends to the Schell Creek Range on the east.	A 5-mile buffer was used for the general wildlife and pygmy rabbit CESA because it incorporates habitat within and adjacent to the Plan boundary where most of the impacts to wildlife and pygmy rabbit would occur. The Big Game CESA includes the majority of migration from winter to summer habitats for big game animals impacted by Project activities that occur within this area.

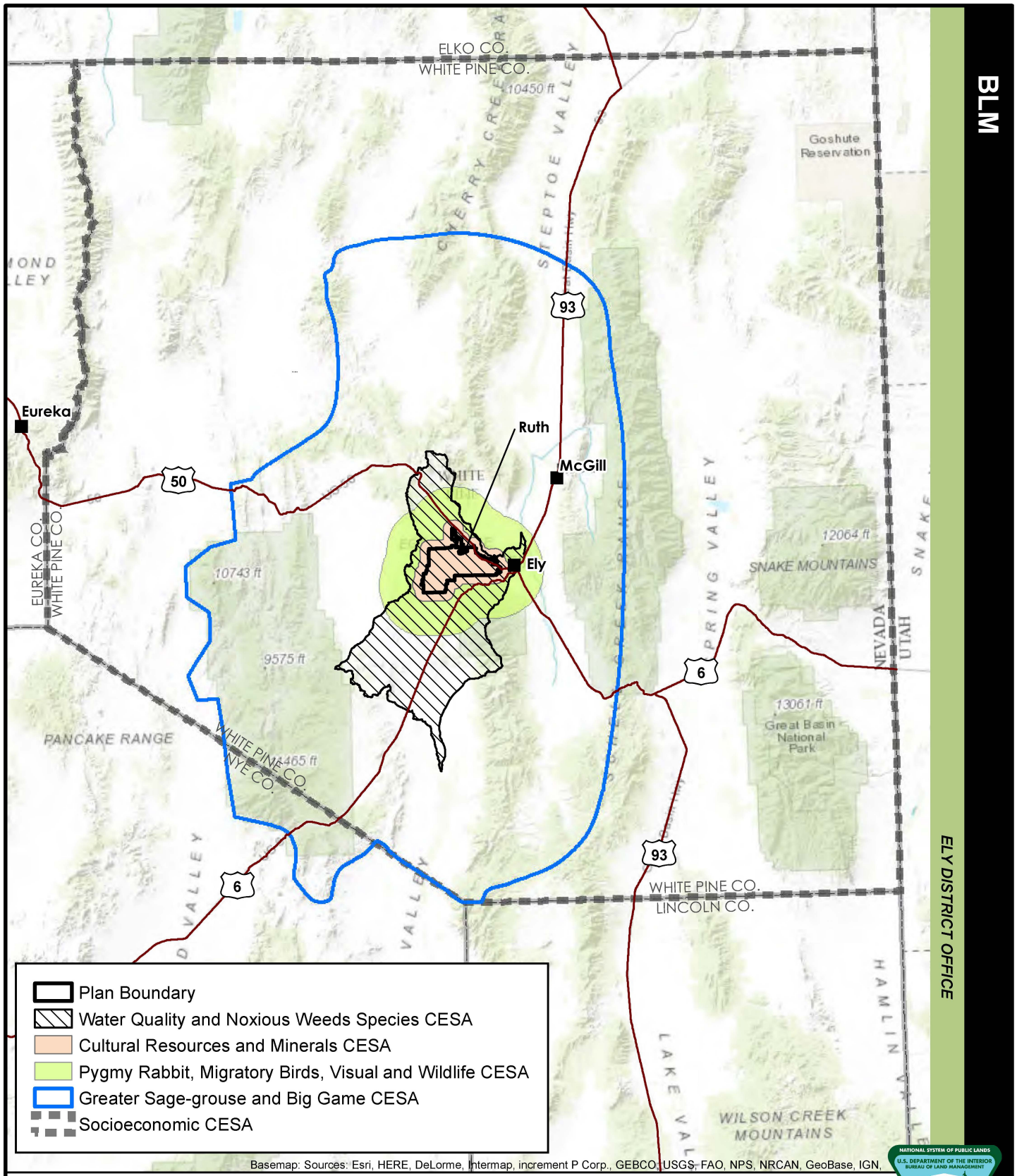

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FIGURE 5-1 CESA BOUNDARIES

KGHM
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0 16 32 Miles
1 inch = 16 miles

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5.2 Past and Present Actions

According to the CEQ Guidance Memorandum on Consideration of Past Actions in Cumulative Effects Analysis dated June 24, 2005, CEQ regulations do not require the consideration of the individual effects of all past actions to determine the present effects of past actions. CEQ regulations do not require agencies to catalogue or exhaustively list and analyze all individual past actions (CEQ, 2005). In compliance with CEQ regulations, only those past actions that have resulted in present impacts were considered in this cumulative effects analysis. The approximate area of surface disturbance that has resulted in the CESAs from each type of past and present action (e.g., public purposes sites, utilities and infrastructure, urban development, sand and gravel operations, agriculture, railroad, etc.) is presented in Table 5-2.

5.2.1 Mineral Development and Exploration Actions

Surface disturbance from mineral development and material sites by CESA boundary are shown in Table 5-2. In general, past and present mining operations within the overall CESA boundary include Alligator Ridge, Winrock/Casino, Yankee, South Casino, Easy Junior, Golden Butte, and Ward/Taylor, as well as the active Bald Mountain Mine, and the Robinson Mine. The Robinson Mine is relatively distant from other mining operations, which tends to limit potential cumulative impacts that could occur to various resources. Past and present mining activities also include various exploration operations associated with these and historic mining operations. In addition, there are numerous past and present permitted sand and gravel operations throughout the CESA boundaries. There are also numerous authorized Notices of Intent (NOIs) for mining exploration operations within the overall CESA boundary. However, disturbance from past NOIs has likely been reclaimed.

5.2.2 Utilities, Infrastructure, and Public Purpose Activities

Utilities and infrastructure within the CESAs include various transmission and distribution lines, communication facilities, and telephone and fiber optic lines. Major utilities within the CESAs include the ON Line Project, the Falcon to Gonder 345 kV transmission line, and the Silver State fiber optic line. In addition there are various water and irrigation facilities within the CESAs. Approximate surface disturbance from utilities and infrastructure within the CESA boundaries are shown in Table 5-2.

Public purpose sites within the overall CESA boundary include sewage treatment facilities including the City of Ely sewage treatment facilities; parks and school sites; various recreation areas and campgrounds; Ely State Prison; and landfills in the City of Ely and White Pine County. Surface disturbance from public purpose sites within the CESA boundaries are shown in Table 5-2.

Table 5-2 Acres of Past and Present Actions within the CESAs

CESA[1]	Acres														
	Mineral Materials Sites	Public Purpose Sites	Comm. Facilities	Water Infra-structure	O&G Pipe lines	Power Lines	Telephone and Fiber Optic Lines	NOIs	Surface Mgmt. Plans[2]	Road[3]	Rail road	Urban Dev.	Ag.	Fire[4]	Total
Cultural and Minerals	463	3	36	253	0	1,513	1,350	23	6,867	1,414	172	76	0	0	12,170
Water and Noxious Weeds	1,356	803	39	266	0	19,174	1,393	35	6,867	3,242	172	971	113	2,262	36,693
Migratory Birds, Visual, General Wildlife, and Pygmy Rabbit	2,497	4,449	39	255	0	20,378	1,363	23	6,867	3,071	469	1,430	174	193	41,208
Greater Sage-grouse and Big Game	7,645	10,686	60	7,100	1	22,110	1,787	154	7,200	15,075	469	1,647	7,557	20,383	101,874

[1] Socioeconomics not included as disturbance acres are not relevant to the analysis
[2] This category includes approved, pending, or closed mine and/or exploration plans of operations; total authorized disturbance acreage but actual disturbance may be less.
[3] Assumptions for road calculations: U.S. Highway 100 foot width, State routes vary from 30- to 70-foot width, county routes vary from 30- to 50-foot width, roads categorized as "other" 20-foot width.
[4] Only fire after 1999 included.

5.2.3 Roads and Railroads

There are numerous roads and miles of railroads within the overall CESA boundary. Roads include: U.S. Highway 50, U.S. Highway 6, and U.S. Highway 93; various State Routes including State Routes 318, 487, 488, 490, 892, 893, 894, and 895; various local and CRs (including CR 44); and other improved or unimproved roads and trails, including USFS designated roads and motorized trails shown on the Ely Ranger District Motor Vehicle Use Maps. The only railroad within the overall CESA boundary is the Northern Nevada Railroad. Surface disturbance from roads and railroads within the CESA boundaries are shown in Table 5-2.

5.2.4 Agriculture

In general, agriculture is limited in White Pine County. Agriculture within the overall CESA boundary primarily occurs in the Lund area of White Pine County and at dispersed locations. Surface disturbance from agriculture operations within the CESA boundaries are shown in Table 5-2.

5.2.5 Urban Development

Urban development within the overall CESA boundary includes Ruth, the City of Ely, and the Town of McGill. In addition to the above mentioned towns and city, there are other small communities and dispersed residential home sites throughout the overall CESA boundary. However, it is not feasible to account for every individual home site within the CESAs, so Table 5-2 accounts for the acres of disturbance associated with the most prevalent urban development within the CESAs.

5.2.6 Wildland Fires and Vegetation Treatment Projects

Only those wildland fires that occurred in 1999 or later were considered in this cumulative effects analysis. Areas affected by wildland fires that occurred earlier than 1999 have generally revegetated and would have no measurable cumulative effects. The total acres of wildland fires for each CESA are presented in Table 5-2.

Vegetation treatments and aerial seeding projects have also likely occurred within the overall CESA on public lands.

5.2.7 Grazing and Range Improvements

Grazing and grazing allotments occur throughout the overall CESA boundary. There are fencing and other range improvements within the CESAs as well. However, the grazing allotment acreage, and the acreage associated with range improvements, was not included in the disturbance calculations in Table 5-2 because actual disturbance associated with grazing and range improvements is difficult to quantify.

5.2.8 Fuelwood Harvest

Personal-use fuelwood harvest occurs on National Forest System and BLM-administered land throughout the CESAs, but surface disturbance is not associated with this activity.

5.3 Reasonably Foreseeable Future Actions

5.3.1 Mineral Development and Exploration Actions

Within the CESA boundaries there are various mining and exploration activities currently proposed with pending approval, including the Gold Rock Mine in White Pine County (BLM, 2016a). There are also several NOIs for exploration operations within the overall CESA boundary. Estimated surface disturbance from reasonably foreseeable future mineral development and exploration projects within the CESA boundaries are shown in Table 5-3. There are also several pending sand and gravel operations within the CESA boundaries.

5.3.2 Utilities, Infrastructure and Public Purpose Activities

There are several pending applications for various public purposes activities and water infrastructure. Surface disturbance from reasonably foreseeable future utilities, infrastructure and public purpose activities within the CESA boundaries are shown in Table 5-3.

5.3.3 Roads

There are several pending ROWs for road construction. Pending road construction consists primarily of new access roads to residences and communication sites, or for grazing operations. Surface disturbance from reasonably foreseeable future roads within the CESA boundaries are shown in Table 5-3.

5.3.4 Vegetation Treatment Projects

Reasonably foreseeable future vegetation treatment projects include the Currant-Ellison Watershed Restoration Project (USFS, 2016). This project is proposed for habitat improvements and restoration, water quality improvements, and fuels reduction near private lands, structures, and other critical resources within the larger CESAs. The project includes 185,000 acres and is located within the White Pine Mountain Range. Surface disturbances from the reasonably foreseeable future vegetation treatment project within the CESA boundaries are not reflected in Table 5-3 as exact locations are unknown.

Table 5-3 Acres of Reasonably Foreseeable Future Actions within the CESAs

CESA[1]	Acres												
	Mineral Materials Sites	Public Purpose Sites	Communi-cations Facilities	Water Infra-structure	O&G Pipelines	Power Lines	Telephone and Fiber Optic Lines	NOIs	Surface Mgmt Plans	Railroads	Roads	Wind Energy	Total
Cultural and Minerals	0	0	0	0	0	0	0	0	0	0	1	0	1
Water and Noxious Weeds	<1	480	0	0	0	0	0	0	1	0	1	0	483
Migratory Birds, Visual, and Wildlife	0	480	0	2	0	0	0	0	1	0	2	0	485
Special Status Species and Big Game	56	520	<1	18	0	0	0	0	1	0	5	21,767	22,358

Source: LR2000

[1] Socioeconomics not included because disturbance acres are not relevant to the analysis.

5.3.5 Fuelwood Harvest

Fuelwood harvesting is expected to continue within the CESAs, with no anticipated surface disturbance associated with this activity.

5.3.6 Grazing and Range Improvements

Grazing and range improvements are expected to continue within the CESAs.

5.4 Cumulative Impact Analysis

5.4.1 Cultural Resources

Cultural resources potentially vulnerable to cumulative effects include historic properties, historic structures, and TCPs. The incremental degradation of the resources reduces the information and interpretive potential of historic properties.

Approximately 30,085 acres of the CESA (42,365 acres) are managed by the BLM and 10 acres managed by the Bureau of Indian Affairs. This equates to 71 percent of the CESA under federal regulatory oversight. The remaining land includes 12,270 acres (29 percent) of private lands, which are subject to Section 106 of NHPA when a project is considered a federal undertaking. The primary land uses in the CESA include mining and ranching/livestock grazing.

Past and present disturbances to cultural resources in the CESA are the result of mining, road construction and maintenance, above and below ground utilities, ranching/livestock grazing, residential and community development, fire, and likely vandalism and/or unauthorized artifact collection. The past and present land uses in the CESA could result in the loss, disturbance, theft, and burial of cultural artifacts and sites, as well as the modification and alteration of the setting of historic properties and resources. The incremental degradation of cultural resources reduces the information and interpretive potential of historic properties.

Development on state and federal lands requires that cultural resource surveys be conducted to determine the presence of cultural resource sites eligible for listing on the National Register; there is no such requirement for disturbance on private lands unless there is a federal or state nexus. As directed by Section 106 of the NHPA, National Register-eligible sites are generally avoided or mitigated if avoidance is not possible for projects with a federal or state nexus. Projects/development disturbances conducted prior to 1966 (i.e., prior to NHPA) and/or those without a federal or state nexus generally did not identify/quantify cultural resource sites or impacts to them.

Sites that have been determined to be ineligible for the National Register did not require avoidance, have been discharged from management, and therefore could be impacted by the activities requiring the cultural resource inventory (i.e., development, utility installation, fence projects, road construction, etc.).

Past and present actions have disturbed approximately 12,170 acres (29 percent) of the CESA. Mining disturbances have included the Robinson Mine as well as associated exploration projects. Road construction and maintenance has disturbed 1,414 acres; this includes portions of U.S. Highway 50 and U.S. Highway 6, as well as CRs, local roads, and unnamed miscellaneous roads. Additional past and present activities/disturbances in the CESA include mineral materials sites, public purpose sites, communication facilities, water infrastructure, power lines, telephone and fiber optic lines, railroad, and urban development.

The RFFAs in the CESA, other than continued authorized mining operations, is road development which would disturb an additional one acre within the CESA; however, if there is a federal or state nexus, avoidance and/or mitigation of impacts to NRHP-eligible cultural resources would be required. Other unquantifiable disturbances would likely include road maintenance, grazing, vegetation management, and recreational activities.

Although limited in the CESA, recreational use is expected to increase. Increases in dispersed recreational use of the area increases the potential for vandalism and/or artifact collection at historic properties.

Past, present, and RFFA disturbance to cultural resources in the CESA have been and would be the result of mining activities, road development, utility development, ranching/livestock grazing, private development, and likely vandalism and unauthorized artifact collection. Private development and vandalism/unauthorized artifact collection are not quantifiable. Of the total 42,365 acres covered by the Cultural Resources CESA, 12,171 acres of disturbance are associated with past, present, or RFFAs, which is a disturbance of approximately 29 percent of the CESA. The Proposed Action would increase the disturbance within the CESA by 327.6 acres to approximately 12,499 acres. This is less than a one percent disturbance increase within the CESA.

5.4.1.1 Proposed Action

Current and future development will contribute to the cumulative effects, both direct and indirect, on prehistoric and historic cultural resources in the CESA. All proposed, reasonably foreseeable developments would be completed under the oversight of Section 106 of NHPA if there were a federal or state nexus and thus project impacts would be individually addressed. Impacts to specific cultural resources would depend on the exact project location and extent of ground disturbance, as well as land jurisdiction. Section 106 of the NHPA requires avoidance and/or mitigation of impacts to NRHP-eligible cultural resources by federal undertakings.

Development of the Proposed Action would be less than one percent of the CESA and may contribute to the loss of site integrity of NRHP-eligible historic properties, if they could not be avoided by project design. However, any historic properties would be avoided or mitigated as directed in the Programmatic Agreement. This impact, in addition to other reasonably foreseeable future activities on federal or state lands would be minor. Data recovery of NRHP-eligible sites that could not be avoided would expand the regional database and knowledge of prehistoric and historic contexts. The mitigation

measures developed to avoid direct impacts to cultural resources would also minimize contributions to cumulative effects. Cumulative impacts to cultural resources from past, present, and RFFAs would be minor to major and long-term.

Increased disturbance from multiple actions could result in cumulative adverse impacts to as yet unknown cultural resource sites. Increased accessibility created by new roads built in association with projects can cause cumulative impacts related to increased public visitation, recreational impacts, unauthorized artifact collection, and vandalism.

5.4.1.2 No Action Alternative

Selection of the No Action Alternative would result in no additional impacts to prehistoric and historic resources other than those already authorized. However, the cultural resource inventories conducted in support of the proposed project and others expand the regional database and knowledge of prehistoric and historic contexts.

Under the No Action Alternative, cumulative impacts would be similar to those described in the Proposed Action, as currently authorized activities would also adhere to the Programmatic Agreement.

5.4.2 Migratory Birds

Past and present actions within the CESA (162,117 acres) have resulted in the loss or modification of habitat suitable for migratory birds. Noise and visual irritation from present mining and exploration operations and public purpose sites has affected migratory birds by causing avoidance of the habitat near these actions. Noise and visual irritation from travel on roads and trails has also caused avoidance of nearby habitat. Roads and utilities have fragmented habitat in the CESA, as have wildland fires. Wildland fires and roads have also likely caused direct mortality of migratory birds.

The surface disturbance associated with the past and present actions in the CESA, as presented in Table 5-2, represents an equivalent area of either foraging or nesting habitat, or both, that has either been lost or modified.

Migratory birds have been impacted from grazing because nesting success can be reduced from the loss of grass understory that is caused from grazing.

Removal of pinyon and juniper trees from RFFAs would further reduce habitat for pinyon-juniper dependent species, including the pinyon jay. However, the removal of pinyon and juniper trees would reduce the number of raptor perches in the CESA, which would likely decrease predation of migratory bird nests.

Continued present actions and RFFAs have the potential to impact migratory birds or their nests. The RFFAs proposed would be required to comply with the MBTA.

Continued present actions and RFFAs have the potential of a “take” of golden eagle or their nests. The RFFAs proposed on BLM-administered land would be required to comply with the BGEPA, so a “take” of nests or eagles from these actions would be

unlikely. Thus, a downward trend in nesting success or eagle populations in the CESA is unlikely in the reasonably foreseeable future.

The ongoing operation of some present actions, such as roads, urban development, and mining operations generate noise and visual disruptions and human activity that may cause migratory birds and raptors to avoid using habitat in the surrounding area. Present public purpose sites, particularly recreation sites also produce similar disruptions and are often associated with regular human activity, which may lead to avoidance of otherwise suitable habitat. Reasonably foreseeable future mining operations would create additional long-term noise and visual disruptions and human presence, potentially leading to additional avoidance of otherwise suitable migratory bird and raptor habitat. Migratory bird and raptor nest sites within proximity to reasonably foreseeable future mining operations may be abandoned if noise and visual disruptions and human activity are constant and of substantial intensity. Abandonment of nests would likely lead to mortality of the young birds. Mortality of adult birds from collisions with vehicles operated on existing roads may have also occurred, and would remain a possibility in the reasonably foreseeable future as travel on roads would continue.

5.4.2.1 Proposed Action

The Proposed Action would result in loss and modification of migratory bird habitat, auditory or visual irritation, and possibly mechanical related mortality. Further, it would result in additional loss or modification of foraging and nesting habitat. Additionally, removal of pinyon and juniper trees may impact species dependent on these habitats, including the pinyon jay. Reclamation would result in the establishment of sagebrush habitat within the CESA. Further, reasonably foreseeable future vegetation treatment projects would be anticipated to improve the amount and quality of migratory bird habitat elsewhere in the CESA.

All RFFAs on BLM- and National Forest System-administered land would have to comply with all applicable laws and policies, and would incorporate project design features and EPMs to minimize impacts to migratory birds, and include mitigation measures to reduce unavoidable impacts. Consequently, the Proposed Action would have negligible to minor long term cumulative impacts on migratory birds, when combined with the impacts from past and present actions and RFFAs in the CESA.

5.4.2.2 No Action Alternative

Under the No Action Alternative, Project-related direct or indirect cumulative impacts to wildlife, including raptors and migratory birds, or habitat within the CESA would be similar to the Proposed Action, as operations would continue under the authorized Plan. However, mining cessation (EOML 2018) and reclamation would occur four years sooner. Similarly, reclamation could result in the establishment of sagebrush habitat within the CESA. Further, reasonably foreseeable future vegetation treatment projects would be anticipated to improve the amount and quality of migratory bird habitat elsewhere in the CESA.

5.4.3 Noxious Weeds

Within the CESA (Figure 5-1), the impervious surfaces and landscaping associated with urban development have permanently removed native vegetation cover. Native vegetation cover has also been permanently removed by the roads and trails, public purpose projects, and mining activities in the CESA. Other past and present actions have changed the species composition and structure of vegetation cover, mostly from removal of vegetation associated with surface disturbance. However, grazing has affected species composition because livestock select or avoid specific plant species, and vegetation species have differing levels of tolerance to grazing (Szaro, 1989). The management of vegetation cover within the ROWs for utility lines has also altered species composition. The objective of past, present and reasonably foreseeable future vegetation treatment projects within the CESA have generally been to directly or indirectly improve the health of vegetation communities. Wildland fire within the vegetation CESA has caused substantial changes to the composition and condition of the vegetation communities. Reasonably foreseeable future sand and gravel operations, public purpose projects, and mining and exploration operations would impact additional vegetation cover in the CESA (Table 5-3).

At the time of their construction or implementation, all of the past and present actions considered in this analysis may have introduced or contributed to the spread of non-native, invasive and noxious species within the CESA. Present actions that may continue to introduce or contribute to the spread of non-native, invasive and noxious species within the CESA include the maintenance of existing utility lines and water pipelines, maintenance and use of roads and trails, and livestock grazing. Many non-native, invasive and noxious species are prone to colonization of areas burned in wildland fire, and it is possible that these species occur in the CESA partially due to wildland fire. The RFFAs on BLM-administered or National Forest System land in the CESA would be subject to control and treatment of non-native, invasive and noxious species, thus reducing their impact on native vegetation cover.

5.4.3.1 Proposed Action

The Proposed Action would impact approximately 327 acres (<1 percent) of vegetation cover within the CESA (204,116 acres). Impacts would include modification of species composition and structure, direct mortality from construction activities and mining operations, and potential establishment or spread of non-native, invasive and noxious species. Existing and future infestations of non-native, invasive species and noxious species within the Plan boundary would be treated as required in the *Robinson Operation Noxious Weed Management Plan* (SRK, 2016c). Outside of the Plan boundary, existing noxious weed species on BLM-administered land would continue to be treated as described in the Ely District Integrated Weed Management Plan. Continued use of roads and continued recreation may cause weeds to spread throughout other portions of the CESA. Modification of vegetation cover and intentional removal of certain vegetation types would be to improve the long-term ecological health and resiliency of the vegetation communities within the Plan boundary. Project design features would require the treatment and control of noxious weeds. The incremental

impact of the Proposed Action would be long term and negligible when combined with past, present, and RFFAs.

5.4.3.2 No Action Alternative

Under the No Action alternative, direct removal of vegetation or modification of vegetation within the Plan boundary would occur to those areas currently authorized for disturbance under the authorized Plan. Existing infestations of non-native, invasive species and noxious weeds within the Plan boundary would be treated as required in the *Robinson Operation Noxious Weed Management Plan*. Outside the Plan boundary, existing noxious weed species on BLM-administered land would continue to be treated as described in the Ely District Integrated Weed Management Plan. Continued use of roads and continued recreation may cause weeds to spread throughout other portions of the CESA. RFFAs on BLM- or National Forest System-administered land would require treatment of infestations elsewhere in the CESA. The incremental impact from the potential spread of non-native, invasive and noxious weed species throughout the Plan boundary would have negligible cumulative impacts on vegetation resources within the CESA.

5.4.4 Water Quality

The Water Resources CESA (204,116 acres) was and will continue to be impacted by past and present urban development, sand and gravel operations, public purpose projects, utilities and infrastructure, mining and exploration, roads, and wildfire. Future development and uses within the CESA would result in sedimentation resulting from erosion and impacts from disturbances within floodplains and other natural drainages.

As 79 percent of the CESA is under BLM administration, grazing is expected to be an important land use within the CESA for the foreseeable future. Grazing within the Plan boundary would not be conducted prior to final reclamation. Therefore, for an extended period of time, there would be no effects from grazing on water resources in the Plan boundary. However, grazing in other portions of the CESA would have the potential to increase erosion and sedimentation with potential cumulative impacts to water quality, but would be managed by the BLM. In the long term, the cumulative effects would be minor.

5.4.4.1 Proposed Action

Cumulative effects may occur in the area surrounding the Plan boundary if other projects that impact surface or ground water are located within or near the drainage basins impacted by the Proposed Action or its alternatives. For surface water resources, the Proposed Action drains either northward into Robinson Canyon and Gleason Creek and then into Steptoe Valley, or to the southwest into Giroux Wash and finally into the White River Valley, which is part of the upper Colorado River Basin in Nevada.

Given the minor impacts to water resources that have occurred as a result of mining in past years, and the predicted negligible to minor level of impacts predicted to occur for water resources under the Proposed Action, the cumulative impacts to water resources would be minor and long term.

5.4.4.2 No Action Alternative

Under the No Action Alternative, mining would continue under the authorized Plan (EOML 2018), ending four years earlier than the Proposed Action. Cumulative impacts to water resources would be similar to those described in the 1994 FEIS (BLM, 1994a).

5.4.5 Minerals

Mining activities typically have the largest impacts on mineral resources because they contribute to mineral resource depletion, removal of mineral resources from availability for development, topographic changes, and affect geotechnical stability. Other actions, such as sand and gravel extraction operations; utility lines; roads; public purpose projects; water infrastructure; wildland fires; and fuel treatment, burn control, and restoration projects also disturb surface acreage; however, they typically conform closely to the local topography and have negligible, if any, impacts on mineral resources. Disturbance associated with utilities, infrastructure, public purpose projects, wildland fires, restoration, and seeding projects are not included in the disturbance calculations presented below because the impacts are not directly related to minerals.

5.4.5.1 Proposed Action

The Proposed Action would contribute to the depletion of copper reserves within the CESA which is a finite resource. Other actions that may cumulatively impact mineral resources are limited to future mining. Cumulative impacts from these activities would be minor to moderate as mineral resources are removed considering the prevalence of mineral-bearing rock in the region. As a result of past, present, and RFFA disturbances in the mineral resources CESA in conjunction with the Proposed Action, cumulative disturbance effects on mineral resources would be minor and long term.

5.4.5.2 No Action Alternative

Under the No Action Alternative, cumulative impacts to mineral resources within the CESA would be similar to the Proposed Action, as operations would continue under the authorized Plan. However, less of the mineral resource would be removed.

5.4.6 Socioeconomics

The CESA for socioeconomics includes White Pine County. The individuals and businesses that would be affected by the Project would be primarily in this County, with the cumulative effects greater for the individuals and businesses in Ruth and Ely, the towns located closest to the Robinson Mine. The social and economic structures and relationships that are in place in the CESA in support of previous and current mining and other activity in the area are described in Section 4.9, in addition to the local, mine-related employment and activity.

RFFAs include new industry within White Pine County, such as wind energy development (Table 5-3). New industry would help to diversify and stabilize the economy of White Pine County from the boom and bust economics associated with mining.

5.4.6.1 Proposed Action

The incremental socioeconomic impacts of the Proposed Action would include a constant level of employment and economic contribution from tax, royalty, and service revenues for the next five years (EOML 2022). Cumulatively, the mining in White Pine County, including that which occurs at the Bald Mountain Mine in conjunction with current mining at the Robinson Mine, contribute to the economy and need for services in the CESA. There is a cumulative need for housing, schools, retail, food services, and municipal services such as police, fire, etc. because of the presence of (and active mining at) the mines within the CESA. Consequently, the eventual closure of these mines will have a long term and moderate cumulative impact to these factors in the CESA, which would be more substantial depending on the timing of the cessation of mining at each facility.

5.4.6.2 No Action Alternative

Under the No Action Alternative, mining of copper under the authorized Plan would continue until the available copper reserves are depleted (EOML 2018), four years earlier than the Proposed Action. Cumulative socioeconomic impacts would be similar to those described under the Proposed Action.

5.4.7 Special Status Species

5.4.7.1 Greater Sage-Grouse

Table 5-2 details past and present actions within the CESA (1,977,525 acres). However, not all of the disturbance detailed on Table 5-2 is within designated greater sage-grouse habitat. The surface disturbance from past and present actions within the greater sage-grouse CESA have altered or removed habitat that the BLM has designated as either essential/irreplaceable habitat, important habitat, or habitat of moderate importance. Past vegetation treatment projects generally improve greater sage-grouse habitat by increasing the amount and quality of sagebrush habitat within the CESA.

In addition to direct loss or modification of habitat, past and present urban development, public purpose sites, and roads, as well as present mining operations and recreational uses, have increased human activity and presence in the CESA. Increased human activity has caused visual and noise irritations that have likely led to avoidance of habitat near these activities. Existing roads, as well as railroads and utility lines have also caused fragmentation of greater sage-grouse habitat.

The RFFAs would impact greater sage-grouse habitat that the BLM has designated as either PHMA, GHMA, or OHMA. However, the majority of the impacts would occur from reasonably foreseeable future wind energy and public purpose projects. Additionally, in accordance with the *Nevada and Northeastern California Greater Sage-grouse Approved Resource Management Plan Amendment* (BLM, 2015), BLM would apply conservation and mitigation measures, timing restrictions, and RDFs to any RFFAs considered discretionary projects occurring on BLM-administered land. RFFAs may impact greater sage-grouse during operations from increased visual and noise irritation.

5.4.7.1.1 Proposed Action

The Proposed Action may result in greater sage-grouse avoidance of the Plan boundary during operations. Reclamation would result in the establishment of sagebrush habitat within the CESA. Further, reasonably foreseeable future vegetation treatment projects would be anticipated to improve the amount and quality of greater sage-grouse habitat elsewhere in the CESA, thus reducing impacts to greater sage-grouse. The Proposed Action would not result in a trend toward federal listing or a loss of viability of greater sage-grouse when combined with the impact of the other actions in the CESA. Accordingly, the cumulative impacts to greater sage-grouse from the Proposed Action would be long term and minor.

5.4.7.1.2 No Action Alternative

Under the No Action Alternative, Project-related cumulative impacts to greater sage-grouse or habitat within the CESA would be similar to the Proposed Action, as operations would continue under the authorized Plan. However, mining cessation (EOML 2018) and reclamation would occur sooner. Reclamation would result in the establishment of sagebrush habitat within the CESA. Further, reasonably foreseeable future vegetation treatment projects would be anticipated to improve the amount and quality of greater sage-grouse habitat elsewhere in the CESA, thus reducing impacts to greater sage-grouse. Therefore, the cumulative impacts to greater sage-grouse from the No Action Alternative would be long term and minor.

5.4.7.2 Pygmy Rabbits

Past and present actions within the CESA (162,117 acres) have resulted in the loss or modification of habitat suitable for pygmy rabbit. Noise and visual irritation from present mining and exploration operations and public purpose sites has affected pygmy rabbit by potentially causing avoidance of the habitat near these actions. Noise and visual irritation from travel on roads and trails has also caused avoidance of nearby habitat. Roads and utilities have fragmented habitat in the CESA, as have wildland fires. Wildland fires and roads have also potentially caused direct mortality of pygmy rabbit.

Livestock grazing may reduce ground cover and nutrient content of forbs and grasses which may have impacts to pygmy rabbit (Thines et al., 2004). Livestock grazing may also have damaged or destroyed rabbit burrows.

Removal of sagebrush habitat associated with RFFAs may increase predation of pygmy rabbits and would result in avoidance of otherwise suitable habitat. Removal of pinyon and juniper trees would reduce the number of raptor perches in the CESA, which would likely decrease predation of pygmy rabbits.

5.4.7.2.1 Proposed Action

The Proposed Action may result in pygmy rabbit avoidance of the Plan boundary during operations and potentially direct mortality from vehicles. Reclamation would result in the establishment of sagebrush habitat within the CESA. Further, reasonably foreseeable future vegetation treatment projects would be anticipated to improve the amount and quality of pygmy rabbit habitat elsewhere in the CESA, thus reducing impacts to pygmy rabbit. The Proposed Action would not result in a loss of viability of pygmy rabbit when

combined with the impact of the other actions in the CESA. Accordingly, the cumulative impact to pygmy rabbit from the Proposed Action would be negligible to minor and long term.

5.4.7.2.2 No Action Alternative

Under the No Action Alternative, Project-related direct or indirect cumulative impacts to pygmy rabbit or habitat within the CESA would be similar to the Proposed Action, as operations would continue under the authorized Plan. However, mining cessation (EOML 2018) and reclamation would occur sooner. Reclamation would result in the establishment of sagebrush habitat within the CESA. Further, reasonably foreseeable future vegetation treatment projects would be anticipated to improve the amount and quality of pygmy rabbit habitat elsewhere in the CESA, thus reducing impacts to pygmy rabbit.

5.4.8 Visual Resources

The CESA for visual resources is the Plan boundary and a five-mile buffer. While the location of the mine and ancillary facilities are topographically screened from certain directions, visual disturbances associated with the mining operations are visible for travelers on the highways north (U.S. Highway 50) and southeast (U.S. Highway 6) of the Plan boundary. Combined with other ongoing surface disturbing activities within the CESA, including urban development, public purpose projects, sand and gravel operations, utility lines, and infrastructure, mining in the Plan boundary cumulatively contributes to a visually impacted landscape.

5.4.8.1 Proposed Action

Under the Proposed Action, mining would continue to EOML 2022; mining disturbance would increase in areas visible both north and southeast of the Plan boundary. The Proposed Action would result in surface disturbances that repeat the existing form, line, texture, and color of the existing landscape which includes past and present mining activities. Reclamation would include recontouring and revegetating disturbed areas. Areas of valley fill would permanently alter area topography and would be intermittently visible in the landscape, contributing to cumulative effects. Residual effects of mining would be apparent for a number of years until the reclaimed area naturalizes with mature vegetation. Cumulative impacts to visual resources would be long term but minimized due to reclamation efforts.

5.4.8.2 No Action Alternative

Cumulative impacts of the No Action Alternative would be similar to the Proposed Action. However, mining and reclamation under the No Action Alternative would conclude sooner than the Proposed Action (EOML 2018).

5.4.9 Wildlife

For the cumulative effects analysis, wildlife was grouped into two categories general wildlife including raptors and big game. The CESA description and explanation for each

wildlife group is detailed in Table 5-1. The CESA boundaries are presented on Figure 5-1.

5.4.9.1 General Wildlife

All of the past and present actions within the general wildlife CESA have resulted in the loss or modification of habitat suitable for wildlife. Noise and visual irritation from present mining and exploration operations and public purpose sites has affected wildlife by causing avoidance of the habitat near these actions. Noise and visual irritation from travel on roads and trails has also caused avoidance of nearby habitat. Roads and utilities have fragmented habitat in the CESA, as have wildland fires. Wildland fires and roads have also likely caused direct mortality of general wildlife.

The surface disturbance associated with the past and present actions in the CESA, as presented in Table 5-2, represents an equivalent area of either raptor foraging or nesting habitat, or both, that has either been lost or modified. Suitable raptor habitat in the CESA has also been fragmented from linear past and present actions, such as roads and trails, utility lines, pipelines, and railroads. Reasonably foreseeable future public purpose projects, power lines, and water pipelines would further fragment raptor habitat in the CESA. Surface disturbance associated with reasonably foreseeable future vegetation treatment projects would be expected to either directly or indirectly improve habitat quality.

Livestock grazing may reduce ground cover. The reduced grass understory may impact many species of general wildlife by creating increased competition for forage area.

Removal of sagebrush habitat associated with RFFAs may increase predation of wildlife, and would result in avoidance of otherwise suitable habitat. Removal of pinyon and juniper trees from RFFAs would further reduce habitat for pinyon-juniper dependent species. However, the removal of pinyon and juniper trees would reduce the number of raptor perches in the CESA, which would likely decrease predation of small mammals and reptiles.

5.4.9.1.1 Proposed Action

The Proposed Action would result in loss and modification of wildlife habitat, auditory or visual irritation, and possibly vehicle related mortality. Further, it would result in additional loss or modification of foraging and nesting habitat. Adverse impacts to raptors nests would be avoided. Additionally, removal of pinyon and juniper may impact species dependent on these habitats. The long-term cumulative impacts of the Proposed Action when combined with the impacts from past and present actions and RFFAs would not exceed minor or result in a loss of viability or trend toward federal listing for any wildlife species.

All RFFAs on BLM- and National Forest System-administered land would have to comply with all applicable laws and policies, and would incorporate project design features and EPMs to minimize impacts to raptors, and include mitigation measures to reduce unavoidable impacts. Consequently, the Proposed Action would have long-term,

minor cumulative impacts on wildlife, including raptors, when combined with the impacts from past and present actions and RFFAs in the CESA.

5.4.9.1.2 No Action Alternative

Under the No Action Alternative, Project-related direct or indirect cumulative impacts to wildlife, including raptors, or habitat within the CESA would be similar to the Proposed Action, as operations would continue under the authorized Plan. However, mining cessation (EOML 2018) and reclamation would occur sooner. Reclamation would result in the establishment of sagebrush habitat within the CESA.

5.4.9.2 Big Game

Past and present actions in the CESA have resulted in the loss or modification of big game habitat. Past and present actions such as urban development, public purpose sites, roads and trails, and mineral exploration and mining operations (including sand and gravel operations) have resulted in the long term to permanent loss of big game habitat. Past and present agriculture and management of vegetation within the ROWs for utility lines and water pipelines have modified habitat. Modification of habitat has decreased the habitat quality, and in some areas resulted in the loss of habitat. Wildland fire has also modified and destroyed habitat within the CESA.

Past and present vegetation treatment projects have generally improved the health of vegetation and habitat quality in the CESA. However, the removal of pinyon and juniper from these treatment projects has reduced the area of mule deer and elk cover within the CESA.

Reasonably foreseeable future mining and exploration operations, sand and gravel operations, public purpose projects, water infrastructure, and wind energy development would impact additional potential big game habitat within the CESA. Reasonably foreseeable future vegetation treatments would impact additional potential big game habitat, but habitat quality would generally improve following the vegetation treatment projects. However, cover for mule deer and elk may be reduced after completion of vegetation treatment project.

Seasonal migration corridors for mule deer and elk occur in the big game CESA. Past and present mining and mineral exploration projects have likely removed habitat from some locations within the corridors. There are numerous roads and trails that also cross these corridors. It is possible that mining and exploration operations and roads and trails have affected mule deer and elk movement. It is also possible that wildland fires within the CESA have altered habitat and affected migratory movements. However, there is no known data available comparing migration numbers prior to the roads and trails, mining operations, and wildland fires.

Reasonably foreseeable future mining and exploration projects would remove habitat, which may potentially affect seasonal big game migration. Any potential impacts to big game migration movement from vegetation treatment projects would be expected to be temporary, occurring only during implementation of the treatment activities. In the long

term, habitat quality would be improved within portions of the CESA where reasonably foreseeable future vegetation treatment projects are proposed.

Mule deer, elk, and antelope have likely suffered mortality from vehicle collisions on the existing roads within the CESA. Continued travel on roads would be expected to result in additional mortality in the reasonably foreseeable future. Roads and trails, as well as utility lines and water lines have also fragmented habitat within the CESA. Recreational uses within the CESA have also caused avoidance of habitat near roads and trails and other public purpose sites with recreational uses. Recreational use of the CESA is expected to occur into the reasonably foreseeable future.

5.4.9.2.1 Proposed Action

During implementation of the Proposed Action, big game may avoid the Plan boundary due to the continued noise and visual irritations associated with mining operations, project equipment, and personnel. Long-term impacts would also result in a loss of mule deer and elk cover from removal of pinyon and juniper trees, although this habitat type is abundant in the surrounding area. The RFFAs in the big game CESA consist of mineral material sites, public purpose projects, water infrastructure, and wind energy development that would also have long-term impacts to wildlife habitat, and would also likely reduce the mule deer and elk cover available within the CESA. However, other pinyon and juniper cover occurs within the CESA. Reclamation would result in the establishment of sagebrush habitat within the CESA. Further, reasonably foreseeable future vegetation treatment projects would be anticipated to improve the amount and quality of big game habitat elsewhere in the CESA. The cumulative impact would be long term and negligible to minor because the viability of any big game species would not be reduced or jeopardized.

5.4.9.2.2 No Action Alternative

Under the No Action Alternative, Project-related direct or indirect cumulative impacts to big game or habitat within the CESA would be similar to the Proposed Action, as operations would continue under the authorized Plan. However, mining cessation (EOML 2018) and reclamation would occur sooner. Reclamation would result in the establishment of sagebrush habitat within the CESA. Further, reasonably foreseeable future vegetation treatment projects would be anticipated to improve the amount and quality of big game habitat elsewhere in the CESA.

Chapter 6 Consultation and Coordination

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6.1 Individuals, Organizations, and Tribes Consulted

The following tribes were contacted regarding this proposed project:

- Confederated Tribe of the Goshute Reservation;
- Duckwater Shoshone Tribe of the Duckwater Reservation; and
- Te-Moak Tribe of the Western Shoshone Indians of Nevada.

Formal consultation was initiated on October 2, 2015. The Duckwater Shoshone Tribe, the Ely Shoshone Tribe, and the Confederated Tribes of the Goshute in Utah were invited to be concurring parties to the Programmatic Agreement (Appendix A) during a Tribal consultation meeting attended by the Native American Coordinator of the BLM Ely District. These tribes indicated that there were no known issues regarding the project (BLM and Nevada SHPO, 2016).

Further, a project scoping letter was sent to the Tribes on June 13, 2016. Two tribal representatives attended the June 15, 2016 Mine Tour: Kathryn Griffith from Ely Shoshone Tribe and Annette George from the Duckwater Shoshone Tribe. No comments were received in response to the scoping letter or mine tour.

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Chapter 7 List of Preparers

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Table 7-1 List of BLM Preparers

Name	Title	Responsible for the Following Section(s) of this Document
Duane Bays	Environmental Protection Specialist	Project Manager / Minerals
Concetta Brown	Planning and Environmental Coordinator	NEPA Compliance
Elizabeth Domina	Outdoor Recreation Planner	Visual Resources
Andy Gault	Hydrologist	Water Quality
Nancy Herms	Wildlife Biologist	Migratory Birds, Wildlife, and Special Status Species
Randall Johnson	Unit Aviation Manager	Hazardous or Solid Waste, Human Health and Safety
Christopher McVicars	Natural Resource Specialist	Noxious Weeds and Non-native Invasive Species
Elena Montenegro-Long	Realty Specialist	Lands and Realty
Jill Moore	Field Manager	Project Approval
Leslie Riley	Assistant Field Manager	Cultural Resources
Scott Standfill	Range Management Specialist	Soils, Vegetation, Rangeland
Ruth Thompson	Wild Horse and Burro Specialist	Wild Horses
Elvis Wall	Civil Engineering Technician	Native American Religious Concerns
Kathleen Walsh	Natural Resource Specialist	Forest/Timber

Table 7-2 List of Third-Party Consultant Preparers

Name	Title	Responsible for the Following Section(s) of this Document
Robert Berry	Senior Hydrogeologist/Geochemist	Water Quality
Diana Eck	Environmental Scientist	Visual Resources, Technical Review
Dulcy Engelmeier	Project Coordinator	Technical Editor
Erica Freese	Project Manager/Environmental Scientist	Project Manager
George Dix	Environmental Scientist	Environmental Justice, Lands and Realty
Jenni Prince-Mahoney	Environmental Scientist	Lead Author
Kristi Schaff	Project Manager	Senior Review

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Appendix A Programmatic Agreement

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PROGRAMMATIC AGREEMENT

AMONG

THE BUREAU OF LAND MANAGEMENT, EGAN FIELD OFFICE

AND

THE NEVADA STATE HISTORIC PRESERVATION OFFICER

REGARDING THE KGHM INTERNATIONAL LTD., ROBINSON MINE,

ROBINSON NEVADA MINING COMPANY

WHEREAS, the Bureau of Land Management Egan Field Office (BLM) has determined that the authorization of mining operations at KGHM International Ltd., Robinson Mine, Robinson Nevada Mining Company (RNMC) in White Pine County, Nevada, is an undertaking as defined at 36 CFR 800.16(y) that may have an effect on historic properties eligible for inclusion in the National Register of Historic Places (NRHP), and has consulted with the Nevada State Historic Preservation Officer (SHPO) pursuant to Title 54 U.S.C. §300101, et. seq., commonly known as the National Historic Preservation Act of 1966, as amended (NHPA), and Title 54 U.S.C. §306108, commonly known as Section 106 of the NHPA (Section 106); and

WHEREAS, effects to historic properties in the Area of Potential Effect (APE) (Appendix A) cannot be fully determined prior to approval for RNMC. The BLM, in consultation with the SHPO, enter into this Programmatic Agreement (PA) to set forth procedures to be followed in satisfaction of BLM's Section 106 responsibilities of the NHPA, for the RNMC in the APE; and

WHEREAS, the BLM has defined the Undertaking's area of potential effect (APE) as all geographic areas within which the Undertaking may have direct or indirect effects to historic properties. The APE for ground disturbance has been determined to be approximately 24,000 acres. The BLM also defined an APE for visual effects to historic properties within the view shed of the project. The boundary of the view shed APE is one mile from the proposed action unless otherwise obstructed by natural topographic features. The view shed APE totals approximately 40,000 acres; and

WHEREAS, the BLM, SHPO, and the Advisory Council on Historic Preservation (ACHP) are Signatories to a PA entitled *Programmatic Agreement among the Bureau of Land Management, Ely District, Nevada Division of Historic Preservation and Archaeology, and the Advisory Council of Historic Preservation regarding the Treatment of Historic Properties during Mineral Development Associated with the Robinson Mine by Robinson Mining Limited Partnership* that governs all aspects of the development for the RNMC executed in July, 1990; and

WHEREAS, in accordance with Stipulation 5.c of the 2012 *National Programmatic Agreement among the Bureau of Land Management, the Advisory Council on Historic Preservation, and the National Conference of State Historic Preservation Officers, Regarding the Manner in which the*

BLM Will Meet its Responsibilities under the National Historic Preservation Act, the BLM has consulted with the Advisory Council for Historic Preservation (ACHP) pursuant to 36 CFR §800.14(b), to develop and execute this PA, and the ACHP, through a letter dated December 9, 2015, has elected not to formally enter consultation on the development of this PA; and

WHEREAS, the BLM, the SHPO, and the ACHP wish to terminate the existing Robinson Mine PA effective on the day this document is executed, and the BLM and the SHPO desire to enter into this PA; and

WHEREAS, the BLM has invited Robinson Nevada Mining Company (RNMC) to be a Signatory to this PA; and

WHEREAS, local Native American Tribes, the Duckwater Shoshone Tribe, the Ely Shoshone Tribe, and the Confederated Tribes of the Goshute in Utah have been invited to be concurring parties to the PA, with formal consultation initiated on October 2, 2015, with a Tribal consultation meeting attended by the Native American Coordinator of the BLM, Ely District,. These entities indicated that there were no known issues regarding the project; and

WHEREAS, the BLM has notified the public of the Undertaking and has provided members of the public with an opportunity to express their views on the development of the PA and the Section 106 process pursuant to 36 CFR § 800.6(a) (4) and 36 CFR § 800.14(b) (2)(ii) during and concurrent with the public comment process for the draft *Robinson Mine-Plan of Operation Amendment* NEPA No. DOI-BLM-NV-L010-2016-0005-EA for the RNMC; and

WHEREAS, the State Protocol Agreement between BLM and SHPO dated December, 2014 (Protocol) is hereby incorporated by reference into this PA; and

WHEREAS, the definitions given in the Protocol apply throughout this PA, unless specifically modified below; and

WHEREAS, this PA covers all aspects of RNMC mining operations as defined by the APE; and

NOW, THEREFORE, the Signatories agree that the RNMC shall be administered in accordance with the following stipulations to ensure that historic properties will be treated to avoid or mitigate effects to the extent practicable, regardless of surface ownership, and to satisfy BLM's Section 106 responsibilities for all aspects of the RNMC.

STIPULATIONS

BLM will ensure that the following stipulations are carried out:

I. ROLES AND RESPONSIBILITIES

A. BLM is responsible for administering this PA. This includes but is not limited to ensuring that all Signatories carry out their responsibilities; overseeing all cultural resource work; and assembling all submissions to the SHPO and consulting parties during the implementation of this PA. The Egan Field Manager is the BLM Authorized Officer for RNMC. The Authorized Officer, or their designee, is the RNMC point of contact for BLM.

B. RNMC's signatory, or their designees, will be the responsible point of contact for the RNMC and provide BLM with any and all information needed to implement this PA.

C. RNMC shall bear the expense of identification, evaluation, and treatment of all historic properties directly or indirectly affected by RNMC related activity. Such costs shall include, but not be limited to, pre-field planning, fieldwork, post-fieldwork analysis, research and report preparation, interim and summary report preparation, publications for the general public, costs associated with the preparation of documents and collected artifacts for curation, and the cost of curating project documentation and artifact collections. If RNMC withdraws project applications, then RNMC shall incur no further expense except for completing fieldwork and post-fieldwork activities (production of final inventory, testing and data recovery reports covering the description and analysis of data, and the curation of materials) that has occurred as of the date of withdrawal.

D. BLM will be responsible for all submissions to SHPO and any other interested parties identified during the implementation of this PA for the RNMC. Any submission to SHPO not from BLM will be considered as informational only and will not trigger any compliance timelines or other actions.

E. BLM, in consultation with the SHPO, shall ensure that ethnographic, historic, architectural, and archaeological work conducted pursuant to this PA is carried out by or under the direct supervision of persons meeting qualifications set forth in the *Secretary of the Interior's Professional Qualifications Standards* (currently available at http://www.nps.gov/history/local-law/arch_stnds_9.htm) and who have been permitted for such work on public lands by BLM Nevada State Office.

F. The BLM, in consultation with the SHPO, shall ensure that all work undertaken to satisfy the terms of this PA meets the *Secretary of Interior's Standards and Guidelines for Archeology and Historic Preservation* (48 FR 44716-44742, September 23, 1983) (Standards) and takes into consideration the ACHP's Section 106 Archaeology Guidance (2009; available online at www.achp.gov/archguide), the *BLM Nevada Guidelines and Standards for Archaeological Inventory, 5th edition* (BLM Guidelines) or any subsequent edition issued by the BLM, and any other applicable guidelines or standards.

G. RNMC, in cooperation with BLM and SHPO, shall provide in-house training to ensure that all its personnel and all the personnel of its contractors and subcontractors are directed not to engage in the illegal collection of historic and prehistoric materials. Subsequent hires will also be required to be subject to similar training. Training can be in association with RNMC's safety and or related job training and project orientation. RNMC shall cooperate with BLM to ensure compliance with the Archaeological Resources Protection Act of 1979 (ARPA) (16 U.S.C. 470) on Federal lands.

H. RNMC shall be responsible for costs of rehabilitation or mitigation, and may be subject to criminal penalties, should damage to cultural resources inside or outside the APE occur during the period of construction, mine operation or reclamation due to the unauthorized, inadvertent, or negligent actions of RNMC, their employees, contractors or any other project personnel.

I. If the RNMC is sold or otherwise transferred to another proponent other than RNMC, the Signatories will determine within 90 days of the sale or transfer if the PA will remain in effect, be amended per Stipulation V, or be terminated per Stipulation VI. All provisions of the PA will remain in effect until such a determination is made.

II. PROCESS

A. IDENTIFICATION OF HISTORIC PROPERTIES

1. BLM shall consult with interested parties and Tribes as identified through the Section 106 process, as appropriate, in all activities carried out under this PA associated with the Project. Identification and evaluation of historic properties shall be conducted on all lands identified within approved Plans of Operation and subsequent amendments on RNMC.
2. Cultural resource inventories shall be completed at Class III (no wider than 30m) spacing intervals unless otherwise approved by BLM. BLM may require inventory spacing intervals less than 30m, as appropriate.
3. BLM shall require the consulting archaeologists conduct records searches of General Land Office (GLO) plat maps, BLM's Master Title Plats/Historic Index, the GLO Land Records website (http://www.glorecords.BLM SWFO.gov/), the Nevada State Lands Patent Database Query (http://www.lands.nv.gov/patents/patents.htm), the Nevada Cultural Resources Information System (NVCRIS), the National and State Register of Historic Places, National Trail System, historic maps, BLM and SHPO cultural resources records, and pertinent historic records/publications and maps to identify historic properties as a part of the identification process.
4. Required identification activities shall be completed on both Federal and private lands owned by RNMC. For privately held lands not owned by RNMC, RNMC shall exercise reasonable effort to obtain access from the landowner for the purpose of conducting inventory, eligibility, and adverse effects analysis.

"Reasonable effort" for this purpose is defined as seeking to obtain landowner consent on reasonable, negotiated terms, without resorting to any formal legal process or proceedings. After all such reasonable efforts have been made, if access cannot be obtained to private land not owned by RNMC and after consulting with BLM, RNMC shall use existing data to determine the types of resources that might be present and anticipated effects. Upon BLM determination that the intention of this section has been satisfied, BLM Authorized Officer may issue a Notice to Proceed (NTP) for any construction segment as prescribed in Stipulation II.G.

5. Contractors will submit any and all information concerning historic properties located in the RNMC APE to the BLM. RNMC shall protect, secure, and restrict access to this sensitive information to RNMC's designated point of contact. RNMC shall not share this information with others without prior written consent from the appropriate BLM Officer.

B. ELIGIBILITY

1. BLM, in consultation with SHPO, shall evaluate all cultural resources identified in the APE for eligibility to the NRHP based on the following document: *Historical Context for the Robinson Mining District, White Pine County, Nevada*, (Stoner 2004). This document shall be reviewed for adequacy every five years or by the request of a Signatory, whichever comes first.

2. BLM shall consult with the appropriate Tribes to evaluate the eligibility of properties of traditional religious and cultural importance within the APE.

3. A separate report will be prepared to document historic properties with standing architectural resources that qualify for the National Register under Criteria A, B, or C in order to expedite SHPO review. Recording and reporting of architectural resources shall follow the most recent edition of *Guidelines for Recording and Reporting Architectural Resources in Nevada, 2014,* available from the BLM Ely District Office upon request.

4. To the extent practicable, NRHP eligibility determinations shall be based on documented inventory information. If the information gathered in the inventory is inadequate to determine eligibility, RNMC, through its contractor, may be required to conduct limited subsurface testing or other evaluative techniques to determine eligibility. Subject to approval by BLM, in consultation with SHPO, evaluative testing is intended to provide the minimum data necessary to define the nature, age, and distribution of materials in potential historic properties, to make final evaluations of eligibility, and to inform the development of a treatment plan should data recovery be deemed necessary. BLM requires RNMC's cultural resource contractor be approved for a testing Cultural Resources Use Permit (CRUP) prior to subsurface probing, testing, data recovery or surface material collection.

5. If any of the Signatories, Tribes, or other consulting parties disagree regarding eligibility of a cultural resource, BLM and SHPO shall work together with Tribes and consulting parties (when appropriate) to seek a resolution on the determination of eligibility. If the dispute cannot be resolved, BLM shall seek a formal determination of eligibility from the Keeper of the National Register in accordance with 36 CFR 63.2. The Keeper's determination will be considered final.

6. Eligibility will be determined prior to the initiation of activities that may adversely affect those cultural resources. Eligibility will be determined in a manner consistent with the Protocol. The required evaluation activities shall be completed on Federal or private lands owned by RNMC. If RNMC cannot gain access to private land not owned by RNMC after a reasonable effort is made, the historic property shall remain unevaluated. Cultural resources may remain unevaluated for the NRHP only with approval by BLM in consultation with SHPO.

C. TREATMENT

1. BLM shall ensure that RNMC avoids adverse effects to historic properties, whenever practical, through project design, or redesign, relocation of facilities, or by other means in a manner consistent with the Protocol.

2. When avoidance is not practical and data recovery is proposed to minimize or mitigate project related adverse effects to historic properties, BLM, in consultation with the SHPO, shall ensure that RNMC, through its contractor, develops a Historic Properties Treatment Plan (HPTP) that is consistent with the Secretary of the Interior's Standards and Guidelines for Archaeology and Historic Preservation (48 FR 44716-37), *Treatment of Historic Properties: A Handbook* (Advisory Council on Historic Preservation 1980) and Section 106: Archaeology Guidance (ACHP 2009) as well as agency standards. The required mitigation activities shall be completed regardless of the ownership (Federal or private lands owned by RNMC) of the lands involved. If RNMC cannot gain access to private lands not owned by RNMC through reasonable efforts, only the portions of the historic property directly affected by the project shall be treated. BLM shall submit HPTPs to SHPO for review. Concurrently, BLM shall provide Tribes and other consulting parties, as appropriate, with copies of HPTPs with a fifteen (15) day review opportunity.

3. For historic properties eligible under criteria A through C, BLM will consider, in consultation with SHPO, mitigation other than data recovery in the HPTP (e.g., oral history, historic markers, exhibits, interpretive brochures or publications, etc.). Where appropriate, the HPTP shall include provisions (content and number of copies) for a publication for the general public.

4. Pursuant to Stipulation F, BLM shall ensure as a condition of approval/special stipulation on any authorization or Notice to Proceed (NTP) that RNMC, through its contractor, shall implement and complete the fieldwork portions of any final HPTP prior to initiating any activities that may affect those historic properties.

5. BLM shall ensure that all records and materials resulting from identification and treatment efforts are curated in accordance with 36 CFR 79 in an approved curation facility in Nevada. As defined in the Native American Graves Protection and Repatriation Act (NAGPRA), Native American human remains, associated funerary objects, and objects of cultural patrimony will be handled in accordance with 43 CFR 10. All materials collected will be maintained in accordance with 36 CFR 79 or 43 CFR 10, until the final treatment report is complete and collections are curated and/or returned to their owners. RNMC, or their contractor, shall provide proof of a current curation agreement to BLM within two (2) weeks of BLM acceptance of the final reports.

6. BLM shall provide to SHPO, and other consulting parties as appropriate, all draft archaeological reports resulting from actions pursuant to this PA. Tribes with Data Sharing Agreements may receive a report upon request. All such reports shall be consistent with the Department of Interior's Formal Standards for Final Reports of Data Recovery Program (42 FR 5377-79). Final reports shall be submitted to the SHPO and other consulting parties as appropriate in both paper and electronic copies and will include digital copies of all associated data (e.g. GPS files, GIS data layers, digital photographs, etc.).

D. OTHER CONSIDERATIONS

1. Identification, evaluation, and treatment efforts may extend beyond the geographic limits of the APE when the resources being considered extend beyond the boundary of the construction activities.

2. No identification, evaluation, or treatment efforts will occur beyond that necessary to gather data for the completion of the Section 106 process as agreed to in this PA.

3. Information on the location and nature of all cultural resources or information considered proprietary by a Tribe will be held confidential to the extent provided by Federal and state law.

E. OBSERVATION AND MONITORING

1. Any Signatory may observe actions carried out pursuant to this PA, provided that personnel undertaking observation activities shall comply with all applicable RNMC mine safety and health rules and requirements when visiting the mine. To the extent practicable, all observation activities conducted by SHPO, Tribes, or other consulting parties will attempt to minimize the number of observers involved in RNMC.

2. Any areas that BLM, in consultation with the SHPO, identifies as sensitive will be monitored during related construction activities by a qualified individual (Monitor). Monitors shall be empowered to stop work to protect resources if that work is inconsistent with the terms of this PA or any corresponding treatment or monitoring plan.

F. NOTICES TO PROCEED

BLM may issue NTP to RNMC for individual construction segments as defined by RNMC in their Plans, under any of the following conditions:

1. BLM, in consultation with SHPO, have determined that there are no cultural resources within the APE for that construction segment; or

2. BLM, in consultation with SHPO, have determined that there are no historic properties within the APE for the construction segment; or

3. BLM, in consultation with the SHPO, Tribes, and other consulting parties as appropriate, has implemented an adequate HPTP for the historic properties affected by the construction segment; and

   (a) RNMC has posted a surety as set forth in Stipulation H. 1; and

   (b) The fieldwork phase of the treatment option has been completed; and

   (c) BLM has accepted a summary description of the fieldwork performed and a reporting schedule for that work; and

   (d) BLM shall provide an electronic copy of the summary to SHPO; and

   (e) SHPO shall review the summary and if the SHPO concurs or does not respond within two working days of receipt, BLM shall assume concurrence and issue the NTP; and

   (f) RNMC shall not begin any ground disturbing activities within the boundary of any historic property until BLM issues a NTP for the property.

G. TIME FRAMES

1. BLM will review and comment on any report submitted by RNMC, through its contractor, within thirty (30) calendar days of receipt.

2. BLM shall submit the results of all identification, evaluation, effects assessment, and treatment efforts, including discovery situations, and HPTPs to the SHPO. The SHPO will have thirty-five (35) calendar days from their receipt to review and comment on any submission. In the event SHPO does not respond within thirty-five (35) calendar days from its receipt, BLM shall assume SHPO concurrence.

3. A draft final report of all identification, evaluation, treatment activities will be due to BLM from RNMC within nine (9) months after the completion of the fieldwork associated with the activity, unless otherwise negotiated. Final reports will be due sixty (60) days after receiving BLM comments.

H. SURETY BONDS

1. Based on a written detailed cost estimate submitted by the Cultural Contractor and agreed to by RNMC and BLM, RNMC will post a surety bond with the BLM, not to exceed $500,000 to cover all costs associated with all data recovery fieldwork, analysis, research and report preparation, interim and summary reports, and curation of project documentation and artifact collections in an approved curation facility anticipated to run concurrently from the signing date of the PA to one calendar year from the signing date. The surety shall be posted prior to BLM issuing any NTP.

2. Portions of the surety bond posted shall be subject to forfeiture if the data recovery project tasks are not completed within the time period established by the treatment option selected; provided, however, BLM and RNMC may agree to extend any such time periods. BLM shall notify RNMC that the surety is subject to forfeiture and shall allow RNMC thirty (30) calendar days to respond before action is taken to forfeit the surety.

3. The surety bond may be increased or decreased annually based on a written detailed cost estimate submitted to the BLM by RNMC for concurrently running data recovery projects anticipated for the following year. If the amount of concurrently running data recovery projects exceeds what is presented in the Cultural Contractor's cost estimate, the BLM shall meet with RNMC to increase the bond amount prior the required annual surety bond adjustment date.

J. POST-REVIEW DISCOVERY SITUATIONS

Stipulations of this PA are intended to identify and mitigate adverse effects to historic properties. Unplanned discoveries of buried cultural resources are not anticipated. In the case of an unplanned discovery, the BLM will ensure that provisions in the Protocol (Section VI.B-C) and the following stipulations are met.

1. When previously unidentified cultural resources are discovered or an unanticipated impact situation occurs, all RNMC related activities within 100 meters of the discovery/impact will cease immediately. RNMC, through its contractor or its authorized representative, shall secure the location to prevent vandalism or other damage. RNMC or its authorized representative shall immediately notify the BLM Authorized Officer of the discovery followed by written confirmation. RNMC and BLM shall suspend activity at the location until the discovery has been evaluated and any necessary mitigation measures completed.

2. BLM shall notify SHPO, Tribes, and other consulting parties as appropriate, within one (1) working day of the discovery or unanticipated impact notification, and consider their initial comments on the situation. Within two (2) working days after initial discovery, BLM shall notify SHPO or other parties, of the decision to either allow RNMC activities to proceed or to require further evaluation and/or mitigation.

3. If BLM determines, in consultation with SHPO, that mitigation for discoveries or unanticipated impacts is required, BLM shall solicit comments from SHPO, Tribes, and other consulting parties, as appropriate, to develop mitigating measures. SHPO, Tribes, and other consulting parties, as appropriate, will have two (2) working days to provide BLM with comments on the nature and extent of mitigative efforts. Within seven (7) working days of initial SHPO notification, BLM will inform SHPO of the nature of the mitigation required, and ensure that such mitigative actions are implemented before allowing RNMC activities to resume through issuing a NTP.

4. BLM shall ensure that reports of mitigation efforts for discoveries or unanticipated impacts are completed in a timely manner and conform to the Department of Interior's Formal Standards for Final Reports of Data Recovery Program (42 FR 5377-79). BLM shall submit drafts of such reports to the SHPO for a fifteen (15) day review and comment period. BLM will submit final reports to the SHPO, other Signatories, Tribes, and other consulting parties, as appropriate for informational purposes.

5. Any disputes or objections arising during a discovery or unanticipated impact situation regarding the treatment of historic properties that cannot be resolved by BLM and SHPO shall be referred to the Nevada BLM State Office Deputy

Preservation Officer (DPO) for consultation. The Nevada BLM State Office shall be given seven (7) days to provide BLM with comments.

6. RNMC related activities in the area of the discovery will be halted until RNMC is notified by the BLM Authorized Officer in writing that mitigation is complete and activities can resume.

III. DISPUTE RESOLUTION

1. If any Signatory or consulting party to this PA objects to any activities proposed pursuant to the terms of this PA, BLM shall consult with the objecting party and SHPO to resolve the issue. If the BLM determines that the objection cannot be resolved, it shall request the assistance of the BLM State Office Deputy Preservation Officer to help resolve the objection. The BLM State Office decision shall be considered final.

2. The Signatories may continue all actions under this PA that are not the subject of the dispute.

IV. DURATION

This PA shall become effective on the date of the last signature below, and shall remain in effect for a period of ten years or until terminated as provided in Stipulation VI. If RNMC does not initiate the Project within the ten (10) year period, this PA will automatically terminate.

V. AMENDMENT

Any Signatory to this PA may request that this PA be amended, whereupon the Signatories will consult to consider such amendment. The amendment will be effective on the date a copy signed by all of the Signatories is filed with the ACHP.

VI. TERMINATION

Any Signatory may terminate this PA by providing written notice with cause to the other party. After notification by the initiating party, the other Signatory shall have thirty (30) calendar days to consult to seek agreement on amendments or any other actions that would address the issues and avoid termination. If such consultation fails, the termination will go into effect at the end of this thirty (30) calendar-day period, unless both parties agree to a longer period. The Signatories shall be required to meet any and all current or outstanding obligations the Signatories assumed under the terms of the PA.

EXECUTION of this PA and implementation of its terms evidences that the BLM has taken into account the effects of this undertaking on historic properties and afforded the ACHP an opportunity to comment.

SIGNATORIES:

6/14/16

Jill A. Moore
Egan Field Manager, BLM Ely District — Date

6/20/16

Rebecca L. Palmer — Date
Nevada State Historic Preservation Officer

Invited Signatory:

General Manager — Date
KGHM International Ltd., Robinson Mine, Robinson Nevada Mining Company

Concurring Parties:

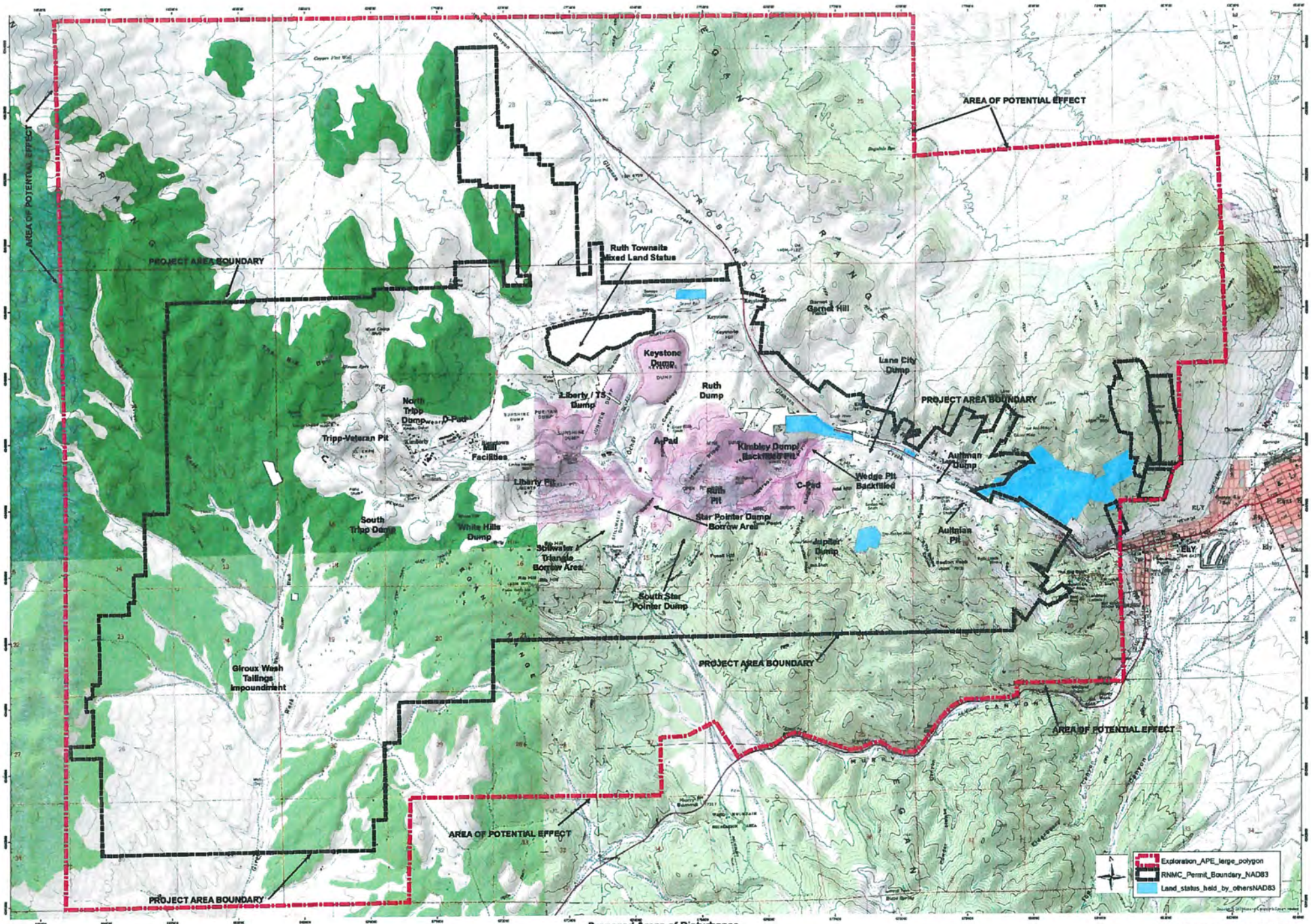
Chairman — Date
Duckwater Shoshone Tribe

Chairman — Date
Ely Shoshone Tribe

Chairman — Date
Confederated Tribes of the Goshute

Appendix A

Robinson Nevada Mining Company Area of Potential Effect



Proposed Areas of Disturbance and Area of Potential Effect
Robinson Mine - Ely, Nevada
White Pine County

Coordinate system: UTM NAD 83 zone 11
Contour interval equals 40 feet
Drawn by: Deborah Potts 06/10/2015

Appendix B Water Modeling Results

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18 April 2016
COR-16-047
Overnight Delivery

Mr. Tom Gray
Nevada Division of Environmental Protection
Bureau of Mining Regulation and Reclamation
901 South Stewart Street – Suite 4001
Carson City, Nevada 89701-5249

RE: Interim Pit Lake Study, Robinson Operation, White Pine County, Nevada, Water Pollution Control Permit NEV0092105.

Dear Mr. Gray,

Please find enclosed the Pit Lake Study for the Robinson Operations prepared by Schlumberger Water. Responses to NDEP-BMRR comments received February 17, 2016 will be addressed in a future comprehensive PLS planned to be submitted by Q2 2017. This submittal is intended to satisfy comment number 3 from the February 17, 2016 Pit Lake Study approval letter.

I appreciate your time in review and approval of the information presented. Robinson understands that expansion of Ruth pit would not occur until this Pit Lake Plan is approved. If you have any questions about this submittal, I can be reached at (775)289-7040.

Sincerely,

Frederick Partey
Superintendent, Environmental Resources

Enclosure

CC: Central Files 2.3.2
J. Sawyer, NDEP

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April 18, 2016

Interim Pit Lake Study for Ruth Pit Expansion

Robinson Nevada Mining Company

Schlumberger
Water Services

April 18, 2016

Interim Pit Lake Study for Ruth Pit Expansion

Robinson Nevada Mining Company

Report: 056176/R01

Prepared for:

Robinson Nevada Mining Company
A subsidiary of KGHM
PO Box 382
Ruth, Nevada 89319

Prepared by:

Schlumberger Water Services
5401 Longley Lane
Suite 5
Reno, NV 89511, USA

Schlumberger
Water Services

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ABBREVIATIONS

ABA	acid based accounting
AGP	acid generating potential
ANP	acid neutralizing potential
ARD	acid rock drainage
BMRR	Bureau of Mining Regulation and Reclamation
DRZ	damaged rock zone
DSM	Dynamic systems model
ft amsl	feet above mean sea level
gpm	gallons per minute
HCT	humidity cell test
HGU	hydrogeologic units
MCL	maximum concentration level
meqs	milliequivalents
mg/L	milligrams per liter
MWMP	meteoric water mobility procedures
NDEP	Nevada Department of Environmental Protection
NRV	Nevada Reference Value
PAG	potentially acid-generating
REE	rare earth elements
RNMC	Robinson Nevada Mining Company
SWS	Schlumberger Water Services
TDS	total dissolved solids
WPCP	Water Pollution Control Permit
WRMP	Waste rock management plan Introduction

1 INTRODUCTION

The purpose of this report is to provide an interim pit lake study to support mine expansion in the Ruth Pit complex. Robinson Nevada Mining Company (RNMC) proposes to deepen and expand the Ruth West and Ruth East open pits, thus triggering an evaluation of future pit lake water quality as per RNMC's Water Pollution Control Permit (WPCP) number NEV0092105. RNMC received comments from Nevada Department of Environmental Protection-Bureau of Mining Regulation and Reclamation (NDEP-BMRR) dated February 17, 2016 in conjunction of acceptance of the previous Pit Lake Study (SWS, 2015). This interim study addresses comment number 3, pertaining to an interim Pit Lake Study (PLS), however all other comments will be addressed in a future comprehensive PLS which incorporates newly collected geochemical data (NDEP-BMRR, 2016).

This report:

- Describes the expanded mine plan for Ruth West (Ruth West 4) and Ruth East (Ruth East 3).
- Discusses the geochemical characterization program to assess exposed pit wall surfaces in Ruth Pits, including additional sampling and testing.
- Predicts future pit lake water quality of the expanded Ruth Pits with the caveat that a more rigorous analysis will be performed upon the completion of HCT geochemical testing.
- Provides recommendations to be incorporated in the comprehensive pit lake study upon completion of geochemical testing.

The proposed expansion of Ruth West and Ruth East pits are identified as the Ruth West Phase 4 (Ruth West 4) and Ruth East Phase 3 (Ruth East 3) mining phases respectively. Mine expansion is confined to the Ruth Pits and will extend the mine life through the end of 2022. Kimbley Pit has been backfilled to the 6,900 ft elevation and is continuing to receive waste rock. Non-PAG material was used to backfill 50 ft above the predicted recovery elevation (6,633 ft amsl). Material above the 50 ft recovery elevation is composed of PAG and Non-PAG materials in accordance with NDEP-BMRR approval (NDEP-BMRR, 2014).

The prosed Ruth West 4 mine plan will deepen the pit floor to the 5950 ft amsl elevation. Mining will primarily occur in the western hemisphere of Ruth West with up to an additional 550 ft of mining in the pit's northwest sector. The south wall of Ruth West will also be deepened and approximately 150 ft – 250 ft and extended to the south (Figure 1.1). A cross-section comparing the proposed mine expansion pit shell to the current (March 2016) and previously approved life of mine (LOM) pit shell is shown in Figure 1.2. Ruth West 4 layback will expose additional Kmp, Prh, Pel, and dump materials in the north-west sector. The Mollie Gibson dump will be intersected during the layback, removing approximately 40% of the material, and exposing acid leached material (ALM) below the Mollie Gibson dump in the pit wall. A comparison between Ruth West 4 and previously permitted LOM pit shell lithologies are provided in Figure 1.3.

Ruth East 3 mining will deepen the pit floor to the 6100 ft elevation. Mining will occur exclusively in the east and south walls of Ruth East Pit. An east wall step out will deepen the pit by approximately 300 ft – 450 ft. The south wall will also be deepened 150 ft – 250 ft and extended (Figure 1.1). The Ruth East 3 layback will expose additional Pel in the south wall. Non-PAG Kimbley backfill will also compose a significant portion of the exposed pit wall surface (~ 13%). Relative abundances of other lithologies will be slightly reduced. A comparison between Ruth East 3 and the previously permitted LOM pit shell lithologies are provided in Figure 1.4.

2 GEOCHEMICAL DATA COLLECTION AND CHARACTERIZATION

A representative geochemical dataset was compiled for the Ruth West 4 and Ruth East 3 pit shells by collecting new geochemical rock samples and examining the existing geochemical database. RNMC collected 74 new samples during the end of 2015 and beginning of 2016 which were submitted for acid base accounting (ABA) testing to characterize the acid generating potential of wall rock. RNMC intends to select 29 samples for humidity cell testing (HCT) to capture the release of constituents in oxidized environments. In addition, examination of the existing geochemical database helped identify an additional 47 ABA samples and 5 HCT samples which are representative of material in the expanded pit walls.

Guidelines for selecting representative pit wall samples were as follows:

- Samples were collected within 100 ft of the LOM pit wall;
- Samples were selected to spatially sample the open pit footprint, where possible;
- Each lithology was sampled;
- Potentially PAG lithologies (Kmp, Mc, Silica-Pyrite) were preferentially sampled.

2.1 Ruth West 4 characterization

A total of 75 ABA samples were available to characterize Ruth West 4. Forty-four (44) samples were newly collected samples and 31 samples were existing samples. Sample locations are shown in Figure 2.1. ABA samples were used to assess the abundance of potentially acid generating (PAG) lithology along the pit shells. Sample locations along the pit shell are shown in cross-section in Figures 2.2 through 2.4. A summary of ABA testing is provided in Table 2.1.

PAG material is classified at the Robinson site as having an ANP/AGP ratio < 0.3 (NDEP-BMRR, 2015b). The modified classification for PAG material is based on an evaluation of all existing HCT samples that indicates samples with an ANP/AGP > 0.3 have not produced leachate with a pH <5.5. Results of ABA testing by lithology is shown in Figure 2.5. Based on Robinson's definition of PAG, the percentage of PAG material by rock type is summarized as follows:

- Kmp: 20 PAG samples out of 36 ABA samples (56% PAG)
- Mc: 9 PAG samples out of 16 ABA samples (56% PAG)
- Pal: no PAG samples; 2 ABA samples (0% PAG)
- Pel: 1 PAG sample out of 6 ABA samples (17% PAG)
- Silica-Pyrite: 5 PAG samples out of 8 ABA samples (63% PAG)
- Prh: no PAG samples; 2 ABA samples (0% PAG)
- Tr: no PAG samples; 4 ABA samples (0% PAG)
- Ruth Dumps (Star pointer dump): no PAG samples; 1 ABA sample (0% PAG)

PAG material composes more than half of Kmp, Mc, and Silica-Pyrite exposures in the Ruth West 4 Pit wall. The percentage of Kmp and Silica-Pyrite PAG material is nearly equivalent to the prior PLS evaluation, which was used to define that 54% of Kmp and 73% of Silica-Pyrite material was PAG respectively (SWS, 2015). There is a greater

abundance of PAG Mc material in the Ruth West 4 pit wall than the prior PLS (which determined 28% PAG material). The increase of PAG material is believed to be associated with the improved selection of Mc samples rather than a substantial change in pit wall material. Remaining material types indicate a lower abundance of PAG in the pit wall than the 2015 PLS.

Table 2.1: Ruth West 4 ABA Testing Summary

Sample ID	Lithology	Total AGP (t $CaCO_3$/kt)	Total ANP (t $CaCO_3$/kt)	ANP/AGP	Paste pH	Source	PAG Classification
QC09-005 (755-775)	Kmp	204	52	0.25	7.6	2015 Sample	PAG
QC15-023 (1063-1093)	Kmp	248	109	0.440	7.03	2015 Sample	Non-PAG
QC15-023 (1473-1493)	Kmp	124	28.7	0.23	7.54	2016 Sample	PAG
QC08-008_1175.2-1180	Kmp	43.43	58	1.34		Existing ABA Sample	Non-PAG
QC08-008_1175-1175.2	Kmp	34.68	40.25	1.16		Existing ABA Sample	Non-PAG
QC08-008_1175-1210	Kmp	44.06	51.33	1.17		Existing ABA Sample	Non-PAG
QC08-008_1180-1184	Kmp	45.93	54.75	1.19		Existing ABA Sample	Non-PAG
QC08-008_1184-1187.6	Kmp	50.93	59.5	1.17		Existing ABA Sample	Non-PAG
QC08-008_1187.6-1191	Kmp	47.81	56.5	1.18		Existing ABA Sample	Non-PAG
QC08-008_1191-1195.2	Kmp	41.56	58	1.40		Existing ABA Sample	Non-PAG
QC08-008_1195.2-1200.3	Kmp	47.5	47.25	0.99		Existing ABA Sample	Non-PAG
QC08-008_1200.3-1204.9	Kmp	45.93	44.25	0.96		Existing ABA Sample	Non-PAG
QC08-008_1204.9-1210	Kmp	38.75	43.5	1.12		Existing ABA Sample	Non-PAG
QC12-003_300-325	Kmp	220	9.9	0.05		Existing ABA Sample	PAG
QR08-022_535-560	Kmp	210	7.2	0.03		Existing ABA Sample	PAG
QR08-022_615-645	Kmp	272	35.7	0.13		Existing ABA Sample	PAG
QR08-022_670-700	Kmp	327	25.9	0.08		Existing ABA Sample	PAG
QR08-024_600-605	Kmp	312.5	1	0.00		Existing ABA Sample	PAG
QR08-024_600-640	Kmp	312.5	1.15	0.00		Existing ABA Sample	PAG
QR08-024_605-610	Kmp	312.5	1.25	0.00		Existing ABA Sample	PAG
QR08-024_610-615	Kmp	312.5	0.75	0.00		Existing ABA Sample	PAG
QR08-024_615-620	Kmp	312.5	0.75	0.00		Existing ABA Sample	PAG
QR08-024_620-625	Kmp	312.5	1	0.00		Existing ABA Sample	PAG
QR08-024_625-630	Kmp	312.5	1.5	0.00		Existing ABA Sample	PAG
QR08-024_630-635	Kmp	312.5	1	0.00		Existing ABA Sample	PAG
QR08-024_635-640	Kmp	312.5	2	0.01		Existing ABA Sample	PAG
QC08-005 (735-745)	Kmp	98.8	90.7	0.92	7.7	New Sample	Non-PAG
QC08-021 (665-685)	Kmp	65.2	37.4	0.57	7.59	New Sample	Non-PAG
QC13-019 (390-410)	Kmp	48.9	50.1	1.02	7.07	New Sample	Non-PAG
QC15-020 (1105-1125)	Kmp	155	26.5	0.171	7.7	New Sample	PAG
QC08-008_1175-1210	Kmp	44.1	51.3	1.17		Pre-2015 Sample	Non-PAG
QC12-003_300-325	Kmp	220	9.9	0.05		Pre-2015 Sample	PAG
QR08-022_615-645	Kmp	272	35.7	0.13		Pre-2015 Sample	PAG

Sample ID	Lithology	Total AGP (t $CaCO_3$/kt)	Total ANP (t $CaCO_3$/kt)	ANP/AGP	Paste pH	Source	PAG Classification
QR08-022_670-700	Kmp	327	25.9	0.08		Pre-2015 Sample	PAG
QR08-024_600-640	Kmp	312.5	1.15	0.00		Pre-2015 Sample	PAG
QR08-065_185-205	Kmp	90	48	0.53		Pre-2015 Sample	Non-PAG
QC08-008 (1055-1075)	Mc	12.9	135	10.5	8.2	2015 Sample	Non-PAG
QC09-010 (705-725)	Mc	240	90.9	0.38	7.7	2015 Sample	Non-PAG
QC10-025 (280-300)	Mc	107	67.5	0.63	7.8	2015 Sample	Non-PAG
QC15-023 (1183-1213)	Mc	325	72	0.222	7.04	2016 Sample	PAG
QC15-023 (1323-1353)	Mc	115	24.8	0.216	7.58	2016 Sample	PAG
QC12-001_203-228	Mc	220	0.3	0.00		Existing ABA Sample	PAG
QC12-006_19-45	Mc	83	6.7	0.08		Existing ABA Sample	PAG
QR08-055_200-220	Mc	68	0.3	0.00		Existing ABA Sample	PAG
QC07-027 (390-400)	Mc	167	101	0.60	7.66	New Sample	Non-PAG
QC08-009 (170-180)	Mc	0.45	2.99	6.59	7.06	New Sample	Non-PAG
QC10-005_200-220	Mc	35	23	0.66		Pre-2015 Sample	Non-PAG
QC10-018_205-235	Mc	81	5	0.06		Pre-2015 Sample	PAG
QC12-001_203-228	Mc	220	0.3	0.00		Pre-2015 Sample	PAG
QC12-006_19-45	Mc	83	6.7	0.08		Pre-2015 Sample	PAG
QR08-053_875-925	Mc	20.5	27.4	1.34		Pre-2015 Sample	Non-PAG
QR08-055_200-220	Mc	68	0.3	0.00		Pre-2015 Sample	PAG
QC15-002 (225-235)	Pal	0.532	390	733	8.57	New Sample	Non-PAG
QC15-026 (345-365)	Pal	0.312	222	712	8.55	New Sample	Non-PAG
QC15-002 (105-135)	Pel	0.62	563	908	9.05	2015 Sample	Non-PAG
QC15-004 (135-165)	Pel	1.41	292	207	8.66	2015 Sample	Non-PAG
RTS_0806-WR21	Pel	0.3	717	2390.00		Existing ABA Sample	Non-PAG
QR08-080_95-155	Pel	0.3	428	1427		Pre-2015 Sample	Non-PAG
QC15-009 (1215-1245)	Pel-sk	117	54.9	0.47	7.19	2015 Sample	Non-PAG
QR08-029_405-425	Pel-sk	140	32	0.23		Existing ABA Sample	PAG
QC12-008 (544-564.5)	Prh	70.1	589	8.40	8.8	2015 Sample	Non-PAG
QC15-026 (640-660)	Prh	0.312	931	2984	8.33	New Sample	Non-PAG
QC12-008_127_148	Ruth_Dumps	1.2	530	441.67		Existing ABA Sample	Non-PAG
QC08-001 (460-480)	SilPy	133	505	3.80	8.1	2015 Sample	Non-PAG
QC12-007 (710.5-732)	SilPy	218	291	1.33	7.8	2015 Sample	Non-PAG
QC12-007 (790.5-813)	SilPy	358	93	0.26	6.0	2015 Sample	PAG
QC15-009 (1125-1150)	SilPy	191	0.3	0.00	4.27	2015 Sample	PAG
QR07-011 (70-90)	SilPy	55.5	545	9.82	8.03	2015 Sample	Non-PAG
QR08-003_600-620	SilPy	210	0.3	0.00		Existing ABA Sample	PAG
QR08-003_600-620	SilPy	210	0.3	0.00		Pre-2015 Sample	PAG
QR08-006_380-400	SilPy	57	0.3	0.01		Pre-2015 Sample	PAG

Sample ID	Lithology	Total AGP (t $CaCO_3$/kt)	Total ANP (t $CaCO_3$/kt)	ANP/AGP	Paste pH	Source	PAG Classification
QC09-006 (575-595)	Tr	63.6	312	4.91	7.4	2015 Sample	Non-PAG
QC15-024 (348-378)	Tr	0.312	37.5	120	8.3	2015 Sample	Non-PAG
QC12-003_455-485	Tr	28	22	0.79		Existing ABA Sample	Non-PAG
QC12-003_455-485	Tr	28	22	0.79		Pre-2015 Sample	Non-PAG

Greater confidence is associated with the current evaluation of PAG material in the pit wall for the following reasons:

- ABA sample selection is constrained to an immediate envelope surrounding the pit shell, thus eliminating samples which are not representative of pit walls.
- ABA samples were selected across a more uniform footprint of the pit, thus providing a better representation of wall rock variation.
- The majority of ABA samples in the evaluation were composed of modern testing methods.

RNMC proposes to perform HCT tests on 18 ABA samples, 13 samples for lithologies and 5 samples for Mollie Gibson ALM. The Mollie Gibson sampling will compose a greater exposure of pit wall in the Ruth West 4 plan, and will also aid to improve identification of other onsite acid-generating sources which contribute to acidic ponds or runoff. Proposed samples are shown in Table 2.2. If samples are not conducive to HCTs, a replacement sample will be selected of the same lithology and comparable ANP/AGP ratio. HCT samples will be processed for total metals in accordance with NDEP-BMRR guidance.

Table 2.2: Ruth West 4 Proposed HCTs

Sample ID	Lithology	Total AGP (t $CaCO_3$/kt)	Total ANP (t $CaCO_3$/kt)	ANP/AGP	PAG Classification
QC15-023 (1473-1493)	Kmp	124	28.7	0.23	PAG
QC08-021 (665-685)	Kmp	65.2	37.4	0.57	Non-PAG
QC15-020 (1105-1125)	Kmp	155	26.5	0.171	PAG
QR08-022_670-700	Kmp	327	25.9	0.08	PAG
QC15-023 (1183-1213)	Mc	325	72	0.222	PAG
QC15-023 (1323-1353)	Mc	115	24.8	0.216	PAG
QC12-006_19-45	Mc	83	6.7	0.08	PAG
QR08-055_200-220	Mc	68	0.3	0.00	PAG
QC15-026 (345-365)	Pal	0.312	222	712	Non-PAG
QC15-004 (135-165)	Pel	1.41	292	207	Non-PAG
QC15-026 (640-660)	Prh	0.312	931	2984	Non-PAG
QC15-009 (1125-1150)	SilPy	191	0.3	0.00	PAG
QC09-006 (575-595)	Tr	63.6	312	4.91	Non-PAG
Overburden (composite)	ALM	62	184.7	0.34	Non-PAG
Top ALM (composite)	ALM	3.0	71.3	0.04	PAG
Mollie Gibson ALM (composite)	ALM	5.4	9.2	0.59	Non-PAG
Bottom ALM (composite)	ALM	6.9	0.3	21.23	Non-PAG
Mollie Gibson ALM with Top ALM effluent	ALM	3.0	71.3	0.04	PAG

2.2 Ruth East 3 characterization

A total of 45 ABA samples were available to characterize Ruth East 3. Twenty-nine (29) samples were newly collected samples and 16 samples were existing samples. Sample locations are shown in Figure 2.6. Sample locations along the pit shell are shown in cross-section in Figures 2.7 through 2.9. ABA samples were used to assess the abundance of potentially acid generating (PAG) lithology along the pit shells. A summary of ABA testing is provided in Table 2.3. Results of ABA testing by lithology is shown in Figure 2.10. Based on Robinson's definition of PAG, the percentage of PAG material by rock type is summarized as follows:

- Kmp: 7 PAG samples out of 13 ABA samples (54% PAG)
- Mc: 4 PAG samples out of 11 ABA samples (36% PAG)
- Pel: no PAG sample; 6 ABA samples (0% PAG)
- Prh: no PAG samples; 7 ABA samples (0% PAG)
- Tr: no PAG samples; 3 ABA samples (0% PAG)
- Old Kimbley ALM material: 5 PAG samples out of 5 ABA samples (100% PAG) which were part of the existing dataset.

Table 2.3: Ruth East 3 ABA Testing Summary

Sample ID	Lithology	Total AGP (t $CaCO_3$/kt)	Total ANP (t $CaCO_3$/kt)	ANP/AGP	Paste pH	Source	PAG Classification
QC15-001 (330-335)	Kmp	0.00	0.00	0.00	6.8	2016 Sample	PAG
QC15-003 (235-240)	Kmp	0.05	0.05	0.05	7.44	2016 Sample	PAG
QC15-005 (250-255)	Kmp	0.07	0.07	0.07	5.43	2016 Sample	PAG
QC15-007 (270-293)	Kmp	0.24	0.24	0.24	8.33	2016 Sample	PAG
QC15-010 (245-250)	Kmp	0.24	0.24	0.24	7.8	2016 Sample	PAG
QC15-011 (775-780)	Kmp	0.83	0.83	0.83	7.79	2016 Sample	Non-PAG
QC15-012 (298-328)	Kmp	0.34	0.34	0.34	8.04	2016 Sample	Non-PAG
QC15-012 (365-370)	Kmp	0.17	0.17	0.17	8.23	2016 Sample	PAG
QC15-014 (610-640)	Kmp	0.75	0.75	0.75	7.88	2016 Sample	Non-PAG
QC16-002 (597-602)	Kmp	0.00	0.00	0.00	6.25	2016 Sample	PAG
QR07-161 (270-275)	Kmp	0.33	0.33	0.33	7.67	2016 Sample	Non-PAG
QR08-065_185-205	Kmp	0.53	0.53	0.53		Existing ABA Sample	Non-PAG
QR07-163_565-585	Kmp	0.67	0.67	0.67		Existing ABA Sample	Non-PAG
QC12-032 (446-451)	Mc	1.24	1.24	1.24	7.55	2016 Sample	Non-PAG
QC14-005 (412-417)	Mc	1.27	1.27	1.27	8.14	2016 Sample	Non-PAG
QC15-006 (281-286)	Mc	0.00	0.00	0.00	7.02	2016 Sample	PAG
QC16-001 (240-250)	Mc	0.26	0.26	0.26	8.1	2016 Sample	PAG
QC16-001 (639-645)	Mc	0.69	0.69	0.69	8.2	2016 Sample	Non-PAG
QR15-008 (490-495)	Mc	0.62	0.62	0.62	8.02	2016 Sample	Non-PAG
QR15-008 (500-505)	Mc	0.16	0.16	0.16	7.91	2016 Sample	PAG
QR15-008 (600-605)	Mc	0.70	0.70	0.70	8.41	2016 Sample	Non-PAG

Sample ID	Lithology	Total AGP (t $CaCO_3$/kt)	Total ANP (t $CaCO_3$/kt)	ANP/AGP	Paste pH	Source	PAG Classification
QR08-064_570-590	Mc	0.73	0.73	0.73		Existing ABA Sample	Non-PAG
QC10-016_705-720	Mc	0.31	0.31	0.31		Existing ABA Sample	Non-PAG
QC08-014_590-610	Mc	0.12	0.12	0.12		Existing ABA Sample	PAG
QC16-001 (140-145)	Pel	477.56	477.56	477.56	8.15	2016 Sample	Non-PAG
QC16-003 (200-208)	Pel	1522.44	1522.44	1522.44	9.12	2016 Sample	Non-PAG
QC13-002 (287.5-294)	Pel	200.32	200.32	200.32	8.55	Pre-2015 Sample	Non-PAG
QC12-009_275-310	Pel-Skarn	1064.51	1064.51	1064.51		Existing ABA Sample	Non-PAG
QR07-143_525-560	Pel-Skarn	5.04	5.04	5.04		Existing ABA Sample	Non-PAG
QR07-167 (310-315)	Pel-Skarn	24.97	24.97	24.97	8.26	Pre-2015 Sample	Non-PAG
QC16-005 (210-224)	Prh	554.20	554.20	554.20	9.02	2016 Sample	Non-PAG
QC16-005 (318-327)	Prh	808.51	808.51	808.51	9.06	2016 Sample	Non-PAG
QR08-074_170-190	Prh	120.00	120.00	120.00		Existing ABA Sample	Non-PAG
QR08-072_190-210	Prh	127.27	127.27	127.27		Existing ABA Sample	Non-PAG
QC08-010_541-562	Prh	1.33	1.33	1.33		Existing ABA Sample	Non-PAG
QC08-010_541-562	Prh	1.08	1.08	1.08		Existing ABA Sample	Non-PAG
QR08-059 (220-225)	Prh	224.79	224.79	224.79	8.55	Pre-2015 Sample	Non-PAG
QC12-046_47_67	Ruth_Dumps	0.22	0.22	0.22		Existing ABA Sample	PAG
QC12-046_257_277	Ruth_Dumps	0.03	0.03	0.03		Existing ABA Sample	PAG
QC12-046_224.5_242	Ruth_Dumps	0.01	0.01	0.01		Existing ABA Sample	PAG
QC12-046_164_184	Ruth_Dumps	0.01	0.01	0.01		Existing ABA Sample	PAG
QC12-046_107_127	Ruth_Dumps	0.10	0.10	0.10		Existing ABA Sample	PAG
QC15-003 (200-205)	Tr	0.84	0.84	0.84	7.67	2016 Sample	Non-PAG
QC15-014 (450-480)	Tr	1.10	1.10	1.10	7.47	2016 Sample	Non-PAG
QC15-014 (450-480)	Tr	1.10	1.10	1.10	7.47	2016 Sample	Non-PAG

PAG material composes more than half of Kmp, which is more abundant in comparison to the prior PLS evaluation (35%) (SWS, 2015). Mc material has roughly the same composition of PAG material as indicated in the prior PLS evaluation (43%). All other lithologies in Ruth East do not have PAG samples associated with them. ALM material in Kimbley pit has been backfilled with non-PAG material, thus it is not anticipated to negatively impact runoff into Ruth East Pit Lake.

RNMC proposes to perform HCT tests on 11 ABA samples to evaluate the release of constituents. There are 5 pre-existing HCT tests that were performed on samples adjacent to the Ruth East 3 layback, and are suitable for inclusion in the Ruth East 3 geochemical dataset. The HCT sample summary is shown in Table 2.4.

Table 2.4: Ruth West 4 Proposed HCTs

Sample ID	Lithology	Total AGP (t $CaCO_3$/kt)	Total ANP (t $CaCO_3$/kt)	ANP/AGP	PAG Classification	HCT Status
QC15-001 (330-335)	Kmp	126	0.3	0.00	PAG	New
QC15-005 (250-255)	Kmp	85.9	5.64	0.07	Non-PAG	New
QC15-010 (245-250)	Kmp	26	6.12	0.24	PAG	New
QC15-012 (298-328)	Kmp	38.3	12.9	0.34	Non-PAG	New
QC14-005 (412-417)	Mc	125	159	1.27	Non-PAG	New
QC15-006 (281-286)	Mc	126	0.3	0.00	PAG	New
QR15-008 (490-495)	Mc	191	118	0.62	Non-PAG	New
QC16-001 (140-145)	Pel	0.312	149	478	Non-PAG	New
QR07-167 (310-315)	Pel-Skarn	2.9	72.4	24.97	Non-PAG	New
QC16-005 (318-327)	Prh	0.611	494	809	Non-PAG	New
QC15-003 (200-205)	Tr	160	134	0.84	Non-PAG	New
QR07-163_565-585	Kmp	185	125	0.67	Non-PAG	Pre-existing
QC12-046_257_277	Ruth_Dumps	9.4	0.3	0.03	PAG	Pre-existing
QC12-046_224.5_242	Ruth_Dumps	21	0.3	0.01	PAG	Pre-existing
QC12-046_107_127	Ruth_Dumps	110	11	0.1	PAG	Pre-existing
QC08-014_590-610	Mc	190	22	0.12	PAG	Pre-existing

3 RUTH PIT LAKE INTERIM ANALYSIS

3.1 Approach

The interim pit lake analysis follows the same methodology, water balance and pit filling rates, surrogate HCT geochemical profiles, and geochemical modeling approach as was used in the 2015 PLS with two notable exceptions (SWS, 2015).

1. The interim PLS uses an updated pit wall lithology distribution based on the Ruth West 4 and Ruth East 3 LOM pits (Figures 2.1 and 2.6).
2. The interim PLS updates the percentage of PAG and Non-PAG materials for each lithology type according to the new selected ABA samples discussed in Section 2.

Identical water balances, HCT geochemical profiles, and geochemical modeling approaches are used as the previous PLS; a brief synopsis of the modeling approach is provided in the following sections.

3.1.1 Ruth Pit water balance

The water balance for Ruth Pits and Kimbley backfill was dynamically constructed such that overflow and filling between the three pits is simulated simultaneously. For example, Ruth West and Ruth East water balances are independent until Ruth West (or Ruth East) recovers to the 6,550 ft elevation. Overflow from Ruth West to Ruth East is calculated and added to Ruth East. Once both pits recover to the same elevation and are united, the water balance is combined and the pits are simulated simultaneously to equilibrium.

Ruth West water balance

Ruth West water balance is described as:

- Precipitation falls directly on the pit lake surface. Precipitation inflow rates range from 70 to 120 gpm with an equilibrium rate of 92 gpm.
- Evaporation is removed from the pit lake surface. Evaporation off the pit lake ranges from 25 to 658 gpm with an equilibrium of 309 gpm.
- Groundwater inflow occurs primarily from carbonate South Block aquifer. Groundwater inflow rates from the South Block range from 500 to 1,500 gpm during filling. At equilibrium, groundwater inflow is approximately 348 gpm to support evaporation losses at the pit lake.
- A minor component (<4%) of groundwater inflow is derived from the surrounding mineralized groundwater system. The South Block's high secondary permeability puts the pit lake in strong connection with the South Block groundwater system. Groundwater inflows to the pit were determined from the MODLFOW SURFACT numerical model (SWS, 2014), which was developed for water rights permitting and mine planning. Initial groundwater inflows from mineralized groundwater were predicted to range between 0 and 150 gpm.
- Groundwater outflow rates are simulated to occur during filling and equilibrium along the western edge of Ruth West. The open pit intersects beds of Ely Limestone at depth and the D-Level (6100 ft) workings.

- Both pits serve as flow conduits that connect the pit to down gradient water levels north of Ruth. Outflow is estimated to be 123 gpm at equilibrium.
- Pit wall and overland runoff was estimated using a runoff coefficient of 14% of precipitation. The pit wall runoff contribution was predicted to range between 35 and 58 gpm with an equilibrium rate of 45 gpm. Pit wall runoff was simulated as flow reporting to the pit as interflow through the damaged rock zone (DRZ).
- Outflow from Ruth West to Ruth East ranges from 0 to 855 gpm. At equilibrium approximately 53 gpm of inflow is required to maintain evaporative demand.
- No pit lake pumping is assumed to occur.
- The final pit lake stage is predicted to be 6,633 ft amsl, which is reached ~70 years after the end of mining. The pit lake naturally recovers quickly, with 95% of the recovery reached after 28 years. The pit lake filling curve is shown in Figure 3.1.
- The equilibrated combined Ruth Pit Lake will span an area of ~279 acres.
- Ruth West begins to overflow into Ruth East by year 19. This greatly accelerates the recovery of Ruth East. The Ruth pit lakes combine after 22 years of recovery.

Ruth East water balance

Ruth East water balance conceptual model is described as:

- Precipitation falls directly on the pit lake surface. Precipitation inflow rates range from 42 to 77 gpm with an equilibrium rate of 58 gpm.
- Evaporation is removed from the pit lake surface. Evaporation off the pit lake range from 16 to 422 gpm with an equilibrium rate of 195 gpm.
- Groundwater inflow occurs primarily from carbonate South Block aquifer. A minor component (<4%) of groundwater inflow is derived from the surrounding mineralized groundwater system. Groundwater inflows to the pit were determined from the MODLFOW SURFACT numerical model (SWS, 2014). Initial groundwater inflows from mineralized groundwater were predicted to range between 7 and 70 gpm. The equilibrium inflow rate is 6 gpm.
- Groundwater inflow rates from the South Block range from 270 to 500 gpm during filling. At equilibrium, groundwater inflow is approximately 99 gpm to support evaporation losses at the pit lake.
- Incoming flow from Ruth West ranges from 0 to 855 gpm. At equilibrium approximately 53 gpm of water is required to maintain evaporative demand.
- No groundwater outflow is predicted to occur in Ruth East, however due to mixing of the combined pit lake, water originating in Ruth East may migrate to Ruth West and discharge.
- Pit wall and overland runoff were estimated using a runoff coefficient of 14% of precipitation. The pit wall runoff contribution was predicted to range between 25 and 44 gpm with an equilibrium rate of 33 gpm. Pit wall runoff was simulated as flow reporting to the pit as interflow through the DRZ.
- Discharge rates to Kimbley Pit range from 0 to 95 gpm with an equilibrium discharge rate of 54 gpm.
- No pit lake pumping is assumed to occur.

- The final pit lake stage is predicted to be 6,633 ft amsl. The pit lake naturally recovers quickly, with 95% of the recovery reached after 28 years. The reactivated pit lake filling curve is shown in Figure 3.2.

Kimbley backfill water balance

The Kimbley backfill model simulation commences at the end of mining and is described as follows:

- Infiltration is simulated as precipitation which falls directly on the waste rock dump surface and is able to percolate prior to evaporation. An average infiltration rate of 0.88 in/yr or 6.3% of mean annual precipitation (MAP) is determined to recharge the uncapped backfill dump from precipitation. Infiltration through the uncovered waste rock is based on cover performance estimates in the 2014 WRMP (Geomega, 2014), and matches well with Maxey-Eakin infiltration estimates for the Ruth vicinity. Across the backfill dump area over Wedge pit; this translates into 1.6 to 2.8 gpm of infiltration with an equilibrium rate of ~2.6 gpm. Infiltration rinses the unsaturated material placed 50 ft above the recovered water level. This material is assumed to be composed of 50% PAG and 50% Non-PAG material.
- No evaporation occurs because the ultimate equilibrium water table is several hundred feet below the backfill dump surface.
- Overland or pit wall runoff will not occur because the backfill dump is a topographic high and will have surface water diversions.
- Inflows and outflows to the groundwater system are dynamically calculated using the MODFLOW-SURFACT groundwater model. Groundwater inflows are predicted to range between 0.2 and 7 gpm.
- Simulated discharge rates to the Ruth combined pit lake range from 1.6 to 2.8 gpm. The equilibrium groundwater outflow rate is ~ 2.8 gpm. Excess infiltration is discharged to the combined Ruth Pit Lake because the pit lake is an evaporative sink and well connected to the backfill.
- The final water level in the backfill is predicted to be 6,633 ft amsl reached ~32 years after the end of mining. Backfill recovery is shown in Figure 3.3.

3.1.2 HCT profiles for wall rock chemistry

Ruth West HCT selection

Geochemical profiles assigned to early and late pore flushes for pit wall runoff and rinsing are shown in Tables 3.1 and 3.2. Submerged pit wall rinsing utilizes week 0 HCT results. Pit wall runoff utilizes week 0 HCT results to simulate early flushing and week 32/40 HCT results to simulate late flushing. The ratio between early and late pore flushes is functionalized through time according to the number of pore volumes rinsed by runoff. The following rock lithologies are identified as unique geochemical profiles in the geochemical model:

- Kmp non-PAG was simulated using a composite of QR07-004 265-305 and QR08-003 140-170 HCT sample results. ANP:AGP ratios for the samples are 3.62 and 0.68, respectively.
- Kmp non-PAG was simulated using a composite of QC08-002 330-350, QR07-159 1140-1165, and QR08-022 535-560 HCT sample results. ANP:AGP ratios for the samples are 0.019, 0.17, and 0.034, respectively.
- Mc non-PAG was simulated using a composite of QR08-053 875-925 and QR08-068 955-1079 HCT sample results. ANP:AGP ratios for the samples are 1.34 and 2.3, respectively.

- Mc PAG was simulated using a QR08-032 670-700 HCT sample results, which has an ANP:AGP ratio of 0.02.
- Pel and Pal non-PAG was simulated using a composite of QR08-006 1070-1090, QR08-002 1350-1370, and QR08-965 860-930 HCT sample results. ANP:AGP ratios for the samples are 71 and 0.26 respectively; QR08-965 860-930 does not have a recorded ANP:AGP ratio, but HCT tests indicate it is non-PAG material.
- Silica-Pyrite non-PAG was simulated using a composite of QR08-003 810-825 and QR08-003 1200-1250 HCT sample results. ANP:AGP ratios for the samples are 0.40 and 3.75, respectively.
- Silica-Pyrite PAG was simulated using a composite of QR08-001 515-535 and QC08-004 725-755.4 HCT sample results. ANP:AGP ratios for the samples are 0.02 and 0.21, respectively.
- Prh non-PAG was simulated using a composite of QR07-177 180-210 and QR08-002 300-325 HCT sample results. ANP:AGP ratios for the samples are 13.67 and 0.71, respectively.
- Tr non-PAG was simulated using historic HCT sample NWL-34.
- Mollie Gibson ALM material was simulated using QC12-046 107-127, QC12-046 224.5-242, and QC12-046 257-277 HCT samples. ANP:AGP ratios for the samples are 0.1, 0.014, and 0.03, respectively.

Table 3.1: Ruth West lithology early flush geochemical profiles

Rock /Alteration		Kmp Non-PAG	KMP PAG	Mc Non-PAG	Mc PAG	Pel / Pal non-PAG	Silica-Pyrite non-PAG	Silica-Pyrite PAG	Prh non-PAG	Tr non-PAG	Mollie Gibson ALM[1]
Sample ID		Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite	NWL-34	Composite
Week		0	0	0	0	0	0	0	1		
Parameter	Unit										
Alkalinity Total	mg/L	179	44	47	14	128	20	16	137	19	31
Aluminum	mg/L	ND	0.480	0.040	0.040	0.051	0.152	0.062	0.545	0.044	0.023
Antimony	mg/L	ND	ND	0.002	0.002	0.004	0.001	0.001	ND	ND	0.001
Arsenic	mg/L	0.004	0.000	0.002	0.002	0.001	0.010	0.001	0.097	0.001	0.003
Boron	mg/L	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Barium	mg/L	0.048	0.046	0.056	0.002	0.046	0.029	0.006	0.233	0.003	0.005
Beryllium	mg/L	ND	0.001	0.001	0.001	ND	0.001	0.001	ND	0.001	0.001
Cadmium	mg/L	ND	0.033	0.001	0.001	0.001	0.024	0.014	0.047	ND	0.003
Calcium	mg/L	383	308	67	47	160	155	53	60	155	160
Chloride	mg/L	19.5	6.1	9.0	2.5	5.2	5.1	1.9	15.5	14.9	5.0
Chromium	mg/L	ND	ND	0.003	0.003	ND	0.003	0.001	0.005	0.135	0.003
Copper	mg/L	0.02	2.64	0.05	0.01	0.07	26.90	32.00	0.15	0.01	0.55
Fluoride	mg/L	4.00	4.19	1.97	0.65	2.03	0.77	0.23	2.67	1.00	0.50
Iron	mg/L	0.035	0.073	0.030	0.030	ND	0.436	0.288	2.095	0.555	0.005
Lead	mg/L	ND	0.002	0.002	0.002	ND	0.002	0.002	0.103	0.001	ND
Lithium	mg/L	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Magnesium	mg/L	28.2	22.7	10.6	6.9	34.4	34.5	7.3	12.4	13.7	27.0
Manganese	mg/L	0.376	18.896	0.018	0.121	0.569	18.974	5.065	0.262	0.372	1.420
Mercury	mg/L	ND	ND	0.0001	0.0001	ND	ND	ND	ND	0.0001	0.0001
Molybdenum	mg/L	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Nickel	mg/L	ND	0.31	0.01	0.01	0.02	0.45	0.09	ND	0.01	0.04
Total Nitrogen	mg/L	1.37	0.99	0.75	ND	0.32	0.28	0.28	0.63	ND	0.97
pH	s.u.	8.04	6.88	7.61	6.91	7.90	6.68	6.80	7.84	7.60	6.49
Phosphorus	mg/L	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Potassium	mg/L	18.9	20.3	13.8	5.3	12.2	10.8	3.8	4.4	7.6	13.7
Selenium	mg/L	0.051	0.005	0.007	0.002	0.017	0.168	0.001	ND	ND	0.012
Silver	mg/L	ND	ND	0.003	0.003	ND	0.002	0.001	ND	ND	0.003
Sodium	mg/L	0.0	0.0	30.8	5.0	0.0	5.7	0.8	0.0	9.6	47.3
Strontium	mg/L	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Sulfate	mg/L	890	903	210	127	437	570	211	174	408	613
Thallium	mg/L	0.008	0.004	0.001	0.001	0.002	0.098	0.085	0.001	ND	0.001
Tin	mg/L	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
TDS	mg/L	1525	1369	391	208	781	871	334	411	630	901
Uranium	mg/L	0.108	0.002	0.005	0.001	0.010	0.002	0.001	ND	ND	0.003
Vanadium	mg/L	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Zinc	mg/L	0.021	36.865	0.003	0.005	0.166	21.807	3.010	1.164	0.005	0.222

[1] samples taken from Kimbley ALM material

ND simulated values indicate results are below detection limits.

NS: Constituent was not sampled.

Table 3.2: Ruth West lithology late flush geochemical profiles

Rock /Alteration		Kmp Non-PAG	KMP PAG	Mc Non-PAG	Mc PAG	Pel / Pal non-PAG	Silica-Pyrite non-PAG	Silica-Pyrite PAG	Prh non-PAG	Tr non-PAG	Mollie Gibson ALM[11]
Sample ID		Composite	Composite	Composite	Composite	Composite	Composite	Composite	Composite	NWL-34	Composite
Week		0	0	0	0	0	0	0	1		
Parameter	Unit										
Alkalinity Total	mg/L	50	63	35	1	37	13	10	13	42	7
Aluminum	mg/L	ND	0.022	0.040	19.100	0.013	0.175	0.206	0.020	0.004	0.055
Antimony	mg/L	ND	ND	0.002	0.002	0.002	0.001	0.001	ND	0.006	0.001
Arsenic	mg/L	0.002	0.000	0.002	0.025	0.001	0.001	0.001	0.006	0.001	0.003
Boron	mg/L	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Barium	mg/L	0.019	0.006	0.002	0.053	0.018	0.006	0.005	0.024	0.008	0.005
Beryllium	mg/L	ND	ND	0.001	0.001	ND	ND	ND	ND	0.001	0.001
Cadmium	mg/L	ND	0.002	0.001	0.014	ND	0.010	0.013	0.001	0.001	0.001
Calcium	mg/L	42	64	20	95	32	44	36	4	31	4
Chloride	mg/L	0.1	0.5	0.1	2.5	0.1	2.1	2.8	0.1	3.0	0.5
Chromium	mg/L	ND	ND	0.003	0.067	ND	0.011	0.012	0.002	0.003	0.003
Copper	mg/L	0.01	0.12	0.01	0.16	0.01	33.75	45.00	0.01	0.02	0.03
Fluoride	mg/L	0.70	2.41	0.23	7.49	0.45	0.96	0.53	0.05	0.50	0.19
Iron	mg/L	0.002	0.002	0.030	788.000	ND	16.154	21.503	0.057	0.038	0.094
Lead	mg/L	ND	ND	0.002	0.002	ND	0.003	0.004	0.001	0.003	0.001
Lithium	mg/L	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Magnesium	mg/L	4.2	1.6	2.4	4.7	3.1	4.5	4.0	0.8	3.5	0.4
Manganese	mg/L	0.083	3.372	0.005	0.057	0.058	8.201	2.634	0.014	0.021	0.012
Mercury	mg/L	ND	ND	0.0001	0.0023	ND	ND	ND	ND	0.0001	0.0001
Molybdenum	mg/L	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Nickel	mg/L	ND	ND	0.05	0.92	ND	0.01	0.01	ND	0.01	0.01
Total Nitrogen	mg/L	0.03	0.21	0.64	0.00	0.03	0.21	0.28	0.03	ND	0.55
pH	s.u.	8.03	7.19	7.75	2.04	7.82	5.88	5.56	7.43	7.80	6.66
Phosphorus	mg/L	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Potassium	mg/L	6.4	1.1	3.5	2.2	0.4	0.6	0.8	0.6	5.7	0.6
Selenium	mg/L	0.007	0.001	0.002	0.075	0.003	0.012	0.004	0.000	0.001	0.003
Silver	mg/L	ND	ND	0.003	0.003	ND	0.002	0.001	ND	0.001	0.003
Sodium	mg/L	0.5	0.5	0.7	3.2	0.5	0.2	0.1	0.5	1.8	0.3
Strontium	mg/L	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Sulfate	mg/L	87	103	33	2660	64	232	237	1	60	4
Thallium	mg/L	0.002	0.001	0.001	0.001	0.001	0.012	0.008	ND	0.001	0.001
Tin	mg/L	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
TDS	mg/L	191	239	96	3585	136	359	363	19	148	18
Uranium	mg/L	0.005	0.001	0.002	0.134	0.001	0.003	0.004	0.000	0.000	0.003
Vanadium	mg/L	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Zinc	mg/L	0.003	0.227	0.005	0.356	0.007	1.990	2.503	0.016	ND	0.005

[1] samples taken from Kimbley ALM material
Final week of HCT testing is used
ND indicates all sample results are below detection limits.
NS indicates element was not sampled for

Ruth East HCT selection

Geochemical profiles assigned to early and late pore flushes for pit wall runoff and rinsing are shown in Tables 3.3 and 3.4. The same approach for assigning early and late time flushes as well as submerged pit walls were used as in Ruth West. The following rock lithologies are identified as unique geochemical profiles in the geochemical model:

- Kmp non-PAG was simulated using a composite of QC08-018 310-330 and QR07-163 565-585 HCT sample results. ANP:AGP ratios for the samples are 0.37 and 0.68, respectively.
- Kmp PAG was simulated using a composite of QC08-002 330-350, QR07-159 1140-1165, and QR08-022 535-560 HCT sample results. ANP:AGP ratios for the samples are 0.019, 0.17, and 0.034, respectively. These samples reside in Ruth West, but are used a proxy for Ruth East.
- Mc non-PAG was simulated using a composite of QC08-017 175-195 and QR07-151 1045-1080 HCT sample results. ANP:AGP ratios for the samples are 0.58 and 0.63, respectively.
- Mc PAG was simulated using a composite of QC08-032 670-700 and QC08-014 590-610 HCT sample results. ANP:AGP ratios for the samples are 0.02 and 0.12, respectively.
- Pel non-PAG was simulated using a composite of QR07-143 610-620 and QR07-152 925-950 HCT sample results. ANP:AGP ratios for the samples are 64.8 and 18.6, respectively.
- Prh non-PAG was simulated using the HCT sample QR07-150 285-315 which has an ANP:AGP ratio of 77.6
- Tr non-PAG was simulated using historic HCT sample NWL-34.
- Kimbley non-PAG backfill was simulated using composite HCT results from all HCT samples used in the Ruth West, Ruth East, and Kimbley geochemical models with an ANP:AGP ratio > 0.3, a total of 19 samples.

Table 3.3: Ruth East lithology early flush geochemical profiles

Rock /Alteration		Kmp Non-PAG	KMP PAG	Mc Non-PAG	Mc PAG	Pel non-PAG	Prh non-PAG	Tr non-PAG	Kimbley Non-PAG Backfill
Sample ID		Composite	Composite	Composite	Composite	Composite	QR07-150 285-315	NWL-34	Composite
Week		0	0	0	0	0	0	0-20	0
Parameter	Unit								
Alkalinity Total	mg/L	96	44	70	23	60	70	19	22.2
Aluminum	mg/L	0.03	0.48	0.02	0.02	0.08	ND	0.04	0.22
Antimony	mg/L	ND	ND	ND	0.001	ND	ND	ND	0.002
Arsenic	mg/L	ND	ND	ND	0.001	0.002	0.009	0.001	0.002
Boron	mg/L	NS	NS	NS	NS	NS	NS	NS	NS
Barium	mg/L	0.01	0.05	ND	ND	0.08	0.01	ND	0.02
Beryllium	mg/L	ND	0.001	ND	0.001	ND	ND	0.001	0.0012
Cadmium	mg/L	0.007	0.033	ND	0.001	ND	ND	ND	0.0083
Calcium	mg/L	225	308	81	83	98	43	155	187
Chloride	mg/L	6.7	6.1	8.8	2.5	7.6	14.8	14.9	11
Chromium	mg/L	ND	ND	ND	0.002	ND	ND	0.135	0.004
Copper	mg/L	1.20	2.64	0.01	0.81	0.02	0.05	0.01	0.65
Fluoride	mg/L	1.90	4.19	0.44	0.45	1.97	2.27	1.00	1.31
Iron	mg/L	0.003	0.073	0.011	0.015	0.160	ND	0.555	0.13
Lead	mg/L	ND	0.002	ND	0.001	ND	ND	0.001	0.002
Lithium	mg/L	NS	NS	NS	NS	NS	NS	NS	NS
Magnesium	mg/L	29	23	13	7	8	13	14	40.4
Manganese	mg/L	2.50	18.90	0.08	0.43	0.07	0.07	0.37	18.2
Mercury	mg/L	ND	ND	0.0001	ND	ND	ND	0.0001	0.00002
Molybdenum	mg/L	NS	NS	NS	NS	NS	NS	NS	NS
Nickel	mg/L	0.03	0.31	ND	0.02	0.16	ND	0.01	0.12
Total Nitrogen	mg/L	ND	0.99	0.36	ND	0.59	0.64	ND	1.11
pH	mg/L	7.17	6.88	7.72	6.84	7.46	7.75	7.60	6.36
Phosphorus	mg/L	NS	NS	NS	NS	NS	NS	NS	NS
Potassium	mg/L	17.0	20.3	5.9	7.3	12.3	16.0	7.6	11.8
Selenium	mg/L	0.015	0.005	0.015	0.001	0.010	0.005	ND	0.004
Silver	mg/L	ND	ND	ND	0.001	ND	ND	ND	0.000
Sodium	s.u.	0.5	0.5	0.5	2.5	0.5	0.5	9.6	7.17
Strontium	mg/L	NS	NS	NS	NS	NS	NS	NS	NS
Sulfate	mg/L	635	903	189	229	191	87	408	1,446
Thallium	mg/L	0.013	0.004	0.000	0.001	0.002	0.001	ND	0.003
Tin	mg/L	NS	NS	NS	NS	NS	NS	NS	NS
TDS	mg/L	1080	1431	389	385	441	310	618	1,7470
Uranium	mg/L	0.014	0.002	0.006	ND	0.211	0.001	ND	0.003
Vanadium	mg/L	NS	NS	NS	NS	NS	NS	NS	NS
Zinc	mg/L	2.83	36.87	0.00	0.08	0.12	0.03	ND	0.75

ND indicates all sample results are below detection limits.
NS indicates element was not sampled.

Table 3.4: Ruth East lithology late flush geochemical profiles

Rock /Alteration		Kmp Non-PAG	KMP PAG	Mc Non-PAG	Mc PAG	Pel non-PAG	Prh non-PAG	Tr non-PAG	Kimbley Non-PAG Backfill
Sample ID		Composite	Composite	Composite	Composite	Composite	QR07-150 285-315	NWL-34	Composite
Week		0	0	0	0	0	0	0-20	0
Parameter	Unit								
Alkalinity Total	mg/L	31	63	26	4	34	30	42	22.2
Aluminum	mg/L	0.11	0.02	0.02	9.55	0.02	ND	0.00	0.22
Antimony	mg/L	ND	ND	ND	0.001	ND	ND	0.006	0.002
Arsenic	mg/L	ND	ND	ND	0.013	0.002	0.005	0.001	0.002
Boron	mg/L	NS	NS	NS	NS	NS	NS	NS	NS
Barium	mg/L	0.02	0.01	ND	0.03	0.01	0.03	0.01	0.02
Beryllium	mg/L	ND	ND	ND	0.001	ND	ND	0.001	0.0012
Cadmium	mg/L	0.001	0.002	ND	0.007	ND	ND	0.001	0.0083
Calcium	mg/L	24	64	17	55	19	8	31	187
Chloride	mg/L	0.5	0.5	0.3	1.5	0.1	0.3	3.0	11
Chromium	mg/L	ND	ND	ND	0.034	ND	ND	0.003	0.004
Copper	mg/L	0.01	0.12	ND	0.09	0.01	0.01	0.02	0.65
Fluoride	mg/L	0.52	2.41	0.21	3.77	0.88	0.05	0.50	1.31
Iron	mg/L	0.003	0.002	0.003	394.000	0.015	ND	0.038	0.13
Lead	mg/L	ND	ND	ND	0.001	0.000	ND	0.003	0.002
Lithium	mg/L	NS	NS	NS	NS	NS	NS	NS	NS
Magnesium	mg/L	1	2	2	2	1	2	4	40.4
Manganese	mg/L	0.11	3.37	0.01	0.04	0.01	0.01	0.02	18.2
Mercury	mg/L	ND	ND	ND	0.0012	ND	ND	0.0001	0.00002
Molybdenum	mg/L	NS	NS	NS	NS	NS	NS	NS	NS
Nickel	mg/L	ND	ND	ND	0.46	ND	ND	0.01	0.12
Total Nitrogen	mg/L	ND	0.21	0.01	ND	0.03	0.03	ND	1.11
pH	mg/L	7.50	7.19	7.62	4.45	7.68	8.05	7.80	6.36
Phosphorus	mg/L	NS	NS	NS	NS	NS	NS	NS	NS
Potassium	mg/L	0.8	1.1	1.9	1.2	1.4	1.1	5.7	11.8
Selenium	mg/L	0.003	0.001	0.002	0.038	0.001	0.002	0.001	0.004
Silver	mg/L	ND	ND	ND	0.001	ND	ND	0.001	0.000
Sodium	s.u.	0.5	0.5	0.5	1.6	0.5	0.5	1.8	7.17
Strontium	mg/L	NS	NS	NS	NS	NS	NS	NS	NS
Sulfate	mg/L	29	103	29	1342	21	0	60	1,446
Thallium	mg/L	0.002	0.001	ND	0.001	ND	0.001	0.001	0.003
Tin	mg/L	NS	NS	NS	NS	NS	NS	NS	NS
TDS	mg/L	86	239	77	1815	77	41	148	1,7470
Uranium	mg/L	0.003	0.001	0.001	0.067	0.028	0.001	ND	0.003
Vanadium	mg/L	NS	NS	NS	NS	NS	NS	NS	NS
Zinc	mg/L	0.04	0.23	0.00	0.18	0.01	0.01	ND	0.75

ND indicates all sample results are below detection limits.
NS indicates element was not sampled.

Kimbley Backfill HCT selection

Geochemical profiles assigned to pit wall lithologies for rinsing are shown in Tables 3.5 and 3.6. No pit wall runoff occurs to the backfill, therefore only submerged pit walls and backfill were simulated. The following rock lithologies are identified as unique geochemical profiles in the geochemical model:

- Kmp non-PAG was simulated using a composite of QC08-018 310-330 and QR07-163 565-585 HCT sample results. ANP:AGP ratios for the samples are 0.37 and 0.68, respectively. These samples were applied from Ruth East.
- Kmp PAG was simulated using the HCT sample QC12-046 412-431 which has an ANP:AGP ratio of 0.012.
- Mc PAG was simulated using a composite of QC08-32 670-700 and QC08-014 590-610 HCT sample results. ANP:AGP ratios for the samples are 0.02 and 0.12, respectively. These samples were applied from Ruth East.
- Pel PAG was simulated using the HCT sample QC12-046 337-357 which has an ANP:AGP ratio of 0.012.
- Tr non-PAG was simulated using historic HCT sample NWL-34 results.
- Prh non-PAG was simulated using the HCT sample QR07-150 285-315 which has an ANP:AGP ratio of 77.6. These samples were applied from Ruth East.
- ALM non-PAG was simulated using a composite of QC12-046 107-127, QC12-046 224.5-242, and QC12-046 257-277. ANP:AGP ratios for the samples are 0.10, 0.014, and 0.032 respectively. Although the ABA samples indicate PAG material, HCT testing indicated they release low concentrations of constituents. Therefore 50% of the ALM was assumed to be non-PAG based on HCT results. This in accordance with the previous PLS (SWS, 2015).
- ALM ore PAG was simulated using a water chemistry profile from monitoring well AGT-9P. Fifty percent (50%) of the ALM was assumed to be PAG based on the water chemistry of AGT-9P and historic Kimbley Pit Lake water.
- Kimbley non-PAG backfill was simulated using composite HCT results from all HCT samples used in the Ruth West, Ruth East, and Kimbley geochemical models with an ANP:AGP ratio > 0.3, a total of 19 samples.
- Kimbley PAG backfill (situated above the 50 ft rebounded water level) was simulated using composite HCT samples from all PAG material used in Ruth West, Ruth East, and Kimbley pits with an ANP:AGP ratio <0.3, a total of 10 samples.

Backfill and pit wall rinsing only utilize week 0 HCT results to simulate the mass contribution from submerged rock. Infiltration through backfill also utilizes week 0 HCT results because only a small number of pore volumes are rinsed. Therefore only week 0 results are used for the backfill simulation.

Table 3.5: Kimbley lithology early flush geochemical profiles

Rock /Alteration		Kmp Non-PAG	KMP PAG	Mc PAG	Pel PAG	Tr non-PAG	Prh non-PAG	ALM non-PAG	ALM PAG	Kimbley Non-PAG Backfill	Kimbley PAG Backfill
Sample ID		Composite	QC12-046 412-431	Composite	QC12-046 337-357	NWL-34	QR07-150 285-315	Composite	AGT-9P	Composite	Composite
Week		0	0	0	0	0-20	0	0	N/A	0	0
Parameter	Unit										
Alkalinity Total	mg/L	96	1	23	2	19	70	31	0	22.2	96.9
Aluminum	mg/L	0.03	0.00	0.02	0.02	0.04	0.00	0.02	545.00	0.22	0.06
Antimony	mg/L	ND	ND	0.001	ND	ND	ND	ND	0.005	0.002	0.002
Arsenic	mg/L	ND	ND	0.001	ND	0.001	0.009	0.003	0.025	0.002	0.003
Boron	mg/L	NS	NS	NS	NS	NS	NS	NS	0.200	NS	0
Barium	mg/L	0.013	ND	0.001	ND	0.003	0.01	0.01	0.010	0.02	0.06
Beryllium	mg/L	ND	ND	0.0005	ND	0.0005	ND	0.001	0.0015	0.0012	0.0010
Cadmium	mg/L	0.0068	0.0031	0.0005	ND	0.0001	ND	0.003	0.7760	0.0083	0.0020
Calcium	mg/L	225	77	83	70	155	43	160	447	187	93
Chloride	mg/L	6.7	3.4	2.5	3.6	14.9	14.8	5.0	73.2	11	8
Chromium	mg/L	ND	ND	0.002	ND	0.135	ND	0.003	0.085	0.004	0.004
Copper	mg/L	1.20	0.09	0.81	0.25	0.01	0.05	0.55	95.80	0.65	0.04
Fluoride	mg/L	1.9	0.1	0.5	0.2	1.0	2.27	0.50	78.8	1.31	1.17
Iron	mg/L	ND	0.01	0.02	0.01	0.56	ND	0.005	2,500	0.13	0.05
Lead	mg/L	ND	ND	0.001	ND	0.001	ND	ND	0.002	0.002	0.002
Lithium	mg/L	NS	NS	NS	NS	NS	NS	NS	NS	NS	0
Magnesium	mg/L	29	9	7	16	14	13	27	266	40.4	12.1
Manganese	mg/L	2.50	1.60	0.43	2.10	0.37	0.07	1.42	57.80	18.2	0.2
Molybdenum	mg/L	NS	NS	NS	NS	NS	NS	NS	NS	0.00002	0.00002
Mercury	s.u.	ND	ND	ND	ND	ND	ND	0.0001	0.0001	NS	0
Nickel	mg/L	0.03	0.01	0.02	0.03	0.01	0.00	0.04	2.36	0.12	0.01
Total Nitrogen	mg/L	ND	ND	ND	ND	ND	0.64	0.97	4.16	1.11	0.52
pH	mg/L	7.17	5.81	6.84	5.91	7.60	7.75	6.49	3.88	6.36	7.69
Phosphorus	mg/L	NS	NS	NS	NS	NS	NS	NS	NS	NS	0
Potassium	mg/L	17	20	7	13	8	16.0	13.7	16	11.8	11.6
Selenium	mg/L	0.015	ND	0.001	0.008	ND	0.005	0.012	0.027	0.004	0.007
Silver	mg/L	ND	ND	0.001	ND	ND	ND	0.003	ND	0.000	0.003
Sodium	mg/L	0.5	0.5	3	0.5	10	0.5	47.3	65	7.17	4.0
Strontium	mg/L	NS	NS	NS	NS	NS	NS	NS	NS	NS	0.0
Sulfate	mg/L	635	290	229	310	408	87	613	9,610	1,446	273
Thallium	mg/L	0.013	ND	0.001	ND	0.001	0.001	0.001	0.002	0.003	0.001
Tin	mg/L	NS	NS	NS	NS	NS	NS	NS	NS	NS	0.000
TDS	mg/L	1024	408	362	423	637	255	907	13,794	1,7470	502
Uranium	mg/L	0.014	ND	ND	ND	ND	0.001	0.003	0.059	0.003	0.011
Vanadium	mg/L	NS	NS	NS	NS	NS	NS	NS	NS	NS	0
Zinc	mg/L	2.830	0.190	0.078	0.140	0.05	0.03	0.22	27.70	0.75	0.10

ND indicates all sample results are below detection limits.
NS indicates element was not sampled.

3.1.3 Geochemical modeling

The geochemical simulation is based on cumulative inflows from the water balance. Time steps were chosen at 10, 50, and 100 years to represent water chemistry through the evolution of the pit lake. The first geochemical time step (10 years) represents water chemistry prior to Ruth West overflowing into Ruth East. Subsequent time steps represent the fully mixed water chemistry of combined pits.

Water balance components were assigned geochemical profiles corresponding to source and rock lithology. Geochemistry of water balance components are described as follows:

- *Precipitation* – is assigned a geochemical profile of pure water equilibrated with atmosphere gases. This generates a slightly acidic fluid with a pH of 5.7.
- *Evaporation* – is assigned a geochemical profile of pure water.
- *South Block groundwater* – is assigned a geochemical profile based on water samples from RW-2P; which is the longest operating South Block dewatering well.
- *Mineralized groundwater* – is assigned a composite geochemical profile based on the relative exposure of the pit wall to nearby monitoring wells. Proportions of nearby wells used to generate mineralized groundwater chemistry for each pit is as follows:
    - Ruth West: W-12 (30%), AGT-1P (32%), AGT-2P (13%), and RW-1P (26%)
    - Ruth East: AGT-4P (29%), R-C (47%), R-H (24%)
    - Kimbley backfill: AGT-9P (12%), R-C (34%), W-26RR (37%), W-28R (17%)
- *Submerged pit wall flushing* – Scaled HCT results are assigned to wall rock lithologies of the pit wall to account for mass loading attributed to the submergence and flushing of pit wall rock. Based on SWS's experience with other pit lakes in arid climates, 10 flushed pore volumes (week 0 HCT results) and a DRZ thickness of 5.9 ft is appropriate to account for the accumulation of solutes from flushing the rind around an open pit. A sensitivity analysis using a thicker DRZ is evaluated. Flushed pore volumes are multiplied by the relative percentages of submerged lithologies and the corresponding lithologic geochemical composition. Mass loading from pit wall flushing is considered to occur only once upon initial inundation and used week 0 HCT results.
- *Pit wall and overland runoff*–Precipitation and runoff in contact with pit walls react with minerals in wall rock and can potentially mobilize constituents. The geochemical composition of run-off depends on the type of geochemical unit it is in contact with. An analysis of the geochemical units (lithology and respective PAG/non-PAG classification) for existing and future pit walls is made to determine the relative percentage of each particular exposed geochemical unit. Percentages of exposed geochemical units were used to partition runoff water balance components between the several geochemical units present at each pit. Tables of the new lithology exposures for Ruth West 4 and Ruth East 3 are shown in Tables 3.6 and 3.7 respectively. The previous PLS' percentage of material in the pit wall is provided in grey for comparison to the interim PLS (SWS, 2015).

Table 3.6: Ruth West Pit percentages of lithology surface area

Time (yr)	Stage (ft, amsl)	Kmp Non-PAG	Kmp PAG	Mc Non-PAG	Mc PAG	Pel non-PAG	Pel PAG	Silica-Pyrite non-PAG	Silica-Pyrite PAG	Pal non-PAG	Prh non-PAG	Prh PAG	Tr non-PAG	Dump	Total
Pit Wall Runoff															
10	6453	4% (5%)	5% (6%)	9% (18%)	11% (7%)	14% (21%)	3% (1%)	4% (1%)	6% (11%)	12% (0%)	20% (16%)	0% (1%)	10% (5%)	3% (8%)	100%
50	6620	3% (4%)	4% (5%)	6% (11%)	7% (4%)	15% (25%)	3% (1%)	2% (2%)	4% (8%)	17% (0%)	24% (22%)	0% (1%)	11% (5%)	4% (10%)	100%
100	6633	3% (4%)	3% (5%)	6% (10%)	7% (4%)	15% (26%)	3% (0%)	2% (2%)	3% (7%)	19% (0%)	24% (23%)	0% (2%)	12% (5%)	4% (11%)	100%
Pit Wall Submergence															
10	6453	21% (24%)	26% (28%)	15% (27%)	20% (10%)	2% (1%)	0% (0%)	5% (0%)	8% (7%)	0% (0%)	0% (0%)	0% (0%)	3% (2%)	0% (0%)	100%
50	6620	14% (14%)	17% (17%)	15% (33%)	20% (13%)	8% (5%)	2% (1%)	5% (0%)	9% (14%)	0% (0%)	5% (0%)	0% (0%)	5% (2%)	1% (0%)	100%
100	6633	13% (14%)	17% (16%)	14% (33%)	19% (13%)	9% (6%)	2% (1%)	6% (0%)	9% (14%)	0% (0%)	6% (0%)	0% (0%)	4% (3%)	1% (0%)	100%

Values rounded to nearest percentage
Interim PLS%
(2015 PLS%)

Table 3.7: Ruth East Pit percentages of lithology surface area

Time (yr)	Stage (ft, amsl)	Kmp Non-PAG	KMP PAG	Mc Non-PAG	Mc PAG	Pel non-PAG	Pel PAG	Prh non-PAG	Prh PAG	Tr non-PAG	Kimbley Backfill	Total
Pit Wall Runoff												
10	6353	8% (15%)	9% (11%)	10% (22%)	14% (8%)	20% (20%)	0% (1%)	21% (15%)	0% (1%)	4% (8%)	14% (0%)	100%
50	6619	6% (11%)	7% (8%)	8% (15%)	11% (6%)	22% (30%)	0% (2%)	28% (23%)	0% (1%)	2% (3%)	15% (0%)	100%
100	6633	6% (11%)	7% (8%)	8% (15%)	11% (6%)	22% (30%)	0% (2%)	28% (23%)	0% (1%)	2% (3%)	15% (0%)	100%
Pit Wall Submergence												
10	6353	21% (34%)	25% (24%)	15% (30%)	20% (12%)	0% (0%)	0% (0%)	0% (0%)	0% (0%)	2% (0%)	8% (0%)	100%
50	6619	16% (23%)	18% (17%)	15% (30%)	20% (11%)	9% (8%)	0% (0%)	0% (2%)	0% (0%)	5% (8%)	8% (0%)	100%
100	6633	16% (23%)	18% (17%)	15% (30%)	20% (11%)	9% (8%)	0% (0%)	0% (2%)	0% (0%)	5% (8%)	8% (0%)	100%

Values rounded to nearest percentage
Interim PLS%
(2015 PLS%)

3.2 Predictive geochemical modeling

Mining scenario Ruth West 4 and Ruth East 3 with Kimbley pit backfilled is the only pit configuration considered for the interim PLS because the proposed expansion will be limited to Ruth Pits and backfilling Kimbley Pit has been approved

and is anticipated to be completed by the end of 2016. Two sensitivity evaluations are performed to evaluate an extended DRZ and a more leachate associated with Mollie Gibson ALM material in Ruth West. Thus, a total of three (3) predictive geochemical analyses are included in this update. All three scenarios follow the 2015 PLS approach. Predictive scenarios are described as follows:

- Base case scenario: Ruth West 4 and Ruth East 3 laybacks using updated pit wall lithology and PAG/Non-PAG distributions.
- Extended DRZ scenario: Base Case scenario using a DRZ thickness of 50 ft.
- ALM scenario: Extended DRZ scenario using a geochemical profile from AGT-9P to represent Mollie Gibson ALM exposed in Ruth West 4. The scenario also uses a DRZ thickness of 50 ft.

3.3 Geochemical modeling results

3.3.1 Base Case

Ruth West results

Base case scenario of pit lake chemistry indicates there will be no exceedances of constituents for Profile III (biological receptors) or Permit MCLs (groundwater) in Ruth West Pit Lake. Simulated PHREEQC results are provided in Table 3.8.

Mining the Ruth West Pit greatly alters the hydrologic and geochemical regimes by removing the Alta Gold Tailings disposed of in the historic Ruth Pit, and intercepting the South Block aquifer which is the dominant source of water composing the new pit lake. The effects of these two mechanisms greatly improves the water quality of the Ruth Pit Lake compared to the historic ephemeral pit lake present prior to the onset of recent mining.

Ruth East results

Base case scenario of pit lake chemistry indicates there will be no exceedances of constituents for Profile III (biological receptors) or Permit MCLs (groundwater) in Ruth East Pit Lake. Simulated PHREEQC results are provided in Table 3.9.

Table 3.8: Ruth West Pit Base Case PHREEQC modeling results at 10, 50, and 100 years

Concentration (mg/L)	*Profile III*	*Permit MCL (Ruth Mineralized)*	Ruth West - 10yr	Ruth Combined-50yr	Ruth Combined-100yr
pH	*6.5-8.5*	*6.5-8.5*	7.86	7.86	7.87
pe	-----	-----	4.00	1.00	-4.00
Alkalinity Total	-----	-----	180	183	188
Aluminum	*4.47*	*0.2*	0.00	0.00	0.00
Antimony	*0.29*	-----	0.000	0.000	0.000
Arsenic	*0.2*	*0.063*	0.000	0.000	0.002
Barium	*23.1*	*2*	0.04	0.04	0.04
Beryllium	*2.83*	*0.004*	0.000	0.000	0.000
Boron	*5*	-----	0.001	0.003	0.003
Cadmium	*0.05*	*0.005*	0.001	0.001	0.001
Calcium	----	-----	59	64	64
Chloride	----	*400*	5	7	8
Chromium	*1*	*0.1*	0.00	0.00	0.00
Copper	*0.5*	*1*	0.000	0.000	0.000
Fluoride	*2*	*4*	0.41	0.45	0.52
Iron	----	*10.31*	0.00	0.00	1.10
Lead	*0.1*	*0.015*	0.001	0.000	0.001
Lithium	*40.3*	-----	0.00	0.00	0.00
Magnesium	----	*150*	28	34	39
Manganese	*377*	*1.375*	0.4	0.2	0.2
Mercury	*0.10*	*0.002*	0.0000	0.0001	0.0001
Molybdenum	*0.60*	-----	0.00	0.00	0.00
Nickel	*171*	*0.1*	0.01	0.01	0.02
Total Nitrogen	*100*	-----	0.56	0.69	0.82
Phosphorus	----	-----	0.00	0.00	0.01
Potassium	----	-----	1.8	2.4	2.7
Selenium	*0.05*	*0.05*	0.003	0.002	0.003
Silver	----	*0.1*	0.000	0.000	0.000
Sodium	*2000*	-----	13	19	22
Strontium	*1127*	-----	0.0	0.0	0.0
Sulfate	----	*709.3*	134	179	203
Thallium	*0.032*	-----	0.0005	0.0003	0.0002
Tin	*29.2*	-----	0.00	0.00	0.00
TDS	*7000*	*1227*	422	490	531
TSS	-----	-----	NS	NS	NS
Uranium	*6.995*	*0.02*	0.000	0.000	0.000
Vanadium	*0.1*	-----	0.000	0.000	0.000
Zinc	*25*	*5*	0.26	0.21	0.23

0.00	Indicates Profile III and RNMC permit exceedance
0.00	Indicates Profile III exceedance
0.00	Indicates Permit MCL exceedance

NS indicates element was not simulated

Table 3.9: Ruth East Pit Base Case PHREEQC modeling results at 10, 50, and 100 years

Concentration (mg/L)	*Profile III*	*Permit MCL (Ruth Mineralized)*	Ruth East - 10yr	Ruth Combined-50yr	Ruth Combined-100yr
pH	*6.5-8.5*	*6.5-8.5*	7.72	7.86	7.87
pe	-----	-----	4.00	1.00	-4.00
Alkalinity Total	-----	-----	138	183	188
Aluminum	*4.47*	*0.2*	0.00	0.00	0.00
Antimony	*0.29*	-----	0.000	0.000	0.000
Arsenic	*0.2*	*0.063*	0.000	0.000	0.002
Barium	*23.1*	*2*	0.03	0.04	0.04
Beryllium	*2.83*	*0.004*	0.000	0.000	0.000
Boron	*5*	-----	0.023	0.003	0.003
Cadmium	*0.05*	*0.005*	0.001	0.001	0.001
Calcium	----	-----	137	64	64
Chloride	----	*400*	14	7	8
Chromium	*1*	*0.1*	0.00	0.00	0.00
Copper	*0.5*	*1*	0.000	0.000	0.000
Fluoride	*2*	*4*	0.63	0.45	0.52
Iron	----	*10.31*	0.00	0.00	1.10
Lead	*0.1*	*0.015*	0.000	0.000	0.001
Lithium	*40.3*	-----	0.00	0.00	0.00
Magnesium	----	*150*	42	34	39
Manganese	*377*	*1.375*	0.5	0.2	0.2
Mercury	*0.10*	*0.002*	0.0000	0.0001	0.0001
Molybdenum	*0.60*	-----	0.00	0.00	0.00
Nickel	*171*	*0.1*	0.01	0.01	0.02
Total Nitrogen	*100*	-----	0.45	0.69	0.82
Phosphorus	----	-----	0.02	0.00	0.01
Potassium	----	-----	3.7	2.4	2.7
Selenium	*0.05*	*0.05*	0.002	0.002	0.003
Silver	----	*0.1*	0.000	0.000	0.000
Sodium	*2000*	-----	25	19	22
Strontium	*1127*	-----	0.4	0.0	0.0
Sulfate	----	*709.3*	425	179	203
Thallium	*0.032*	-----	0.0009	0.0003	0.0002
Tin	*29.2*	-----	0.00	0.00	0.00
TDS	*7000*	*1227*	788	490	531
TSS	-----	-----	NS	NS	NS
Uranium	*6.995*	*0.02*	0.001	0.000	0.000
Vanadium	*0.1*	-----	0.000	0.000	0.000
Zinc	*25*	*5*	0.51	0.21	0.23

0.00	Indicates Profile III and RNMC permit exceedance
0.00	Indicates Profile III exceedance
0.00	Indicates Permit MCL exceedance

NS indicates element was not simulated

3.3.2 Extended DRZ Sensitivity

The extended DRZ sensitivity scenario evaluates pit lake chemistry under the assumption that the DRZ thickness is increased to 50 ft. This is the same sensitivity as was performed for the 2015 PLS (SWS, 2015). The water balance is modified to incorporate the additional volume of water rinsing a thicker DRZ. A total of 10 pore volumes is flushed from the extended DRZ. Otherwise, the simulation is identical to the Base Case scenario.

Ruth West results

The extended DRZ sensitivity indicates there will be no exceedances of constituents for Profile III (biological receptors) or Permit MCLs (groundwater) in Ruth West Pit Lake. Concentrations are slightly higher than the Base Case scenario for most constituents, which is expected with the additional mass loading from the extended DRZ. Results are shown in Table 3.10.

Ruth East results

The extended DRZ sensitivity indicates there will be no exceedances of constituents for Profile III or Permit MCLs (groundwater) in Ruth East Pit Lake. Concentrations are slightly higher than the Base Case scenario for most constituents, which is expected with the additional mass loading from the extended DRZ. Results are shown in Table 3.11.

The sensitivity scenario indicates that flushing from the DRZ using the given geochemical profiles for rock lithologies does not meaningfully change predicted pit lake chemistry. Pit lake water quality is still predicted to meet Permit and Profile III standards. Water in the pit lake is overwhelmingly composed of South Block groundwater, which is high in alkalinity and low in dissolved solids. This is the main reason for the minimal effect on pit lake chemistry. South Block water composes 60% - 85% of the Ruth pit lakes, whereas that contributed by DRZ is 1.5% - 3.5%. The additional mass contributed by the DRZ, regular or extended thicknesses, comprises a small fraction of pit lake mass and minimally affects predicted water chemistry.

Table 3.10: Ruth West Pit DRZ Sensitivity PHREEQC modeling results at 10, 50, and 100 years

Concentration (mg/L)	*Profile III*	*Permit MCL (Ruth Mineralized)*	Ruth West - 10yr	Ruth Combined-50yr	Ruth Combined-100yr
pH	*6.5-8.5*	*6.5-8.5*	7.84	7.87	7.86
pe	-----	-----	4.00	1.00	-4.00
Alkalinity Total	-----	-----	175	188	186
Aluminum	*4.47*	*0.2*	0.00	0.00	0.00
Antimony	*0.29*	-----	0.000	0.000	0.000
Arsenic	*0.2*	*0.063*	0.002	0.000	0.003
Barium	*23.1*	*2*	0.04	0.04	0.04
Beryllium	*2.83*	*0.004*	0.000	0.000	0.000
Boron	*5*	-----	0.001	0.005	0.006
Cadmium	*0.05*	*0.005*	0.001	0.001	0.001
Calcium	----	-----	64	72	75
Chloride	----	*400*	6	8	9
Chromium	*1*	*0.1*	0.00	0.00	0.00
Copper	*0.5*	*1*	0.115	0.000	0.000
Fluoride	*2*	*4*	0.51	0.51	0.58
Iron	----	*10.31*	0.00	0.00	1.11
Lead	*0.1*	*0.015*	0.001	0.000	0.001
Lithium	*40.3*	-----	0.00	0.00	0.00
Magnesium	----	*150*	28	35	40
Manganese	*377*	*1.375*	0.4	0.3	0.3
Mercury	*0.10*	*0.002*	0.0000	0.0002	0.0003
Molybdenum	*0.60*	-----	0.00	0.00	0.00
Nickel	*171*	*0.1*	0.01	0.01	0.02
Total Nitrogen	*100*	-----	0.58	0.67	0.77
Phosphorus	----	-----	0.00	0.01	0.02
Potassium	----	-----	2.3	2.7	3.0
Selenium	*0.05*	*0.05*	0.003	0.002	0.004
Silver	----	*0.1*	0.000	0.000	0.000
Sodium	*2000*	-----	13	23	24
Strontium	*1127*	-----	0.0	0.1	0.1
Sulfate	----	*709.3*	156	204	237
Thallium	*0.032*	-----	0.0010	0.0006	0.0006
Tin	*29.2*	-----	0.00	0.00	0.00
TDS	*7000*	*1227*	447	535	578
TSS	-----	-----	NS	NS	NS
Uranium	*6.995*	*0.02*	0.000	0.000	0.000
Vanadium	*0.1*	-----	0.000	0.000	0.000
Zinc	*25*	*5*	0.69	0.40	0.46

0.00	Indicates Profile III and RNMC permit exceedance
0.00	Indicates Profile III exceedance
0.00	Indicates Permit MCL exceedance

NS indicates element was not simulated

Table 3.11: Ruth East Pit DRZ Sensitivity PHREEQC modeling results at 10, 50, and 100 years

Concentration (mg/L)	*Profile III*	*Permit MCL (Ruth Mineralized)*	Ruth East - 10yr	Ruth Combined-50yr	Ruth Combined-100yr
pH	*6.5-8.5*	*6.5-8.5*	7.72	7.87	7.86
pe	-----	-----	4.00	1.00	-4.00
Alkalinity Total	-----	-----	136	188	186
Aluminum	*4.47*	*0.2*	0.00	0.00	0.00
Antimony	*0.29*	-----	0.000	0.000	0.000
Arsenic	*0.2*	*0.063*	0.000	0.000	0.003
Barium	*23.1*	*2*	0.02	0.04	0.04
Beryllium	*2.83*	*0.004*	0.000	0.000	0.000
Boron	*5*	-----	0.023	0.005	0.006
Cadmium	*0.05*	*0.005*	0.001	0.001	0.001
Calcium	----	-----	143	72	75
Chloride	----	*400*	15	8	9
Chromium	*1*	*0.1*	0.00	0.00	0.00
Copper	*0.5*	*1*	0.000	0.000	0.000
Fluoride	*2*	*4*	0.71	0.51	0.58
Iron	----	*10.31*	0.00	0.00	1.11
Lead	*0.1*	*0.015*	0.001	0.000	0.001
Lithium	*40.3*	-----	0.00	0.00	0.00
Magnesium	----	*150*	42	35	40
Manganese	*377*	*1.375*	0.7	0.3	0.3
Mercury	*0.10*	*0.002*	0.0000	0.0002	0.0003
Molybdenum	*0.60*	-----	0.00	0.00	0.00
Nickel	*171*	*0.1*	0.02	0.01	0.02
Total Nitrogen	*100*	-----	0.46	0.67	0.77
Phosphorus	----	-----	0.02	0.01	0.02
Potassium	----	-----	4.2	2.7	3.0
Selenium	*0.05*	*0.05*	0.002	0.002	0.004
Silver	----	*0.1*	0.000	0.000	0.000
Sodium	*2000*	-----	25	23	24
Strontium	*1127*	-----	0.4	0.1	0.1
Sulfate	----	*709.3*	446	204	237
Thallium	*0.032*	-----	0.0011	0.0006	0.0006
Tin	*29.2*	-----	0.00	0.00	0.00
TDS	*7000*	*1227*	815	535	578
TSS	-----	-----	NS	NS	NS
Uranium	*6.995*	*0.02*	0.001	0.000	0.000
Vanadium	*0.1*	-----	0.000	0.000	0.000
Zinc	*25*	*5*	0.99	0.40	0.46

0.00	Indicates Profile III and RNMC permit exceedance
0.00	Indicates Profile III exceedance
0.00	Indicates Permit MCL exceedance

NS indicates element was not simulated

3.3.3 ALM in Ruth West pit wall sensitivity

The ALM sensitivity scenario evaluates pit lake chemistry under the hypothetical condition that all dump material in Ruth West pit wall, including Mollie Gibson material and Star Pointer dumps, is acid-generating. A geochemical profile using water chemistry from AGT-9P is used as a surrogate for ALM leachate. AGT-9P chemistry is shown in Table 3.5 for ALM PAG. A DRZ thickness of 50 ft is used, building upon the DRZ sensitivity scenario in terms of mass loading from pit wall material. ALM chemistry will be updated in the comprehensive PLS, following completion of geochemical testing.

Ruth West results

The ALM sensitivity indicates there will be no exceedances of constituents for Profile III or Permit MCLs (groundwater) in Ruth West Pit Lake. Simulated PHREEQC results are provided in Table 3.12.

The sensitivity scenario indicates that the contribution of mass from ALM material in Ruth West has a minor effect on pit lake chemistry. SWS anticipates that leachate from ALM material will be low pH, but also possess concentrations of metals and constituents below those represented by AGT-9P because previous leaching episodes will have removed most of the leachable mass from the material. Under this situation, the impact of ALM material in terms of potential degradation of pit lake chemistry will be less than currently predicted. ALM material is being tested using HCTs, the results of which will be used to improve geochemical predictions in the comprehensive PLS.

The main reason ALM material has a minor impact to pit lake chemistry is because the percentage of ALM leachate in the pit lake mass balance is small. South Block water is the major control on pit lake chemistry, composing 60% - 85% of the Ruth pit lakes, whereas the contribution from exposed ALM material is <0.5%.

Ruth East results

The ALM sensitivity indicates there will be no exceedances of constituents for Profile III (biological receptors) or Permit MCLs (groundwater) in Ruth East Pit Lake. Simulated PHREEQC results are provided in Table 3.13.

Table 3.12: Ruth West Pit ALM Sensitivity PHREEQC modeling results at 10, 50, and 100 years

Concentration (mg/L)		*Permit MCL (Ruth Mineralized)*	Ruth West - 10yr	Ruth Combined-50yr	Ruth Combined-100yr
pH	*6.5-8.5*	*6.5-8.5*	7.84	7.87	7.86
pe	-----	-----	4.00	1.00	-4.00
Alkalinity Total	-----	-----	172	190	187
Aluminum	*4.47*	*0.2*	0.00	0.00	0.00
Antimony	*0.29*	-----	0.000	0.000	0.000
Arsenic	*0.2*	*0.063*	0.000	0.000	0.002
Barium	*23.1*	*2*	0.04	0.04	0.04
Beryllium	*2.83*	*0.004*	0.000	0.000	0.000
Boron	*5*	-----	0.002	0.003	0.003
Cadmium	*0.05*	*0.005*	0.002	0.002	0.002
Calcium	----	-----	67	68	70
Chloride	----	*400*	6	7	8
Chromium	*1*	*0.1*	0.00	0.00	0.00
Copper	*0.5*	*1*	0.000	0.000	0.000
Fluoride	*2*	*4*	0.58	0.55	0.69
Iron	----	*10.31*	0.00	0.00	1.15
Lead	*0.1*	*0.015*	0.000	0.000	0.001
Lithium	*40.3*	-----	0.00	0.00	0.00
Magnesium	----	*150*	28	34	40
Manganese	*377*	*1.375*	0.4	0.4	0.4
Mercury	*0.10*	*0.002*	0.0000	0.0001	0.0001
Molybdenum	*0.60*	-----	0.00	0.00	0.00
Nickel	*171*	*0.1*	0.01	0.01	0.02
Total Nitrogen	*100*	-----	0.59	0.70	0.82
Phosphorus	----	-----	0.00	0.00	0.01
Potassium	----	-----	2.3	2.7	3.0
Selenium	*0.05*	*0.05*	0.002	0.001	0.004
Silver	----	*0.1*	0.000	0.000	0.000
Sodium	*2000*	-----	14	23	24
Strontium	*1127*	-----	0.0	0.0	0.0
Sulfate	----	*709.3*	164	193	225
Thallium	*0.032*	-----	0.0010	0.0006	0.0005
Tin	*29.2*	-----	0.00	0.00	0.00
TDS	*7000*	*1227*	456	520	560
TSS	-----	-----	NS	NS	NS
Uranium	*6.995*	*0.02*	0.000	0.000	0.000
Vanadium	*0.1*	-----	0.000	0.000	0.045
Zinc	*25*	*5*	0.56	0.32	0.38

0.00	Indicates Profile III and RNMC permit exceedance
0.00	Indicates Profile III exceedance
0.00	Indicates Permit MCL exceedance

NS indicates element was not simulated

Table 3.13: Ruth East Pit ALM Sensitivity PHREEQC modeling results at 10, 50, and 100 years

Concentration (mg/L)	*Profile III*	*Permit MCL (Ruth Mineralized)*	Ruth East - 10yr	Ruth Combined-50yr	Ruth Combined-100yr
pH	*6.5-8.5*	*6.5-8.5*	7.72	7.87	7.86
pe	-----	-----	4.00	1.00	-4.00
Alkalinity Total	-----	-----	136	190	187
Aluminum	*4.47*	*0.2*	0.00	0.00	0.00
Antimony	*0.29*	-----	0.000	0.000	0.000
Arsenic	*0.2*	*0.063*	0.000	0.000	0.002
Barium	*23.1*	*2*	0.02	0.04	0.04
Beryllium	*2.83*	*0.004*	0.000	0.000	0.000
Boron	*5*	-----	0.023	0.003	0.003
Cadmium	*0.05*	*0.005*	0.001	0.002	0.002
Calcium	----	-----	143	68	70
Chloride	----	*400*	15	7	8
Chromium	*1*	*0.1*	0.00	0.00	0.00
Copper	*0.5*	*1*	0.000	0.000	0.000
Fluoride	*2*	*4*	0.71	0.55	0.69
Iron	----	*10.31*	0.00	0.00	1.15
Lead	*0.1*	*0.015*	0.001	0.000	0.001
Lithium	*40.3*	-----	0.00	0.00	0.00
Magnesium	----	*150*	42	34	40
Manganese	*377*	*1.375*	0.7	0.4	0.4
Mercury	*0.10*	*0.002*	0.0000	0.0001	0.0001
Molybdenum	*0.60*	-----	0.00	0.00	0.00
Nickel	*171*	*0.1*	0.02	0.01	0.02
Total Nitrogen	*100*	-----	0.46	0.70	0.82
Phosphorus	----	-----	0.02	0.00	0.01
Potassium	----	-----	4.2	2.7	3.0
Selenium	*0.05*	*0.05*	0.002	0.001	0.004
Silver	----	*0.1*	0.000	0.000	0.000
Sodium	*2000*	-----	25	23	24
Strontium	*1127*	-----	0.4	0.0	0.0
Sulfate	----	*709.3*	446	193	225
Thallium	*0.032*	-----	0.0011	0.0006	0.0005
Tin	*29.2*	-----	0.00	0.00	0.00
TDS	*7000*	*1227*	815	520	560
TSS	-----	-----	NS	NS	NS
Uranium	*6.995*	*0.02*	0.001	0.000	0.000
Vanadium	*0.1*	-----	0.000	0.000	0.045
Zinc	*25*	*5*	0.99	0.32	0.38

0.00	Indicates Profile III and RNMC permit exceedance
0.00	Indicates Profile III exceedance
0.00	Indicates Permit MCL exceedance

NS indicates element was not simulated

4 CONCLUSIONS AND RECOMMENDATIONS

The interim PLS predicts Ruth Pit chemistry for three scenarios, all of which indicate no constituent exceedances will occur under RNMC's WPCP permit or Profile III MCLs. Thus, no water quality impacts are anticipated to the groundwater system or to biological receptors in this assessment.

Pit lake water chemistry predictions build upon the data and methodology used in the 2015 PLS with new ABA data collected specifically to characterize the pit walls of Ruth West 4 and Ruth East 3 laybacks. Variance between sensitivity scenarios is low because the contribution of mass via pit wall runoff and submerged pit wall flushing is small relative to the contribution from South Block groundwater. The current suite of HCT samples undergoing testing will improve the representation of mass leaching from wall rock in a comprehensive future PLS.

A comprehensive PLS will be initiated upon the termination of HCTs or until sufficient data has been collected, in coordination with NDEP-BMRR. Potential mitigation plans, which may be required based on the results of the comprehensive PLS, will be addressed by RNMC, as necessary.

4.1 Recommendations

Recommendations for the comprehensive future PLS are provided and follow guidance given by NDEP-BMRR in correspondence regarding the PLS analysis (NDEP-BMRR, 2016). Recommendations include (but are not limited to):

- Develop updated groundwater inflow rates using the most recent update of the numerical groundwater model by SWS and Ruth West 4/Ruth East 3 mine plans (SWS, 2016).
- Re-evaluate water chemistry profiles assigned to groundwater based on new well locations and additional samples collected. Particular emphasis would address, but not be limited to: W-26RR, W-28R, W-12RRR, R-CR, P1a, P1b, P3, W-23, W-24, and W-25.
- Continue the proposed HCT characterization program for 29 additional samples, as agreed upon with NDEP-BMRR. The characterization program is designed to preferentially sample PAG materials found within 100 ft of the Ruth West 4 and Ruth East 3 ultimate pit shells. HCT samples include:
    - 11 samples from Ruth East
    - 13 samples from Ruth West
    - 5 samples of Mollie Gibson ALM material, located in Ruth West.
- Re-evaluate geochemical profiles assigned to pit wall submergence and runoff components of the water balance after HCT testing is completed.
- Generate a new comprehensive pit lake study based on the current mine plan. Additional changes to the mine plan which have occurred and will be incorporated in the comprehensive PLS (unless further mine plan revisions occur) include:
    - No additional mining in Liberty and Tripp-Vet pits. Thus, the current pit configurations will be evaluated.
    - Ruth West 4 layback.
    - Ruth East 3 layback.

- Kimbley and Wedge pits have already been backfilled, thus, no open pit scenario will be evaluated for these pits.

The comprehensive PLS will begin once HCTs are terminated or when sufficient data has been collected, as discussed and approved by NDEP-BMRR. Therefore, the comprehensive PLS is expected to be completed in Q2 of 2017.

5 REFERENCES

Geomega. 2014. Comprehensive Waste Rock Management Plan #5. March 2014.

SWS. 2014. 2013 Groundwater Model and Dewatering Plan Update. Prepared by Schlumberger Water Services. January 2014.

SWS. 2015. Robinson Nevada Mining Company Pit Lake Study. Report No. 054214/R5. April 2015.

SWS. 2016. Robinson Groundwater Model Update and Ruth Pit Dewatering Plan 2015 Update. Report No. 055326/R1. January 2016.

NDEP-BMRR. 2014. Approval to Backfill Kimbley Pit. Robinson Operation, White Pine County, Nevada. Nevada Water Pollution Control Permit NEV0092105. September 2015.

NDEP-BMRR. 2015. Approval of Two EDCs; Unified Waste Rock Classification and Revised PAG Cutoff, and Nine New Monitoring Wells. Robinson Operation, White Pine County, Nevada. Nevada Water Pollution Control Permit NEV0092105. April 2015.

NDEP-BMRR. 2016. Review of April 2015 Pit Lake Study and Ecological Risk Assessment. Robinson Operation, White Pine County, Nevada. Nevada Water Pollution Control Permit NEV0092105. February 2016.

6 CERTIFICATION

Information, conclusions, and recommendations in this document have been prepared under the supervision of and reviewed by a Schlumberger Water Services California Professional Geologist.

I certify that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to ensure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate and complete.

Tyler Cluff, 4/15/2015
PG, #8827

A professional geologist certification of conditions comprises a declaration of his or her professional judgment. It does not constitute a warranty or guarantee, expressed or implied, nor does it relieve any other party of its responsibility to abide by contract documents, applicable codes, standards, regulations, and ordinances.

7 REPORT LIMITATIONS

This report has been prepared for the specific purpose identified herein at the request of and for the use of the Client. Observations, conclusions, and recommendations contained herein are opinions based upon the scope of services, information obtained through observations and measurements taken by Schlumberger Water Services at certain points and certain times, and interpretation and extrapolation of secondary information from published and unpublished material. The report may infer the configuration of strata, ground, and groundwater conditions both between data points and below the maximum depth of investigation. The report also may deduce temporal trends and averages for climatic, hydrological, and water quality parameters. Such interpretations and extrapolations are only indicative and no liability is accepted for variations between the opinions expressed herein and conditions that may be identified at a later date through direct measurement and observation.

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Ruth East 3 Layback.

- Eastern & southern hemisphere of Ruth East
- Additional 150 to 450 ft mining

Ruth West 4 Layback.

- Western hemisphere of Ruth West
- Additional 150 to 550 ft mining

Schlumberger Water Services

Proposed Ruth Expansion Mine Plan

CLIENT:	RNMC	PROJECT:	Interim PLS
JOB #:	056176.R	DRAWN:	TC
		CHECKED:	JR
DATE:	April 2016	FIGURE:	1.1

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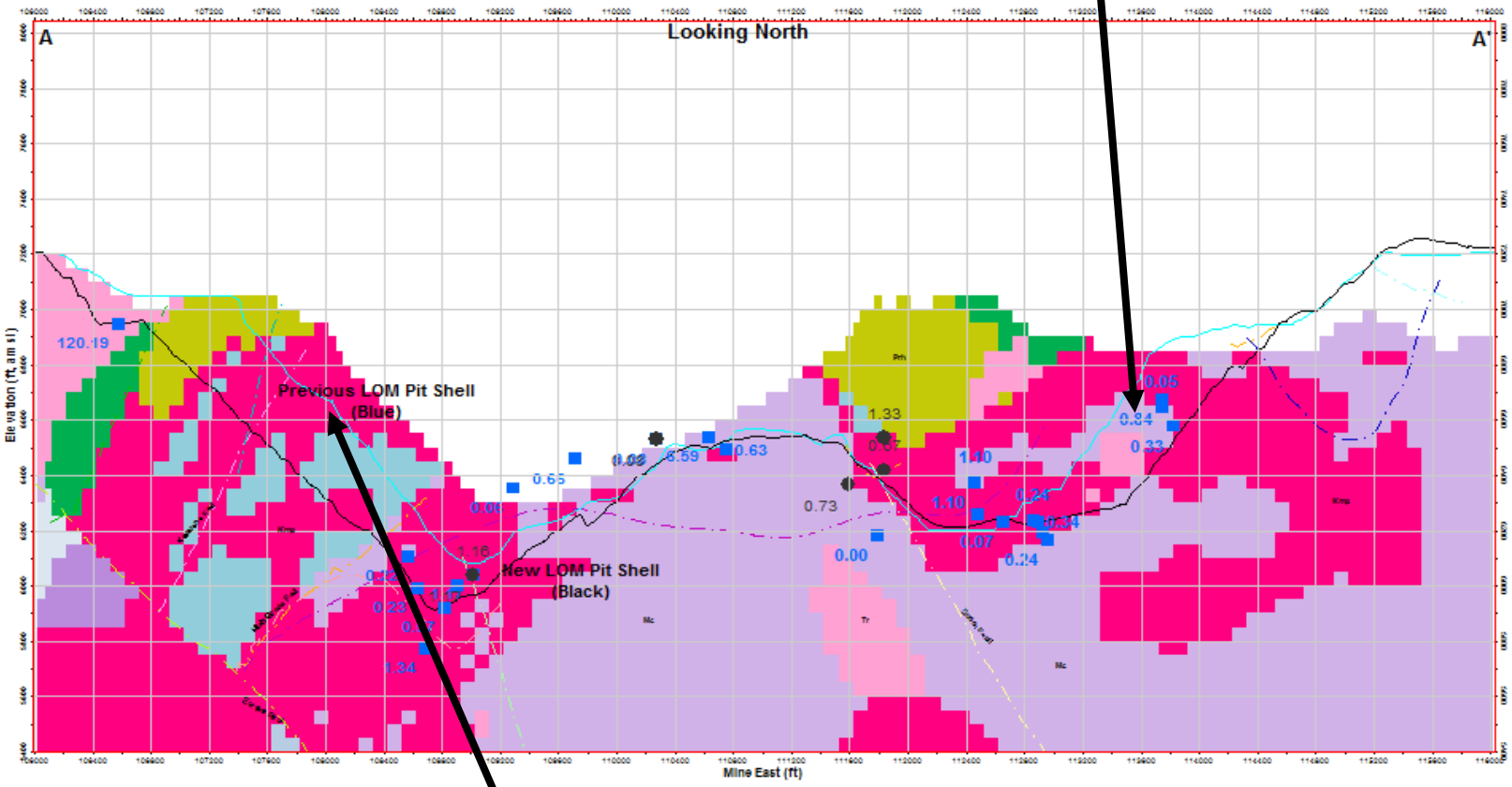
Ruth West 4 Layback.
- Higher exposure of Tr, Prh and Pel in pit wall



Ruth West 4 Layback.
- Higher exposure of Tr, Prh and Pel in pit wall

Legend

- Tr
- Kmp
- Pal
- Prh
- Pel
- Mc

New ABA Sample (ANP/AGP)

Existing ABA Sample within 100 ft envelope (ANP/AGP)

Schlumberger Water Services

Cross-section A-A': Proposed Ruth Expansion Mine Plan

CLIENT:	RNMC
PROJECT:	Interim PLS
JOB #:	056176.R
DRAWN:	TC
CHECKED:	JR
DATE:	April 2016
FIGURE:	1.2

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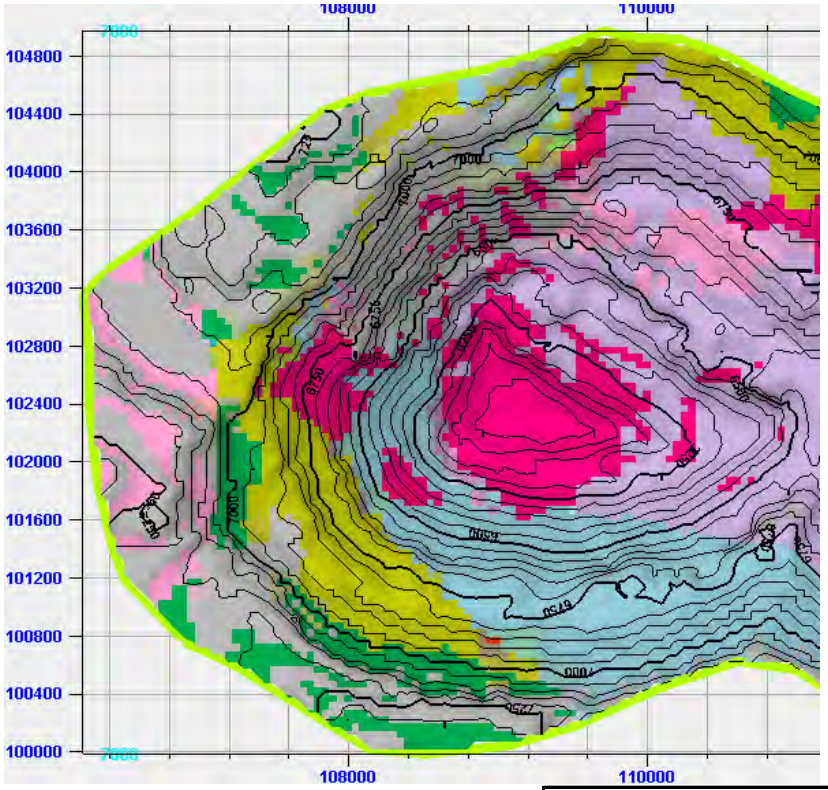
Schlumberger Water Services

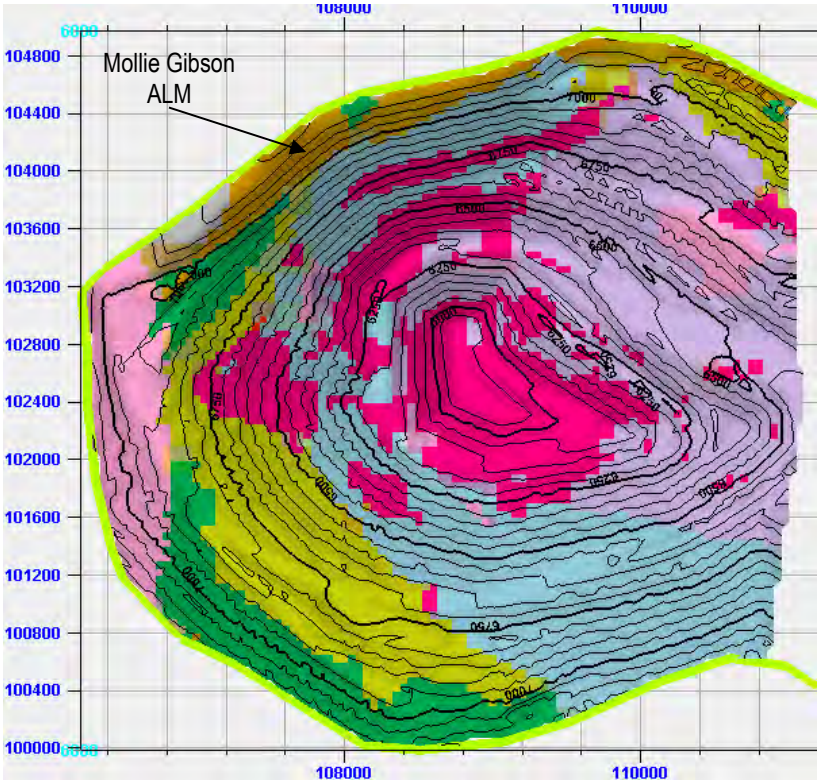
Pit Shell Comparision: Ruth West 4 vs. Previously Approved Mine Plan

CLIENT:	RNMC
PROJECT:	Interim PLS
JOB #:	056176.R
DRAWN:	TC
CHECKED:	JR
DATE:	April 2016
FIGURE:	1.3

Prior Mine Plan



Ruth West 4 Layback



- Tr
- Kmp
- Pal
- Prh
- Pel
- Mc
- Dump
- Undefined

Prior Mine Plan		Ruth West 4 Layback	
Tr	9.1%	Tr	8.0%
Kmp	16.3%	Kmp	18.0%
Pal	10.5%	Pal	9.0%
Prh	16.5%	Prh	14.0%
Pel	23.1%	Pel	23.0%
Mc	24.5%	Mc	23.0%
Dump	0.0%	Dump	5.0%

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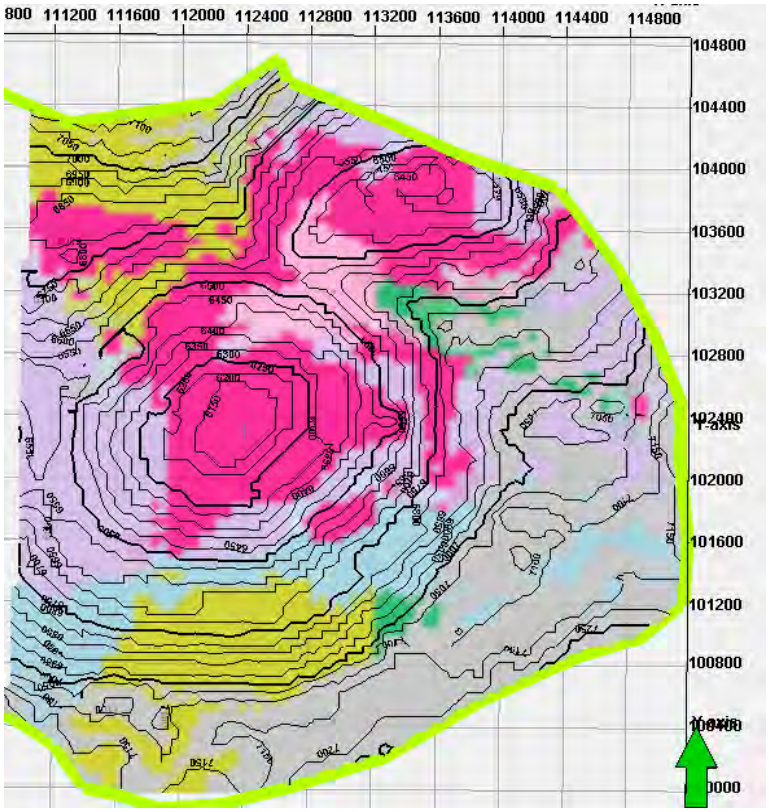
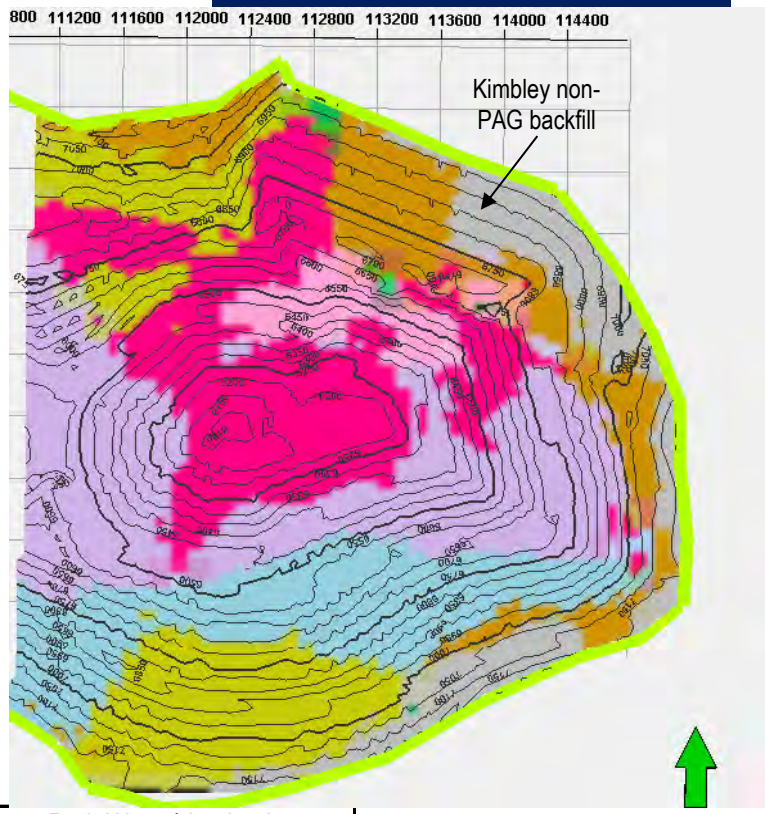
Prior Mine Plan



Ruth East 3 Layback



- Tr
- Kmp
- Pal
- Prh
- Pel
- Mc
- Dump
- Undefined

Prior Mine Plan		Ruth West 4 Layback	
Tr	5.2%	Tr	4.8%
Kmp	31.2%	Kmp	22.3%
Pal	2.6%	Pal	0.5%
Prh	19.7%	Prh	17.8%
Pel	12.8%	Pel	15.8%
Mc	28.4%	Mc	26.1%
Backfill	0.0%	Backfill	12.8%

Schlumberger Water Services

Pit Shell Comparision: Ruth East 3 vs. Previously Approved Mine Plan

CLIENT: RNMC
PROJECT: Interim PLS
JOB #: 056176.R
DRAWN: TC
CHECKED: JR
DATE: April 2016
FIGURE: 1.4

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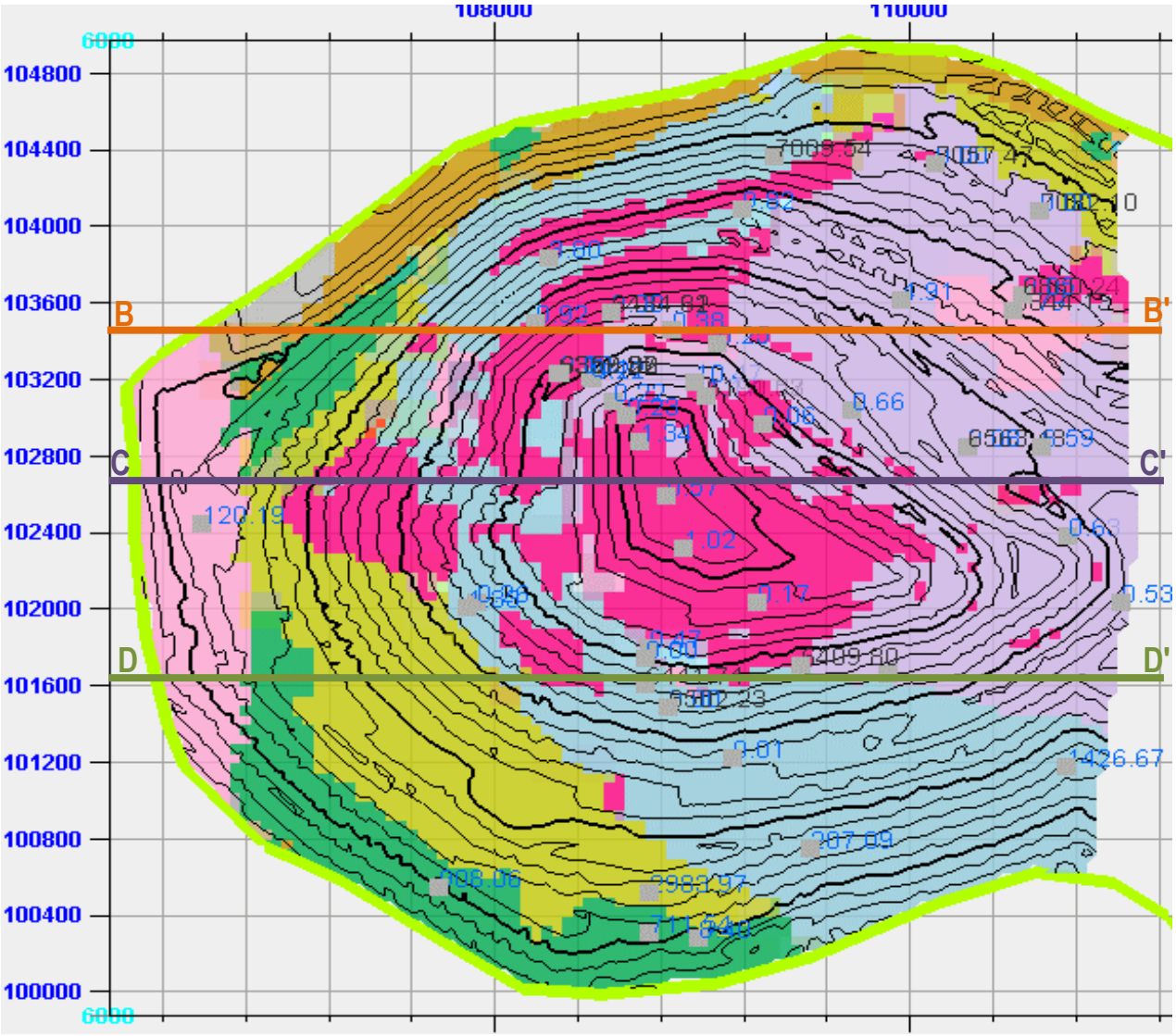

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Ruth West 4 ABA Samples

CLIENT:	RNMC
PROJECT:	Interim PLS
JOB #:	056176.R
DRAWN:	TC
CHECKED	JR
DATE:	April 2016
FIGURE:	2.1

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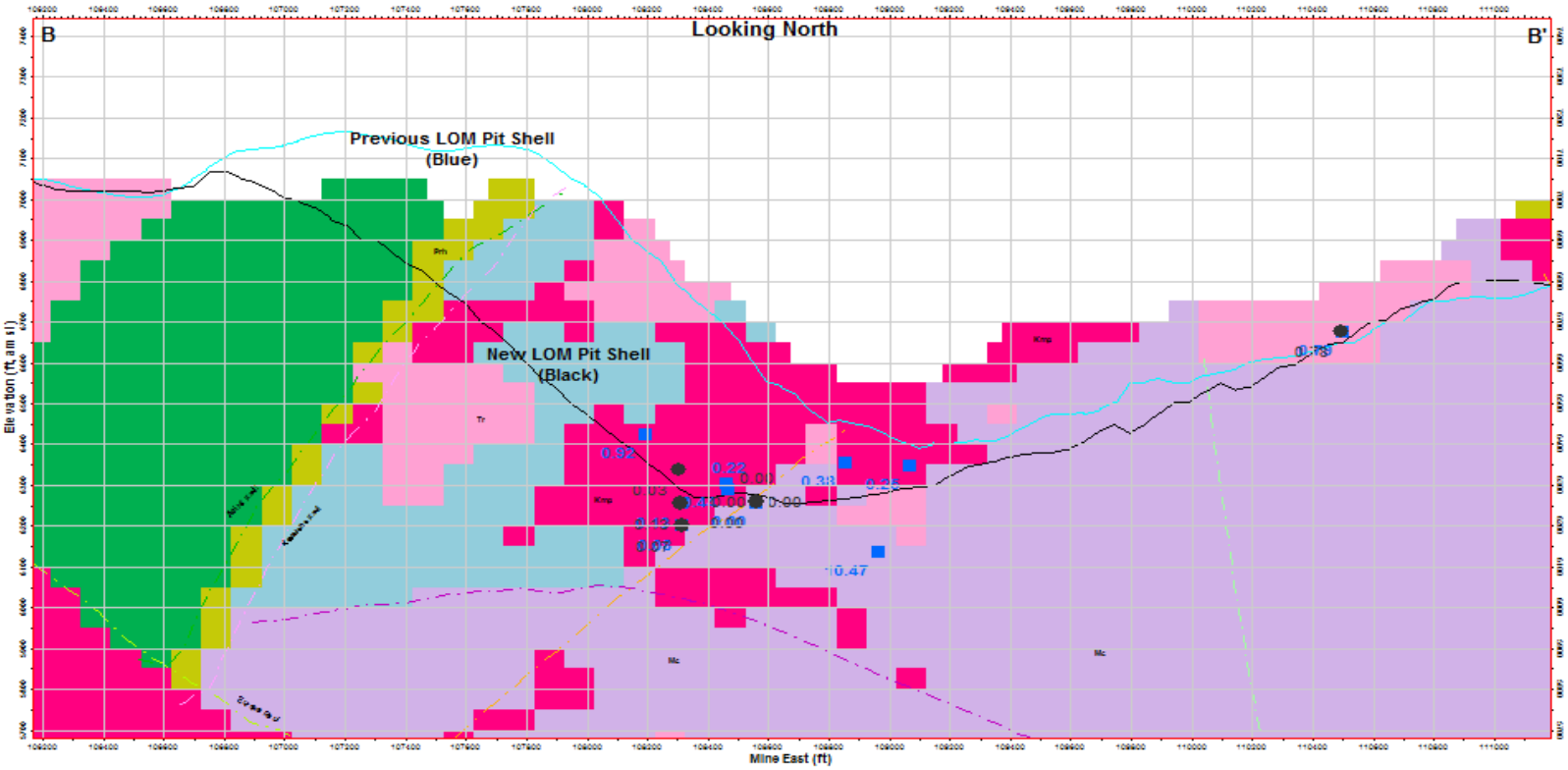

Tr
Kmp
Pal
Prh
Pel
Mc
Dump
Undefined

New ABA Sample (ANP/AGP)

Existing ABA Sample within 100 ft envelope (ANP/AGP)

Schlumberger Water Services

Cross-Section B-B': Ruth West 4 ABA Samples

CLIENT:	RNMC
PROJECT:	Interim PLS
JOB #:	056176.R
DRAWN:	TC
CHECKED	JR
DATE:	April 2016
FIGURE:	2.2

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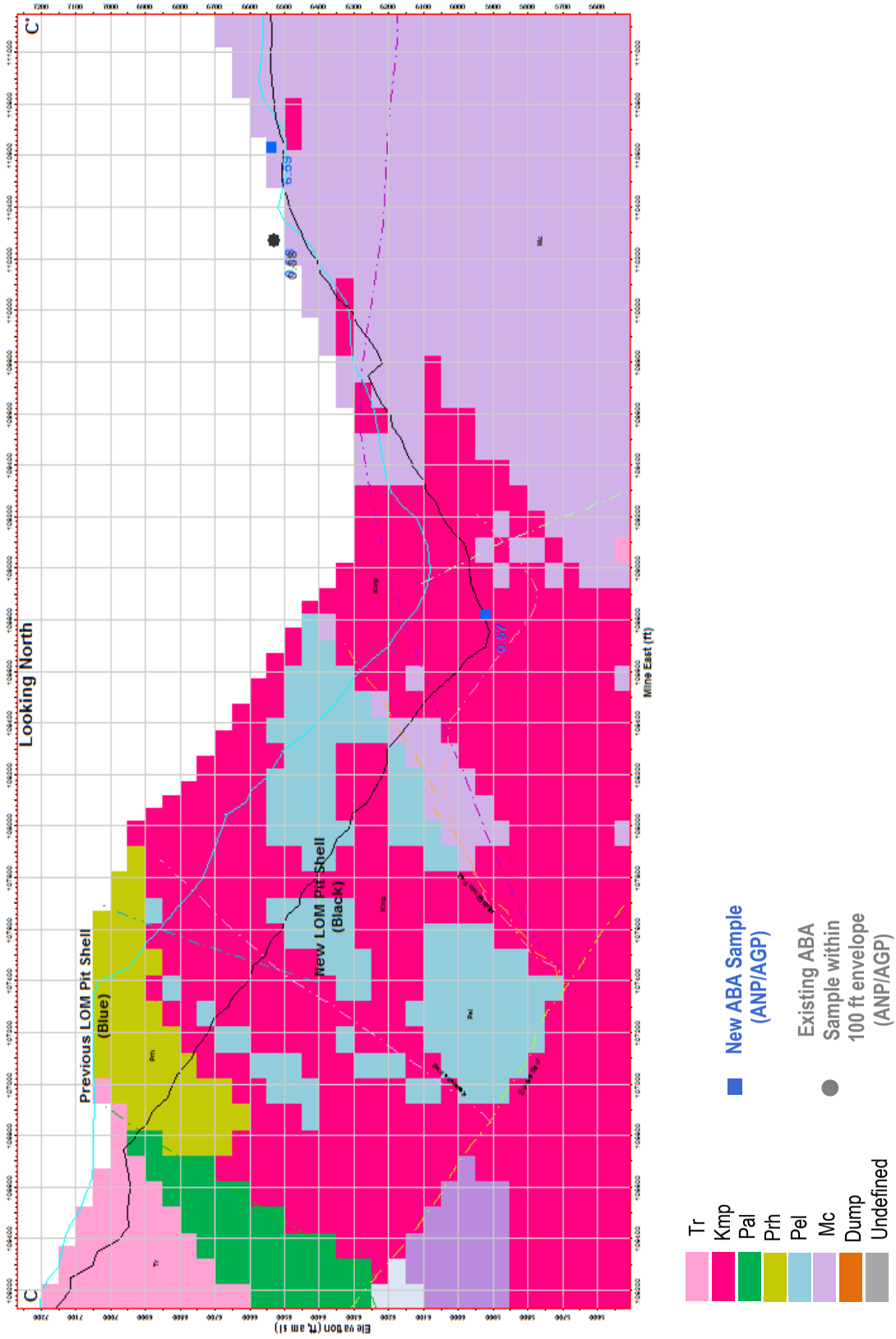

Schlumberger Water Services

Cross-Section C-C': Ruth West 4 ABA Samples

CLIENT:	RNMC	PROJECT:	Interim PLS		
JOB #:	056176.R	DRAWN:	TC	CHECKED	JR
DATE:	April 2016	FIGURE:	2.3		

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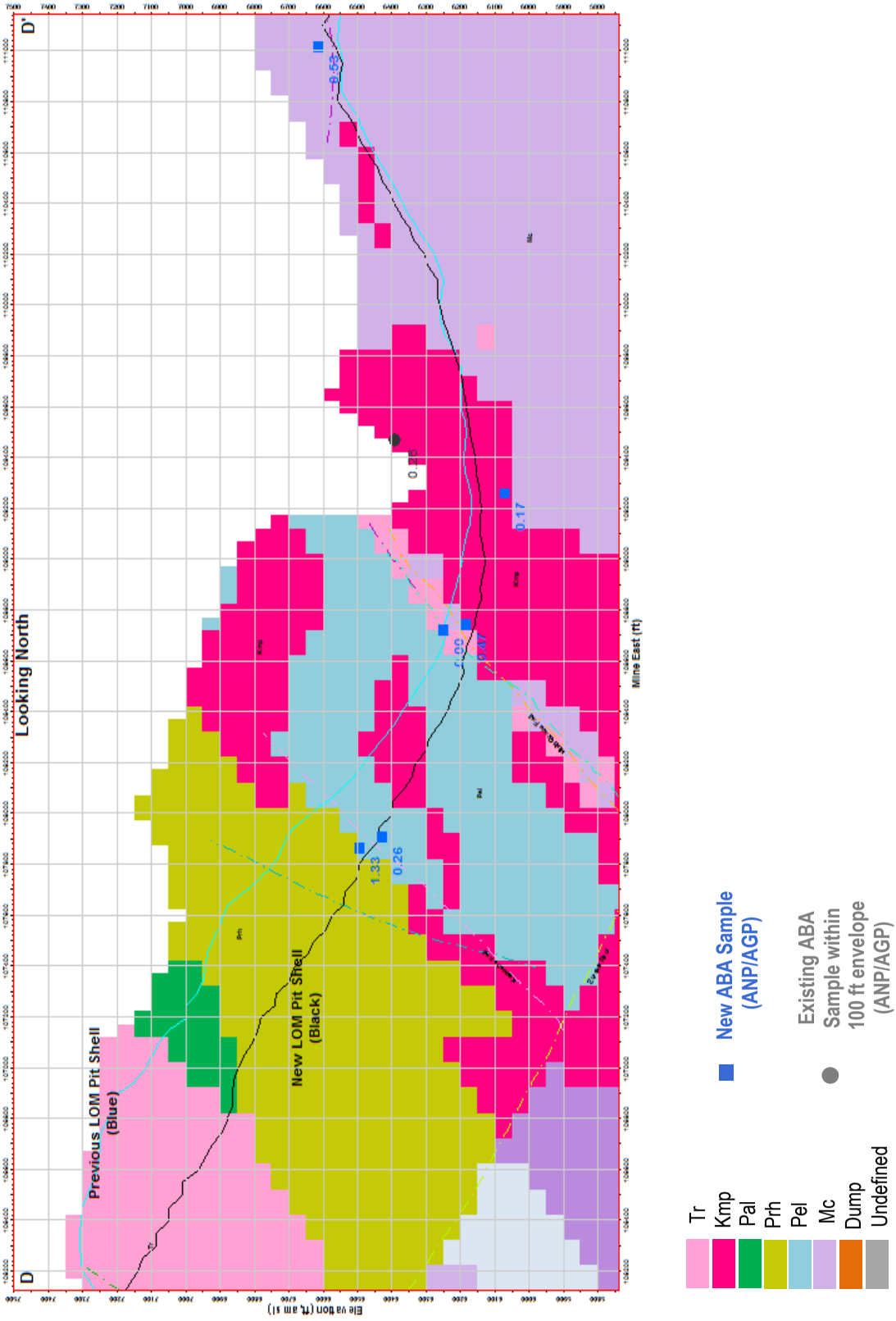
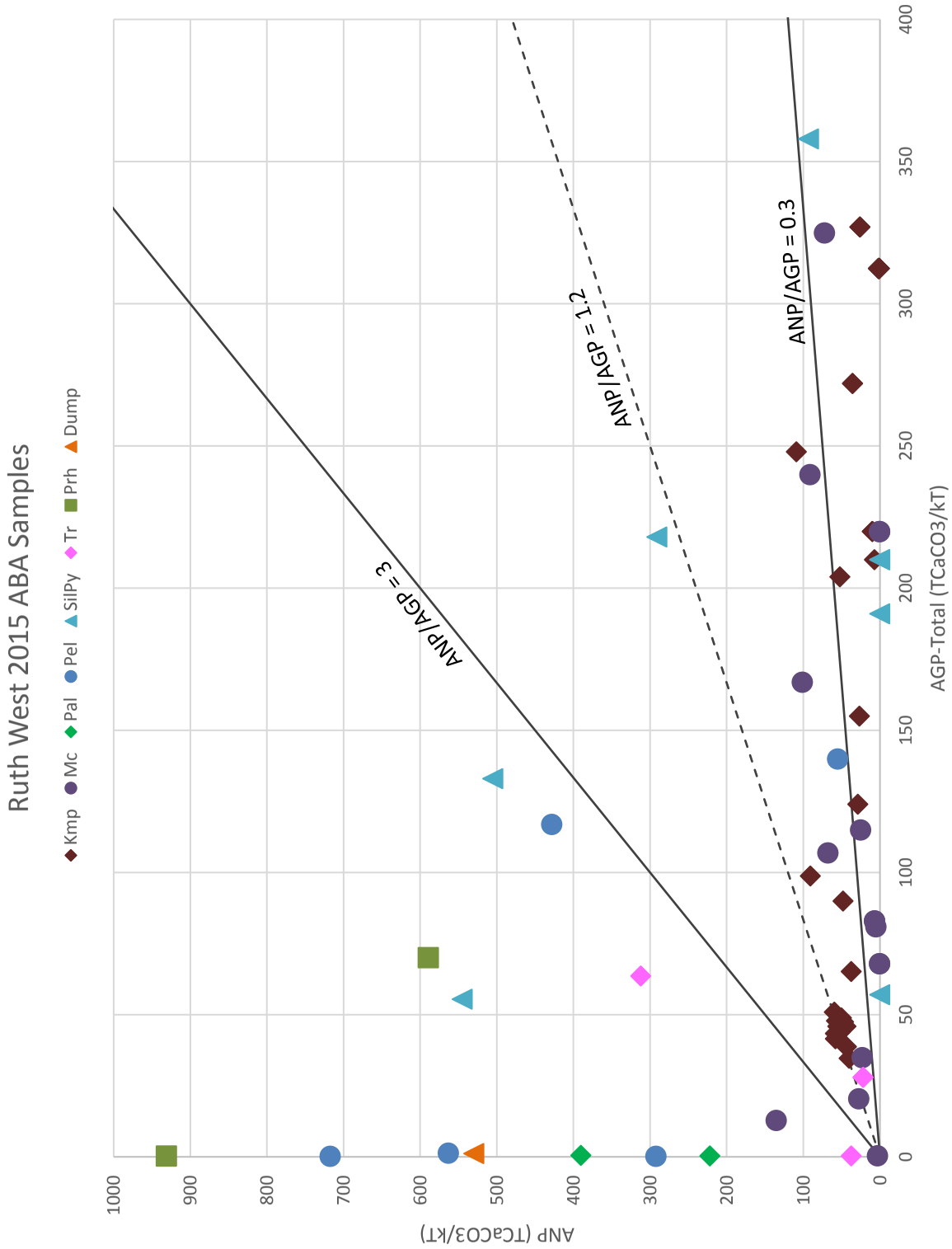


Schlumberger Water Services

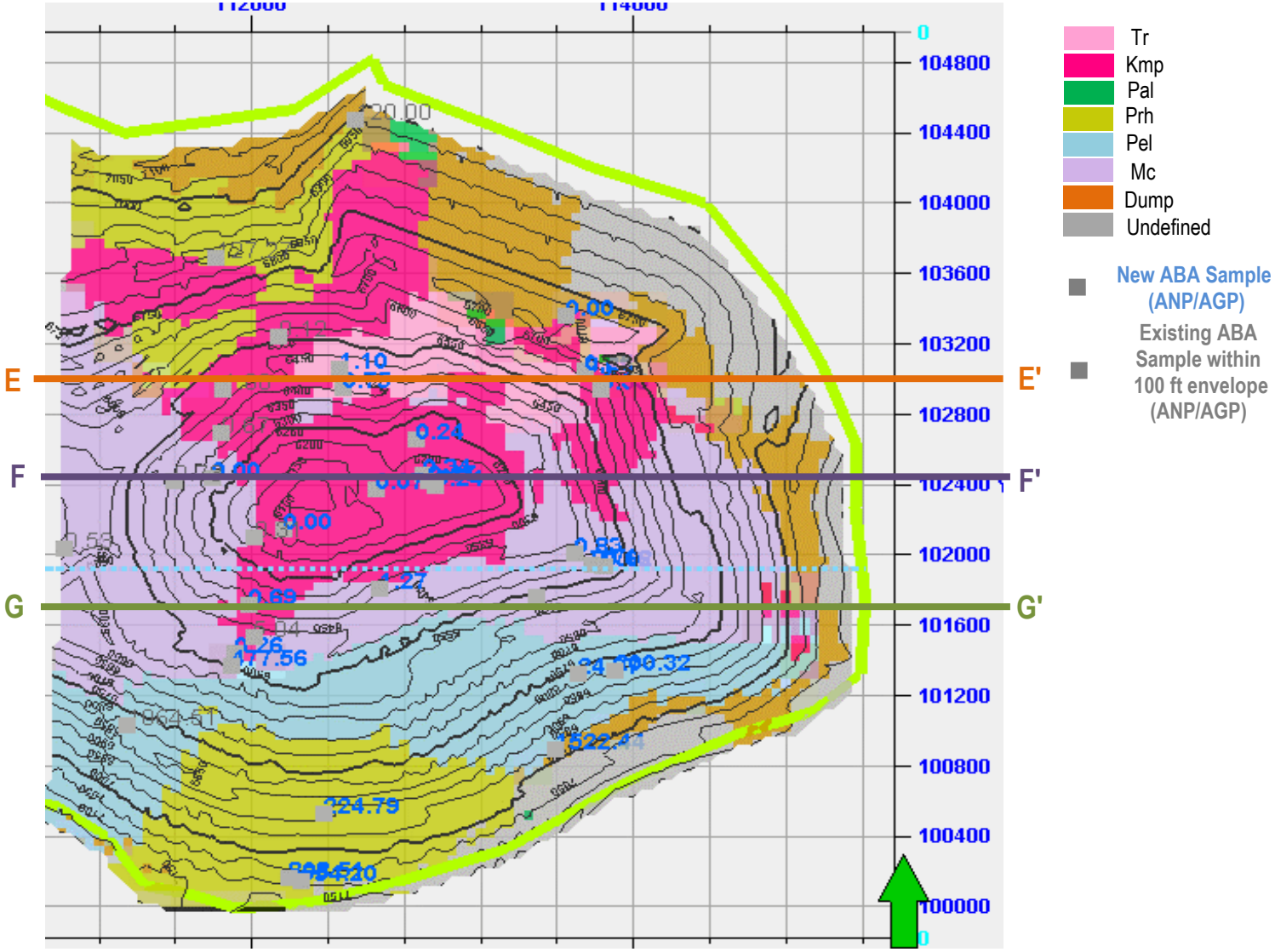
Cross-Section D-D': Ruth West 4 ABA Samples

CLIENT:	RNMC	PROJECT:	Interim PLS		
JOB #:	056176.R	DRAWN:	TC	CHECKED	JR
DATE:	April 2016	FIGURE:	2.4		



Schlumberger Water Services

Ruth West 4 AGP vs. ANP			
CLIENT: RNMC	PROJECT: Interim PLS		
JOB #: 056176.R	DRAWN: TC	CHECKED JR	
DATE: April 2016	FIGURE: 2.5		



Schlumberger Water Services

Ruth East 3 ABA Samples

CLIENT:	RNMC
PROJECT:	Interim PLS
JOB #:	056176.R
DRAWN:	TC
CHECKED	JR
DATE:	April 2016
FIGURE:	2.6

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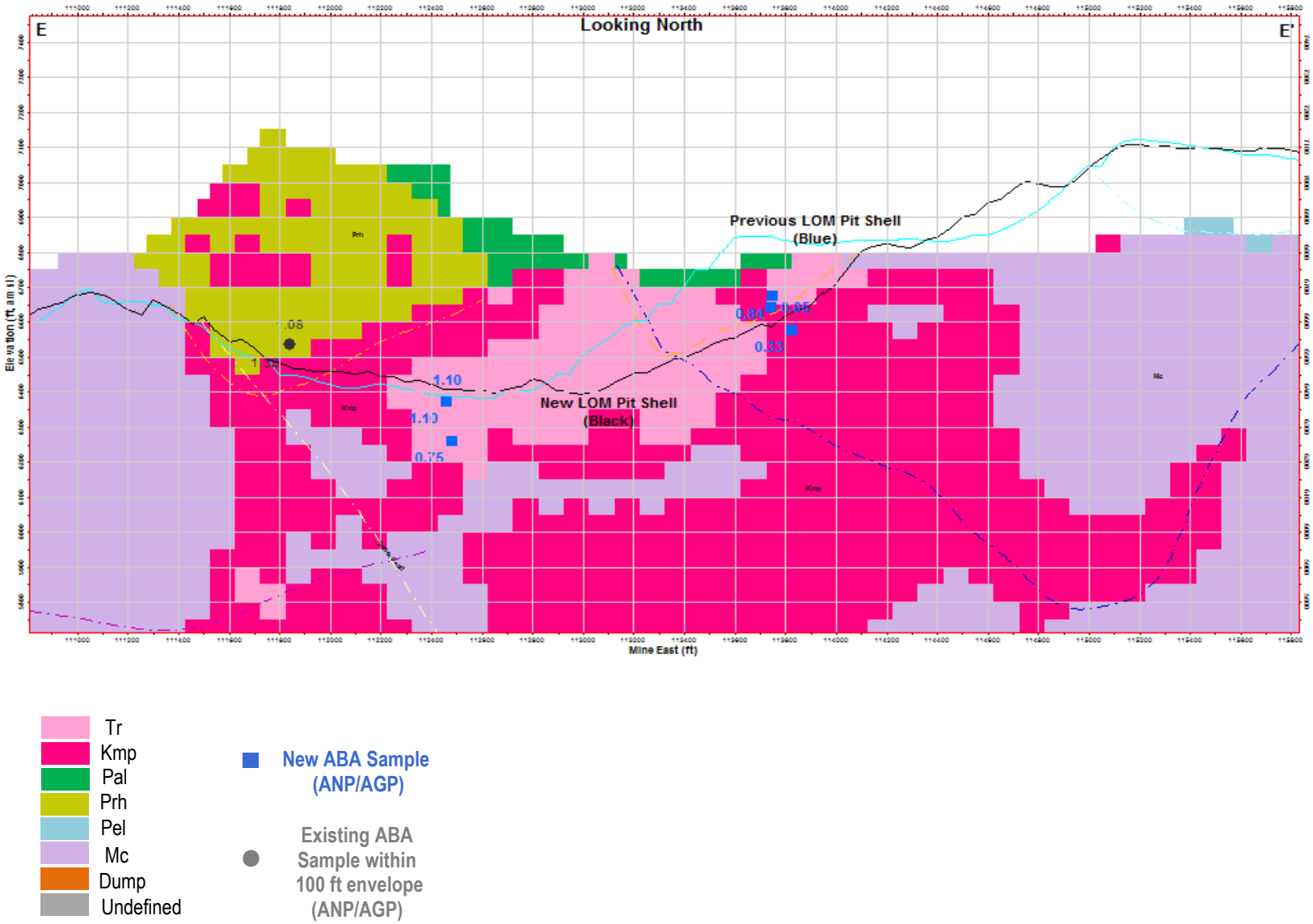

Schlumberger Water Services

Cross-Section E-E': Ruth East 3 ABA Samples

CLIENT:	RNMC
PROJECT:	Interim PLS
JOB #:	056176.R
DRAWN:	TC
CHECKED	JR
DATE:	April 2016
FIGURE:	2.7

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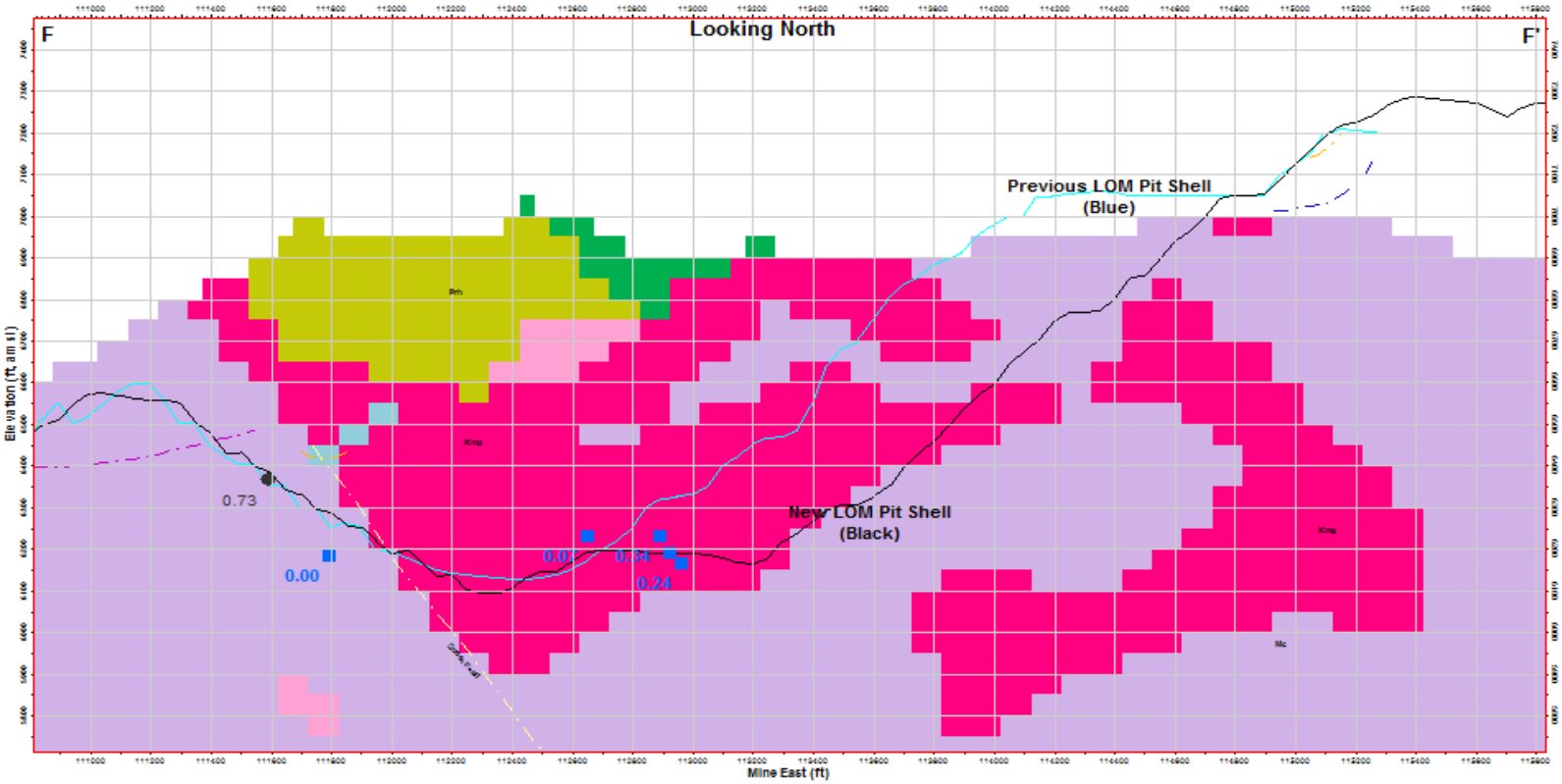

Schlumberger Water Services

Cross-Section F-F': Ruth East 3 ABA Samples

CLIENT:	RNMC
PROJECT:	Interim PLS
JOB #:	056176.R
DRAWN:	TC
CHECKED	JR
DATE:	April 2016
FIGURE:	2.8

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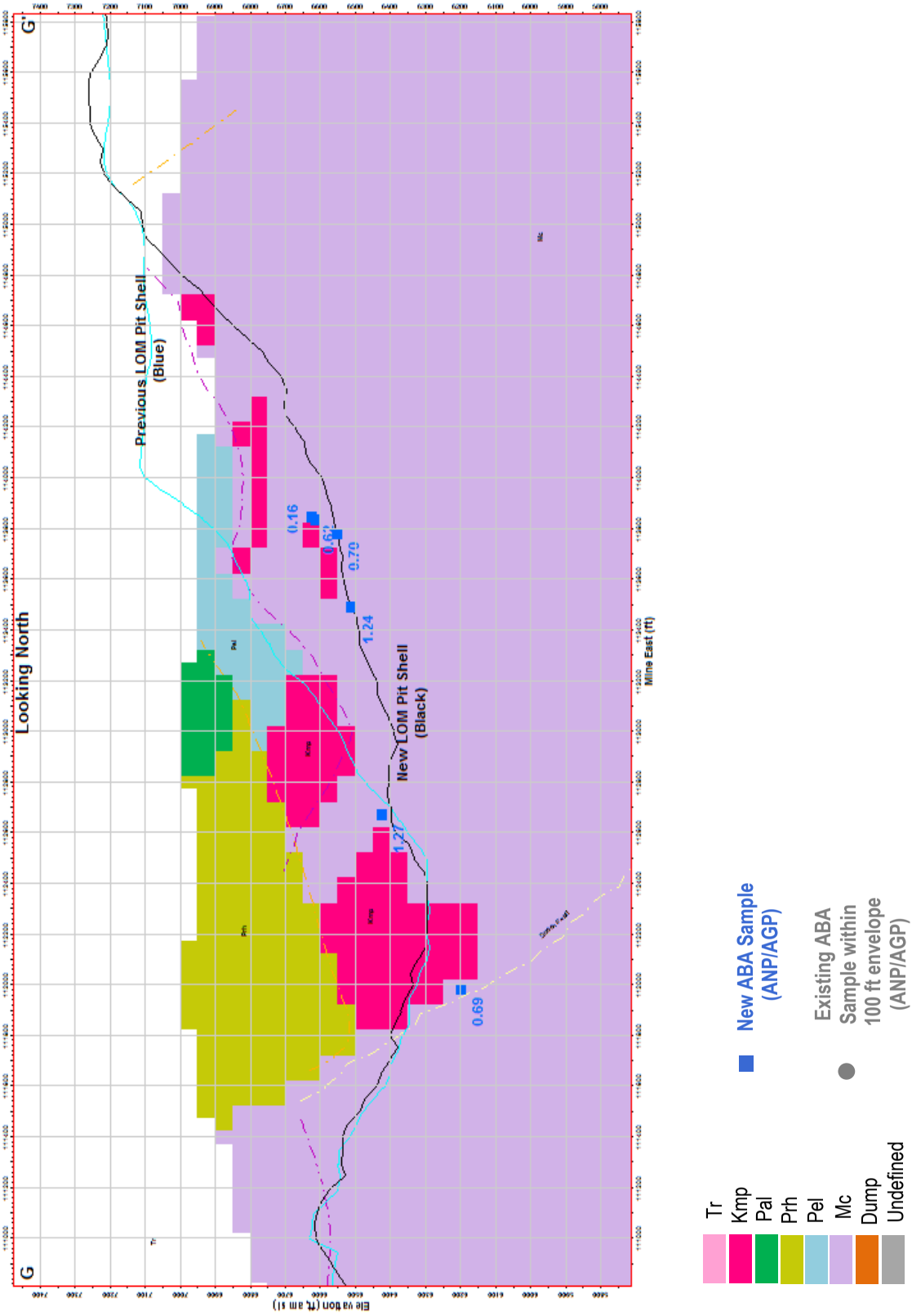

Schlumberger Water Services

Cross-Section G-G': Ruth East 3 ABA Samples			
CLIENT: RNMC	PROJECT: Interim PLS		
JOB #: 056176.R	DRAWN: TC	CHECKED JR	
DATE: April 2016	FIGURE: 2.9		

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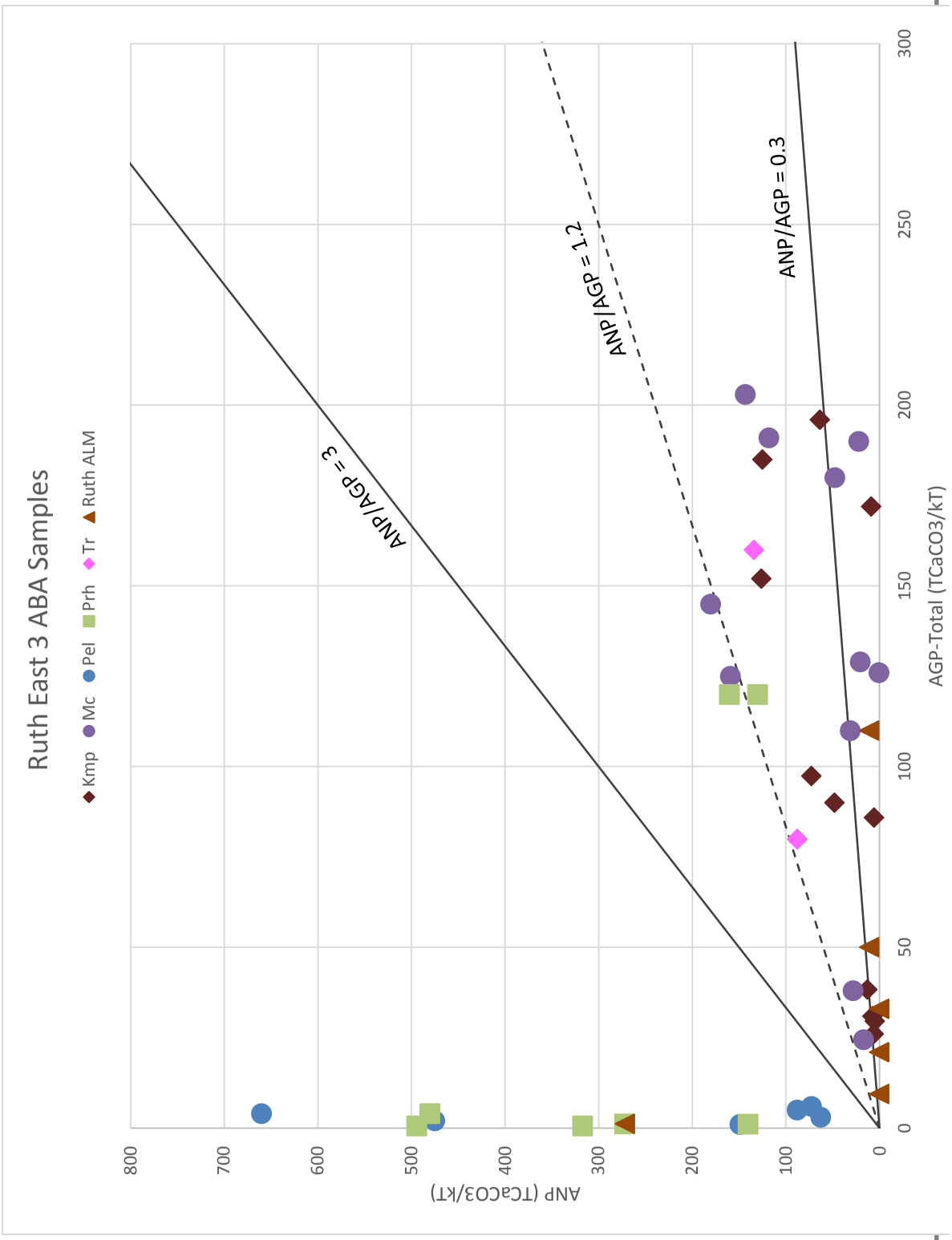

Schlumberger Water Services	Ruth East 3 AGP vs. ANP			
	CLIENT: RNMC	PROJECT: Interim PLS		
	JOB #: 056176.R	DRAWN: TC	CHECKED JR	
	DATE: April 2016	FIGURE: 2.10		

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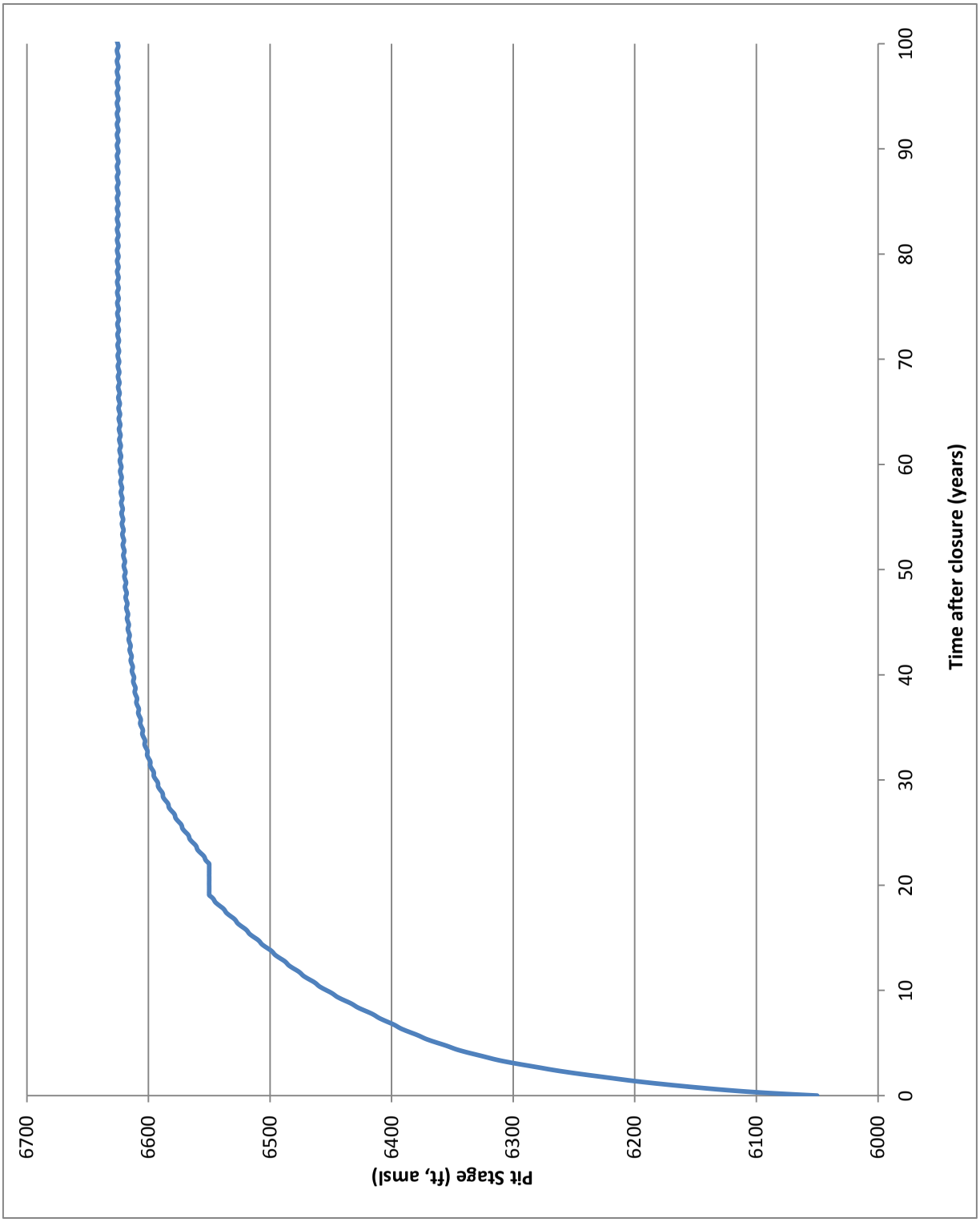

Schlumberger Water Services

Ruth West Pit Lake Recovery Hydrograph

CLIENT:	RNMC	PROJECT:	Interim PLS
JOB:	56176.R	DRAWN: MB	CHECKED: TC
DATE:	April 2016	FIGURE:	3.1

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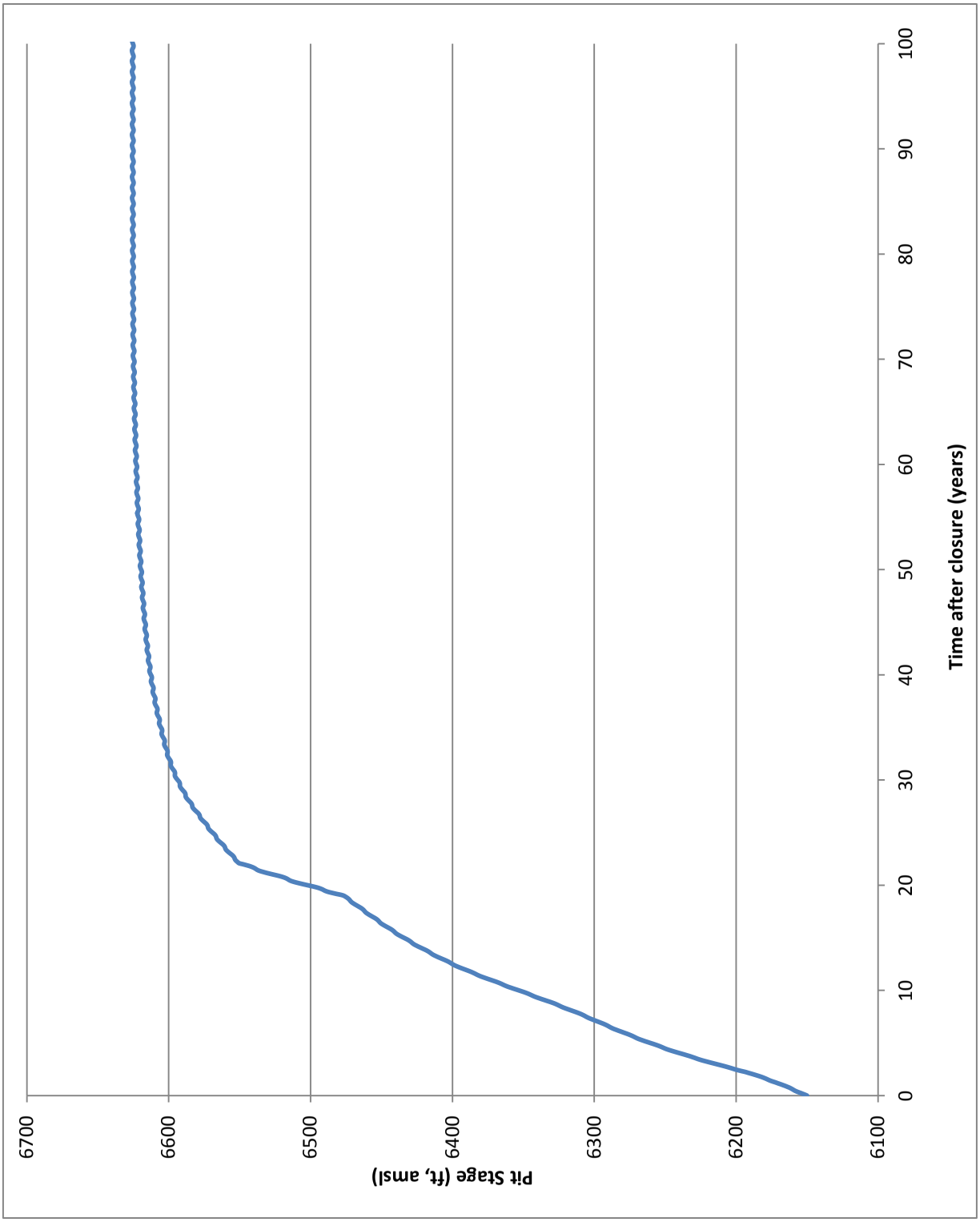

Schlumberger Water Services

Ruth East Pit Lake Recovery Hydrograph

CLIENT:	RNMC	PROJECT:	Interim PLS
JOB:	56176.R	DRAWN: MB	CHECKED: TC
DATE:	April 2016	FIGURE:	3.2

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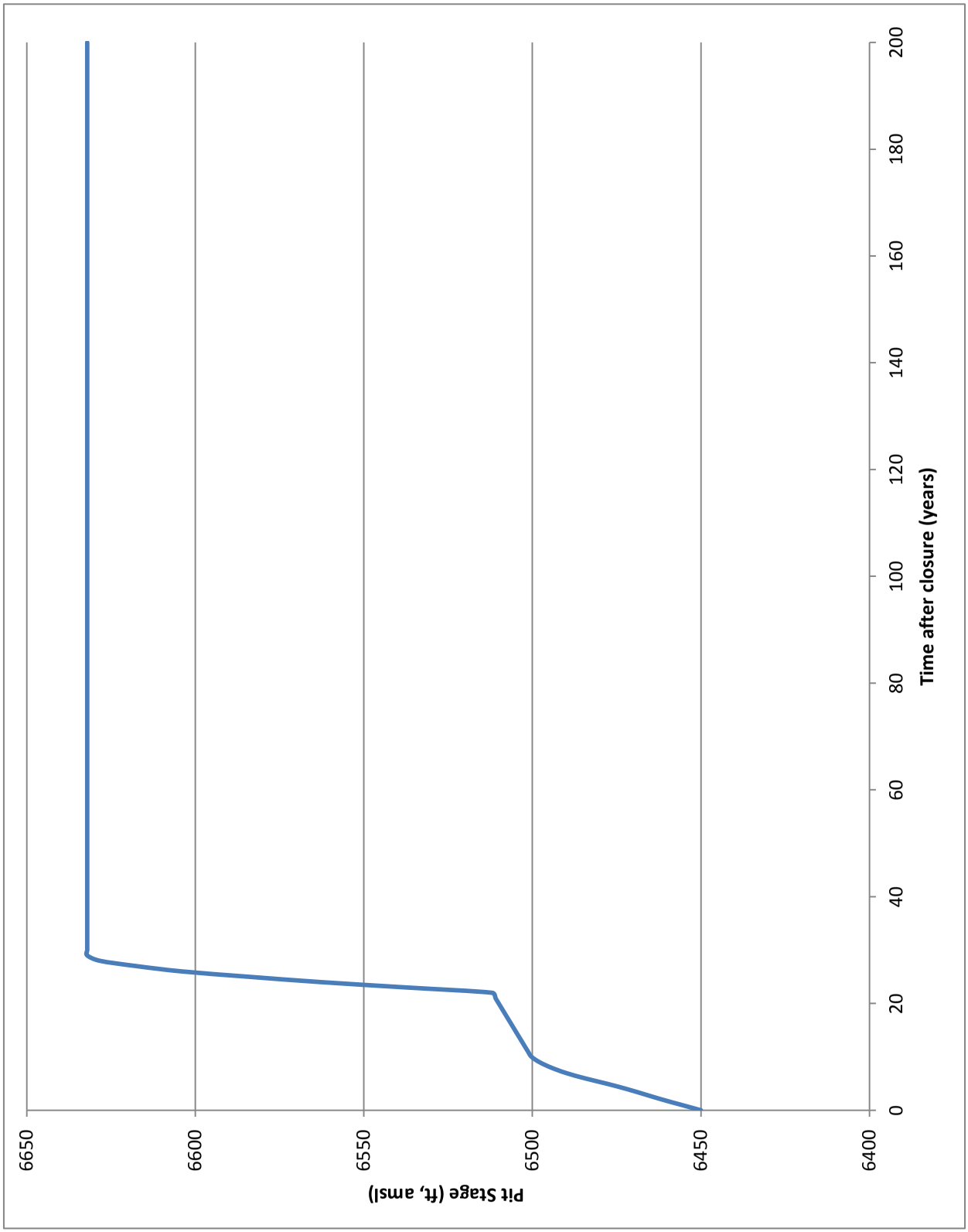

Schlumberger Water Services

Kimbley Backfil Water Level Recovery Hydrograph

CLIENT:	RNMC	PROJECT:	Interim PLS
JOB:	56176.R	DRAWN: MB	CHECKED: TC
DATE:	April 2016	FIGURE:	3.3

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Appendix C Greater Sage-Grouse Required Design Features

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Greater Sage-Grouse ARMPA – *Required Design Features*

Required Design Features (RDFs) are required for certain activities in all GRSG habitat. RDFs establish the minimum specifications for certain activities to help mitigate adverse impacts. However, the applicability and overall effectiveness of each RDF cannot be fully assessed until the project level when the project location and design are known. Because of site-specific circumstances, some RDFs may not apply to some projects (e.g., a resource is not present on a given site) and/or may require slight variations (e.g., a larger or smaller protective area). All variations in RDFs would require that at least one of the following be demonstrated in the NEPA analysis associated with the project/activity:

- A specific RDF is documented to not be applicable to the site-specific conditions of the project/activity (e.g. due to site limitations or engineering considerations). Economic considerations, such as increased costs, do not necessarily require that an RDF be varied or rendered inapplicable;
- An alternative RDF is determined to provide equal or better protection for GRSG or its habitat;
- A specific RDF will provide no additional protection to GRSG or its habitat.

At completion of the following table, please ensure that any resource-specific RDFs have been reviewed and included, as appropriate.

Required Design Feature	Conclusion (Required/Recommended/Not Applicable/Variation/Applicant Committed)	Rationale* (should be one or two statements, if in-depth analysis is needed, it should be provided separately)
RDF Gen 1: Locate new roads outside of GRSG habitat to the extent practical.	Applicant Committed	The area was mapped as OHMA; however, field verification indicates it is non-habitat. Additionally, NDOW did not map the road area as seasonal habitat.
RDF Gen 2: Avoid constructing roads within riparian areas and ephemeral drainages. Construct low-water crossings at right angles to ephemeral drainages and stream crossings (note that such construction may require permitting under Sections 401 and 404 of the Clean Water Act).	Not Applicable	The project would not impact riparian areas and ephemeral drainages.
RDF Gen 3: Limit construction of new roads where roads are already in existence and could be used or upgraded to meet the needs of the project or operation. Design roads to an appropriate standard, no higher than necessary, to accommodate intended purpose and level of use.	Applicant Committed	This RDF will be applied; no variation or additional protection is needed.
RDF Gen 4: Coordinate road construction and use with ROW holders to minimize disturbance to the extent possible.	Not Applicable	This RDF is not applicable to the site-specific conditions of the project/activity as no ROW holders would be impacted.
RDF Gen 5: During project construction and operation, establish and post speed limits in GRSG habitat to reduce vehicle/wildlife collisions or design roads to be driven at slower speeds.	Applicant Committed	This RDF will be applied; no variation or additional protection is needed.

Required Design Feature	Conclusion (Required/Recommended/Not Applicable/Variation/Applicant Committed)	Rationale* (should be one or two statements, if in-depth analysis is needed, it should be provided separately)
RDF Gen 6: Newly constructed project roads that access valid existing rights would not be managed as public access roads. Proponents will restrict access by employing traffic control devices such as signage, gates, and fencing.	Applicant Committed	This RDF will be applied; no variation or additional protection is needed.
RDF Gen 7: Require dust abatement practices when authorizing use on roads.	Applicant Committed	This RDF will be applied; no variation or additional protection is needed.
RDF Gen 9: Upon project completion, reclaim roads developed for project access on public lands unless, based on site-specific analysis, the route provides specific benefits for public access and does not contribute to resource conflicts.	Not Applicable	Once the road is no longer used for the mine in 2026, it will be taken over by White Pine County.
RDF Gen 10: Design or site permanent structures that create movement (e.g., pump jack/ windmill) to minimize impacts on GRSG habitat.	Not Applicable	All facilities on public land will be removed and the area reclaimed after mining operations cease.
RDF Gen 11: Equip temporary and permanent aboveground facilities with structures or devices that discourage nesting and perching of raptors, corvids, and other predators.	Applicant Committed	This RDF will be applied; no variation or additional protection is needed.
RDF Gen 12: Control the spread and effects of nonnative, invasive plant species (e.g., by washing vehicles and equipment, minimize unnecessary surface disturbance; Evangelista et al. 2011). All projects would be required to have a noxious weed management plan in place prior to construction and operations.	Applicant Committed	A Noxious Weed Management Plan is in place.
RDF Gen 13: Implement project site-cleaning practices to preclude the accumulation of debris, solid waste, putrescible wastes, and other potential anthropogenic subsidies for predators of GRSG.	Applicant Committed	This RDF will be applied; no variation or additional protection is needed.
RDF Gen 14: Locate project related temporary housing sites outside of GRSG habitat.	Not Applicable	No project related temporary housing is proposed.
RDF Gen 15: When interim reclamation is required, irrigate site to establish seedlings more quickly if the site requires it.	Applicant Committed	This RDF will be applied; no variation or additional protection is needed.
RDF Gen 16: Utilize mulching techniques to expedite reclamation and to protect soils if the site requires it.	Applicant Committed	This RDF will be applied; no variation or additional protection is needed.
RDF Gen 17: Restore disturbed areas at final reclamation to the pre-disturbance landforms and desired plant community.	Applicant Committed	This RDF will be applied; no variation or additional protection is needed.
RDF GEN 18: When authorizing ground-disturbing activities, require the use of vegetation and soil reclamation standards suitable for the site type prior to construction.	Applicant Committed	This RDF will be applied; no variation or additional protection is needed.

Required Design Feature	Conclusion (Required/Recommended/Not Applicable/Variation/Applicant Committed)	Rationale* (should be one or two statements, if in-depth analysis is needed, it should be provided separately)
RDF GEN 19: Instruct all construction employees to avoid harassment and disturbance of wildlife, especially during the GRSG breeding (e.g., courtship and nesting) season. In addition, pets shall not be permitted on site during construction (BLM 2005b).	Applicant Committed	This RDF will be applied; no variation or additional protection is needed.
RDF GEN 20: To reduce predator perching in GRSG habitat, limit the construction of vertical facilities and fences to the minimum number and amount needed and install anti-perch devices where applicable.	Applicant Committed	This RDF will be applied; no variation or additional protection is needed.
RDF GEN 21: Outfit all reservoirs, pits, tanks, troughs or similar features with appropriate type and number of wildlife escape ramps (BLM 1990; Taylor and Tuttle 2007).	Applicant Committed	Project EPMs include wildlife escape ramps for water sources. No variation or additional protection is needed.
RDF GEN 22: Load and unload all equipment on existing roads to minimize disturbance to vegetation and soil.	Applicant Committed	This RDF will be applied; no variation or additional protection is needed.

*Rationale: Alternative will be equal or provide more protection/ No additional protection/Describe variation and rationale

Resource-specific RDFs for Locatable Minerals

Required Design Feature	Conclusion (Required/Recommended/Not Applicable/Variation/Applicant Committed)	Rationale* (should be one or two statements, if in-depth analysis is needed, it should be provided separately)
LOC 1: Install noise shields to comply with noise restrictions (see Action SSS 7) when drilling during the breeding, nesting, brood-rearing, and/or wintering season. Apply GRSG seasonal timing restrictions when noise restrictions cannot be met (see Action SSS 6).	Not Applicable	Drilling is already authorized. Proponent does not plan to install noise shields, since most drilling occurs below grade.
LOC 2: Cluster disturbances associated with operations and facilities as close as possible, unless site-specific conditions indicate that disturbances to GRSG habitat would be reduced if operations and facilities locations would best fit a unique special arrangement.	Applicant Committed	This RDF will be applied; no variation or additional protection is needed.
LOC 3: Restrict pit and impoundment construction to reduce or eliminate augmenting threats from West Nile virus (Dougherty 2007).	Not Applicable	No new pits or impoundments are proposed for this project.
LOC 4: Remove or re-inject produced water to reduce habitat for mosquitoes that vector West Nile virus. If surface disposal of produced water continues, use the following steps for reservoir design to limit favorable mosquito habitat (Doherty 2007): • Overbuild size of ponds for muddy and non-vegetated shorelines • Build steep shorelines to decrease vegetation and increase wave actions • Avoid flooding terrestrial vegetation in flat terrain or low lying areas • Avoid flooding terrestrial vegetation in flat terrain or low lying areas • Construct dams or impoundments that restrict down slope seepage or overflow • Construct dams or impoundments that restrict down slope seepage or overflow • Line the channel where discharge water flows into the pond with crushed rock • Construct spillway with steep sides and line it with crushed rock. • Treat waters with larvicides to reduce mosquito production where water occurs on the surface.	Not Applicable	Water discharge has already been authorized. Proponent does not plan to change currently authorized discharge.
LOC 5: Address post reclamation management in reclamation plan such that goals and objectives are to protect and improve sage-grouse habitat needs.	Applicant Committed	This RDF will be applied; no variation or additional protection is needed.
LOC 6: Maximize the area of interim reclamation on long-term access roads and well pads including reshaping, topsoiling and revegetating cut and fill slopes.	Applicant Committed	This RDF will be applied; no variation or additional protection is needed.

Required Design Feature	Conclusion (Required/Recommended/Not Applicable/Variation/Applicant Committed)	Rationale* (should be one or two statements, if in-depth analysis is needed, it should be provided separately)
LOC 7: Cover (e.g., fine mesh netting or use other effective techniques) all pits and tanks regardless of size to reduce sage-grouse mortality.	Not Applicable	No new pits or impoundments are proposed for this project. Netting is already placed over small ponds where the water quality warrants protection of avian species.

*Rationale: Alternative will be equal or provide more protection/ No additional protection/Describe variation and rationale