2.0 Alternatives Including the Proposed Action

2.1 Introduction

This chapter describes the proposed project (Proposed Action) as described by Newmont in their most recent POO Amendment #NVN-067930 (07-3A) and Permit for Reclamation (#0223) (Newmont 2010a). Descriptions of other alternatives, including the No Action Alternative, presented in this chapter are based on supporting information provided by Newmont and reviewed by the BLM. This chapter also includes a summary of other alternatives that were considered but eliminated from detailed analysis, and a comparative impact analysis summary of the proposed project alternatives (Section 2.9, Comparative Analysis of Alternatives). Past, present, and reasonably foreseeable future actions (RFFAs) considered in the cumulative impact assessment are presented in Section 2.8, Past, Present, and Reasonably Foreseeable Actions. The BLM's preferred alternative is identified in Section 2.10, BLM-preferred Alternative.

The existing Phoenix Mine is located in the Copper Canyon area of the Battle Mountain Mining District. The Copper Canyon area has a long history of minerals production dating back to the initial discovery of copper ore in 1864. Mining and beneficiation operations have been conducted through a steady succession of owners/operators and production periods. Mineral development within the Battle Mountain Range has included mining and shipping of copper ores in the 19th century, mining and milling of copper ores in the early 20th century, intermediate precious metal lode mining throughout the first half of the 20th century, placer dredge operations in the 1940s and early 1950s, copper mining and flotation milling from 1940 through the 1970s, mining and recovery of precious metal ores beginning in the late 1970s and continuing through 1993, and mining and heap leaching of disseminated precious metal ores beginning in 1990 and continuing through the present.

2.2 No Action Alternative

The No Action Alternative would involve continuation of currently authorized mining, leaching, and milling operations at the Phoenix Mine in accordance with POO #NVN-067930, as analyzed and permitted under the Phoenix Project Final EIS (BLM 2002a) and the other federal and state permits listed in Section 1.3.5, Plan Amendments for the Phoenix Mine since the 2002 Final EIS.

Under this alternative, the proposed Phoenix Copper Leach Project would not be constructed, and the currently classified waste rock that contains leach-grade copper would continue to be disposed of in one or more of the currently permitted waste rock facilities at the Phoenix Mine. Upon completion of currently permitted mining operations, the existing facilities identified and analyzed in the Phoenix Project Final EIS (BLM 2002a) would be closed and reclaimed in accordance with current permits and applicable federal and state closure and reclamation requirements.

The No Action Alternative would result in a total of approximately 7,210 acres of currently permitted surface disturbance, including approximately 4,163 acres on private land and 3,047 acres on public land administered by the BLM Mount Lewis Field Office. **Table 2.2-1** lists the authorized facilities associated with the No Action Alternative. The No Action mine facilities are shown in **Figure 2.2-1**.

2.2.1 Surface Ownership

Table 2.2-1 presents the surface ownership within the existing project boundary and surface ownership outside of the project boundary. Surface ownership in the mine vicinity is shown in **Figure 2.2-2**.

Table 2.2-1 Authorized Surface Disturbance by Land Ownership

Project Component	Private Land Surface Disturbance (acres)	Public Land Surface Disturbance (acres)	Total Surface Disturbance (acres)
Open Pits[1]			
Phoenix	452	100	552
Reona	13	128	141
Midas	429	179	608
Minnie	45	8	53
Iron Canyon	67	25	92
Subtotal	**1,006**	**440**	**1,446**
Waste Rock Facilities			
Iron Canyon North	50	39	89
Iron Canyon South	98	30	128
Iron Canyon East	12	75	87
Box Canyon	43	170	213
Butte Canyon	2	25	27
Philadelphia Canyon	376	14	390
Natomas	292	705	997
North Fortitude	56	26	82
Subtotal	**929**	**1,084**	**2,013**
Reona HLF (Gold)	303	168	471
Tailings Facility (TF)	1,030	366	1,396
Mill and Processing Facility	0	31	31
Ore Stockpiles	29	33	62
Growth Media Stockpiles	0	67	67
Clay Borrow Area	463	6	469
Borrow Area	176	52	228
North Optional Use Area	70	8	78
South Optional Use Area	0	437	437
Phoenix HLF[2]	0	205	205
Haul Road and Utility Corridor	39	58	97
Utility Corridor	43	12	55
Office Area	3	49	52

Table 2.2-1 Authorized Surface Disturbance by Land Ownership

Project Component	Private Land Surface Disturbance (acres)	Public Land Surface Disturbance (acres)	Total Surface Disturbance (acres)
Ancillary Facilities	21	0	21
Exploration[3]	25	25	50
Subtotal	**2,202**	**1,517**	**3,719**
Total Disturbance Within the Phoenix Mine Boundary	**4,137**	**3,041**	**7,178**
Willow Creek County Road Reroute	23	4	27
Buffalo Valley Power Line	2	1	3
Philadelphia Canyon Power Line	1	1	2
Total Disturbance Outside the Phoenix Mine Boundary	**26**	**6**	**32**
Total Project Disturbance	**4,163**	**3,047**	**7,210**

[1] Open pit disturbance includes post-reclamation highwalls and pit backfill facilities.

[2] Phoenix HLF is located in the South OUA and has been approved for the development of a new HLF with one 20-foot lift.

[3] Exploration disturbance included for purposes of the Reclamation Cost Estimate.

Source: Newmont 2010a.

2.2.2 Open Pits

Five open pits occur within the Phoenix Mine boundary including the Phoenix, Iron Canyon, Reona, Midas, and Minnie pits. Pit-related disturbance, including both pit highwall and pit backfill, includes 1,446 acres (**Figure 2.2-1** and **Table 2.2-1**).

2.2.3 Waste Rock Facilities

Eight WRFs occur within the Phoenix Mine boundary including the North Fortitude, Iron Canyon North, Iron Canyon South, Iron Canyon East, Butte Canyon, Box Canyon, Philadelphia Canyon, and Natomas WRFs. Surface disturbance from WRFs total 2,013 acres (**Figure 2.2-1** and **Table 2.2-1**).

2.2.4 Heap Leach Facility

The existing Reona HLF consists of a geosynthetic-lined HLF designed for gold recovery. Currently, the Reona HLF covers approximately 151 acres, but the permitted disturbance acreage for this facility is 471 acres (**Figure 2.2-1** and **Table 2.2-1**). This facility is currently inactive.

Based on the Phoenix Project Final EIS (BLM 2002a) analysis and subsequent POO approvals, Newmont currently has authorization and has commenced the construction of a new heap leach pad in Section 8 of the South OUA; however, the BLM has only authorized the development of one 20-foot lift of ore: processing of this ore has not been permitted. This pad and associated facilities would be further developed as the proposed Phoenix Copper HLF, pending receipt of additional required permits and authorizations.

2.2.5 Tailings Facility

The existing Phoenix TF is a lined zero-discharge facility that is permitted for 1,396 acres of land disturbance (**Figure 2.2-1** and **Table 2.2-1**). The TF is operated to maintain adequate storage volume to contain a supernatant pool plus 3 feet of freeboard for a 100-year, 24-hour storm event and an allowance for wave action.

2.2.6 Mill and Processing Facility

The mill and processing facility is located on 31 acres of private land (**Figure 2.2-1** and **Table 2.2-1**). The current mill and processing facility includes crushing; gravity separation and cyanide leaching circuits for native gold; a three-stage flotation circuit for concentrating copper and precious metals; a cyanide leaching and carbon-in-pulp circuit; and a carbon stripping, electrowinning (EW), and retorting circuit.

2.2.7 Ponds

There are two ponds that receive process solutions at the Phoenix Mine: the Reona HLF process pond and the tailings reclaim pond. These ponds are double-lined with 80-mil high-density polyethylene (HDPE) and have drainage/leak detection layers between the synthetic liners. Total capacities of the tailings reclaim pond and Reona HLF pond are 16,430,700 gallons and 16,890,000 gallons, respectively.

Additional permitted lined ponds in the mine area include:

- Iron Canyon Surge Pond – single-lined; 6,400,000-gallon capacity;
- Copper Canyon Event Pond – double-lined with leak detection; 5,635,200-gallon capacity;
- Run-of-Mine (ROM) I & II Stockpile Collection Pond – double-lined with leak detection; 860,600-gallon capacity;
- ROM III Stockpile Collection Pond – double-lined with leak detection; 718,400-gallon capacity;
- Fortitude Dewatering Pond – 1,259,300-gallon capacity;
- Truck Wash Clear Water Pond – 1,925,300-gallon capacity; and
- Tailings Pond for Extra Evapotranspiration (ET) Capacity – 14,700,000-gallon capacity.

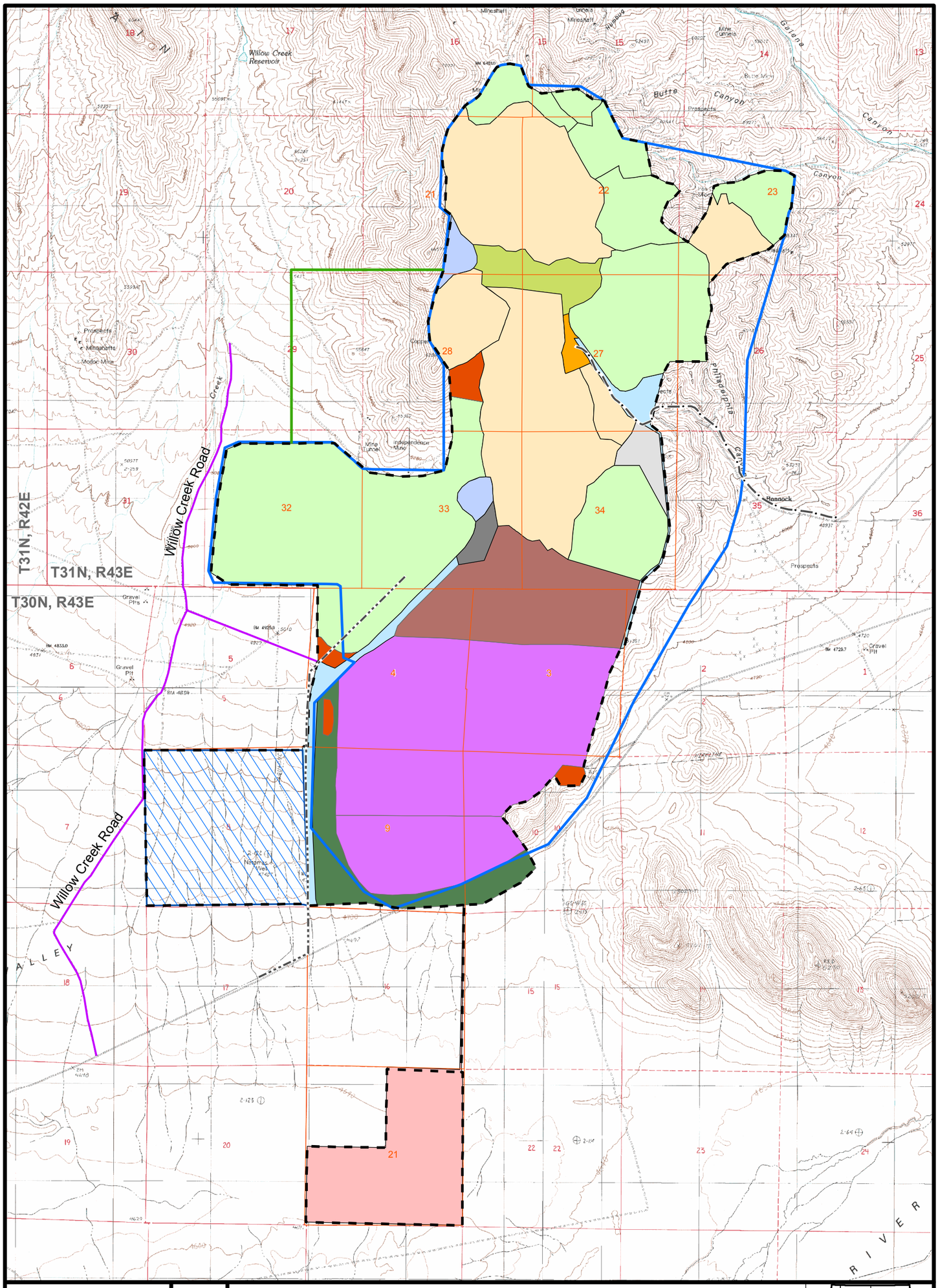
Surface disturbance acreages for the ponds are not included in **Table 2.2-1** since they are duplicative with the disturbance areas included in other categories, such as WRFs.

2.2.8 Ore Stockpiles

Ore stockpiles within the mine area are located on 62 acres (**Figure 2.2-1** and **Table 2.2-1**). Ore stockpiles are used to store ore for subsequent processing.

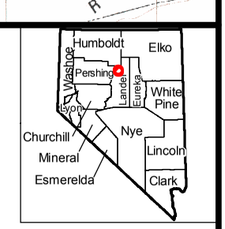
2.2.9 Growth Media Stockpiles

Growth media stockpiles within the mine area are located on 67 acres (**Figure 2.2-1** and **Table 2.2-1**). Growth media is stockpiled for subsequent use in reclamation. Growth media has been collected, where practicable, from areas with low to moderate salinity and where topographic conditions promote safe excavation and stockpiling. Stockpiled growth media is stabilized by either seeding or with a biodegradable chemical soil stabilizer and, in some cases, are posted with signs to prevent use of the material for anything other than reclamation purposes.



Legend

- Existing POO Boundary
- Existing Fenceline
- Reona POO Fenceline
- Willow Creek Road
- Borrow Area
- Clay Borrow Area
- Heap Leach Pad
- Waste Rock Facilities
- Mill and Processing Facility
- Ancillary Facilities
- Open Pits
- Tailings Facility
- Growth Media Stockpiles
- Office Areas
- Haul Road and Utility Corridor
- South Optional Use Area
- North Optional Use Area
- Ore Stockpile
- Buffalo Valley 120-kV Transmission Line
- Philadelphia Canyon 69-kV Transmission Line



N

0 0.5 1 Miles

Source: BLM 1994b; Newmont 2010a.

Phoenix Copper Leach Project

Figure 2.2-1

No Action Alternative

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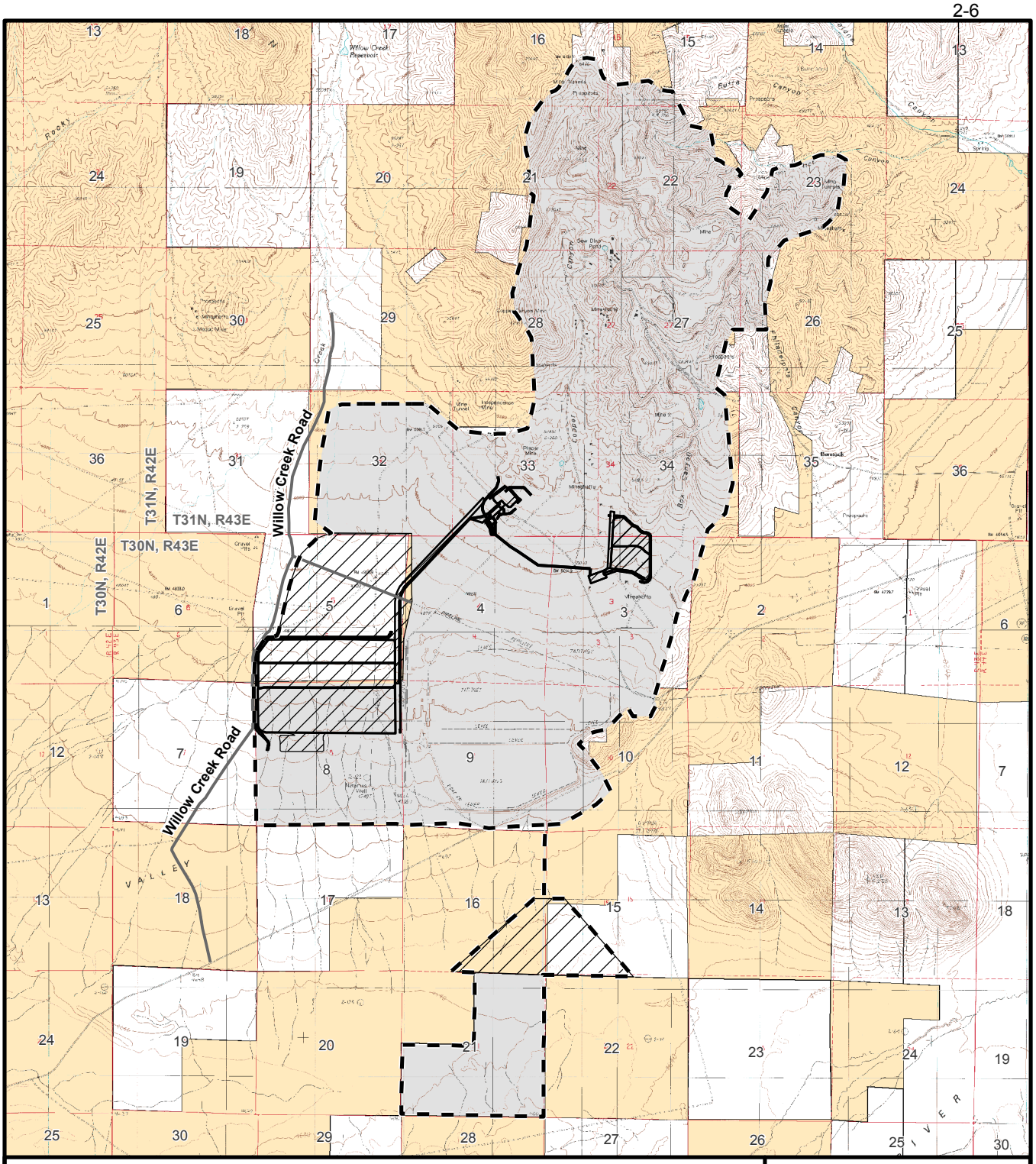


Legend

- Proposed POO Boundary
- Proposed Action
- Proposed Linear Feature
- Permitted Disturbance
- Private Land
- Public Land

N

0 0.5 1 Miles

Source: BLM 2010c; Newmont 2010a.

Phoenix Copper Leach Project

Figure 2.2-2

Land Ownership in the Project Vicinity

05/25/2011

2.2.10 Clay Borrow Area

The clay borrow area includes 469 acres (**Figure 2.2-1** and **Table 2.2-1**). The primary use of this clay material is for the construction of composite liner systems. This material has been successfully used in construction of liners for the Reona HLF and storm water diversion channels.

2.2.11 Borrow Area

The borrow area consists of an alluvial borrow area, and disturbance acreage for this facility includes 228 acres (**Figure 2.2-1** and **Table 2.2-1**).

2.2.12 Optional Use Areas

The Phoenix Mine contains two OUAs: the North OUA and South OUA. The North OUA is located on former precious metal processing facilities (Sections 21, 22, 27, and 28, T31N, R43E) and is authorized for use as a WRF, haul road corridor, or for construction of ancillary facilities. This OUA covers 78 acres. The South OUA is comprised of lands within Section 8, T30N, R43E, and is authorized for use as a TF, HLF, and borrow area and includes approximately 437 acres (**Figure 2.2-1** and **Table 2.2-1**).

2.2.13 Haul Roads and Utility Corridors

Approximately 97 acres of the mine disturbance is associated with an existing haul road and utility corridor in the central and southwestern portion of mine. A 55-acre utility corridor is located on the east side of the Phoenix Mine site (**Figure 2.2-1** and **Table 2.2-1**).

Other haul roads, access roads, secondary roads, trails, and drainage crossings within the Phoenix Mine site would be consumed by mine facilities as the mine life advances. All roads are constructed with standard cut-and-fill techniques and are in compliance with all Mine Safety and Health Administration (MSHA) regulations.

2.2.14 Office Areas

The office areas contain mine-related buildings and cover approximately 52 acres (**Figure 2.2-1** and **Table 2.2-1**).

2.2.15 Ancillary Facilities

Ancillary facilities cover 21 acres and include mine-related buildings constructed by Newmont and its predecessors (**Figure 2.2-1** and **Table 2.2-1**).

2.2.16 Exploration

Drill exploration activities, totaling approximately 50 acres, have been authorized within the Phoenix Mine POO boundary. Drill exploration activities may include, but are not limited to, the following: building drill roads, constructing drill sites, and drilling exploration holes.

2.2.17 Willow Creek County Road Reroute

The haul road to Section 8 would cross the existing Willow Creek County Road in order to transport ROM materials to the Phoenix HLF. To ensure public safety, Newmont has been authorized to re-align a portion of the Willow Creek County Road totaling approximately 27 acres. The re-aligned road section, which currently passes through the lower portion of the Section 8, has been re-routed to a location outside the proposed POO boundary (BLM 2008c) (**Figure 2.2-1** and **Table 2.2-1**).

2.2.18 Electrical Power

Two electric transmission lines currently supply power to the Phoenix Mine. The Buffalo Valley 120-kilovolt (kV) transmission line enters the project area from the southwest and the Philadelphia Canyon 69-kV transmission line enters the project area from the east. Surface disturbance associated with the Buffalo Valley 120-kV and Philadelphia Canyon 69-kV transmission lines total approximately 3 and 2 acres, respectively (**Figure 2.2-1** and **Table 2.2-1**).

2.2.19 Fencing and Site Security

The Phoenix Mine is bounded by approximately 16 miles of BLM-approved four-strand range fence (**Figure 2.2-1**), gates, and appropriate signage, to prevent access by livestock and to provide for public safety.

Approximately 2 miles of additional new perimeter fence of similar design will be constructed northwest of the existing POO boundary to encompass portions of T31N, R43E, Sections 28, 29, 32, and 33, as authorized under the 1994 Reona POO Amendment (BLM 1994b) (**Figure 2.2-1**).

2.2.20 Monitoring and Production Wells

In accordance with the Phoenix Mine Water Resource Monitoring Plan and Water Pollution Control Permit (WPCP) NEV 0087061, monitoring of groundwater levels occur on a monthly or quarterly basis. Quarterly sampling of groundwater monitoring wells and semi-annual sampling of production wells also occurs in compliance with the Water Resource Monitoring Plan and WPCP. Results are presented to the NDEP and BLM in quarterly and annual monitoring reports.

2.2.21 Air Quality Management

Newmont's Phoenix Mine facilities operate under a NDEP Class II air permit (AP 1041-0220.03). Best Management Practices (BMPs) and other Newmont management practices are actively applied to control fugitive dust and point source emissions. On-site employees and supervisors are trained to identify and minimize fugitive dust emissions associated with mine operations. All equipment to control emissions is installed, operated, and maintained in good working order to stay within the permit limitations.

2.2.22 Waste Management

Under this alternative, Newmont would continue to produce and ship the following average annual quantities of hazardous materials and wastes to Clean Harbors Environmental Services at Aragonite, Utah:

- Two, 55-gallon drums of paint-related waste; and
- Five broken lead acid batteries used for light vehicles and heavy equipment.

2.3 Proposed Action

Newmont is planning to expand the existing mining operations at the Phoenix Mine. The areas of planned expansion and development are illustrated in **Figure 2.3-1** and include the following components:

- Expansion of the existing POO boundary;
- Development and operation of two copper HLFs;
- Construction of six new process ponds;
- Construction and operation of a new SX-EW facility;

- Designation of a new OUA (Section 5 OUA), that could be developed as a copper HLF and borrow area;
- Establishment of a new clay borrow area;
- Development of new water monitoring wells;
- Construction of a new haul road, pipeline, and utility corridor; and
- Development of a new production well.

Most of the facilities associated with the Proposed Action would be located on lands currently approved for surface disturbance as shown in **Figure 2.3-1**, but would represent a change in use. Additionally, the Proposed Action would result in 902 acres of new surface disturbance, including 194 acres of BLM-administered land and 708 acres of private land (**Figure 2.2-2**). The areas of planned expansion and development are summarized in **Table 2.3-1**.

Table 2.3-1 Proposed Action – Surface Disturbance

Project Component	Currently Permitted (acres)	Proposed Action (acres)			Total (acres)
		Private	Public	Total	
Open Pits[1]	1,446	0	0	0	1,446
Waste Rock Facilities	2,013	0	0	0	2,013[2]
Reona HLF	471	0	0	0	471[3]
TF	1,396	0	0	0	1,396
Mill and Processing Area	31	0	0	0	31
Ore Stockpiles	62	0	0	0	62
Growth Media Stockpiles	67	0	0	0	67
Clay Borrow Area	469	0	0	0	469
Borrow Area	228	0	0	0	228
North Optional Use Area	78	0	0	0	78
South Optional Use Area	437	0	0	0	437[4]
Phoenix HLF	205	200	0	200	405
Haul Roads and Utility Corridors	97	25	25	50	147
Utility Corridor	55	0	0	0	55
Office Area	52	0	0	0	52

Table 2.3-1 Proposed Action – Surface Disturbance

Project Component	Currently Permitted (acres)	Proposed Action (acres)			Total (acres)
		Private	Public	Total	
Ancillary Facilities	21	0	0	0	21
Exploration	50	0	0	0	50
Section 5 Optional Use Area	0	360	38	398	398[5]
Section15 Borrow Area	0	123	3	126	126
Section 16 Borrow Area	0	0	128	128	128
Subtotal[6]	**7,178**	**708**	**194**	**902**	**8,080**
Willow Creek Road Reroute	27	0	0	0	27
Buffalo Valley Power Line	3	0	0	0	3
Philadelphia Canyon Power Line	2	0	0	0	2
Subtotal[7]	**32**	**0**	**0**	**0**	**32**
Total Proposed Action Disturbance	**7,210**	**708**	**194**	**902**	**8,112**

[1] Pit disturbance includes post-reclamation highwalls and pit backfill facilities.

[2] The SX-EW Beneficiation Facility and a portion of the proposed haul road and utility corridor would be located within the area permitted for the Natomas WRF.

[3] The proposed Reona HLF (approximately 58 acres) would be developed in the permitted Reona HLF (Gold). Up to approximately 12 additional acres would be utilized for the development of evaporation ponds (E-ponds) during closure of the Reona Copper HLF.

[4] Phase 1 of the Phoenix HLF would be developed in the permitted South OUA. Up to approximately 75 additional acres would be utilized for the development of E-ponds during closure of the Phoenix Copper HLF.

[5] New surface disturbance would occur from the development of Proposed Action facilities.

[6] Acres of disturbance within the proposed Phoenix Mine POO boundary.

[7] Acres of disturbance associated with ROWs outside the proposed Phoenix Mine POO boundary.

Source: Newmont 2010a.

2.3.1 Land Ownership

Current land ownership within the project area is shown in **Figure 2.2-2**. The proposed POO boundary would be expanded by 902 acres, for a total of 8,080 acres. Surface ownership within the proposed POO boundary would include 4,845 acres of private land and 3,235 acres of public land. No changes to land ownership would occur under the Proposed Action.

2.3.2 Schedule and Work Force

A general construction and operation schedule for the Proposed Action is provided in **Table 2.3-2**. The anticipated construction time frames for the Phoenix and Reona copper HLFs is 8 months. Construction of the SX-EW facility would extend for approximately 1 year. Haul and access road construction would occur in conjunction with construction of the proposed copper HLFs. The construction work force would include 150 to 250 employees (Newmont 2010a). Active mining and processing would last approximately 24 years. In addition to the existing operations work force (approximately 460 employees), 40 to 50 new employees would be hired for the proposed copper leaching operations. The new employees are expected to be employed for approximately 22 years. Overall closure and reclamation activities associated with the project facilities are expected to extend approximately 10 years beyond the operational phase.

Table 2.3-2 Proposed Action – Construction and Operation Schedule

Activity	Years	1				2				3 to 22				23				24			
	Quarter	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Heap Leach Pad Construction[1]																					
SX-EW Facility Construction																					
Leach Heap Pad Loading																					
Active Leaching																					
SX-EW Operation																					

[1] Phase 1 Phoenix HLP construction previously approved under the Phoenix Final EIS (2002).

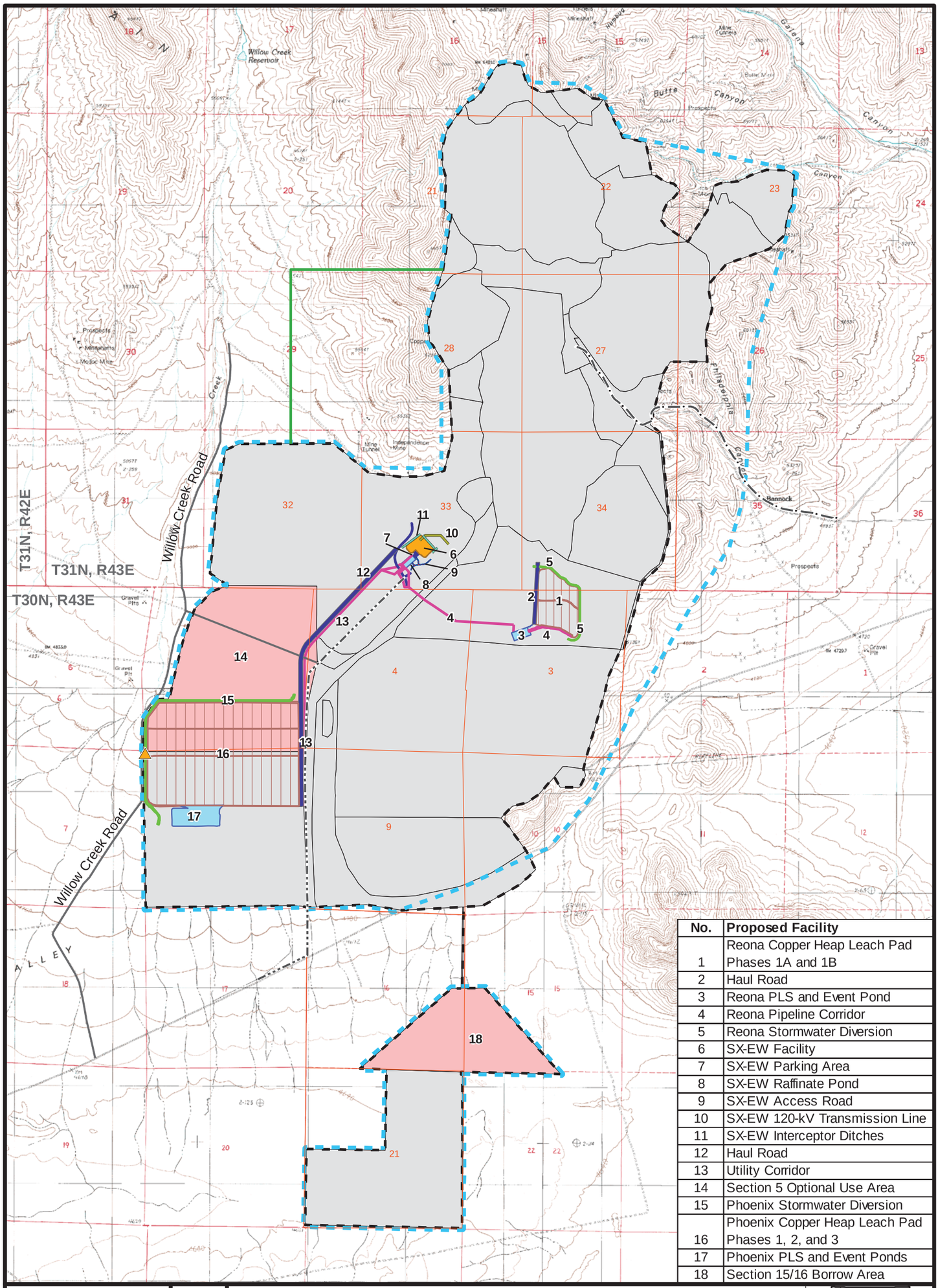
Source: Newmont 2011a.

2.3.3 Copper Heap Leach Facilities

The Proposed Action includes plans for two copper HLFs: Phoenix and Reona (**Figure 2.3-2**). The Reona HLF for copper would be built adjacent to the existing Reona HLF for gold. Under the Proposed Action, up to 158,000,000 tons of copper ore would be mined for processing. All copper ore is planned for processing as ROM; no crushing of the copper ore is proposed. Both facilities are designed to process the same ore. The Phoenix HLF would be constructed first, with the Reona HLF constructed only when economics and planning indicate that the Phoenix HLF does not have sufficient capacity. Active leaching at the Phoenix and Reona copper HLFs would last approximately 23 years.

The design for the Phoenix and Reona HLFs includes an engineered liner system to prevent loss of the copper and acid leach solutions. The facilities are designed with protection of the environment as a primary goal. Applicant-committed protection measures include the following:

- A system for monitoring leaks within high solution flow areas of the heap leach pad is included in the design of the Process Component Monitoring System (PCMS);
- Limiting hydraulic head on the heap leach pad liner system would promote lateral movement instead of downward movement of solution, thereby reducing the risk of uncontrolled seepage;
- A system for monitoring leaks within the ponds and sumps is included in the design of the leak collection and recovery system (LCRS);



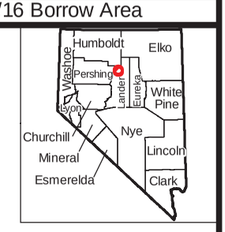
No.	Proposed Facility
1	Reona Copper Heap Leach Pad Phases 1A and 1B
2	Haul Road
3	Reona PLS and Event Pond
4	Reona Pipeline Corridor
5	Reona Stormwater Diversion
6	SX-EW Facility
7	SX-EW Parking Area
8	SX-EW Raffinate Pond
9	SX-EW Access Road
10	SX-EW 120-kV Transmission Line
11	SX-EW Interceptor Ditches
12	Haul Road
13	Utility Corridor
14	Section 5 Optional Use Area
15	Phoenix Stormwater Diversion
16	Phoenix Copper Heap Leach Pad Phases 1, 2, and 3
17	Phoenix PLS and Event Ponds
18	Section 15/16 Borrow Area

Figure 2.3-1
Proposed Action

Phoenix Copper Leach Project

Legend

- Proposed POO Boundary
- Proposed Fenceline
- Reona POO Fenceline
- Proposed New Surface Disturbance
- SX-EW Facility
- Copper Heap Leach Pads
- PLS and Event Ponds
- Permitted Disturbance
- Buffalo Valley 120-kV Transmission Line
- Philadelphia Canyon 69-kV Transmission Line
- Haul Road
- Stormwater Diversion
- Pipeline Corridor
- Interceptor Ditch
- Transmission Line Corridor
- Proposed Production Well



N

0 0.5 1 Miles

Source: BLM 1994b; Newmont 2010a.

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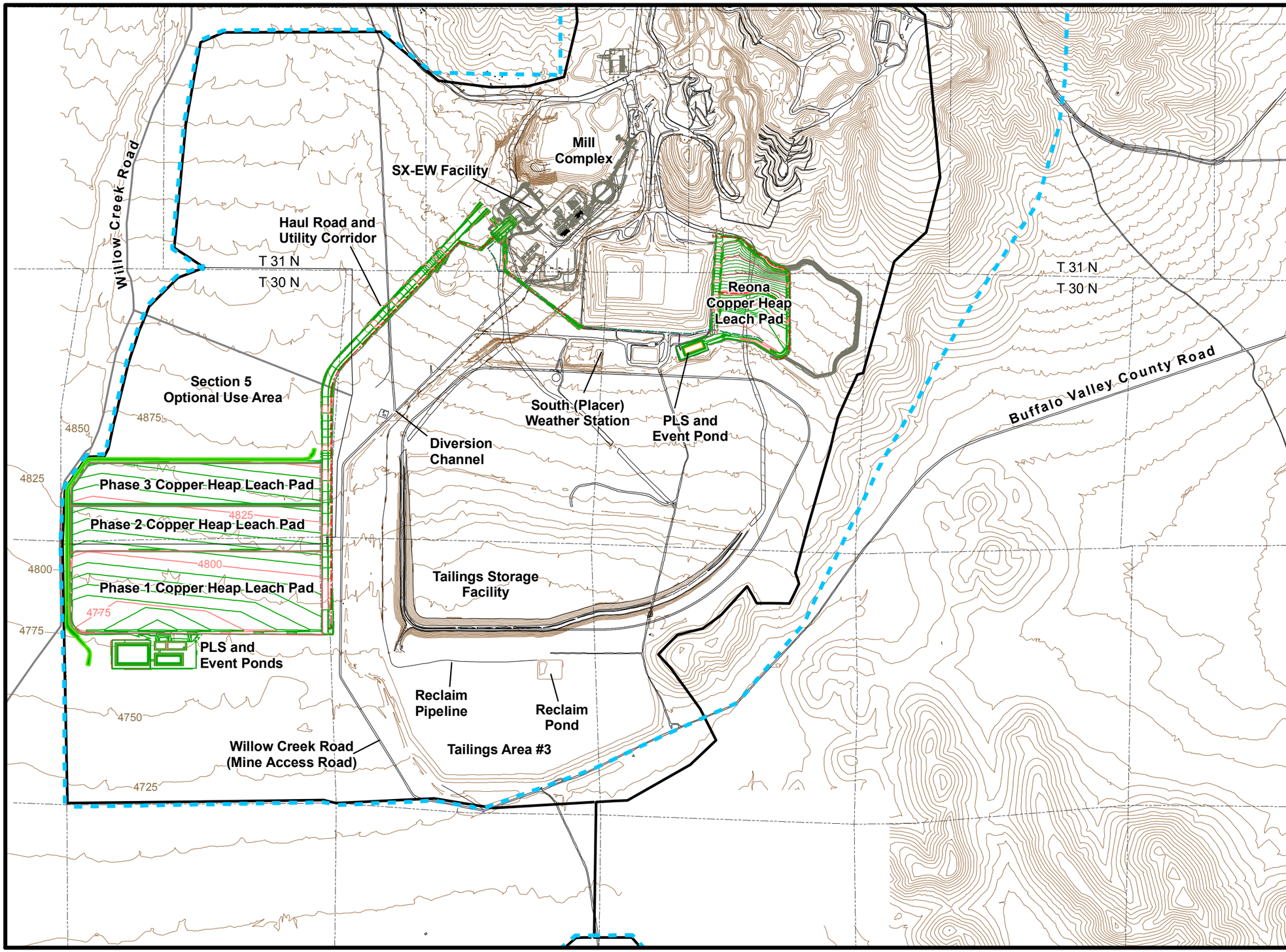


Legend

- Proposed POO Boundary
- Proposed Fenceline
- Existing Ground Surface (Feet)
- Proposed Ground Surface Contour
- Existing Roads

Source: Newmont 2010a.

N W E S

0 0.25 0.5 Miles

Phoenix Copper Leach Project

Figure 2.3-2

Proposed Action
Phoenix Copper Heap Leach Project Site Layout

05/27/2011

- A composite liner system would provide a virtually impervious barrier beneath the heap leach pad to restrict vertical movement;
- Exterior heap slopes would be constructed at the 1.4 horizontal (H):1 vertical (V) angle of repose and then dozed to an overall slope for operations of 2.5H:1V and regraded to 3H:1V during reclamation;
- The ponds would be utilized during construction to collect sediment from the proposed disturbance areas; and
- An 8-foot-high chain-link fence would be installed around the process ponds (including the raffinate pond), and bird netting pond covers, or floating "bird balls," as appropriate, would be installed over ditches and ponds containing leach solutions, to minimize potential impacts to avian and terrestrial wildlife.

2.3.3.1 Phoenix Heap Leach Facility

The proposed Phoenix HLF would be constructed in three phases (Phases 1, 2, and 3) and would occupy approximately 405 acres (**Figure 2.3-3**). Phase 1 of the Phoenix HLF would be constructed within the previously permitted South OUA and would occupy approximately 205 acres. As discussed in Section 2.2.4, Newmont currently has authorization and has commenced the construction of the Phase 1 heap leach pad, which includes the development of one 20-foot lift of ore. Processing of copper ore has not been permitted under this authorization. Phases 2 and 3 would be developed in Section 5, T30N, R43E, and would occupy approximately 106 and 94 acres, respectively. Up to approximately 75 acres would be utilized as E-ponds during facility closure in the permitted South OUA, as authorized in the Phoenix Final EIS (BLM 2002a). A typical cross-section of the Phoenix copper heap leach pad is illustrated in **Figure 2.3-4**. The maximum capacity of the proposed facility would be approximately 150 million tons (MT) loaded to an ultimate heap height of 300 feet (**Table 2.3-3**). The Phoenix HLF would be a phased expansion that would be built from the south (Phase 1) to the north (Phases 2 and 3). The Phoenix copper heap leach pad would include ten 500-foot-wide independent cells for solution collection purposes. A perimeter road would be designed around the entire facility. Along the north, west, and south sides of the facility, the road would have a width of 20 feet, while the road width would be 100 feet along the facilities east side.

Table 2.3-3 Proposed Copper Heap Design Parameters Summary

Facility	Height (feet)	Capacity (MT)	Footprint (acres)
Phoenix	300	150	405
Reona	300	8	58

Source: Newmont 2010a.

2.3.3.2 Reona Heap Leach Facility

The Reona HLF would be built in two phases (Phase 1A and Phase 1B) and would occupy approximately 58 acres. Phases 1A and 1B would occupy approximately 32 and 26 acres, respectively. This facility would be developed in the currently permitted heap leach pad development area, adjacent to the existing and inactive Reona HLF (Gold) (Section 5, T31N, R43E; Section 3, T30N, R43E) (**Figure 2.3-5**). Up to approximately 12 additional acres would be utilized for E-ponds during facility closure in the permitted Reona HLF (Gold) as authorized in the Phoenix Final EIS (BLM 2002a). A typical cross-section for the Reona copper heap leach pad is illustrated in **Figure 2.3-6**. The capacity of Phase 1A and Phase 1B would be approximately 8 MT loaded to an ultimate heap height of 300 feet (**Table 2.3-3**). The Reona HLF would be a phased expansion that would be built when the Phoenix HLF

nears capacity. The Reona Copper HLF would include three independent cells for solution collection purposes. These cells would vary in width from 350 to 500 feet.

2.3.3.3 Construction of the Heap Leach Pads

A rigorous Quality Assurance and Quality Control (QA/QC) program (Smith Williams Consultants, Inc. [SWC] 2007) would be implemented during construction to ensure that the plans and technical specifications, developed as part of the design, are observed and that design intent is met. The QA/QC program would be implemented during liner installation to: 1) ensure the geomembrane is installed according to the manufacturer's recommendations; 2) monitor the integrity of the seams; and 3) ensure the minimum thickness of the overlying protective layer is maintained to minimize damage from equipment traffic.

In preparation for construction, the heap leach pads would be grubbed and excavated to an average depth of 12 feet to salvage material for reclamation purposes. The material would be either stockpiled or would be hauled to a location undergoing concurrent reclamation at the mine. The excavated surfaces would be graded to slopes ranging from 1.5 to 2.5 percent for accommodate solution collection.

The compacted, low permeability soil layer "prepared subgrade" would be 12 inches thick and have a coefficient of permeability less than or equal to $1x10^{-6}$ centimeters per second. The prepared subgrade would be placed throughout the extent of the heap leach pads, through the solution channels, and along the upstream face of the perimeter berms. The material would have a plasticity index greater than 10 and would be compacted to a minimum 92 percent of maximum dry density, as determined by American Society of Testing and Materials 1557.

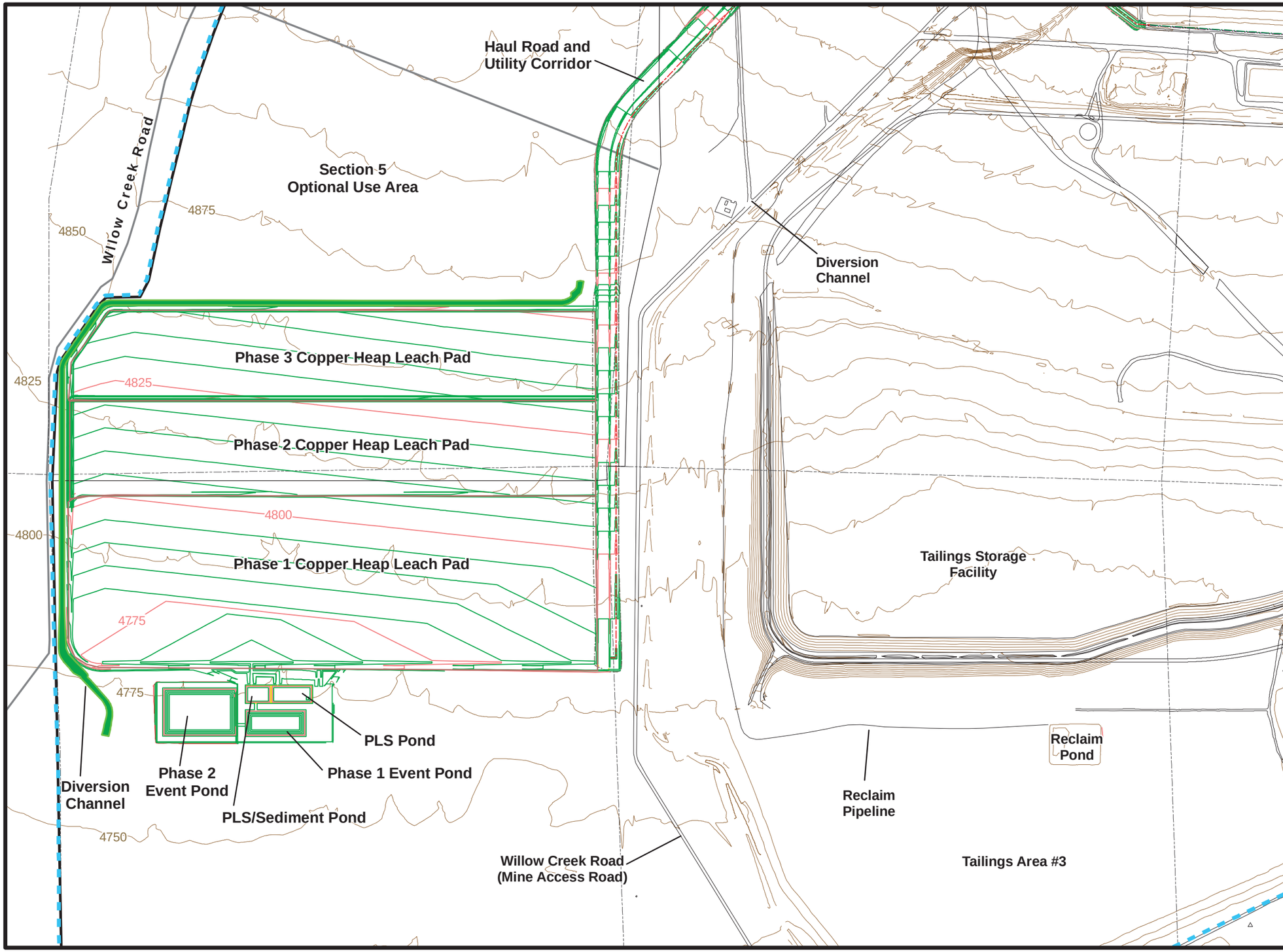
The surface of the prepared subgrade would be designed to enhance the interface strength between the prepared subgrade and the 80-mil (nominal value) double-textured HDPE liner. The friction material, consisting of 0.5-inch minus sand with gravel, is intended to decrease the sliding of the geomembrane on the underlying prepared subgrade. The friction material would be broadcast over the surface of the prepared subgrade and mechanically bonded to and integrated with the prepared subgrade by compacting with a smooth drum roller.

An 80-mil double-textured HDPE liner would be placed over the friction material. A double-textured HDPE liner was selected to improve the strength at the interface between the geomembrane and the underlying friction material and overlying protective layer.

The protective layer would be placed over the liner to protect against puncture from the overlying drainage layer. It would be 12 inches thick and consist of sand with gravel or silt with a maximum particle size of 1 inch.

A heap leach pad solution collection piping system would be placed on top of the protective layer. The collection piping system would be covered with a 15-inch drainage layer consisting of materials with a maximum size of 6 inches and fines content less than 5 percent.

An existing fleet of 150- to 350-ton haul trucks would be used to transport ROM copper ore (currently mined as waste rock) directly from the open pits to one of the two proposed heap leach pads. Ore would be stacked in lifts with an average thickness of approximately 20 feet at an angle of repose slope of 1.4H:1V. Trucks would travel across each lift on access ramps made of ROM ore that would become compacted by travel. Trucks would end-dump from the ramp followed by dozers spreading the material. In addition to the dozer and haul trucks, smaller equipment used for heap leach pad maintenance would traverse the area. Ramps may be constructed on the interior of the heap leach pad or on the perimeter. Ramps on the interior would be ripped and leached when no longer needed. The perimeter ramps would not be removed and would be graded to 3H:1V slopes at closure. Ramps would be maintained by mine operations per standard operating procedure for road maintenance.



Legend

- Proposed POO Boundary
- Proposed Fenceline
- Existing Ground Surface (Feet)
- Proposed Ground Surface Contour
- Existing Roads

Source: Newmont 2010a.

N
W E
S

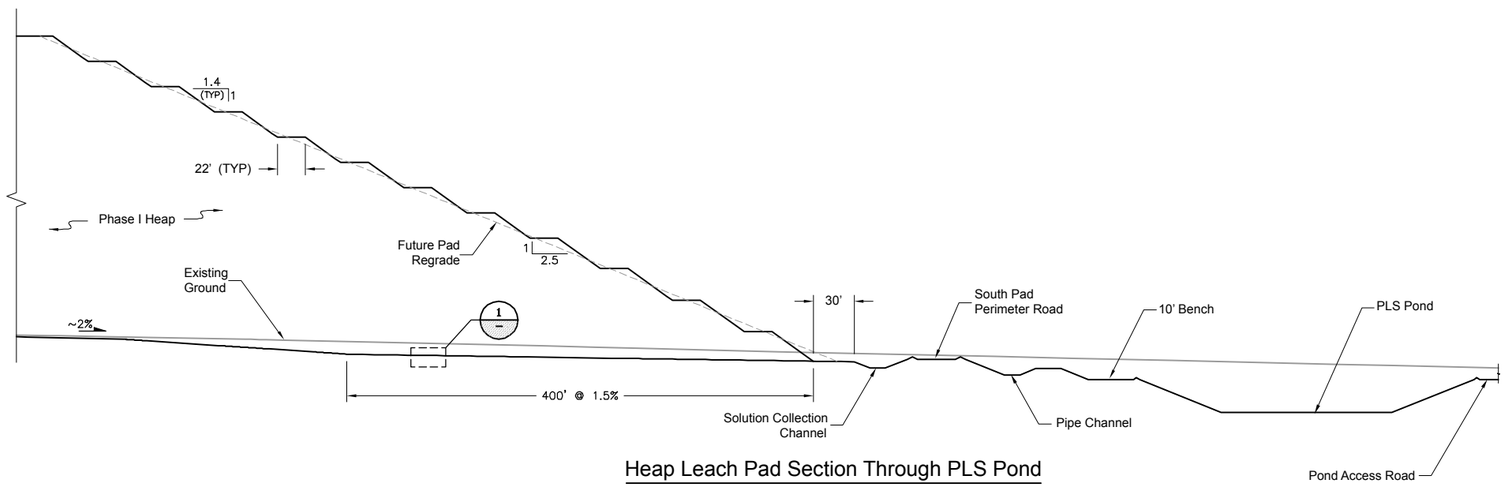
0 520 1,040
Feet

Phoenix Copper Leach Project

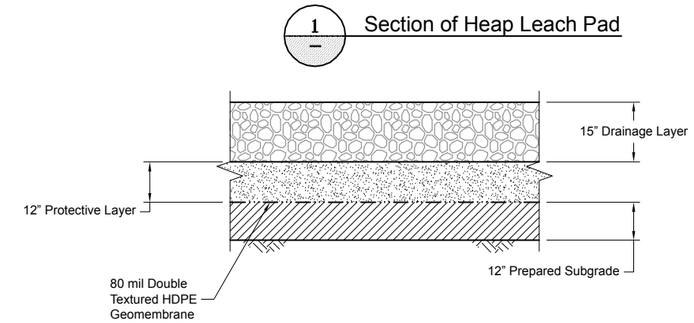
Figure 2.3-3

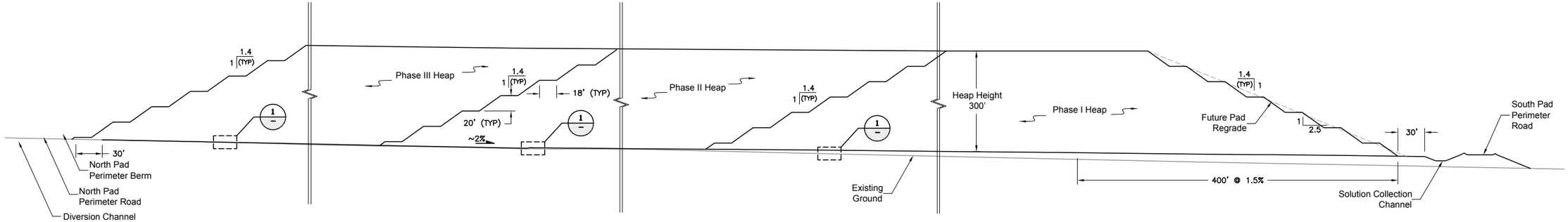
Proposed Action
Phoenix Copper Heap
Leach Facility Site Layout

05/27/2011



Heap Leach Pad Section Through PLS Pond





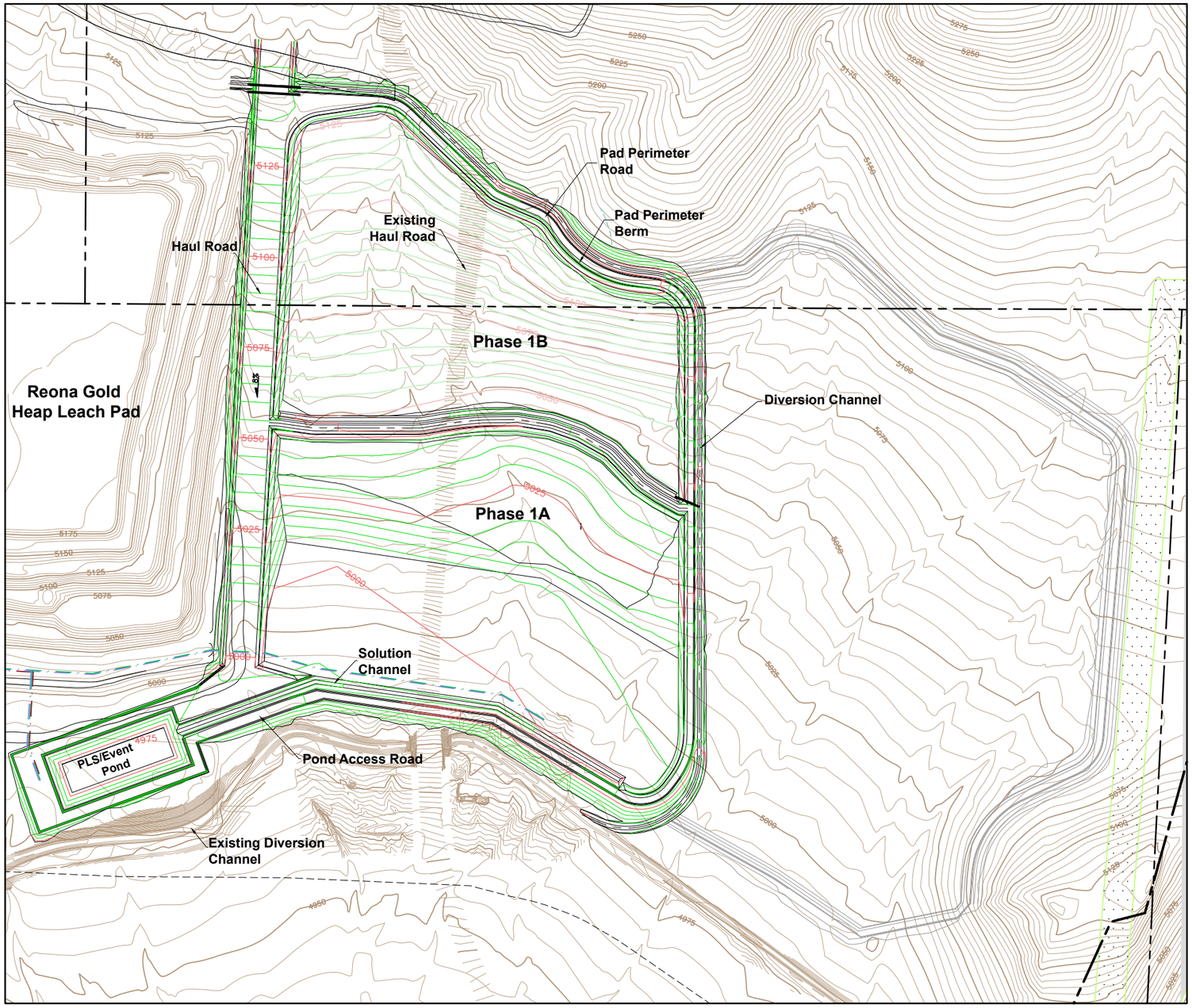
Heap Leach Pad Section

Phoenix Copper Leach Project

Figure 2.3-4

Proposed Action
Phoenix Copper Heap Leach Pad Typical Cross-section

Note: Not to scale.
Source: Newmont 2010a.



Legend

- Existing Ground Surface Contour and Elevation (feet)
- Phase 1A Proposed Ground Surface Contour and Elevation (feet)
- Phase 1B Future Ground Surface Contour and Elevation (feet)
- Plan of Operation Boundary
- Section Lines

Source: Newmont 2010a.

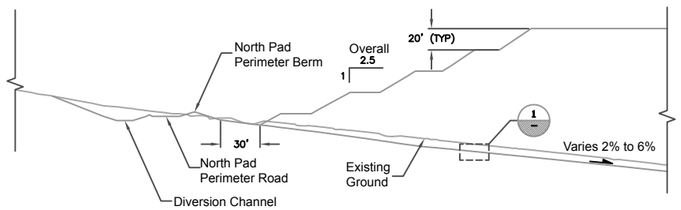
N

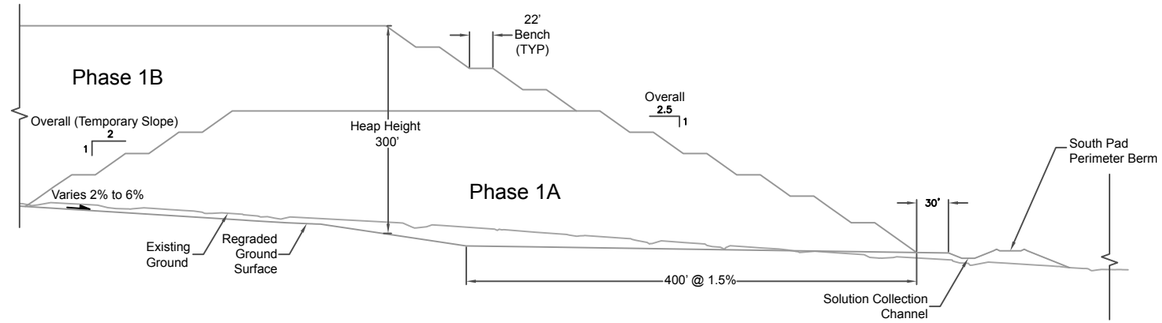
0 200 400 FEET

Phoenix Copper Leach Project

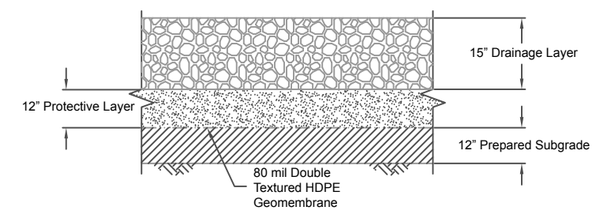
Figure 2.3-5

Proposed Action
Reona Copper Heap Leach Facility Site Layout

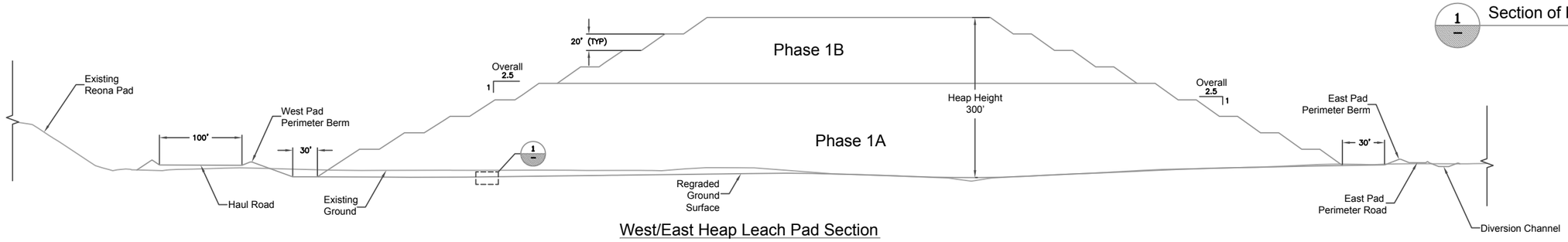




North/South Heap Leach Pad Section



1 Section of Heap Leach Pad



West/East Heap Leach Pad Section

Note: Not to scale.
Source: Newmont 2010a.

Phoenix Copper Leach Project

Figure 2.3-6

Proposed Action
Reona Copper Heap Leach Pad
Typical Cross-section

05/27/2011

The first lift thickness may vary from a minimum of 10 feet to a maximum of 35 feet. Each lift would have a bench width ranging from 18 to 22 feet wide. The first lift would be started approximately 30 feet in from the crest of the solution conveyance channels to ensure the reclaimed slope of 3H:1V stays on containment. In order to minimize the exposure of large ROM boulders in the side slopes of the heap leach pads at closure, Newmont would cover the heap leach pads with a minimum of 5 feet of capping material. Additionally, the practice of pushing the heap leach pads from angle of repose (1.4H:1V) slopes to the reclaim slope of 3H:1V would move finer material over larger ROM material at the base of each pad.

2.3.3.4 Solution Collection System

To leach copper from ore heaps, a dilute sulfuric leach solution (3 to 10 grams per liter sulfuric acid) would be applied to the ores via drip emitters on the stacked ore. The leach solution would be circulated over the ore for at least 90 days, at which time another lift of ore would be placed on top of the previously leached ore.

As the leach solution percolates through the ore, it dissolves the copper minerals and creates a copper sulfate solution (pregnant leach solution [PLS]). The PLS would be collected in a system of perforated pipes leading to the partitioned PLS pond. The PLS would flow into the sediment pond section that would allow for the settling of excess solids. The clarified PLS would then overflow into the PLS pond section where it would be pumped to the copper beneficiation plant for SX-EW processing and recovery. The PLS would be pumped along transfer corridors consisting of a lined ditch with two pipes; the PLS pipe for transfer of pregnant solution to the SX-EW plant and the raffinate pipe for transfer of barren raffinate solution back to the HLF. The ditch and pipelines would be built as specified in the design report (Samuel Engineering, Inc. [SEI] 2007).

The solution collection systems for the proposed Phoenix and Reona copper HLFs are illustrated in **Figures 2.3-7** through **2.3-8**, respectively. Each of the 13 cells (10 at Phoenix and 3 at Reona) would contain a system of 4-inch-diameter perforated plastic pipes placed on 20- or 25-foot centers in a herring bone pattern. These collection pipes would convey solution flow to perforated 12- or 24-inch-diameter (Reona or Phoenix, respectively) collection header pipes that would be installed in trenches near the center of each cell. The trenches would be 12 inches lower than the grade of the heap leach pad and would be underlain by a PCMS.

The header pipes would convey the solution to a solid (non-perforated) plastic pipe (12-inch-diameter at Reona; 24-inch-diameter pipe at Phoenix) located at the south end of the heap leach pads. The solution would then be transferred from the solid pipe into a Parshall flume for flow measurement and sampling. Solution would exit the flume and discharge into a solid 12- or 32-inch-diameter plastic pipe (Reona or Phoenix, respectively) that would traverse the solution channels. This pipe would convey the solution down the solution channels to the PLS pond. The solution channel pipe would be placed on the 80-mil liner and would be equipped with valves to prevent backflow and ensure the solution flow is directed to the ponds.

The solution channels would have 2.5H:1V side slopes and would be graded at a minimum slope of 0.75 percent toward the ponds. The solution channels would have PCMS as described in Section 2.3.3.6, Process Component Monitoring System. The PCMS would connect to individual sumps at the outlet of the solution channels. These sumps would be built as a pipe inside a pipe and would accommodate a small pump and discharge pipe to remove any solution that is collected in the sump.

2.3.3.5 Precipitate Formation

The use of sulfuric acid to leach copper can have a number of chemical effects. As the sulfuric acid leaches through the ore, it would not only dissolve copper, but it also would dissolve a number of other constituents. These other constituents may precipitate out as the solution becomes supersaturated. Geomega performed a modeling study to describe the heap leach draindown geochemistry of the

proposed project (Geomega 2010). Based on the Geomega study, the precipitates that may form in the heap leach pad include: goethite, gibbsite, nontronite, gypsum, cryolite, and alunite.

2.3.3.6 Process Component Monitoring System

The PCMS has been designed to allow independent monitoring for each of the heap leach pad cells as well as various sections of the solution channels where flow would be concentrated. At the outlet of each PCMS channel, a monitoring sump would be constructed. A PCMS for a solution channel is shown in **Figure 2.3-9**.

The PCMS would consist of the following layers from bottom to top:

- Prepared subgrade and 80-mil HDPE geomembrane to promote lateral flow and restrict vertical infiltration;
- A 4-inch-diameter perforated corrugated polyethylene pipe placed within a gravel bed to provide additional flow capacity within the system. The perforated pipe would be extended under potential expansions;
- A solid 6-inch-diameter HDPE pipe in areas where the pipe would serve as an outlet pipe for potential expansions; and
- Select gravel placed to cover the pipes and overlain with a 10-ounce per square yard non woven geotextile to limit migration of fines from the overlying prepared subgrade layer.

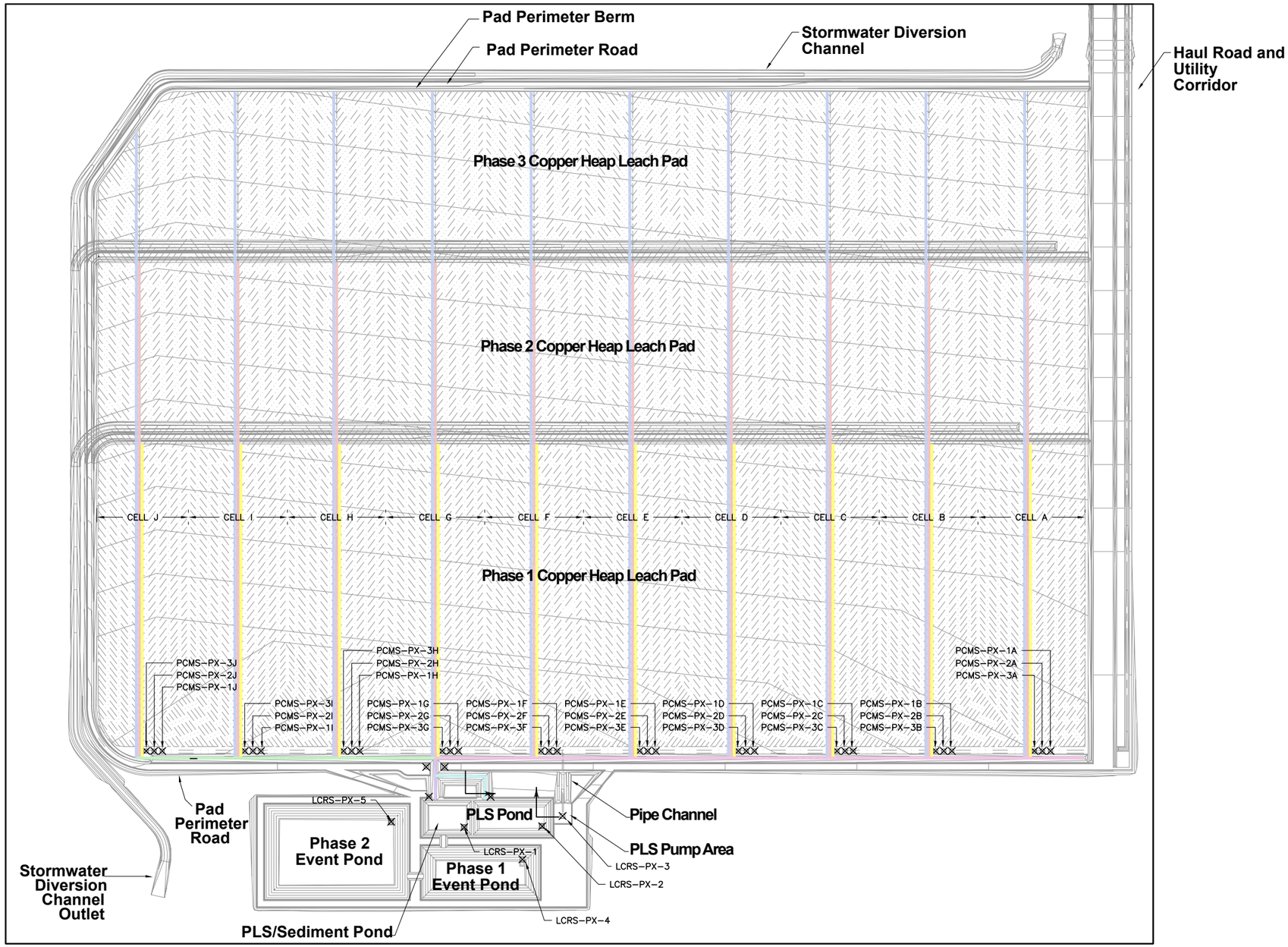
2.3.3.7 Leak Collection and Recovery System

The LCRS associated with the process ponds would be constructed similarly to the PCMS system for the heap leach pads and solution collection channels (**Figure 2.3-10**). A monitoring sump would be located at each pond, and any solution collected in the LCRS sumps would be pumped back into the ponds.

2.3.4 Process Solution and Storm Water Event Ponds

Six new lined ponds would be constructed in association with the copper beneficiation plant and associated facilities. The proposed project ponds, their volumes, and dimensions are listed in **Table 2.3-4**. All six ponds are designed with a double liner and leak detection system in accordance with NAC 445.438. The ponds have been designed with side slopes of 2.5H:1V and depths that ranges from 15 to 30 feet. The ponds would be lined with, from bottom to top, 12 inches of prepared subgrade, a secondary 80-mil HDPE geomembrane, a LCRS consisting of a geonet, and a primary 80-mil HDPE geomembrane. The bottoms of the ponds would be sloped at a minimum 0.5 percent toward a low spot in a corner of each pond for collection of solution from sumps that would be 25 feet square on top, 2 feet deep, and 15 feet square on bottom. The PLS ponds for the Phoenix and Reona copper heap leach pads would each provide surge capacity between the heap leach operations and the copper beneficiation plant.

The Phoenix HLF would include one PLS Pond and one Sediment Pond that are interconnected. Each pond would have the capacity to hold the operating volume for 8 hours of operation with 3 feet of freeboard, for a combined capacity of 8,600,000 gallons (**Table 2.3-4**). The Phoenix event ponds (Phase 1 and Phase 2), which would be connected to the PLS and sediment ponds via an overflow channel, would have the capacity to contain a 24-hour, 100-year precipitation event over the heap leach pad with 3 feet of freeboard. The capacity of the Phoenix event ponds would be 19,900,000 gallons and 52,200,000 gallons for Phase 1 and Phase 2 event ponds, respectively, for a combined total of 72,100,000 gallons.



Legend

- Proposed Ground Surface Contour and Elevation (feet)
- PCMS For Phase 1 Heap Leach Pad Cells
- PCMS For Phase 2 Heap Leach Pad Cells
- PCMS For Phase 3 Heap Leach Pad Cells
- PCMS For East Solution Channel
- PCMS For West Solution Channel
- Pond Solution Channel PCMS 1 of 2
- Pond Solution Channel PCMS 2 of 2
- Pond Solution Channel PCMS 2 of 2
- Pond Solution Channel PCMS 2 of 2

Source: Newmont 2010a.

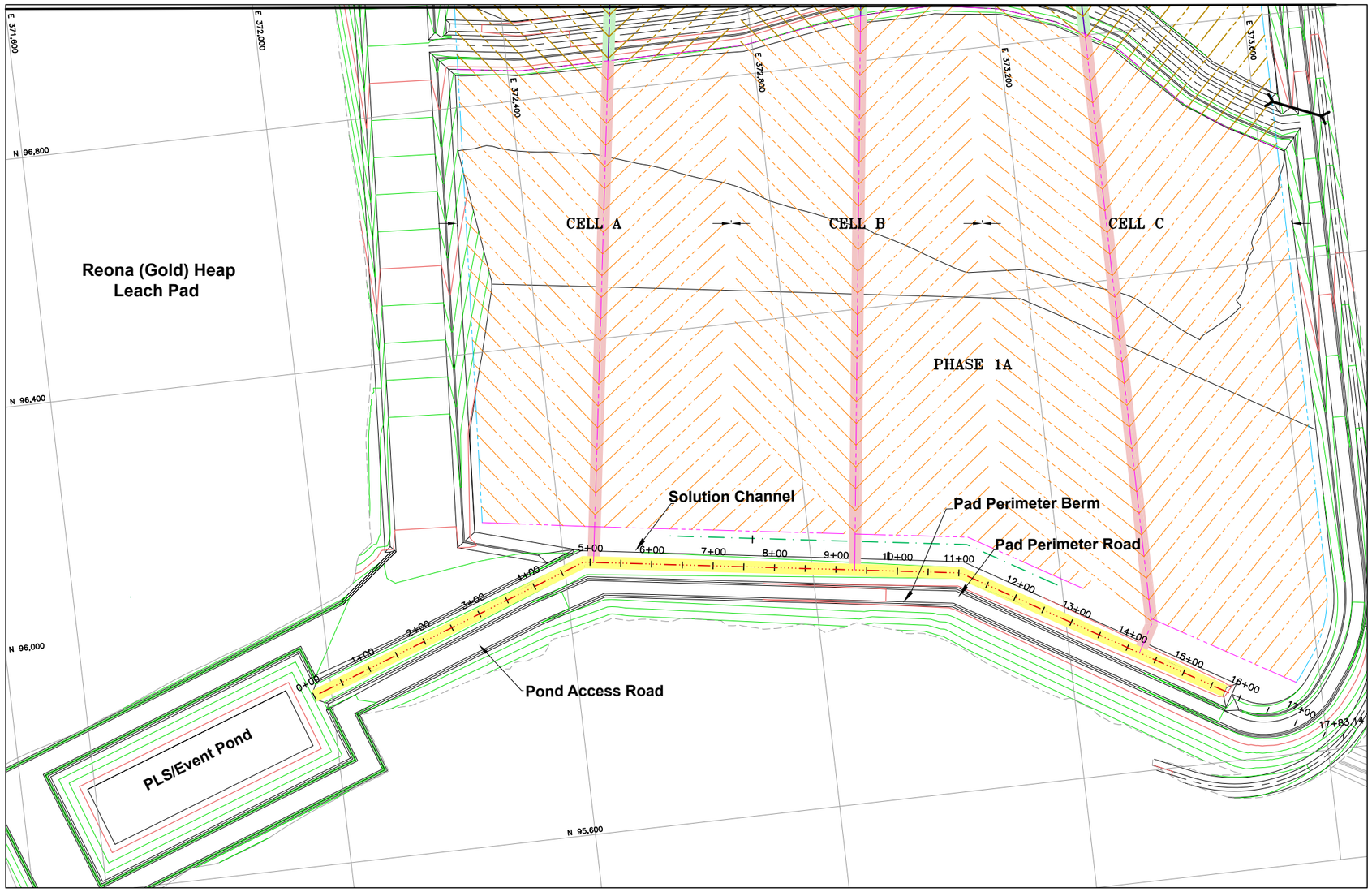
N

0 300 600 FEET

Phoenix Copper Leach Project

Figure 2.3-7

Proposed Action
Phoenix Copper Heap Leach Facility Solution Collection System



Legend

- PCMS for Heap Leach Pad Cells (Phase 1A)
- PCMS for Heap Leach Pad Cells (Phase 1B)
- PCMS for Solution Channel
- 4" DIA Perforated CPeP (Type SP) Phase 1A
- 12" DIA Solid HDPE (SDR 21) Pipe

Source: Newmont 2010a.

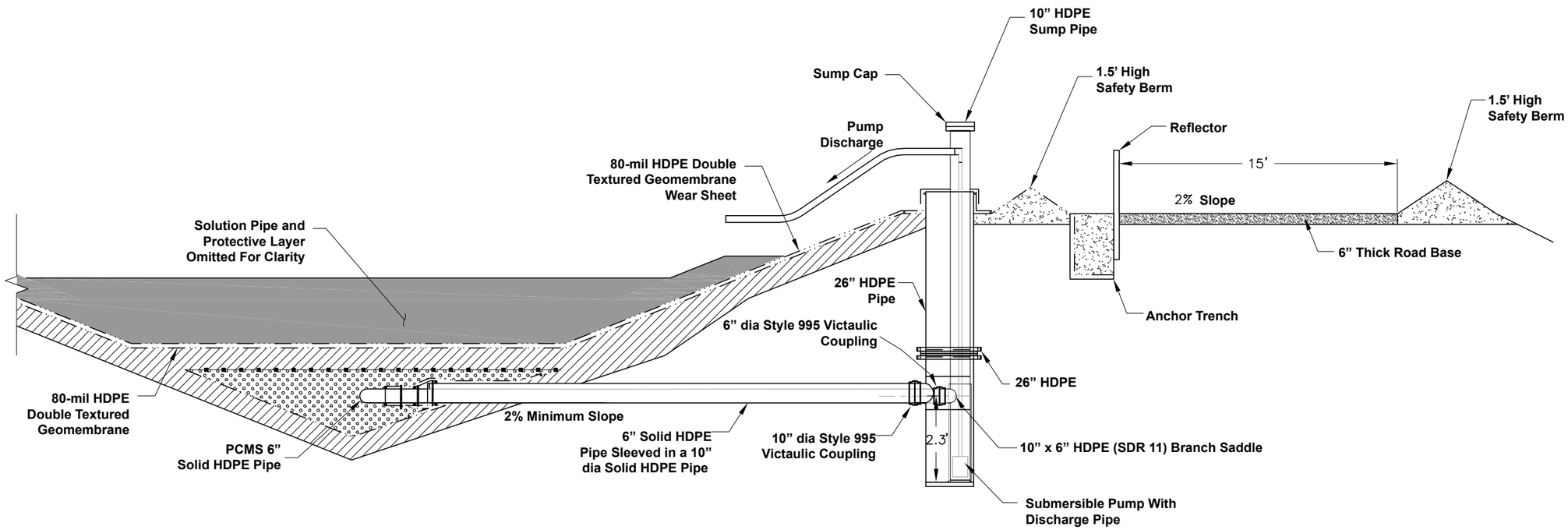
N

0 100 200 FEET

Phoenix Copper Leach Project

Figure 2.3-8

Proposed Action
Reona Copper
Heap Leach Facility
Solution Collection System



Legend

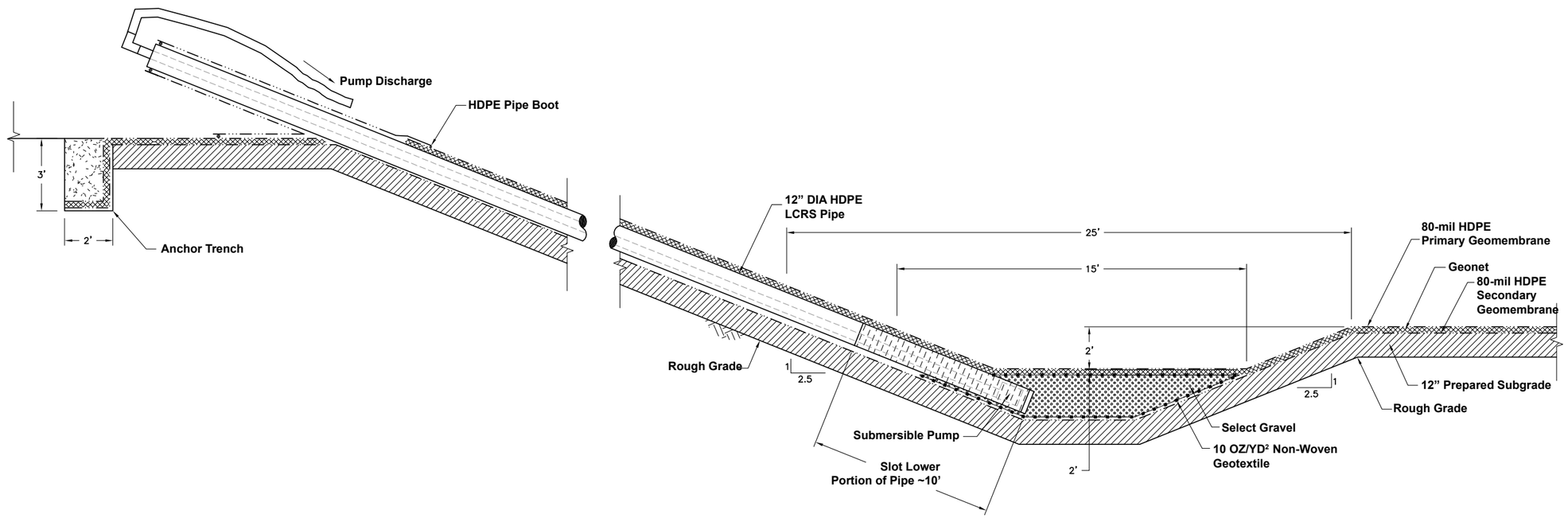
- 80-mil HDPE Double Textured Geomembrane
- 10 ounce per square yard Non-woven Geotextile
- Prepared Subgrade
- Select Gravel
- Random Fill
- Road Base

Note: Not to scale.
Source: Newmont 2010a.

Phoenix Copper Leach Project

Figure 2.3-9

Process Component Monitoring System (PCMS) for Solution Channels



Legend

- 80-mil HDPE Geomembrane
- 10 OZ/YD² Non-woven Geotextile
- Geonet
- Random Fill
- Select Gravel
- Prepared Subgrade

Note: Not to scale.
Source: Newmont 2010a.

Phoenix Copper Leach Project

Figure 2.3-10

Solution Pond Leak Detection System (LCRS) Sump

Table 2.3-4 Proposed Pond Capacities and Dimensions

Pond Name	Capacity (gallons)	Area (square feet)	Length, Width, and Depth (feet)
Phoenix PLS Pond	6,600,000	66,300	390 x 170 x 17
Phoenix Sediment Pond	2,000,000	40,800	240 x 170 x 15
Phoenix Phase 1 Event Pond	19,900,000	162,000	600 x 270 x 30
Phoenix Phase 2 Event Pond	52,200,000	350,400	480 x 730 x 30
Reona PLS/Event Pond	6,100,000	85,500	450 x 190 x 18
Raffinate Pond	4,600,000	58,800	420 x 140 x 24
Total	**91,400,000**	**763,800**	

Source: Newmont 2010a.

The Reona PLS/Event Pond would have a capacity to hold the operating volume of 8 hours of operation, and would have the capacity to contain a 24-hour, 100-year precipitation event over the heap leach pad with 3 feet of freeboard. The capacity of the Reona PLS Pond would be 6,100,000 gallons.

The raffinate pond would have a capacity of 4,600,000 gallons and would hold the volume from a 4-hour heap draindown event and the volume of a 24-hour, 100-year precipitation event over the SX-EW facility with 3 feet of freeboard.

All process ponds would be fenced with a minimum of 8-foot-high chain-link fence to exclude wildlife access to the ponds, and ponds would be covered with bird netting or floating “bird balls,” as appropriate. An Industrial Artificial Pond Permit (IAPP) would be obtained from the NDOW prior to construction.

In addition to process ponds, there would be an unspecified number of storm water ponds constructed as necessary, as described in Section 2.3.10.3, Storm Water Diversion Channel, Ponds, and Controls.

2.3.5 Solvent Extraction and Electrowinning

In the first step of the solvent extraction (SX) process, the PLS would be mixed with an organic phase, which is a mixture of copper-specific extraction reagents (referred to as the extractant) and an organic carrier (referred to as the diluent). The PLS and organic phase are immiscible liquids that must be well mixed to facilitate the recovery of copper from the PLS.

The mixing and subsequent gravity separation of the PLS and the organic phase would be performed in mixer-settlers that likely would be constructed of stainless steel or modular fiber-reinforced plastic construction. The mixer-settlers would be covered to reduce process solution evaporation and to protect the solutions from extreme weather conditions.

The Proposed Action would use three mixer-settlers arranged with two parallel extractors. The process flow for the SX-EW system is shown in **Figure 2.3-11**.This facility would be developed within the currently permitted Natomas WRF area (Section 33, T31N, R43E).

2.3.5.1 Copper Stripping

The copper stripping process involves concentrating and acidifying the copper that is recovered during the extraction process. Once the extractant has been loaded with copper, the organic phase and PLS is

separated using gravity techniques. The loaded organic phase from the extraction step would then be pumped to the second step of the process where the copper is stripped from the copper-specific reagent into another aqueous phase, which would become the feed to the EW stage. This aqueous strip solution loaded with copper is referred to as the rich electrolyte. The stripped organic phase discharging from the stripping stage returns to the extraction stage to take up copper in the closed loop process.

2.3.5.2 Electrowinning

Electrowinning is an electrochemical process in which ionic copper from an aqueous solution is electrochemically reduced to form solid metallic copper. Oxygen and sulfuric acid are the byproducts of this process. The aqueous feed solution in the EW process is the rich electrolyte from the SX stripping process. The aqueous stripping solution that leaves the EW process is called lean electrolyte and is a bleed stream of the large tank-house electrolyte flow. EW is performed in the tank house, which consists of several EW cells.

2.3.5.3 Acid Mist Containment System

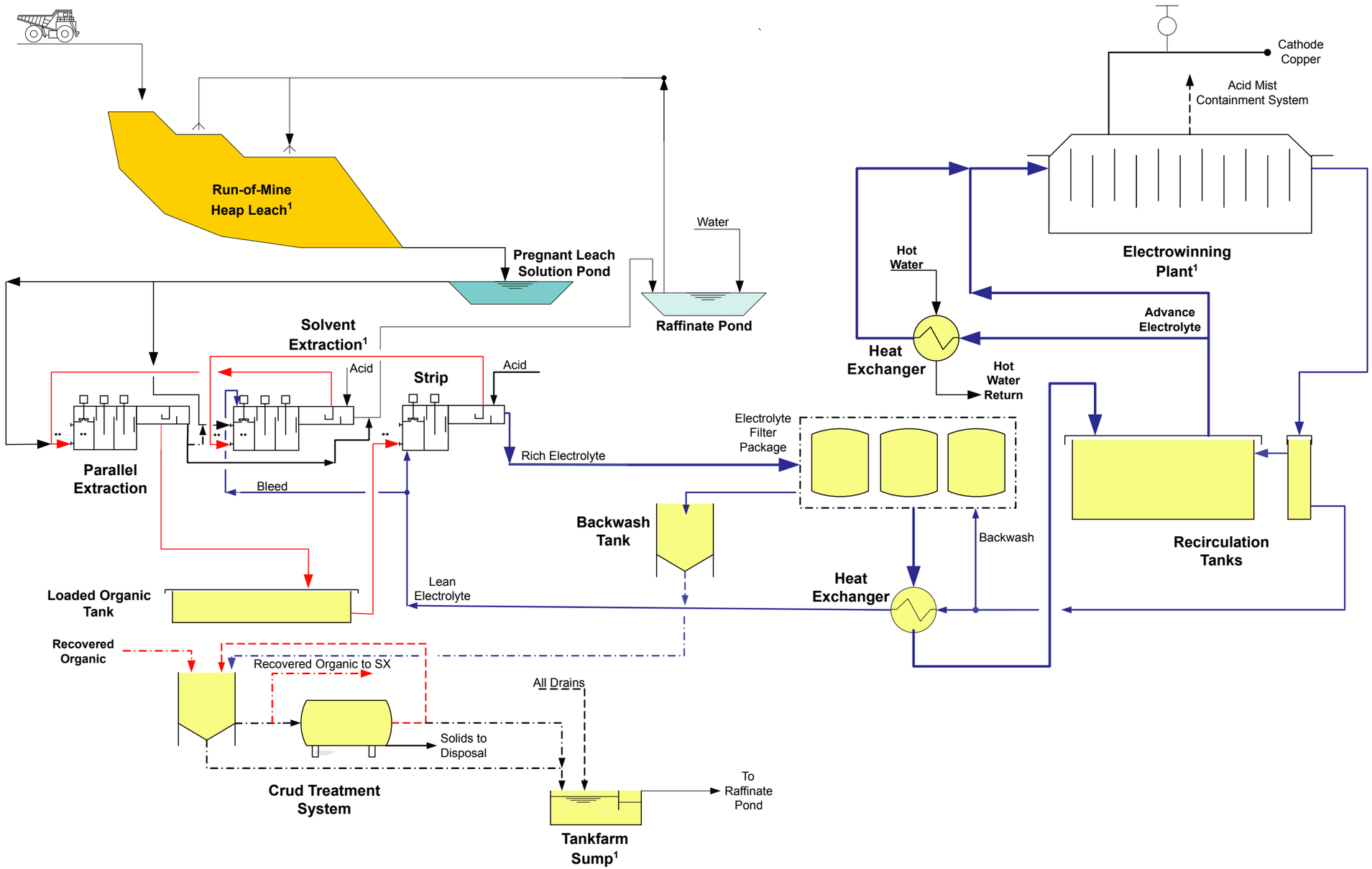
During the EW process, oxygen is released at the anode during metallic copper plating. The anodic oxygen rises to the surface of the electrolyte in the electrowinning cell, and when the oxygen bubble reaches the surface, the bubble bursts releasing a small droplet of copper electrolyte into the air. As a result, an acid mist is released into the tank-house environment. Because acid mist is a health risk to tank-house employees and accelerates corrosion on the EW plant surfaces, the SX-EW facility would use an engineered hood and manifold containment system to capture and recover the acid mist. The containment system also would prevent acid mist from exiting the tank-house and entering the outside environment. In addition, a combination of small hollow spheres and chemical additive FC-1100 would be added to reduce the acid mist levels ahead of the mist containment system.

2.3.5.4 Tank Farm Facility

The tank farm facility would consist of one area with equipment for the storage, treatment, and handling of electrolyte, and another area with equipment for recovering the organic solution crud. The tank farm would be located adjacent to the SX-EW plant and would contain the following tanks and associated equipment:

- Loaded organic surge tank;
- Rich electrolyte filter feed tank;
- Rich electrolyte multi-media filters;
- A crud treatment system;
- Electrolyte circulation tanks;
- Electrolyte heat exchangers; and
- Electrolyte reagent make-up tanks.

The tank farm area would contain a sump, which would permit the collection of tank overflows and drains in the process facility. The tank farm sump would have an overflow baffle to recover the organic from the drains and overflows. The containment has been designed to handle 110 percent of the largest tank or tanks in series. The containment also would be lined with an acid resistant liner (e.g., Rhino hi-Chem). The tank farm sump also would be lined with HDPE.



Note: [1] = Radiation Monitoring Sites.
Source: Newmont 2010a.

Phoenix Copper Leach Project

Figure 2.3-11

Process Flow Diagram

Sulfuric acid is currently used at the Phoenix Mine for cyanide destruction. The additional sulfuric acid would be obtained from existing off-site sources and would be trucked in daily. Up to 20, 2,500-gallon trucks of acid would be delivered daily. Two carbon steel construction sulfuric acid storage tanks would be located adjacent to the SX-EW plant. Each tank would have a capacity of 192,530 gallons and would store approximately 93 percent by weight, or 1,700 grams per liter sulfuric acid. The acid would be added to the raffinate stream to achieve a raffinate acid concentration of between 3 and 10 grams per liter. This dilute acid solution is ideal for the leach process. The overall SX-EW facility and associated project components are shown in **Figure 2.3-12**.

2.3.6 Section 5 Optional Use Area

Newmont proposes a new OUA primarily located in Section 5, T30N, R43E; and, to a lesser extent, Sections 4 and 8, T30N, R43E. The potential use of the proposed Section 5 OUA includes the development of an additional borrow area.

2.3.7 Section 15/16 Borrow Area

Newmont proposes a new borrow area in Sections 15 and 16, T30N, R43E (**Figure 2.3-1**). This facility would provide clay bedding material for pad construction for Phases 2 and 3 of the Phoenix HLF. The material would be excavated to a depth of approximately 2 to 3 feet.

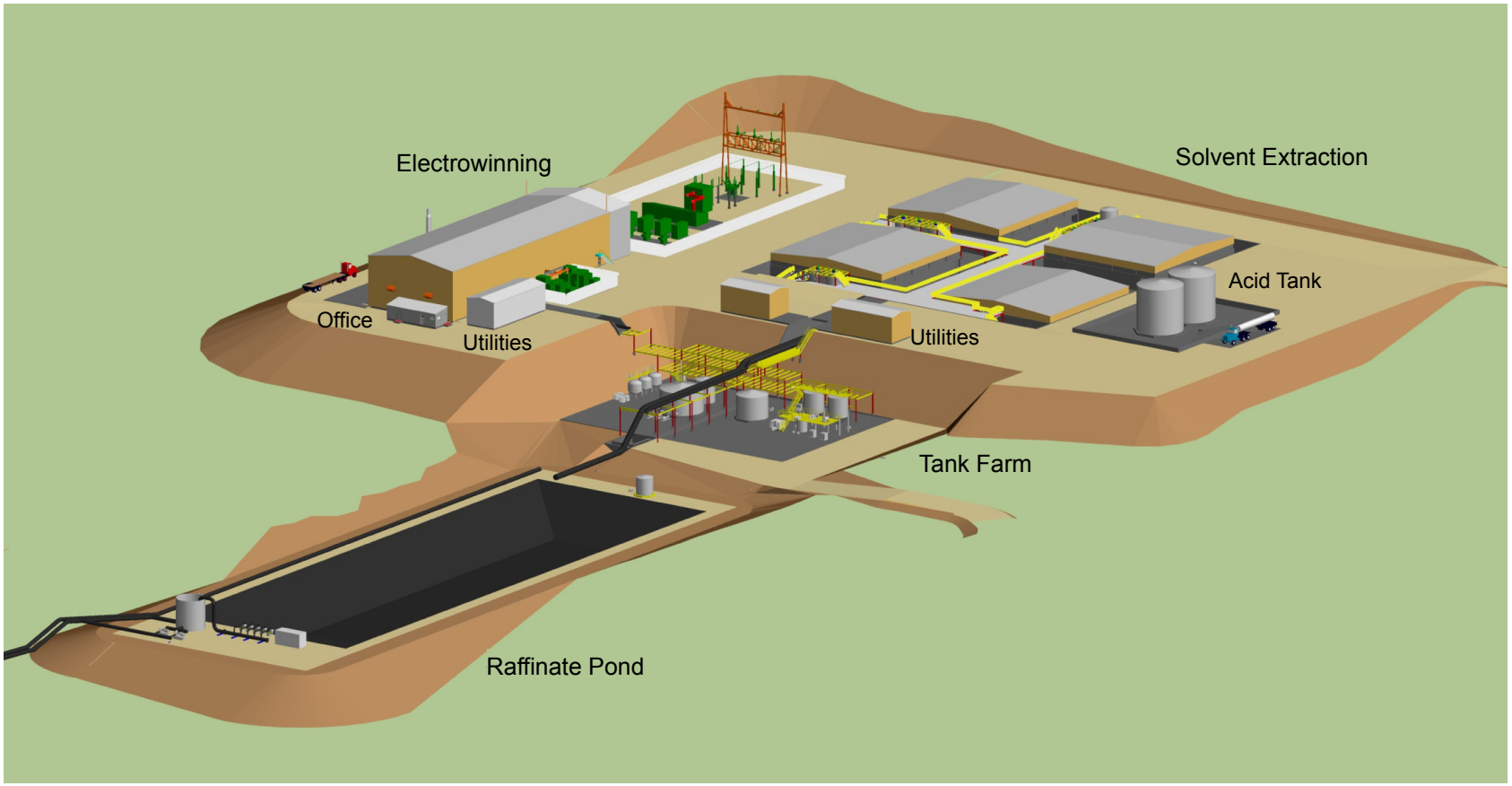
2.3.8 Natomas Waste Rock Facility Reconfiguration

All WRF construction and management activities would comply with the Phoenix Mine Waste Rock Management Plan (WRMP) as approved by the BLM and NDEP (Newmont 2008a). The Natomas WRF would be reconfigured to include the construction of lifts that may vary from 20 to 200 feet and would be constructed at the angle of repose for the material dumped. After each lift is filled to its maximum design capacity, the slopes of the WRFs would be graded to a slope between 2H:1V and 3H:1V. The volume of material placed in the Natomas WRF may be reduced based on this proposed amendment. Constant fluctuation in the value of metals and price of commodities also may change the classification of some waste rock to ore resulting in the reduction of volume of material placed in the Natomas WRF.
Based on a request from the BLM, the Natomas WRF was evaluated to determine the infiltration rates from changes in the configuration of the facility that could result if it is not constructed to capacity due to economic drivers. Potential changes to infiltration and draindown of meteoric water to the facility have been evaluated using a modeling approach generally consistent with the analysis utilized in support of the Phoenix Project EIS (BLM 2002a). The modeling results indicate that the lower elevation associated with the Natomas WRF would receive less meteoric precipitation than previously modeled. With the reduced volume in meteoric precipitation, the infiltration rates also would be reduced. Based on the evaluation, even though the thickness of waste rock would decrease, the decreased precipitation would result in little effect on the timing of percolation of meteoric waters through the WRF and underlying bedrock.

2.3.9 Haul Roads and Utility Corridors

A new haul road and utility corridor would be constructed to connect the Phoenix HLF with the SX-EW facility and would account for approximately 50 acres of new disturbance (**Figure 2.3-1**). The utility corridor also would contain solution pipelines carrying pregnant solution to the SX-EW Facility and barren raffinate back to the leach pad. The utility corridor also would contain 120-kV powerline to the Phoenix HLF.

The BLM-authorized Willow Creek County Road reroute has been constructed to ensure public safety throughout construction and operation of the proposed project (Section 2.2.17).New haul roads also would be constructed along the west side of the Reona copper heap leach pad and adjacent to the SX-EW Facility. Road construction would follow standard cut-and-fill techniques, in compliance with all MSHA regulations. Roadway drainage would be intercepted by channels, which are incorporated into the construction. Haul roads would have a maximum travel width of 120 feet.



Phoenix Copper Leach Project

Figure 2.3-12

Solution Extraction and Electrowinning System Facilities

Source: SEI 2007.

2.3.10 Additional Infrastructure

2.3.10.1 Monitoring and Production Wells

New monitoring wells would be installed in Sections 5 and 8, T30N, R43E, both upgradient and downgradient of the Phoenix copper heap leach pad. Monitoring wells for the Reona copper heap leach pad would be installed in Section 3, T30N, R43E and Section 34, T31N, R43E.

All new monitoring wells would have monitoring and inspection activities comparable to requirements in the current Phoenix Mine WPCP and copies of all quarterly and annual WPCP reports would continue to be sent to the NDEP and BLM. The installation of additional groundwater monitoring wells around the proposed copper beneficiation facilities ensures environmental quality standards are maintained throughout operation of these facilities.

Newmont is proposing to install a new production well to supply water for the proposed copper leach facilities. The well would be located in the NW¼ of Section 8 and would have a maximum flow rate of 1,000 gallons per minute (gpm) and a nominal flow of 600 gpm (**Figure 2.3-1**).

2.3.10.2 Electric Power

A 120-kV power line extension would be constructed to provide power to the new substation adjacent to the EW facility (**Figure 2.3-1**). The approximately 0.2-mile-long power line extension would connect the new substation to the existing electrical substation. In addition, an approximately 2-mile-long 13.8-kV power line extension would be installed adjacent to the utility/haul road corridor to provide power to the proposed Phoenix Copper HLF.

2.3.10.3 Storm Water Diversion Channel, Ponds, and Controls

Two storm water channels would be installed during heap leach pad construction, to divert storm water away from each of the heaps (**Figure 2.3-1**). The Phoenix diversion channel would be approximately 1.7 miles long (9,160 feet) and would have a bottom width of 15 feet, a depth varying between 4.5 and 6 feet, with 2.5H:1V side slopes. Non-woven geotextile would be placed over the prepared channel foundation, then covered with riprap material ranging from 6 to 12 inches at a thickness ranging from 12 to 24 inches.

The Reona diversion channel would be approximately 0.7 mile long (3,671 feet). It would have a bottom width of 10 feet, a depth varying between 4.5 and 5 feet, with 2.5H:1V side slopes. Non-woven geotextile would be placed over the prepared channel foundation, then covered with riprap material ranging from 6 to 12 inches at a thickness ranging from 12 to 24 inches.

Estimated peak flows and velocities resulting from a 100-year, 24-hour storm event were used for sizing the diversion channels and riprap lining.

In addition to the lined storm water event ponds (Section 2.3.4) that are interconnected with other process ponds, engineered culverts and unlined storm water ponds would continue to be placed, as needed, to promote good drainage and control sediment of storm water.

2.3.10.4 Sanitary Waste Facilities

A new septic system and leach field would be installed southwest of the SX-EW facility in Section 4. Approval for the system has been obtained from the State of Nevada. The system would be installed in accordance with all applicable state regulations.

2.3.10.5 Security and Fencing

Public access is restricted within the existing Phoenix Mine by a perimeter fence, gates, and appropriate signage. The perimeter fencing would consist of BLM-approved four-strand range fence and would

extend approximately 3.7 miles to encompass the proposed project boundary. The proposed fence alignment for the Proposed Action is presented in **Figure 2.3-1**. Eight-foot-high chain-link fencing would be installed around the process ponds (including the raffinate pond) to exclude wildlife access, in accordance with requirements for the NDOW IAPP.

2.3.10.6 Fire Protection

Due to the flammability of the organic phase in the SX process, the Phoenix SX-EW plant would employ a fire prevention design in combination with state-of-the-art fire suppression equipment. Elements of the fire prevention design would include, but would not be limited to, operator fire prevention training, plant housekeeping, and a project-specific organic-phase handling system.

2.3.10.7 Reagent Transportation and Storage

Reagents and supplies required for operation of the Proposed Action are listed in **Table 2.3-5**. The various reagents would be mixed or added to the solution circuits in vessels that would be located within contained facilities. All areas where hazardous or reactive materials are stored would be marked with appropriate signs in accordance with MSHA and USEPA regulations. All hazardous materials vessels would be located within concrete secondary containment areas at the SX-EW Facility. The plant and reagent storage areas would be located within the property perimeter fencing and specific wildlife fencing. All reagent storage and containment facilities would be designed in accordance with the requirements of the State of Nevada WPCP.

Transportation routes and modes for reagent use in the Phoenix Copper Leach Project would be the same as described in Section 3.15 of the Phoenix Project Final EIS (BLM 2002a).

2.3.10.8 Waste Management

Waste would be produced as a by-product of the copper leaching and beneficiation process. The potential waste produced and the associated management would include:

- **Spent Anodes and Lead Sludge**. Lead sludge forms as a corrosion layer on anodes and spalls off as flakes. The sludge would be collected and placed in sealed drums for shipment to a lead recycler or lead anode manufacturer. Newmont estimates that approximately 15,000 pounds per year (or approximately 60 drums per year) would be collected and shipped for recycling.
- **Crud Solids**. Crud is a stable mixture of fines and process solutions that would be returned to the heap where it would be re-leached. The crud may return to the leach pad via the raffinate stream or hauled in solid form from the treatment system for placement on the leach pad.
- **Montmorillonite Clay (clean organic/crud)**. This clay would be returned to the heap, via the raffinate stream or hauled in solid form, where it would be re-leached.

Non-hazardous solid wastes currently are, and would continue to be, disposed of in the existing authorized Phoenix Mine Class III waivered landfill located in Section 27, T31N, R43E. Non-hazardous solid waste that is not disposed in the on-site landfill would be transported to the Battle Mountain municipal landfill for disposal.

2.3.10.9 Spill Prevention and Emergency Response

An Emergency Response Plan (Newmont 2010a) has been prepared to address potential spills or other possible incidents involving hazardous materials. The annual amounts of the primary reagents for the proposed leach pads and beneficiation process are identified in **Table 2.3-5**. The Phoenix Mine Emergency Response Plan has been modified to incorporate specific concerns regarding the proposed copper leaching and SX-EW facilities.

Table 2.3-5 Reagents and Supplies Required for the Phoenix Copper Leach Project

Material	Use Location	Estimated Annual Usage	Normal Delivery Format	Storage Method	Waste Disposal	Delivery State	Primary Hazard Designation	Amount Per Load
Sulfuric Acid	Leaching, SX-EW	162,000 tons	Tank Truck	Tanks	Consumed in process	Liquid	Corrosive	40,000 lbs.
Copper Extractant	SX	25,000 gal.	LIBC Totes	Totes	Consumed in process	Liquid	Toxic/ flammable	265 gal.
SX Diluent	SX	225,000 gal.	Tank Truck	Tanks	Consumed in process	Liquid	Combustible	10,000 gal.
Cobalt Sulfate Solution	EW	31,000 lbs.	LIBC Totes	Totes	Consumed in process	Liquid	Toxic	3,300 lbs.
FC-1100 Surfactant	EW	100 gal.	Drums	Drums	Consumed in process	Liquid	Toxic	2 drums
Guar Gum	EW	5,000 lbs.	Paper Bags	Covered pallets	Consumed in process	Solid	Flammable	5,000 lbs.
Montmorillonite Clay	SX	20,000 lbs.	Paper Bags	Pallets	Heap leach	Solid	Toxic	20,000 lbs.
Anthracite Carbon	SX	40,000 lbs.	Paper Bags	Pallets	Heap leach	Solid	Irritant	2,000 lbs.

Source: Newmont 2010a.

The Oil Pollution Act of 1990 and amendments established requirements for Spill Prevention, Control, and Countermeasure (SPCC) plans. The SPCC rule has requirements for oil spill prevention, preparedness, and response to prevent oil discharges to navigable waters and adjoining shorelines (jurisdictional waters). Although no jurisdictional waters are present within the current or proposed project boundary, SPCC plans are available for the Phoenix Mine in accordance with 40 CFR 112. In addition, the SPCC rule does not apply to non-petroleum substances. Newmont has developed the Emergency Response Plan to provide for spill reporting and containment of the hazardous substances and petroleum that would be stored and used at the mine.

2.4 Reclamation

This section of the Proposed Action description is excerpted from the Phoenix Mine Reclamation Plan (Newmont 2010a).

2.4.1 Proposed Reclamation Objectives and Schedule

Newmont's primary objectives for post-mining reclamation of disturbances are to:

- Ensure public safety;
- Reduce or eliminate potential environmental impacts;
- Return the site to a condition that would support land uses similar to those that existed prior to the onset of mining activities. These previous land uses include livestock grazing, wildlife habitat, recreation, and mineral exploration and development;
- Control the introduction and spread of noxious weed and invasive species;
- Control infiltration, erosion, sedimentation, and related degradation of existing drainages in an effort to minimize off-site impacts; and
- Employ reclamation practices using proven methods that do not require ongoing maintenance.

With these objectives in mind, reclamation activities are designed to:

- Stabilize mine-related disturbance areas to a safe condition; and
- Protect both disturbed and undisturbed areas from unnecessary or undue degradation.

The reclamation schedule for the proposed project is presented in **Table 2.4-1**. The proposed schedule for reclamation activities is based on Newmont's plan to conduct concurrent reclamation during the Proposed Action's operations. Although the Reclamation Cost Estimate (RCE) is based on the assumption that the reclamation would be conducted by a third-party contractor once all disturbance has been completed, the actual amount of required reclamation at any time during the proposed project operation would be much less than assumed in the proposed reclamation plan. Phased reclamation plans would be submitted to the NDEP and BLM reflecting actual disturbance and reclamation activities.

The reclamation schedule assumes that closure would begin after active leaching has ceased and includes activities associated with process fluid stabilization (PFS). The estimated time for PFS at the HLFs is 5 years.

Regrading, cover placement, revegetation, and fluid stabilization would be accomplished as each facility is no longer needed for operations. It is anticipated that each project component would be monitored for successful revegetation for a period of 5 years following the completion of reclamation.

Table 2.4-1 Reclamation Schedule

Name	Year	1				2				3				4				5				6				7				8				9 to 13			
	Qtr	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Copper Heap Leach Pads																																					
Recirculation		■	■	■	■	■	■	■	■	■																											
Active Evaporation		■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■																			
Evaporation Pond Conversion[1]																			■	■																	
Regrading														■	■	■	■	■	■	■	■	■	■	■	■												
Cover Placement																	■	■	■	■	■	■	■	■	■	■	■	■	■								
Revegetation																			■	■			■	■	■		■	■	■		■	■	■				
Vegetation Monitoring																							■	■	■		■	■	■		■	■	■		■	■	■
Copper Process Ponds[2]																																					
Liner Cutting and Folding		■	■																																		
Earthwork				■																																	
Revegetation					■																																
Vegetation Monitoring						■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■												
Copper Process Facilities[3]																																					
Demolition		■																																			
Earthwork			■																																		
Revegetation				■																																	
Vegetation Monitoring					■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■												

[1] Active E-pond monitoring would be conducted during operations; regarding, cover placement, revegetation, and vegetation monitoring would be conducted upon E-pond closure.

[2] Raffinate pond only; all other process ponds would be converted to open E-ponds. Following the closure and revegetation of converted and new E-ponds, vegetation monitoring would be conducted quarterly within the growing season.

[3] Includes SX-EW Facility and Acid Storage Area.

Source: Newmont 2010a.

2.4.2 Revegetation Practices

Seeding activities would be conducted during the fall (October or November) and spring (March or April) seasons, when moisture is most prevalent in the region. The most favorable seeding conditions include the presence of a light snow cover, such that seedbed preparation and seed application incorporate the available moisture and soil conditions associated with the snow cover.

Project facilities would be reclaimed using a combination of revegetation practices that promotes the establishment of diverse plant communities and soil cover stability. These revegetation practices have proven successful in the reclamation program conducted at Newmont's Copper Basin Mine, located approximately 7 miles north of the project area. Newmont would continue to evaluate and refine growth media management and revegetation practices to support reclamation and revegetation efforts for all proposed project facilities through the use of revegetation trials and test plot programs. Evaluation of revegetation practices would include trials and test plots in which seed mixtures, growth media, growth media amendments, and seeding techniques would be evaluated. In addition, a program for monitoring of reclamation would be conducted concurrently with Phoenix mining activities, which would provide valuable feedback for future revegetation activities.

Protection of reclaimed areas from livestock grazing by perimeter fencing would be provided during revegetation and active reclamation operations. The fencing would consist of BLM-approved four-strand range fence construction along the periphery of specific sites. These fences would be installed prior to, or concurrent with, the start up of mining and related operations. Perimeter fences would remain in place and be maintained until applicable reclamation standards have been satisfied. Access to reclaimed areas by wildlife would not be restricted.

2.4.2.1 Growth Media Management

Substantial portions of the proposed facilities (e.g., leach pads, ponds, and haul roads) would be located on land previously disturbed by current and past mining and beneficiation operations. Due to previous disturbances, potential natural growth media volumes are limited. In areas where natural growth media conditions are favorable and the growth media can be removed safely, natural growth media would be salvaged and transported to either concurrent reclamation projects or stockpiled for future reclamation use. The stockpile areas would be regraded and seeded following redistribution of the salvaged natural growth media.

Due to the limited volume of natural growth media in the project area, Newmont would rely on alluvium mined from borrow areas in the currently permitted South OUA or the proposed Section 5 OUA to satisfy requirements for facility reclamation caps. Approximately 55 to 65 MT of such material would be required to place facility caps for the Phoenix Mine including the Proposed Action as defined in the Reclamation Plan. As described in the WRMP (Newmont 2008a), approximately 90 MT of capping material (consisting of approximately 33 MT of non-potentially acid generating material and 57 MT of alluvium) has been identified that could be used without the need for neutralizing amendments.

Based on the area and assumed depths ranging from 12 to 15 feet, the South and Section 5 OUAs are capable of providing up to 16 MT of alluvium for reclamation capping. The application of alluvium for facility capping has proven successful at the Copper Basin Mine (Newmont 2010b).

Stockpiled natural growth media would be stabilized by seeding with a certified weed free sterile rye. Seeding would be conducted in the fall of the year in which the stockpile is completed. Alternative stabilization technologies could include chemical stabilization using a biodegradable soil stabilizer. A chemical soil stabilizer would be used only after Newmont has received approval from the BLM and NDEP, in consultation with the NDOW. Chemical stabilization could be conducted once the stockpile was completed or as natural growth media was extracted from the stockpile. Stockpiles would be identified with signs.

2.4.2.2 Seed Mix

Newmont would use a certified weed free seed mixture during interim and final reclamation stages. **Table 2.4-2** lists the proposed seed mix and application rates for revegetation of land disturbances associated with the Proposed Action. The proposed seed mix and application rates could be subject to modification as a result of ongoing reclamation monitoring and refinement of the reclamation program, information obtained from test plots to be established once the proposed project has been initiated, or due to the lack of availability of any single seed species during a given year. Modifications to the proposed seed mix would only be made after consultation with, and approval by, the appropriate agencies.

Table 2.4-2 Reclamation Seed Mix

Scientific Name	Common Name	Application Rate[1] (pounds pure-live-seed per acre)
Grasses		
Bouteloua gracilis	Blue grama	2
Elymus elymoides	Bottlebrush squirreltail	1
Elymus trachycaulus	Slender wheatgrass	1
Leymus cinereus	Great Basin wildrye	2
Oryzopsis hymenoides	Indian ricegrass	2
Sporobolus airoides	Alkali sacaton	1
Forbs		
Sphaeralcea coccinea	Scarlet globemallow	0.25
Linum perenne	Blue flax	2
Melilotus officinalis	Yellow sweet clover	1
Achillea spp.	Yarrow	0.25
Shrubs		
Atriplex canescens	Fourwing saltbush	2
Atriplex confertifolia	Shadscale saltbush	2
Picrothamnus desertorum	Bud sage	2
Ceratoides lanata	Winterfat	1
Total		**19.5**

[1] Broadcast seed application rates would be 1.5 times the drill seed application rates.

[2] Early contemporaneous revegetation would be monitored, and the final seed mix would be evaluated and modified depending on monitoring results.

Source: Newmont 2010a.

The proposed seed mix was developed to accommodate the precipitation and physical conditions existing at the lower elevations (below 5,500 feet above mean sea level [amsl]) of the Phoenix Mine area, including the potential disturbance areas of the Proposed Action. The proposed seed mix is primarily composed of species native to the region, with limited introduced species that may provide interim soil stability. The seed mix contains a mixture of grasses, forbs, and shrubs to provide the

re-establishment of a diverse plant community within the reclaimed areas with a range of soil types. Proposed revegetation species are drought and saline tolerant, promote ET of soil moisture, and would provide forage for livestock and wildlife.

2.4.2.3 Seeding Techniques

Seeding may be accomplished using various methods and equipment depending upon topographic features and soil conditions. Slopes that are shallow enough to allow safe equipment access would be seeded by conventional agricultural methods such as broadcast seeding or drill seeding. For steeper slopes (slopes steeper than 3H:1V), conventional agricultural methods, in combination with hydro seeding techniques, would be used.

Broadcast seeding methods would be conducted using farm tractors fitted with hydraulic ripping mechanisms, such as dam- and diker-type equipment fitted with fargo seed boxes, or by other conventional broadcast methods, such as tractor-hand seeding or hand-cyclone seeding. Where seed is placed with broadcast methods, placement would include harrowing or other seedbed preparation such as shallow ripping, dozer tracking, raking, or chaining techniques to incorporate seeds into the soil surface.

2.4.2.4 Seedbed Amendments

Representative growth media and substrate would be evaluated for pH, nitrogen, phosphorus, and potassium levels prior to seeding to determine if seedbed amendments are necessary. Amendments would be composed of either natural organic materials or inorganic supplements designed to be incorporated into the seedbed substrate to enhance nutrient content and microbial populations. Amendments may include organic and inorganic fertilizers, livestock waste, or mulches, as appropriate.

2.4.2.5 Noxious Weed and Invasive Species Control

A Noxious Weed Inventory and Risk Assessment for the Phoenix Mine was prepared by Environmental Management Associates, Inc. (EMA 1999a). The report identified a limited number of existing noxious weed populations in the project area, and proposed cultural, mechanical, biological, and chemical methods for controlling these populations. The field inventory survey was based on the “Nevada Noxious Weed List,” as developed and maintained by the Nevada Department of Agriculture.” A noxious weed monitoring and control program currently is, and would continue to be, implemented at the Phoenix Mine site for existing and proposed facilities (EMA 1999a; Newmont 2011b).

2.4.2.6 Revegetation Release Criteria

Pursuant to the requirements of Nevada Administrative Code (NAC) 519A and the “Nevada Guidelines for Successful Revegetation for the NDEP, BLM, and USFS” (09/03/98), Newmont may request partial release of its reclamation surety. This request would be made when permit requirements for a discrete portion of a disturbance have been fulfilled, or when permit requirements for a discrete activity have been fulfilled.

To meet the surety release requirements of NAC 519A and the Nevada revegetation guidelines, Newmont would establish Reclaimed Desired Plant Communities (RDPCs) based on the designated post-mining land use. An RDPC is defined as:

> *“A perennial plant community established on a disturbed site which contributes to stability through management and land treatment, and which produces that type and amount of vegetation necessary to meet or exceed both the land use and activity plan objective established for the site.”*

In accordance with reclamation permit stipulations, Newmont would select RDPCs depending upon the reclamation goals and variable site characteristics of the reclaimed disturbances. Major alterations to the

reclaimed mine site and soils, and their effect on the site potential for revegetation, would be considered in selecting the RDPCs based on the following methods:

- Select existing vegetation types around the mine site to represent the varied RDPCs;
- Use test plots, demonstration areas, or areas concurrently reclaimed within the mine site or within similar representative areas from adjacent mines to serve as the RDPCs as long as they meet the reclamation goal; and
- For areas where existing vegetative types adjacent to the mine site are severely disturbed or where test plots or demonstration areas are not reasonable alternatives, RDPCs may be selected using appropriate ecological or range site descriptions or other technical sources.

Selection of the RDPCs and revegetation criteria would be coordinated with the NDEP and BLM in accordance with reclamation permit conditions.

Revegetation for purposes of surety release would be considered complete once revegetation has been established to one of the following levels as determined by the BLM and NDEP and following not less than five complete growing seasons:

- Perennial vegetative cover is as close as possible to 100 percent of selected comparison areas;
- Perennial vegetative cover is as close as possible to 100 percent of the ecological or range site description cover; or
- Revegetation criteria established in the reclamation permit have been achieved.

Data collection for the first method would be conducted using permanent transects established to measure cover with the RDPC. Foliar and basal cover would be determined by the line intercept method. For the second method, cover would be determined by the line intercept method and compared to the ecological or range site description. Evaluation of the various revegetated areas would be conducted during active growing seasons, and revegetation success may first be evaluated during the third full growing season after revegetation was conducted.

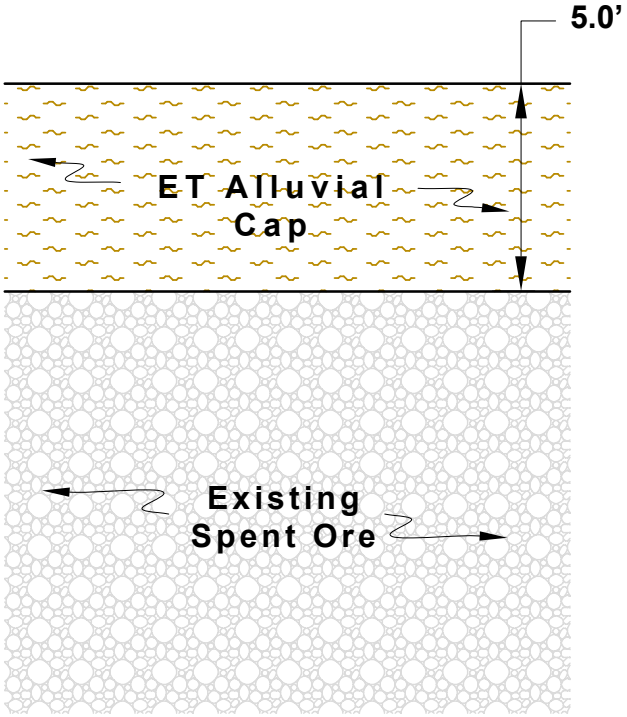
2.4.3 Facility Reclamation

2.4.3.1 Heap Leach Facilities

Heap Leach Pads

Heap slopes would be recontoured to a final slope of 3H:1V and the top of the heaps would be sloped or crowned as necessary to prevent surface ponding. Recontouring of the heaps would be completed with a fleet of dozers. Based on current understanding and developing closure technologies and research, the heap leach pads would be covered with either a 5-foot engineered ET alluvial cap (Closure Option 1) or a synthetic liner with ET alluvial cap (Closure Option 2). The closure options proposed are designed to prevent meteoric infiltration from contacting any soluble solids, the result of project closure, that remain in the closed E-ponds. Cross-sections of these closure options 1 and 2 are shown in **Figures 2.4-1** and **2.4-2**, respectively. The equipment required for cover placement would be dependent on the chosen cover option. Under Option 1, a scraper/dozer fleet would be used for placement of the engineered ET alluvial cap. The alluvial cap material would be obtained from stockpiles located in Sections 5 and 8, T30N, R43E.

The Option 2 cover system would consist of covering the regraded spent heap surface with a 6-inch layer of bedding material (finer grained sand/gravel to prevent puncturing of geomembrane), placing a 60 mil double textured HDPE geomembrane over the bedding layer, and covering the geomembrane with 3.5 feet of an ET alluvial cap. The conceptual plan for subsurface drainage is to construct a network



Engineered Alluvial Cover

Phoenix Copper Leach Project

Figure 2.4-1

Phoenix Copper Heap Leach Pad Closure Option 1

Source: Newmont 2011a.

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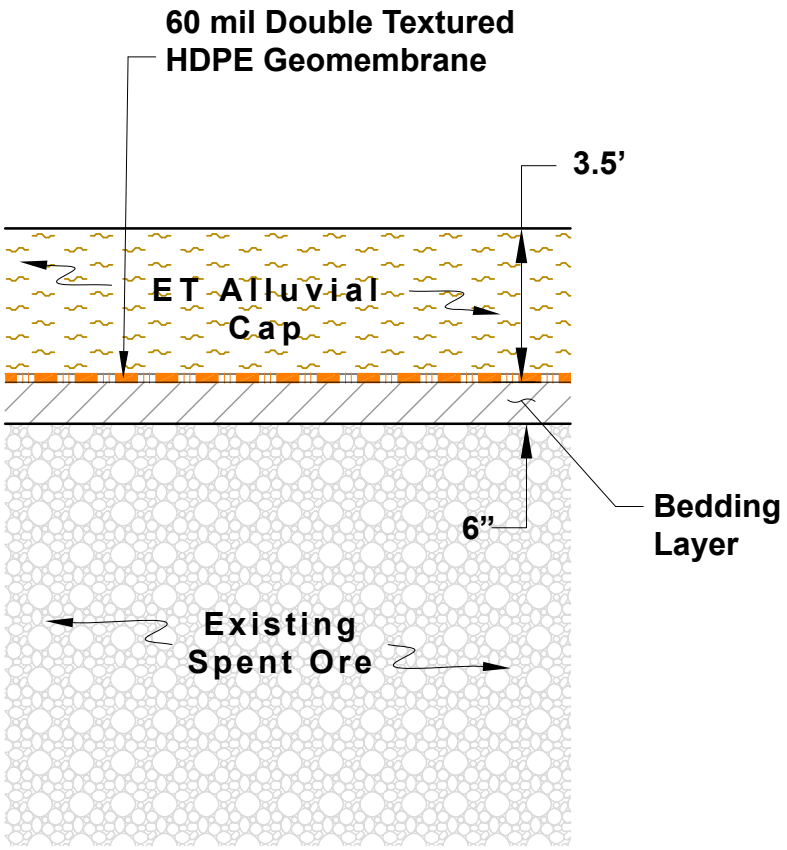


Engineered Synthetic Liner Plus ET Alluvial Cap

Phoenix Copper Leach Project

Figure 2.4-2

Phoenix Copper Heap Leach Pad Closure Option 2

Source: Newmont 2011a.

06/28/11

of drainage pathways consisting of gravel approximately 1-foot-thick underlying 2.5 feet of alluvial cap. The drain pathways would be constructed across the slope and tie into drop down channels (drainages formed within the valleys or swales) constructed every 500 to 1,000 feet (on centers) such that infiltration through the alluvial cap could be collected and routed off the heap. The drainage layer would consist of gravel that would have permeability typically two times in magnitude greater than the alluvial cap material. The alluvial cap material would consist primarily of the silty gravels that are abundantly available within close proximity to the project (**Figure 2.4-2**). The placement of bedding material, drainage material, and growth media would be completed with a scraper /dozer fleet. The drainage material and growth media would be obtained from stockpiles in Sections 5 and 8, T30N, R43E.

The dual textured HDPE geomembrane cover system would incorporate a non-plastic bedding layer and granular growth media below and above the geomembrane, respectively. This type of textured geomembrane is geotechnically stable at slopes of 3H:1V or shallower when placed in accordance with technical specifications (to be developed during final design of the cover). Typical factors of safety for slope stability exceed 1.3 under both unsaturated and saturated conditions and experience only minor permanent deformation (<12 inches) under the influence of EISmic events. This factor of safety and maximum deformation meet or exceed general design standards for heap leach facilities. The textured geomembrane will be secured in anchor trenches placed on 15-foot-wide benches every 50 vertical feet, which allows for easier constructability and serviceability along with reducing the propensity of long-term creep, or soil movement. In addition, subsurface drains are included at this conceptual level to more efficiently drain and route seepage water from the cover system.

Under either closure option, the heaps would be seeded following placement of the selected cover. For Option 1, the seed mix for the heap leach pads would include plants with root depths that do not exceed 5 feet to prevent uptake of precipitates and/or metals that may remain in the heap material. Under Option 2, the seed mix would include plants with root depths that do not exceed the thickness of the growth media placed over the liner system. Reclamation of the heaps also would include draindown tasks associated with PFS (see Section 2.4.3.3).

The final heap cover design (i.e., alluvial cap or synthetic liner with alluvial cap) would function as an element in the protection of water quality. The alluvial cap would store infiltrated water during the dormant season so that it would be available for plant uptake during the growing season. The alluvial cap also would serve as growth media and would assist in revegetation of the reclaimed heaps. The final design for the cover system would be based in part on modeling of both cover options to determine the effectiveness of each cover system. Based on the modeling and other analysis conducted prior to final closure, Newmont may utilize either cover option or determine that another thickness, or cover design, is appropriate. If an alternate cover design is found to be appropriate, Newmont would gain approval for this alternate cover from the NDEP and BLM prior to construction or incorporation in the reclamation plan.

Process Ponds

Impoundments associated with the proposed project would include the lined ponds used to manage process solution. This category includes the synthetically lined ponds associated with the heaps and other solution management facilities, both for process and non-process solutions. Specifically, the raffinate pond, heap leach process solution ponds, and events ponds planned for the proposed project. Capacities and liner areas for each pond are summarized in **Table 2.4-3**. Reclamation of the process ponds would consist of removing the pond liner and backfilling the pond with alluvial material; or converting the ponds to open E-ponds to manage long-term draindown from the heaps.

Reclamation activities for the raffinate pond would include cutting and folding the liner, backfilling the pond to the approximate pre-mining topography, and seeding the surface of the backfilled pond. The liner would be folded and cut with a two-person labor crew and 345B excavator. Prior to cutting the liner, any sludge would be characterized and, if appropriate, removed for disposal on the top of the heap. The pond would be backfilled by a dozer using material adjacent to the pond. The surface would not be

ripped, as the newly backfilled pond would not be significantly compacted. Fencing around, and bird netting over, the pond would be removed after the pond has been reclaimed.

The remaining five process ponds would be converted to open E-ponds, which would be used for long-term draindown management from the heaps. Long-term fluid management and the use of these ponds to facilitate closure are discussed in Section 2.4.3.3. Eight-foot-high chain-link fencing would remain in place around the five process ponds to preclude cattle grazing, wildlife, or public access. Bird netting would remain in place until closure of the open E-ponds is completed.

Additional open E-ponds would be constructed to aid in management of the long-term draindown. Each pond would be constructed, operated, and closed in a similar manner, as discussed in Section 2.4.3.3.

2.4.3.2 Evaporation Pond Design and Construction

This section describes how the general arrangement of process ponds would be altered as part of the reclamation process. Detailed design of the open E-ponds would be completed no less than 2 years prior to closure of the leach pads. The proposed plan would convert four ponds at the Phoenix Copper HLF and one pond at the Reona Copper HLF into open E-ponds. Based on the projected draindown curves modeled with Heap Leach Draindown Estimator (HLDE) and the estimated draindown leachate water quality (JBR Environmental Consultants, Inc. [JBR] 2011a) an additional 33 E-ponds would be required for managing draindown and closure of the Phoenix Copper HLF under Option 1; and 28 additional E-ponds under Option 2 (**Figures 2.4-3** and **2.4-4**). Five additional E-ponds would be needed for draindown and closure of the Reona Copper HLF under Option 1: and four additional E-ponds would be required under Option 2 (**Figures 2.4-5** and **2.4-6**). Additional E-ponds associated with the Phoenix Copper HLF would be constructed south of the proposed process ponds in the permitted South OUA. Additional E-ponds associated with the Reona Copper HLF would be constructed south of the proposed PLS pond in the permitted Reona HLF (Gold). The raffinate pond would not be converted to an E-pond.

Each of the five process ponds, along with any additional future open E-ponds, would be equipped with the following features, described in top-down order. The construction order generally would be the reverse.

- A solution distribution pipe network system;
- A 2-foot layer of alluvial material used to protect the liner from solar damage; and
- A double-liner system with leak detection.

<u>Solution Channel and Distribution Pipe</u>

As indicated above, regrading of the heaps would involve flattening the slopes from a 2.5H:1V incline to a 3H:1V incline. The heaps would be pushed further out at the toe by using material excavated from upper portions of the heaps. This will cover a significant portion of the operational solution channels with spent heap. Consequently, the geomembrane liners will be buried and remain intact under the channels. The Phoenix heap leach pad solution channel would be backfilled from the heap leach pad to a point immediately upgradient from where the channel splits between the Phoenix PLS and sediment ponds. The Reona heap leach pad solution channel would be backfilled to a point immediately upgradient from where the channel empties into the Reona PLS Pond. Draindown from the pads would be conveyed via the piping array installed during operation.

During reclamation, tie-ins and valve arrangements would be installed in the Phoenix heap leach pad distribution line to allow for solution distribution to all four ponds. The valve arrangement would allow simultaneous flow to any combination of the four ponds, or if necessary, it allows for the temporary exclusion of flow to any of the ponds. Additional E-ponds also would be connected to the piping distribution system. All pipelines conveying draindown solution would be dual-contained, pursuant to NDEP WPCP NEV87061.

Solution Distribution System

The solution distribution system would be used to allocate draindown from the heaps across the bottom of the ponds to minimize erosion of the alluvial material covering the liner. The larger diameter solution pipes leading from the solution channel to each respective pond would connect to a smaller diameter pipe at the ponds. Once the smaller pipe is over containment on the E-ponds, it would be transitioned to a perforated pipe. The perforated pipe would be located on the slope on top of the alluvial liner protection and have a cap at the end to force water out of the perforations. The perforated pipe would lie on top of a wear sheet, such as a piece of HDPE liner anchored into the alluvium, to prevent erosion of the alluvial material from the flow from the pipe. The perforated pipe would be located at one end of the pond on the slope to allow the pond to fill with precipitates while allowing flow to exit from the pipe without an operator manipulating the pipe layout as the pond fills with precipitates.

Liner Protection

To facilitate management and prevent degradation of the liner system due to solar radiation, the liner in the open E-ponds would be covered with a layer of geonet followed by 2 feet of selected alluvial material. The alluvial material would be obtained from the material stockpiled during the excavation of the E-ponds. Although the material would not be screened prior to placement, large rocks would be removed to prevent damage to the liner. Properties of the open E-ponds are provided in **Table 2.4-3**. **Figure 2.4-7** illustrates a typical cross-section of an open E-pond during operation and closure phases.

Sand and Gravel Generation, Stockpiling, and Placement

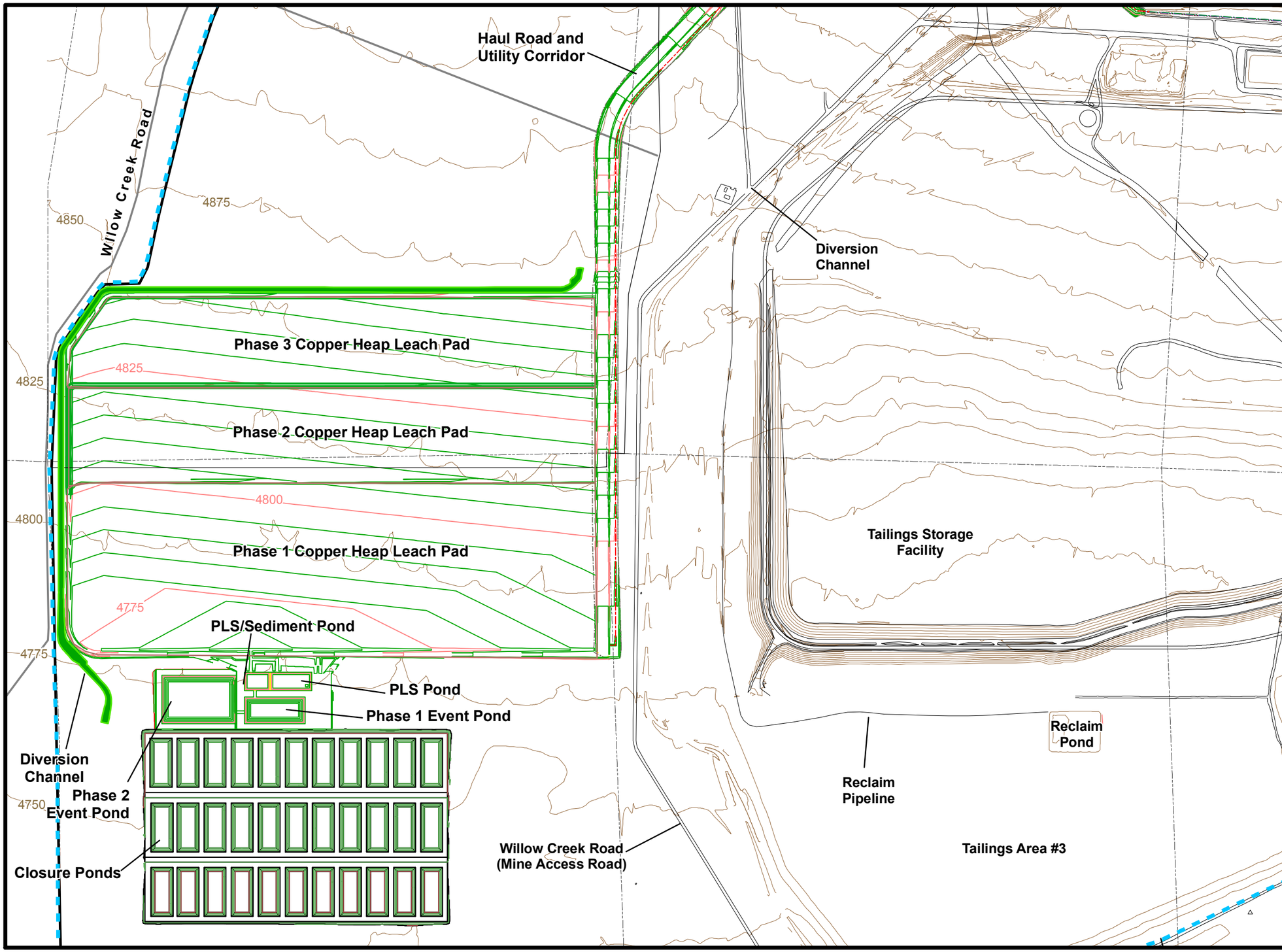
Sand and gravel necessary for construction of the additional open E-ponds would be obtained by screening alluvial material contained within approved areas of disturbance near the leach pads or from the areas where the additional ponds are excavated. The screened material may be used for the prepared base layer below the liner system or as the alluvial material, which lies over the liner system. During E-pond construction, this material would be hauled from the stockpile to the point of placement, spread, leveled, and nominally compacted to prevent differential settlement. Placement procedures would be developed as a method specification under the guidance of the engineer performing the detailed E-pond design as part of the Final Permanent Closure Plan.

2.4.3.3 Management of Residual Draindown and Heap Closure

Once active leaching is no longer economically practical, closure of the Phoenix and Reona copper heap leach pads would begin. Closure of the heap leach pads would occur in three phases: active evaporation and recirculation (Phase 1); active evaporation (Phase 2); and passive evaporation (Phase 3).

Phase 1

Once the active leaching has ceased, evaporators would be placed on the top of the heaps for solution recirculation and active evaporation. Active evaporation would occur on the top of the heaps. Evaporators would be relocated on the heaps on a regular basis to prevent surface ponding. At that time, the previous evaporation area would be ripped to break up any precipitates. The period of solution recirculation and active evaporation is expected to take 2-plus years for the Phoenix heap leach pad (0.5 year for the Reona heap leach pad) based on the projected draindown curve modeled using HLDE. Wildlife protection measures (e.g., 8-foot-high chain-link fence and bird netting) identified for the process ponds would remain in place, as necessary, during this stage. Bird netting also would be installed over areas of ponding on the leach pad to preclude bird access to process solution, as needed.



Legend

- Proposed POO Boundary
- Proposed Fenceline
- Existing Ground Surface (Feet)
- Proposed Ground Surface Contour
- Existing Roads

Source: Newmont 2011a.

N W E S

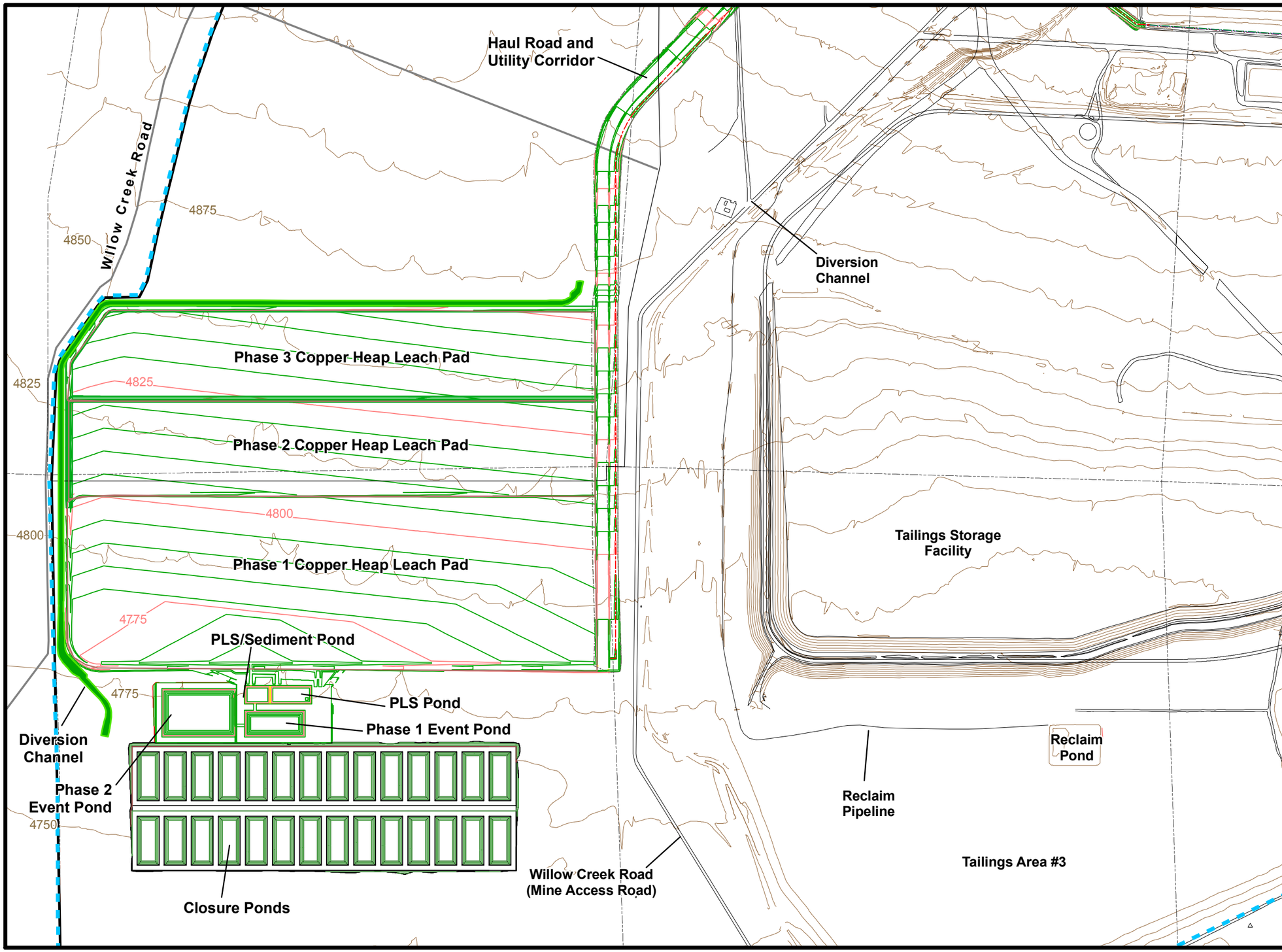
0 520 1,040 Feet

Phoenix Copper Leach Project

Figure 2.4-3

Phoenix Copper Heap Leach Facility Closure Ponds Option 1

08/22/2011



Legend

- Proposed POO Boundary
- Proposed Fenceline
- Existing Ground Surface (Feet)
- Proposed Ground Surface Contour
- Existing Roads

Source: Newmont 2011a.

N W E S

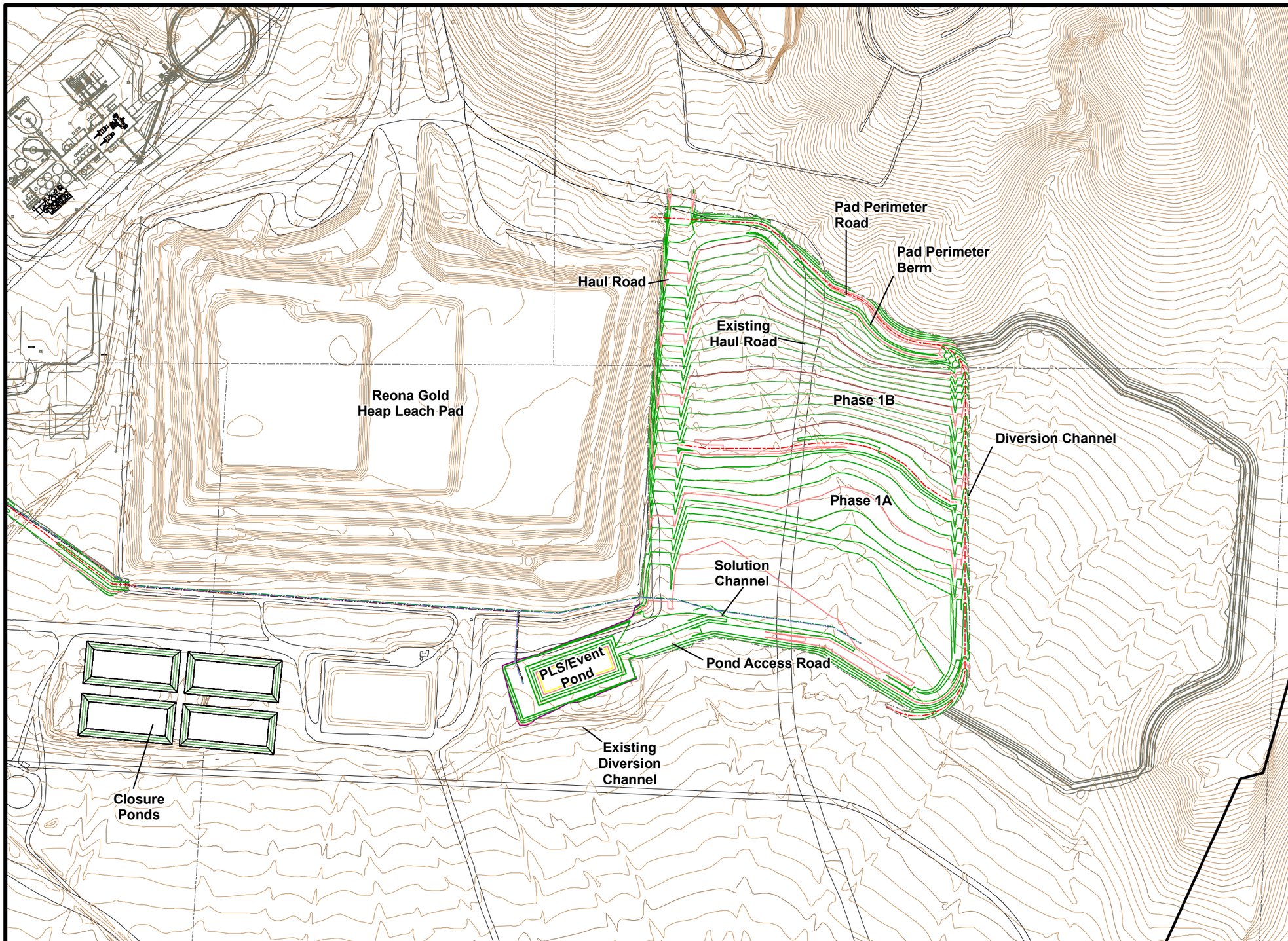
0 500 1,000 Feet

Phoenix Copper Leach Project

Figure 2.4-4

Phoenix Copper Heap Leach Facility Closure Ponds Option 2

08/22/2011



Legend

- Proposed POO Boundary
- Existing Ground Surface
- Proposed Ground Surface Contour
- Existing Roads

Source: Newmont 2011a.

N W E S

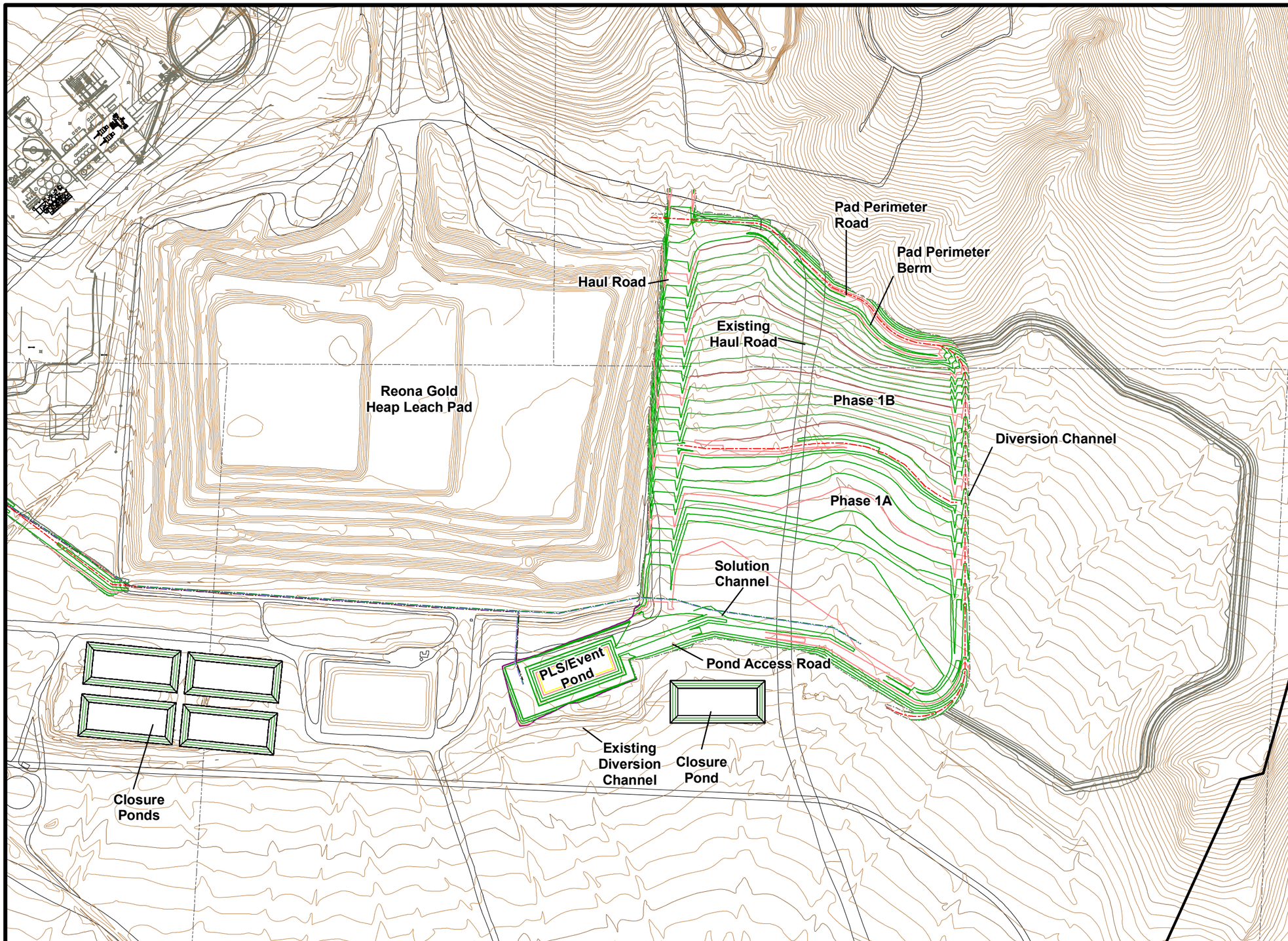
0 350 700 Feet

Phoenix Copper Leach Project

Figure 2.4-5

Reona Copper Heap Leach Facility Closure Ponds – Option 1

08/23/2011



Legend

- Proposed POO Boundary
- Existing Ground Surface
- Proposed Ground Surface Contour
- Existing Roads

Source: Newmont 2011a.

N W E S

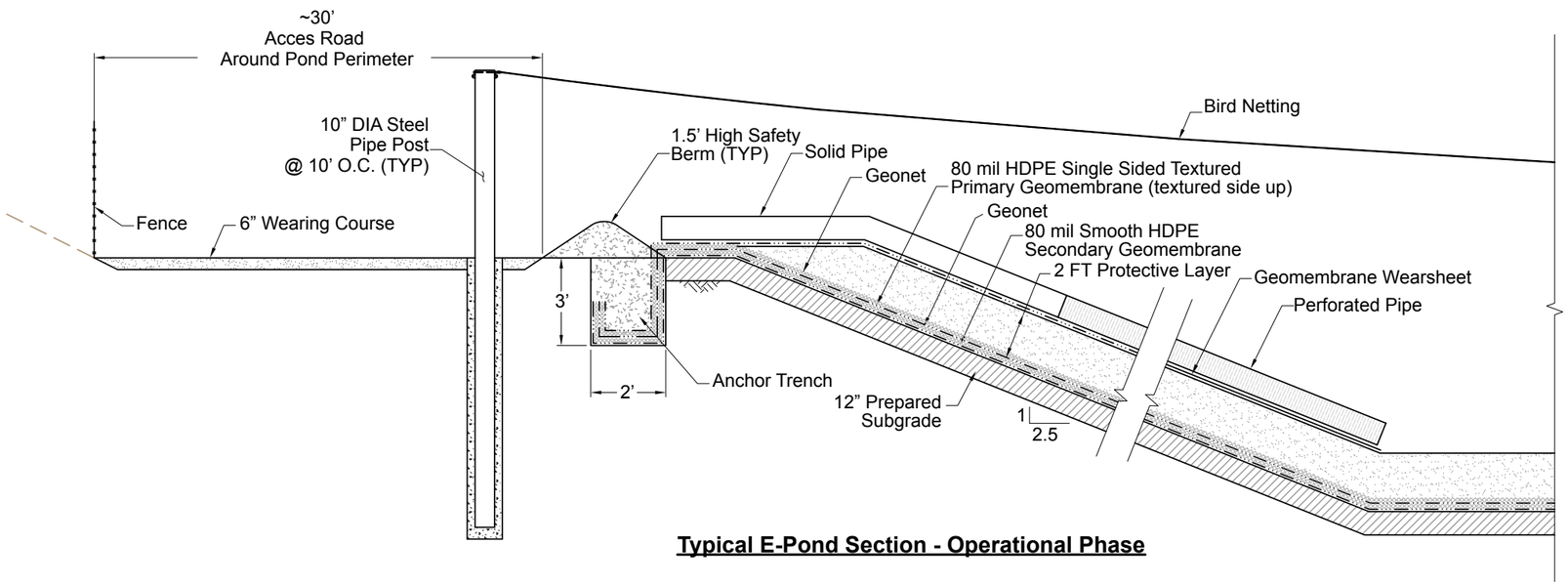
0 350 700 Feet

Phoenix Copper Leach Project

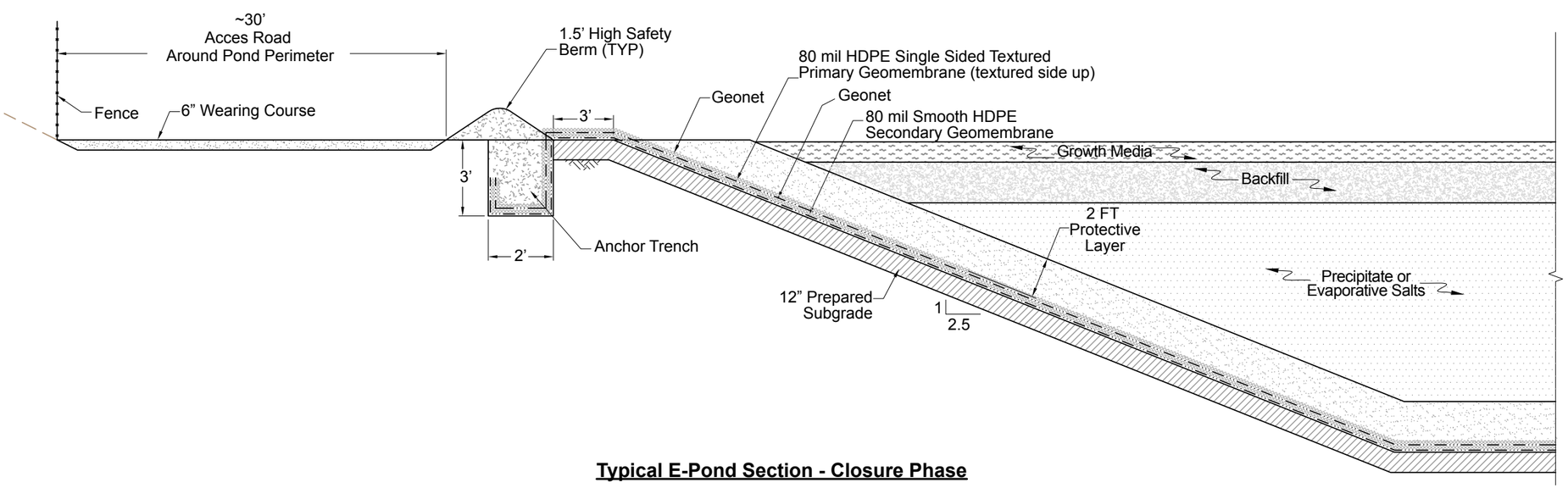
Figure 2.4-6

Reona Copper Heap Leach Facility Closure Ponds – Option 2

08/23/2011



Typical E-Pond Section - Operational Phase



Typical E-Pond Section - Closure Phase

Note: Not to scale.
Source: Newmont 2011a.

Phoenix Copper Leach Project

Figure 2.4-7

Typical Evaporation Pond Cross-section

Table 2.4-3 Open Evaporation Pond Parameters

Parameter	Phoenix Copper HLF				Reona Copper HLF	Additional Open Evaporation Ponds[1,2]
	Sediment Pond	PLS Pond	Phase 1 Event Pond	Phase 2 Event Pond	PLS and Event Pond	Closure Options 1 and 2
Surface area (square feet)	40,800	66,300	162,000	350,400	85,500	98,700
Storage capacity (million gal)	20	6.6	19.9	52.2	6.1	10
Alluvial Material thickness (feet)	2	2	2	2	2	2
Approximate Storage Depth (feet)	13	15	28	28	16	13

[1] Represents the surface area, capacity, and storage depth for each individual E-Pond.

[2] Configurations of the Phoenix and Reona Copper Heap Leach Facility E-ponds for options 1 and 2 are illustrated in **Figures 2.4-3** through **2.4-6**.

Source: Newmont 2010a.

Phase 2

Active evaporation would continue on top of the heaps until draindown from the heaps has been reduced to an average flow rate of approximately 15 gpm from the Phoenix heap (2 gpm from the Reona heap). Bird netting would be installed over areas of ponding on the leach pad to preclude bird access to process solution, as needed. Conversion of the process ponds to open E-ponds would occur shortly before draindown reaches these average threshold flow rates. Eight-foot-high chain-link fencing around the perimeter of the E-ponds and bird netting over the E-ponds would remain intact to minimize exposure of wildlife to process solution. Newmont would begin to cover the Phoenix and Reona heaps with the selected cover system and apply the reclamation seed mix. Data from other Newmont sites (Copper Basin Reclamation Project), past studies (AMEC Earth and Environmental, Inc. [AMEC] 2009), and proposed cover studies would be used to determine which cover option would be selected for the heaps. This phase is expected to take 2 years for the Phoenix heap leach pad (1 year for the Reona heap leach pad).

Phase 3

After conversion of the process ponds to E-ponds has been completed (four ponds at the Phoenix Copper HLF and one pond at the Reona Copper HLF), evaporative equipment would be removed from the heaps and the remaining portions of the unreclaimed heaps would be covered with the selected cover system and seeded. Residual draindown flow would be routed to the E-ponds; and flow would be alternated among E-ponds as necessary to allow for proper maintenance and to prevent the ponds from overtopping as the precipitates build up in the ponds. After ponds fill with precipitates (approximately 2/3 full), material would be allowed to dry sufficiently to support equipment, covered with 5 feet of alluvial material and growth media would be obtained from stockpiles near the ponds. New E-ponds would be constructed as necessary to manage long-term draindown. New ponds would be fenced and bird netting would be installed to preclude wildlife access to process solution. New ponds would have a typical design which would be 470 feet wide, 210 feet long, and 15 feet deep with 2.5H:1V side slopes. Each

new E-pond would be constructed with a double-lined leak detection system. Monitoring and sampling of the draindown would continue during the closure of the heaps as per the WPCP NEV0087061.

Monitoring and Maintenance

The ultimate amount of precipitates that could be stored in the Phoenix Copper HLF E-ponds (assuming that 2/3 of the open volume in the pond is filled with precipitates) is expected to be 4.1 MT under both options 1 and 2. The ultimate amount of precipitates that could be stored in the Reona Copper HLF E-ponds (assuming that 2/3 of the open volume in the pond is filled with precipitates) is expected to be 35.2 thousand tons (kt). Each new evaporation pond is expected to hold 44.4 kt of precipitates. Precipitates that may form in the evaporation ponds include: gypsum; epsomite; and small amounts of alunite, cryolite, gibbsite, and goethite (Geomega 2010). A study was conducted by Geomega to determine the aggregate loading of salts and minerals in the E-pond precipitates due to heap closure (Geomega 2011). The results of this study are presented in **Appendix A**. Since the precipitate volume is expected to exceed the capacity of the initial converted E-ponds, and in order to maintain proper function, the E-ponds would be monitored weekly, through closure, for buildup of excess precipitates.

For both options 1 and 2, the effluent from the heap leach facilities would be managed by evaporation from the E-ponds once the flow rates reaches 15 gpm for the Phoenix Copper HLF and 2 gpm for the Reona Copper HLF. These flow rates are predicted to gradually reduce overtime in response to the cover design and reclamation. The draindown over the initial 30 years was estimated using the HLDE spreadsheet model (JBR 2011a). The HLDE model is designed to estimate draindown curves for HLFs and is used as a tool by the BLM and NDEP for bond calculations (BLM 2011).

Under Option 1, the flow rates are predicted to reduce to approximately 10.3 gpm for the Phoenix Copper HLF and 1.2 gpm for the Reona Copper HLF after 30 years. Under Option 2, the flow rates are predicted to reduce to approximately 8.7 gpm for the Phoenix Copper HLF and 0.9 gpm for the Reona Copper HLF after 30 years. For the purpose of estimating the E-pond storage and reclamation requirements, the flow rates at 30 years were assumed to remain constant over the initial 500 year closure period (JBR 2011a). These long term flow estimates are conservative since the flow rates are predicted to continue to decline after 30 years prior to reaching a final steady state flow rate (AMEC 2011b). (A summary of the estimated long-term steady state flow rates for options 1 and 2 is provided in Section 3.2.2.1, Water Resources and Geochemistry.)

For Option 1, with the assumed chemistry of the leachate and estimated draindown flow rates, the initial E-ponds (i.e., converted process ponds) would reach their full designed precipitate storage capacity at approximately 86 years for the Phoenix Copper HLF E-ponds and 53 years for the Reona Copper HLF E-ponds (JBR 2011a). New E-ponds would be constructed before each prior E-pond reaches its design precipitate storage capacity. A preliminary estimate of the time frame for the new E-pond construction is included in **Table 2.4-4**. Assuming that both the leachate chemistry and 30-year flow rates remain constant in the future, each subsequent E-pond would reach full capacity after an estimated 13 years for the Phoenix Copper HLF, and after 111 years for the Reona Copper HLF.

Under Option 2, the initial E-ponds (i.e., converted process ponds) would reach their full designed precipitate storage capacity at approximately 86 years for the Phoenix Copper HLF E-ponds and 53 years for the Reona Copper HLF E-ponds (JBR 2011a). Each new E-pond constructed during the closure phase would reach full capacity after an estimated 15 years for the Phoenix Copper HLF, and after 149 years for the Reona Copper HLF.

The estimated rate of accumulation of precipitates was calculated using the maximum total dissolved solid (TDS) value (153,000 milligrams per liter [mg/L]) for the Duval-era Phoenix HLF draindown chemistry data set provided in Gemega 2010. The Duval-era Phoenix HLF was operated as a copper HLF on the Phoenix Mine site in the vicinity of the existing Philadelphia Canyon WRF from the mid 1960s to 1984. The Duval-era Phoenix HLF considered an analog for estimating the leachate chemistry from the proposed new copper HLFs (JBR 2011a). The mineral phase assumed for the rate of

precipitate accumulation was based on modeling conducted by Geomega (2010). The modeling showed that several mineral phases would precipitate from the process solution during evaporation. The modeling indicated the primary mineral phases would be gypsum and epsomite. Since epsomite has a greater specific gravity (1.7 kilograms per liter or 2,664.5 pounds per cubic yard), it was selected for use in the precipitate volume calculations to represent a more conservative outcome. The epsomite specific gravity was used to calculate the amount of precipitates which would form over time depending on the heap leach draindown rate over time.

Table 2.4-4 Preliminary Evaporation Pond Construction Schedule

Closure Option	Leach Pad Facility	Years of New E-pond Construction at Closure Phase
Option 1	Phoenix	86, 99, 112, 125, 138, 151, 164, 177, 190, 203, 216, 229, 242, 255, 269, 282, 295, 308, 321, 334, 347, 360, 373, 386, 399, 412, 425, 438, 451, 462, 477, 490, 503
	Reona	53, 164, 276, 386, 497
Option 2	Phoenix	86, 101, 116, 131, 146, 161, 176, 191, 206, 221, 236, 251, 266, 281, 296, 311, 326, 341, 356, 371, 386, 401, 416, 431, 446, 461, 476, 491
	Reona	53, 202, 351, 500

Source: JBR 2011a.

Once the mineral precipitation results in filling the E-pond to its design storage capacity each E-pond would be reclaimed by placement of 5 feet of alluvial material and 2 feet of growth media. The cover materials would be obtained from stockpiles created during construction of the ponds. The growth media would be graded to shed meteoric water to reduce infiltration. Prior to reclamation, the precipitates would be allowed to dry sufficiently to support equipment. The 7-foot cover and growth media thickness, along with selective planting of vegetation with root depths less than 5 feet would preclude the uptake of the precipitates by the vegetation on the reclaimed ponds.

In order to minimize impacts to wildlife species from the exposure to precipitate in the E-ponds, Newmont has committed to: 1) installing and maintaining fencing around and bird netting across E-ponds to prevent wildlife access to the ponds until reclamation is complete; and 2) submitting quarterly reports to the BLM and NDOW on wildlife mortalities. If wildlife mortalities are identified within or near the evaporation ponds, Newmont would immediately contact the NDOW, as required under the IAPPs, and the BLM to determine appropriate mitigation (see Section 2.5.4).

During active operation, Newmont would conduct representative long-term column leach tests on ore in addition to NDEP WPCP sampling. The goal of these tests would be to collect data to be used in the development of a Final Permanent Closure Plan for the proposed facilities. Data to be collected includes, but is not limited to, composite samples for Meteoric Water Mobility Procedures; Acid Base Accounting; and the NDEP's Profile II analysis. Data would be submitted on an annual basis for the NDEP's review.

2.4.3.4 Minimization of Erosion and Sediment Transport

Erosion control and control of sediment transport during and subsequent to reclamation would be accomplished by implementation of the following measures, or other appropriate BLM-approved BMPs:

- Revegetation of disturbed sites;
- Construction of diversion ditches, both permanent and temporary when needed, to divert storm water away from reclaimed sites;
- Installation of silt fences or straw bale dams in areas requiring sediment control; and
- Installation of riprap in erosion-prone areas of ditches and channels.

During operations, Newmont would employ BMPs, as needed, to control sediment transport from active areas. In accordance with Nevada regulations, specific methods for sediment control and details of areas where BMPs may be employed would be outlined in a Storm Water Pollution Prevention Plan (SWPPP). The revised plan would be submitted to the NDEP, Bureau of Water Pollution Control as part of the Storm Water Discharge Permit application process.

Reclaimed areas would be seeded as soon as practicable to minimize the potential for erosion of bare slopes. The seed mix that would be used during reclamation is presented in **Table 2.4-2**.

During reclamation the operational storm water controls would be left in place until no longer needed. Additional controls, primarily consisting of BMPs such as straw bales, sediment retention ponds, mulch or fiber mats, and riprap would be used to control loading of sediment to surface waters, as needed.

Where feasible and appropriate to the type of disturbance, reclamation would include recontouring or shaping to blend with surrounding topography. This mimicking of the natural topography would serve to minimize loading of sediment to surface waters after reclamation.

2.4.3.5 Borrow Areas, OUA, and Utility Corridor, and Yards

The Section 15/16 Borrow Area, Section 5 OUA, utility corridor, and yards would be regraded, as needed, prior to reseeding.

2.4.3.6 Roads

A caterpillar 345B or equivalent excavator would recontour roads to, or near, pre-disturbance topography. A dozer would rip the running surface of roads in order to loosen compacted material. Culverts would be removed and pre-existing, natural drainages would be re-established. No growth media would be added during reclamation since the original (pre-construction) surface material and fill material would be salvaged and available during reclamation. During recontouring, these near-surface materials, with the original growth media would be placed at or near the recontoured surface, prior to reseeding.

2.4.3.7 Buildings and Equipment

Buildings would be demolished and removed from the foundations. The foundations would be broken up and buried under 5 feet of alluvial cover material, and seeded. Facilities to be demolished include the SX-EW and Acid Tank Storage Area.

Salvageable building materials, as well as salvageable material from inside buildings such as tanks, scrap metal, and machinery would be removed from the mine site. Non-salvageable material would be disposed in an appropriate, permitted landfill. Non-permanent structures such as trailers and rolling stock would be removed from the mine site; storage tanks would be demolished.

2.4.3.8 Miscellaneous

Non-hazardous or non-toxic materials such as scrap lumber or metal would be disposed of in a State approved Class III waivered landfill.

Reagents, petroleum products, solvents, and other hazardous or toxic materials would be disposed of according to federal and state regulations.

Equipment including transformers, pumps, generators, fencing, etc. would be salvaged and utilized or disposed of in an appropriate manner. Power lines and power poles owned by Newmont would be removed and salvaged or disposed of in the Class III waivered landfills.

Equipment that contained process solutions including pumps, piping, tanks, and facilities would be cleaned and disposed of or reused in an appropriate manner. The equipment cleaning process would be determined by Newmont in accordance with applicable regulations.

Where accessible, pipes would be removed for reuse or taken to the landfill. Pipes not accessible would be capped/plugged in place and buried with a minimum of 2 feet of cover. Structural building materials would be recycled or hauled to the on-site landfills or to a permitted off-site landfill. Facilities to be demolished include solution storage tanks and a septic system. The septic systems/leach fields would be closed according to state regulations.

2.4.3.9 Surface Facilities that Would Not be Subject to Reclamation

Surface facilities that may not be reclaimed include surface water controls, portions of some roads, and buildings or structures that may have commercial or industrial uses following mining activities. Surface water control structures such as channels and retention ponds may be left un-reclaimed to provide for control of storm water in the post-reclamation period. It is possible that some facilities on private lands, when compatible with the post-mining land uses, would be left in place. It is anticipated that these facilities would consist of buildings that could be used by Newmont to support industrial or commercial use of these lands after closure and reclamation. For purposes of this reclamation plan, however, it is assumed that all other buildings and structures on public land and on private land owned by Newmont would be reclaimed.

2.4.3.10 Description of Well Abandonment Procedures

Holes to be abandoned include monitor wells, production wells, and water supply and dewatering wells. Exploration drill holes are not included because all exploration holes are abandoned immediately after completion and there are no existing un-plugged exploration wells. Such wells are covered under a separate plan. Fifteen monitor wells (2-inch-diameter), one production well (24-inch-diameter), and two water supply/dewatering wells (8-inch-diameter) would be abandoned during the reclamation phase of the proposed project. Abandonment of wells would include removal of pumps, pipe, and electrical cable; perforating casing when present; and plugging of holes in accordance with NAC Chapter 534. Revegetation of disturbed areas near drill holes would be accomplished when roads and other areas have been reclaimed.

2.4.4 Reclamation Cost Estimate

Newmont proposes the use of phased bonding for the proposed Project. Upon approval of the incremental costs for the Project, the current Phoenix Mine RCE would be amended to incorporate the approved costs. The amended RCE would be submitted to the BLM and NDEP for review and approval. A bond for the approved phased amount would be posted prior to initiating project construction.

As part of the periodic review of the RCE, where a deficiency is identified in the adequacy of the funds to meet future reclamation obligations, the BLM district/field manager would take necessary actions, including, but not limited to, issuing a decision to revise the reclamation costs to reflect current reclamation obligations.

2.4.5 Long-term Funding Mechanism

Pursuant to the Guidelines for Establishing a Long-term Funding Mechanism, the BLM has determined that a long-term funding mechanism would be required for post-reclamation obligations (including long-term monitoring and potential mitigation) associated with the closure process of the Phoenix copper HLFs. As identified within Section 2.4.3, Facility Reclamation, and the amended POO, the following closure details would be incorporated into the cost estimate for the long-term funding mechanism:

- Periodic monitoring and maintenance and/or replacement of fencing around and bird netting over each E-pond;
- Scheduled inspection and repairs (as required) of E-pond liner and solution distribution system;
- Management of the residual draindown associated within the three phase heap leach pad closure process;
- Monitoring and sampling of the draindown E-pond capacity;
- Closure of the open E-ponds (once full of precipitates) by covering with alluvial material, growth media, and revegetation;
- Construction of new E-ponds, including installation of a solution distribution pipe network system; a 2-foot layer of alluvial material used to protect the liner from solar damage; and a double-liner system with leak detection;
- Periodic maintenance of access roads;
- Groundwater monitoring and sampling as required by the NDEP for permanent closure; and
- Submittal of quarterly reports to the BLM and NDOW on wildlife mortalities associated with the E-ponds.

The administration of the Long-term Funding Mechanism (LTFM) will include scheduled reviews of the LTFM account balance, by the BLM and Newmont, to ensure that the balance is adequate to meet the projected operating requirements of the LTFM. Based on the review, the BLM will direct Newmont to make the appropriate adjustments to the LTFM fund balance to ensure the fund balance remains adequate to cover the operating requirements of the LTFM.

2.5 Applicant-committed Environmental Protection Measures

During construction and operation of the Phoenix Copper Leach Project, Newmont would implement applicant-committed environmental protection measures to mitigate potential impacts to air, land, water, wildlife, cultural resources, and human resources and to prevent undue or unnecessary degradation of the environment as part of the proposed project's standard operating procedures. Pre-development planning, pollution prevention measures, and pollution control measures and equipment would be used to reduce potential project-generated environmental impacts.

Proposed environmental protection measures applicable to the Proposed Action have been adopted from the Phoenix Mine POO, Phoenix Copper Leach Project Proposed Amendment (Newmont 2010a), Phoenix Project Final EIS (BLM 2002a), and the ROD and POO Approval, Phoenix Project (BLM 2003). These measures are identified below.

2.5.1 Water Resources

- To minimize impacts to water resources, the proposed copper leach facilities would be designed and operated as zero discharge facilities.
- To limit erosion and reduce sediment transport, BMPs (e.g., permanent and temporary diversion ditches, silt fences, riprap) would be installed as outlined in the SWPPP that would be prepared as part of the proposed project's NDEP Storm Water Discharge Permit.
- During operations, Newmont would conduct long-term column leach testing of representative samples of the copper ore placed on the copper HLFs to refine the estimates of the water quality of the leachate to be managed during the closure and post closure period. At a minimum, composite samples of the copper leach ore would be analyzed through the meteoric water mobility procedure, acid-base accounting (ABA), and NDEP's Profile II analysis. The effects of long-term leaching on ore properties such as particle size distribution, moisture contents, and hydraulic conductivity also would be evaluated to enable more precise modeling of heap draindown at closure. The results of the long-term column leach test would be provided to the BLM and NDEP on an annual basis. Resulting data would be used in the development of the Final Plan for Permanent Closure for the Phoenix Copper Leach Project facilities. The plan would be developed 2 years prior to closure of the HLFs pursuant to NDEP requirements (NAC 445A.430 through 445A.447).

2.5.2 Soils and Reclamation

- To minimize impacts to soils, vegetation, and wildlife habitat, project-related disturbance areas would be reclaimed in accordance with the Phoenix Mine Reclamation Plan, as amended for inclusion of the Phoenix Copper Leach Project (Newmont 2010a).
- Protection of reclaimed areas from livestock grazing would be provided by perimeter fencing (BLM-approved four-strand range fencing) installed prior to, or concurrent with, the start-up of operations. Perimeter fences would remain in place until applicable reclamation standards have been satisfied. Access to reclaimed areas by wildlife would not be restricted.

2.5.3 Vegetation

- To minimize the introduction and spread of noxious weeds and invasive species in project-related disturbance areas, Newmont would implement their Weed Management Plan, which outlines the following control measures: prevention techniques, noxious weed surveys, selective site sterilization, and annual spraying (Newmont 2011b).

2.5.4 Wildlife Resources

- Operators would be trained to monitor the mining and process areas for the presence of larger wildlife species (e.g., deer and pronghorn) as well as volant (e.g., bats, birds, etc.) and other terrestrial wildlife. Mortality information would be collected in accordance with the IAPP. Newmont would continue to operate in accordance with established wildlife protection policies that prohibit feeding or harassment of wildlife.
- Newmont would develop a wildlife monitoring plan to identify wildlife mortality in the project area and to report all mortalities. As part of this process, the top of the copper heap leach pads would be monitored daily for any substantial pooling of process solutions. Drip emitters on heap leach pads would be surface run and the heaps would be scarified to minimize ponding and pooling of the process solutions. If pooling does occur during active operations, Newmont would: 1) reduce solution application rates; 2) re-scarify the heap leach pad surface; and 3) place netting over any ponding to prevent wildlife access.

- In order to minimize impacts to wildlife species from the exposure to precipitate in the E-ponds, Newmont has committed to: 1) installing and maintaining fencing around, and bird netting across, E-ponds to minimize wildlife access to the ponds until reclamation is complete; and 2) submitting quarterly reports to the BLM and NDOW on wildlife mortalities. If wildlife mortalities are identified within or near the E-ponds, Newmont would immediately contact the NDOW, as required under the IAPPs, and the BLM to determine appropriate mitigation.
- Eight-foot-high chain-link fencing would be installed around the process ponds (including the raffinate pond) in accordance with the NDOW IAPP. Netting, pond covers, or floating “bird balls,” as appropriate, would be installed over ditches and ponds containing leach solutions to minimize potential impacts to volant and other terrestrial wildlife.
- The new transmission line segment (120 kV) and powerline segment (13.8 kV) would be designed and constructed in accordance with applicable guidelines to minimize raptor perching, nesting, electrocution, and collision potential. To minimize raptor perching and nesting, BLM-approved raptor deterring devices would be installed on horizontal cross bars. To minimize electrocution of raptor species attempting to perch on the lines, standard safe designs as outlined in Suggested Practice for Raptor Protection on Power Lines (Avian Power Line Interaction Committee [APLIC] 2006; APLIC and U.S. Fish and Wildlife Service [USFWS] 2005) would be incorporated, as applicable. To minimize collision potential for foraging raptors, standard safe designs as outlined in Mitigating Bird Collisions with Power Lines (APLIC 1994) would be incorporated, as applicable.
- If construction activities occur during the raptor nesting season (March 1 through July 31), a raptor survey, including, but not limited to, hawks, eagles, and burrowing owls, would be conducted, and appropriate mitigation measures (e.g., buffer zones around occupied nests) would be developed and implemented.
- To protect nesting birds, all ground-disturbing activities will be conducted outside the migratory bird nesting season (March 1-July 31). If ground-disturbing activities cannot be avoided during this time period, pre-construction nest surveys will be conducted by a BLM-approved biologist with the following guidelines: 1) surveys will cover all potential nesting habitat in and within 300 feet of the area to be disturbed; 2) surveys must be conducted between sunrise and 3 hours post-sunrise when birds are most active; 3) surface-disturbing activity must be conducted within 10 days of surveys or additional surveys may be required to "re-clear" the area; and 4) if active nests are detected, a no-disturbance buffer zone (as determined by the USFWS, NDOW, and BLM) will be established. Nest locations will be mapped and submitted to the BLM as needed. Survey protocols will be provided by the BLM to the approved biologist prior to survey initiation.
- Prior to the initiation of surface disturbance activities, pygmy rabbit surveys would be conducted through areas of suitable habitat, as determined by the BLM. If pygmy rabbit burrows are identified, the BLM and NDOW would be contacted to determine appropriate mitigation.

2.5.5 Cultural Resources

- The Archaeological Resources Protection Act (ARPA) codified at 43 CFR 7, as well as the Native American Graves Protection and Repatriation Act (NAGPRA) codified at 43 CFR 10, both provide protection for historic properties, cultural resources, and Native American funerary items and/or physical remains located on federal land. Additionally, ARPA provides for the assessment of criminal and/or civil penalties for damaging cultural resources. Any unplanned discovery of cultural resources, human remains, items of cultural patrimony, sacred objects, or funerary items requires that all activity in the vicinity of the find ceases, and notification be made to the Mount Lewis Field Office Field Manager by telephone (775-635-4000), with written confirmation to follow (50 Bastian Road, Battle Mountain, Nevada 89820), immediately upon such discovery. The location of the find should not be publically disclosed and any human remains must be secured and preserved in place until a notice to proceed (NTP) is issued by the Authorized Officer (AO).

- If previously unknown cultural resources are discovered during construction, all construction activities would cease within 300 feet of the discovery and the BLM AO would be notified of the find. Steps would be taken to protect the resource from vandalism or further damage until the BLM AO can evaluate the nature of the discovery. If the previously unidentified or unevaluated resources are determined eligible to the National Register of Historic Places (NRHP), impacts would be mitigated as outlined in the Programmatic Agreement (PA). Construction would not resume in the area of the discovery until the BLM AO has issued a NTP.

2.5.6 Air Resources

- Current fugitive dust control BMPs (e.g., water application on haul roads) would continue to be implemented. In addition, control equipment would continue to be installed, operated, and maintained in good working order. The training of employees to identify and minimize fugitive dust and point source emissions also would continue.
- Newmont would continue to ensure that the BLM receives copies of all air quality data and reports submitted to the State of Nevada. In addition, Newmont would continue to report annually to BLM on source-specific measures taken to control fugitive dust emissions and the effectiveness of those measures.

2.5.7 Visual Resources

- Wherever possible, the following measures would be incorporated into the operation and reclamation of the proposed project: 1) visually reduce the creation of linear and angular landform crests; 2) vary final lifts of the heap leach pads to create intermediate hummocks and hills; 3) vary interbench heights to reduce linear, equally spaced, terrace-like features; 4) flatten final slopes to 3H:1V; and 5) revegetate surfaces with diagonal patterns/mosaics of grasses and shrubs.
- New night lighting would be shielded and directed downward to comply with the International Dark Sky Association guidelines.

2.5.8 Hazardous Materials

Newmont would monitor for radionuclides in various process areas during active operations (Newmont 2010a). Quarterly testing for uranium and radium would occur at the following:

- Leached copper ore;
- Reona Copper Leach PLS/Events ponds solution;
- Phoenix Copper Leach pond solution;
- All groundwater monitoring wells for Reona and Phoenix Copper Leach; and
- Raffinate pond solution.

In addition, quarterly measurements of gamma radiation would be conducted at the EW plant, recharge strip outfall, and the tank farm sump.

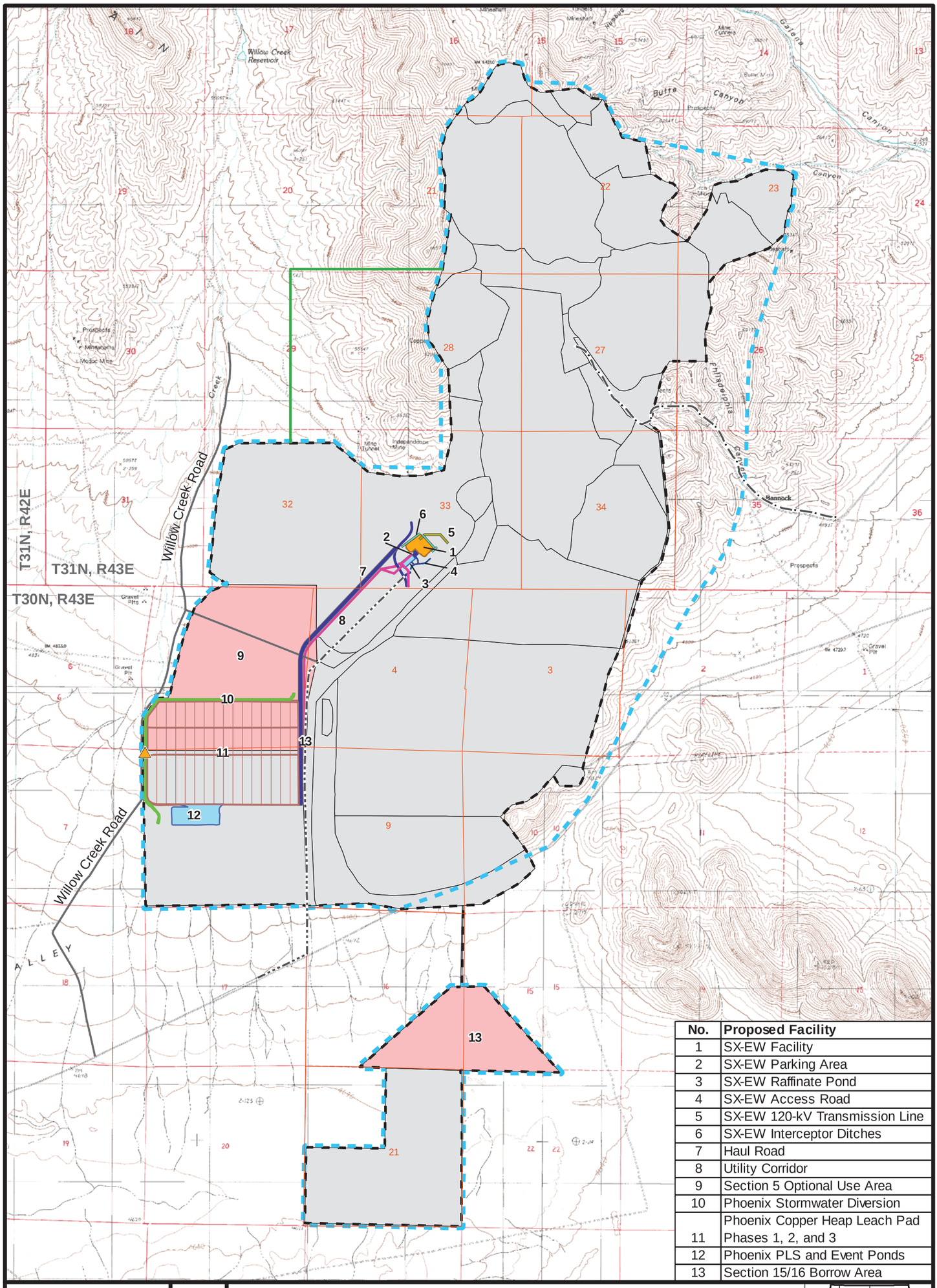
During closure operations, Newmont would (1) employ quarterly gamma meter monitoring of the open E-ponds when workers are performing regular monitoring and maintenance of the E-ponds; and (2) upon full closure of each E-pond, perform a one-time gamma meter measurement over the entire surface of the closed E-pond.

Monitoring results would be provided to the BLM on an annual basis. The monitoring would provide an indication if Technologically Enhanced, Naturally Occurring Radioactive Materials (TENORM) are being concentrated over time. No thresholds of radioactivity are proposed, but if monitoring shows an increase

of radioactivity, Newmont would consult with the appropriate regulatory agencies including the NDEP, USEPA, or MSHA with regard to measures that can be taken to ensure protection of the environment and worker safety.

2.6 Reona Copper Heap Leach Facility Elimination Alternative

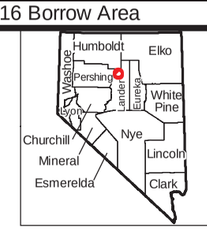
Under the Reona Copper HLF Elimination Alternative, the proposed Reona Copper HLF and associated infrastructure (e.g., solution pipelines between the proposed SX-EW Facility and the Reona Copper HLF, and PLS and event pond) would not be developed (**Figure 2.6-1**). The 58 acres of proposed disturbance within the Reona heap leach pad area would continue to be utilized as a cyanide HLF, as permitted under the Phoenix Final EIS (BLM 2002a).The 8 MT of ore, planned for the Reona Copper HLF, would be mined as waste and not processed for copper leaching. All other facilities would be the same as discussed for the Proposed Action.



No.	Proposed Facility
1	SX-EW Facility
2	SX-EW Parking Area
3	SX-EW Raffinate Pond
4	SX-EW Access Road
5	SX-EW 120-kV Transmission Line
6	SX-EW Interceptor Ditches
7	Haul Road
8	Utility Corridor
9	Section 5 Optional Use Area
10	Phoenix Stormwater Diversion
11	Phoenix Copper Heap Leach Pad Phases 1, 2, and 3
12	Phoenix PLS and Event Ponds
13	Section 15/16 Borrow Area

Legend

- Proposed POO Boundary
- Proposed Fenceline
- Reona POO Fenceline
- Proposed New Surface Disturbance
- SX-EW Facility
- Copper Heap Leach Pads
- PLS and Event Ponds
- Permitted Disturbance
- Buffalo Valley 120-kV Transmission Line
- Philadelphia Canyon 69-kV Transmission Line
- Haul Road
- Stormwater Diversion
- Pipeline Corridor
- Interceptor Ditch
- Transmission Line Corridor
- Proposed Production Well



N

0 0.5 1 Miles

Source: BLM 1994b; Newmont 2010a.

Phoenix Copper Leach Project

Figure 2.6-1

Reona Copper Heap Leach Facility Elimination Alternative

06/28/2011

2.7 Alternatives Considered but Eliminated from Detailed Analysis

This section of the EIS describes the alternatives previously considered but subsequently eliminated from detailed analysis by the BLM and the rationale for their elimination. The alternatives were considered relative to their means of addressing the identified purpose and need, their technological and economic feasibility, as well as their potential to address environmental issues and reduce potential impacts.

2.7.1 Alternative Process Options

2.7.1.1 Sulfidization Acidification Reneutralization Technology

With the Sulfidization Acidification Reneutralization Technology (SART) process, the copper heap leach pads would not be constructed. Alternately, the copper ore would be run through the mill and then chemically treated with sodium hydrosulfide to precipitate the copper. Under this alternative, the proposed Phoenix Copper HLF, Reona Copper HLF, Section 5 OUA, and Section 15/16 Borrow Area would not be constructed or developed; however, both the existing mill and tailings facility would need to be expanded to accommodate the SART process and resulting additional tailings material. The SART process only would be economically feasible if the ore had substantial gold and copper content. Based on the copper and gold content in the ore at the Phoenix Mine, this process would not be economically viable for the proposed project.

2.7.1.2 Copper Cementation

The historic plant originally located in the Phoenix Mine included the cementation process. Essentially, pit water from a working pit is run through wooden launders containing scrap iron. When the aqueous acidic copper solutions flow through the launders, copper precipitates on the iron and forms a silky red material that is 80 to 85 percent copper, depending on the quality of the iron scrap. The copper precipitate is then sent to a smelter. There is only one mine in the U.S. (in Montana) that currently operates the cementation process, with limited market for the resultant product. The potential use of this process for the proposed project was eliminated in favor of more modern and economically advantageous technology.

2.7.1.3 Copper Sulfate Production

A copper sulfate leach option was evaluated for the proposed project. It was determined that a heap leach pad still would be needed, although this option would eliminate the need for an EW plant; however, there is little market demand for copper sulfate, and a plant currently operating in Arizona produces quantities adequate to meet the available demand. Therefore, this alternative was eliminated from further consideration.

2.7.2 Alternative Plant Design

Newmont evaluated a number of alternate plant design options from an engineering perspective. These generally were not considered to have differing environmental consequences or advantages than the Proposed Action and, therefore, were not considered to be topics requiring detailed discussion in the EIS. Among the options considered were the following:

- Alternate EW design criteria
  - Anode/cathode spacing
  - Ultra high current densities
- Alternate SX layout
- Pulsed column technology

2.7.3 Alternative Facility Locations

2.7.3.1 Copper Heap Leach Pad Location Adjacent to the Reona Gold Heap Leach Pad

Initially, Newmont evaluated locating a single large copper heap leach pad adjacent to the existing Reona gold heap leach pad. Due to topographic physical constraints (i.e., land gradient that would require extensive grading), it was determined to be impractical to construct a single large heap leach pad at this location

The Phoenix copper heap leach pad location in Section 8 was selected, in part, because this area previously had been evaluated and permitted as a cyanide HLF as part of the Phoenix Project Final EIS (BLM 2002a). Under the Proposed Action, Phase 1 of the leach pad would be constructed to accommodate 55 MT of ore; however, the Phoenix copper heap leach pad has been designed to accommodate expansion into the Section 5 OUA for Phases 2 and 3 (if determined to be economically viable). Moving the heap leach pad further to the north was limited because of an existing gas line and gas transfer station.

2.7.3.2 SX-EW Plant Site Location (Closer to the Section 8 Phoenix Copper Leach Facility)

A summary of the evaluation of locations for the SX-EW facility is presented below; additional details are available in Newmont's Phoenix Copper SX-EW Project Site Location Study (SEI 2006).

A potential location for the SX-EW facility near the proposed Phoenix Copper HLF location was evaluated along with the proposed location near the current mill; however, the currently proposed location for this facility was selected based on the following primary factors:

- The SX-EW plant location in Section 33, T31N, R43E would be convenient to the existing infrastructure of the current mill, eliminating the need for separate infrastructure facilities;
- The location near the current mill site would provide the desired elevation differences in relation to the HLF to facilitate gravity flow of solutions;
- The proposed location would be centrally located between the proposed Reona and Phoenix copper HLFs;
- The proposed location would avoid interference with potential future expansion of the Phoenix copper HLF; and
- The proposed location would minimize new disturbance areas by using existing roads and pipeline corridors, where possible.

2.7.4 Alternative Raffinate Pond Cover

A summary of the evaluation of raffinate pond cover design options is presented below; additional details are available in Newmont's Raffinate Pond Cover Study (SEI 2008).

Raffinate ponds tend to accumulate an organic layer similar to kerosene on the pond surface. This oily layer poses a hazard to waterfowl or other birds landing on the pond. Use of floating plastic balls, hexagonal pads, or other materials on the surface to prevent bird access also would prevent or impair recovery of the organic liquids. One of the primary alternatives considered was placement of a sprung building over the top of the pond. This alternative was eliminated from further consideration due to the high cost of installation and maintenance in comparison to other viable alternatives. To minimize hazards to avian wildlife, Newmont has committed to installing bird netting over the raffinate pond (see Section 2.5.4, Wildlife Resources). In accordance with the IAPP from the NDOW, an 8-foot-high chain-link fence also would be installed around the pond to exclude terrestrial wildlife.

2.7.5 Alternative Phoenix Pad Configuration

Originally, the design criteria for the Phoenix copper heap leach pad was based on 120 to 180 days of primary leaching to put the leach system at the least risk from an operational perspective; however, based on this criterion, a substantial pad area would have been required. Newmont's design criteria for the proposed Phoenix copper heap leach pad maximizes the pad distance from Willow Creek while still providing sufficient pad area to provide for 90 days of primary leaching (plus 30 days of construction and 30 days of drain down), which is the minimum design criteria that would ensure satisfactory copper recovery. In addition, the leach pad would need sufficient capacity to accommodate 55 MT of ore. Although the pad configuration could be narrower in the east to west dimension and longer in the north to south dimension, that would force the initial pad (Phase 1) to encroach into the potential expansion area (for Phases 2 and 3) in the Section 5 OUA. This alternate configuration was eliminated from further consideration as there were no identified environmental advantages, and it would limit operational flexibility for potential future leaching of copper ore.

2.7.6 Borrow Area Elimination Alternative

The Borrow Area Elimination Alternative would consist of the elimination of Sections 15/16 Borrow Area resulting in approximately 254 fewer acres of disturbance. Under this alternative, borrow material for construction of the proposed copper heap leach pads would be obtained from the borrow area in Section 21. This alternative was eliminated from further consideration given that Newmont would require the use of the Sections 15/16 borrow material for the development of the Proposed Action.

2.8 Past, Present, and Reasonably Foreseeable Future Actions

Cumulative impacts are defined as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and RFFAs regardless of what agency (federal or non-federal) or person undertakes such other actions. Cumulative impacts can result from individually minor, but collectively significant actions taking place over a period of time" (40 CFR 1508.7). BLM IM NV-90-435 specifies that impacts first must be identified for the Proposed Action before cumulative impacts with interrelated actions can occur.

Interrelated projects and actions are defined for this EIS as those past and present actions and RFFAs that could interact with the Proposed Action in a manner that would result in cumulative impacts, resulting primarily from mining, commercial activities, and public uses. These projects and actions are identified in **Table 2.8-1**.

The geographic area for cumulative effects is determined by the type of resource potentially affected. **Figure 2.8-1** shows the distribution of the primary surface-disturbing actions throughout the cumulative effects study areas. The area of concern for cumulative effects varies by resource, with impacts for certain resources being restricted to the actual area of disturbance. Other resources, such as livestock and wildlife, may range over a wide area, and cumulative impacts could involve more than surface disturbance. Resource-specific cumulative effects study areas were developed for each resource, as appropriate, and are discussed in Chapter 3.0, Affected Environment and Environmental Consequences.

2.8.1 Past and Present Actions

The past and present projects and actions considered in the cumulative effects analysis and their associated acreage are presented in **Table 2.8-1**. Included in this category are the historic and ongoing projects and actions in the general vicinity of the proposed project.

Table 2.8-1 Surface Disturbance Associated with Past, Present, and Reasonably Foreseeable Future Actions

Action	Past and Present Approved Disturbance (acres)			RFFA Projected Disturbance (acres)	Total Approved/ Projected Disturbance (acres)	Operating Dates	Source
	Total Approved Disturbance (acres)	Remaining Disturbance (acres)	Reclaimed				
Mining and Milling Projects							
Argenta Mine and Mill (Baker-Hughes Plant)	200	200	0	0	200	Argenta Mine and Mill: 1943 to 1987; Baker-Hughes Plant 1987-present	1
Black Rock Canyon Mine	117	117	0	0	117	2004-present	2
Buffalo Valley Mine	167	65	102	1,500	1,667	Fairmile Gold 1983 to 2010; Newmont Gold 2010-present (6 to 8 years after approval)	3
Clipper Barite Mine (MILLC)	400	21	379	0	400	Closed	2
Copper Basin Mine	463	50	413	0	463	1990-1997	4
Copper Queen Mine/Copper King Mine	500	500	0	0	500	Early 1900s	1
Cortez Gold Mines - Hilltop Exploration POO	92	71	21	0	92	1996-present	5
Cortez Gold Mines - Gold Acres	881	389	492	50	931	1950-present	2
Cortez Gold Mines - Pipeline/South Pipeline	7,616	7,616	0	0	7,616	1996-present	2
Coral Gold Resources - Robertson Exploration POO	285	285	0	0	285	1986-present	2
Dean Mine (Cumberland Mine)	67	67	0	0	67	1987 to 1994	2
Elder Creek Mine*	143	0	143	0	143	1990-1998	2

Table 2.8-1 Surface Disturbance Associated with Past, Present, and Reasonably Foreseeable Future Actions

Action	Past and Present Approved Disturbance (acres)			RFFA Projected Disturbance (acres)	Total Approved/ Projected Disturbance (acres)	Operating Dates	Source
	Total Approved Disturbance (acres)	Remaining Disturbance (acres)	Reclaimed				
Greystone Barite Mine (MILLC)	242	242	0	0	242	1953-present	2
Independence Mine	25	25	0	UNK; awaiting new POO application from new leasee	25	Intermittent from 1938 to 1980; 1984 to 1987	3
Lone Tree Mine	4,223	3,207	1,016	0	4,223	1991-present	4
Marigold Mine	4,441	4,046	395	0	4,441	1988-present	5
May Turquoise Mine	1	1	0	0	1	2004-present	2
McCoy-Cove Mine	4,601	2,761	1,840	0	4,601	1986-2003	4
Mountain Springs Mine	114	0	114	0	114	1970s-1985	6
Mud Spring Gulch Mine	10	10	0	0	10	Inactive	2
Mule Canyon Mine	2,746	2,102	644	0	2,746	1996-2005	4
Phoenix Mine (including historic copper operations)	7,137	7,137	0	902	8,039	1967-present	4, 7, 8, 9
Sunshine Mine	40	40	0	0	40	1994-1998	4
Trenton Canyon Mine	2,485	1,867	618	0	2,485	1996-present	4
Utah Mine and Camp	6	6	0	0	6	Inactive	2
Subtotal	**37,002**	**30,825**	**6,177**	**2,452**	**39,454**	**N/A**	**N/A**

Table 2.8-1 Surface Disturbance Associated with Past, Present, and Reasonably Foreseeable Future Actions

Action	Past and Present Approved Disturbance (acres)			RFFA Projected Disturbance (acres)	Total Approved/ Projected Disturbance (acres)	Operating Dates	Source
	Total Approved Disturbance (acres)	Remaining Disturbance (acres)	Reclaimed				
Exploration (within Buffalo Valley and Lower Reese River Valley)							
Newmont Exploration	50	50	0	0	50	2002-present	10
Newmont Five Exploration Projects	150	150	0	0	150	1991-present	10
Newmont Buffalo Valley Exploration Area	290	190	100	0	290	2007-present	3
Cove-Helen Underground Exploration Project	0	0	0	400	400	2011 - 2015	3
Fire Creek Exploration	125	125	0	0	125	2005-present	3
Subtotal	**615**	**515**	**100**	**400**	**1,015**	**N/A**	**N/A**
Utilities/Community (within Buffalo Valley Cumulative Effects Study Area [CESA])							
Jersey Valley Geothermal Development Project	118	118	0	0	118	12/2010-present	3
County and Other Secondary Roads	566	566	0	0	566	Late 1800s to present	3
Interstate 80 (I-80)	1,067	1,067	0	0	1,067	1960s to present	3
Landfills	17	17	0	0	17	1990s to present	3
Material Sites	1,477	1,477	0	0	1,477	1980s to present	3
Other Public Land Authorizations	1,656	1,656	0	0	1,656	Various	3
State Highways (SHs)	1,442	1,442	0	0	1,442	1940s to present	3

Table 2.8-1 Surface Disturbance Associated with Past, Present, and Reasonably Foreseeable Future Actions

Action	Past and Present Approved Disturbance (acres)			RFFA Projected Disturbance (acres)	Total Approved/ Projected Disturbance (acres)	Operating Dates	Source
	Total Approved Disturbance (acres)	Remaining Disturbance (acres)	Reclaimed				
Utility Corridors	2,660	2,660	0	0	2,660	Various: 1950s to resent	3
Willow Creek County Road Relocation Right-of-Way Project	35	0	35	0	35	2010-present	11
Subtotal	**9,038**	**9,003**	**35**	**0**	**9,038**	**N/A**	**N/A**
Other Developments and Actions							
Coastal Chemical	15	15	0	0	15	1992-present	12
Sierra Chemical	2	2	0	0	2	1980s to present	12
Subtotal	**17**	**17**	**0**	**0**	**17**	**N/A**	**N/A**
Total	**46,672**	**40,360**	**6,312**	**2,852**	**49,524**	**N/A**	**N/A**

* Currently in closure phase.

Sources:

1 Acreages estimated from 1994 aerial photos.
2 BLM 2008d.
3 BLM 2008e.
4 Newmont 2008b.
5 Barrick Gold Corporation 2008, 2005.
6 BLM 2011a.
7 Newmont 2010a.
8 Current disturbed area as approved under the Phoenix Phase (PHS) 1B bond.
9 BLM 2010b.
10 Newmont 2011a.
11 BLM 2008c.
12 BLM 2002a.

2.8.1.1 Mining Actions

Mining constitutes a dominant land use in the project region and locally has been important throughout the past century. Mining activities considered in the cumulative effects analysis includes surface placer operations, underground mining, and open-pit mining at 25 mine locations (**Table 2.8-1**). The surface disturbance associated with these mining activities includes mine workings (adits, shafts, prospect pits); open pits; dredge deposits; waste rock piles; heap-leach pads; tailings ponds; and ore milling and other processing facilities.

2.8.1.2 Exploration Activities

A total of five exploration projects were considered in the cumulative effects analysis (**Table 2.8-1**). Exploration projects include typical surface disturbing activities such as drilling, trenching, drill pad construction, and road construction.

2.8.1.3 Non-mining Activities

Non-mining activities considered in the cumulative effects analysis include industrial activities such as a coal-fired power plant and various chemical plants producing ammonium nitrate, caustic soda, sulfuric and hydrochloric acids, and drilling fluids. Non-mining activities also include other public land authorizations such as gravel pits, utility corridors, and communication sites and roads. Non-mining activities also include local ranching and agricultural enterprises, as well as county road construction (**Table 2.8-1**).

2.8.2 Reasonably Foreseeable Future Actions

In order to qualify as a RFFA for the cumulative effects analysis, a project or action must impact the same resources as the Proposed Action, must occur within the life of the Proposed Action (including reclamation), and must have a reasonable likelihood of going forward. The RFFAs identified for this cumulative effects analysis are presented below.

2.8.2.1 Mining-related Actions

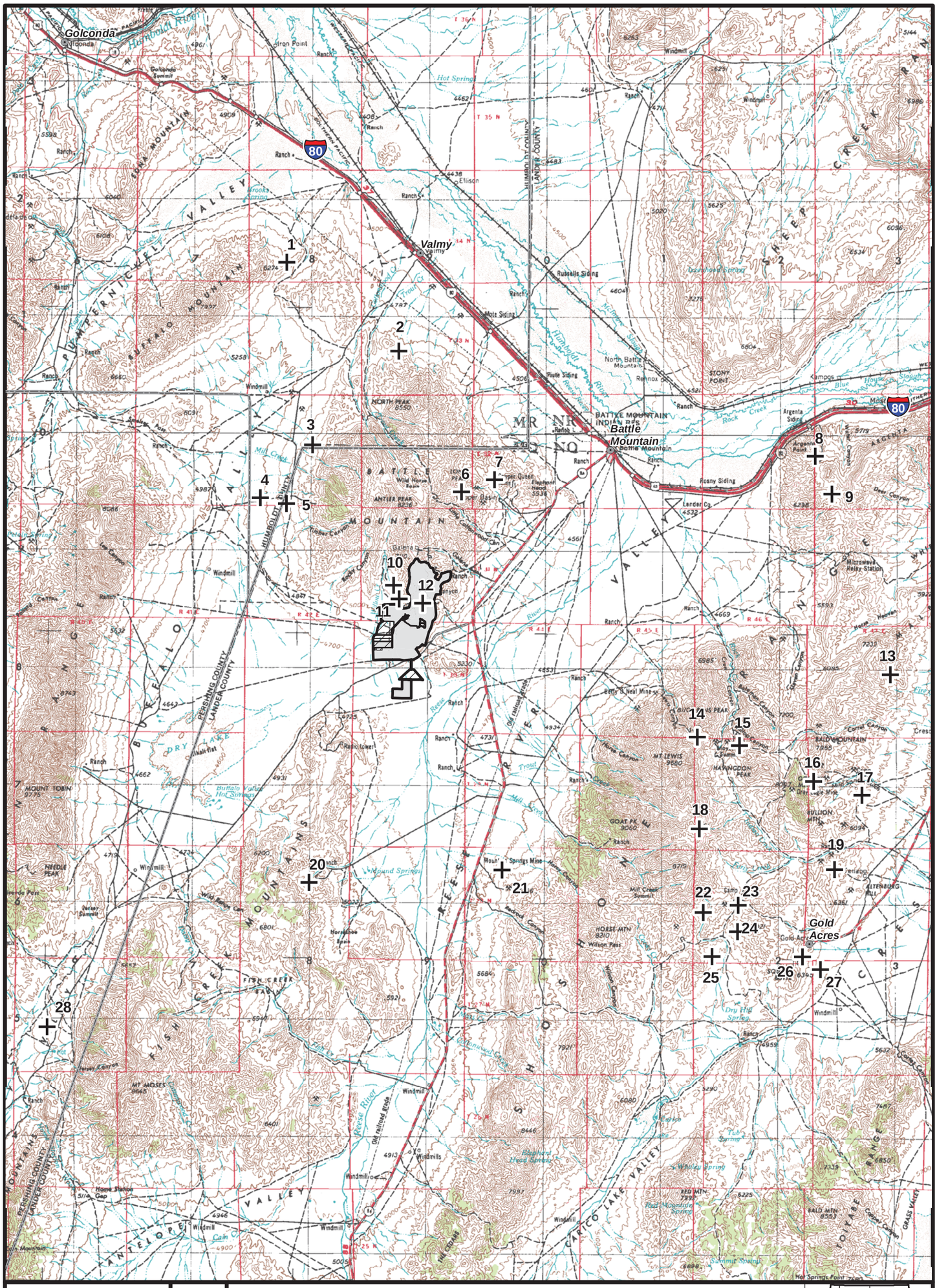
Reasonably foreseeable mining-related activities include potential expansion activities at two existing mines. The Cortez Gold Acres Mine could result in 50 acres of disturbance from open pit and underground mining operations. The Buffalo Valley Mine could include approximately 1,500 acres of disturbance from open pit and ore processing facilities (**Table 2.8-1**). These RFFA mining activities would be subject to future site-specific NEPA analyses.

2.8.2.2 Exploration-related Actions

Reasonably foreseeable exploration activities could occur at the Cove-Helen Mine located approximately 12 miles southwest of the Phoenix Mine. Exploration activities could result in the disturbance of approximately 400 acres from access road and drill pad construction and drilling activities (**Table 2.8-1**).

2.8.2.3 Other Development Actions

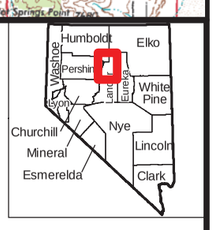
The BLM is not aware of any major foreseeable change in the type or level of activity at any of the industrial facilities described in Section 2.8.1.3. Livestock grazing is likely to continue as a principal land use in the Phoenix Copper Leach Project cumulative effects study area. The BLM conducted a Multiple Use Evaluation for the allotments within the jurisdiction of the Battle Mountain Field Office in 2005 and the current livestock stocking rates for the allotments reflect the results of this evaluation.



Legend

- Proposed POO Boundary
- Proposed Action
- Permitted Disturbance
- Proposed Action Linear Feature
- Past and Present Actions and RFFAs

1) Lone Tree Mine
2) Marigold Mine
3) Trenton Canyon Mine
4) Buffalo Valley Mine
5) Newmont Buffalo Valley Exploration Area
6) Copper Basin Mine
7) Copper Queen/King Mine
8) Argenta Mine and Mill
9) Mule Canyon Mine
10) Sunshine Mine
11) Independence Mine
12) Phoenix Mine/Newmont Exploration/ Newmont Five Exploration Projects
13) Fire Creek Exploration
14) Dean Mine
15) Hilltop Exploration Mine
16) Mud Spring Gulch Mine
17) Black Rock Canyon Mine
18) May Turquoise Mine
19) Robertson Exploration Mine
20) McCoy-Cove Mine/ Cove-Helen Underground Exploration Project
21) Mountain Springs Mine
22) Elder Creek Mine
23) Utah Mine and Camp
24) Greystone Barite Mine
25) Clipper Barite Mine
26) Gold Acres
27) Pipeline/South Pipeline
28) Jersey Valley Geothermal Development Project



N

0 2.5 5 Miles

Note: This figure presents all identified mining-related and exploratory projects within the CESA for this SEIS. The scale has been set to maximize clarity.

Source: BLM 2008e; Newmont 2010a.

Phoenix Copper Leach Project

Figure 2.8-1

Potentially Interrelated Projects for Cumulative Impact Assessment

06/28/2011

2.9 Comparative Analysis of Alternatives

Table 2.9-1 summarizes and compares the environmental impacts between the Proposed Action and the project alternatives. Detailed descriptions of impacts are presented in Chapter 3.0, Affected Environment and Environmental Consequences. The summarized impacts assume the implementation of applicant-committed environmental protection measures but the absence of potential mitigation measures. Implementation of the potential monitoring and mitigation measures identified in Chapter 3.0 potentially would further reduce impacts.

Table 2.9-1 Comparison of the Proposed Action and Other Alternatives

Resources	Proposed Action	Reona Copper HLF Elimination Alternative	No Action Alternative
Geology and Minerals			
Mineral extraction and material generation and disposal	Newmont would extract approximately 245 million pounds of copper and generate approximately 150 MT of spent copper heap leach ore.	Impacts would be the similar to the Proposed Action, except that the recovery of up to 15 million pounds of copper and the generation of up to 8 MT of spent copper leach ore would not occur.	Newmont would continue to produce gold, silver, and copper from existing permitted operations for the Phoenix Project. Approximately 245 million pounds of copper associated with proposed project would not be extracted, and the 158 MT of copper ore would continue to be disposed as waste on currently permitted WRFs.
Geotechnical and EISmic stability	HLFs would be stable with appropriate design and construction.	Impacts would be the same as the Proposed Action.	No new copper HLFs would be developed.
Future availability of mineral resources	No impacts have been identified.	Impacts would be the same as the Proposed Action.	Identified copper ore associated with the proposed project would continue to be disposed as waste on the currently permitted WRFs.
Alteration of topographic and geomorphic features	Permanent alteration of topographic and geomorphic features (i.e., reclaimed heap leach pads and borrow areas) would occur on 852 acres of newly permitted disturbance.	Impacts would be the same as the Proposed Action.	Additional alteration of topographic and geomorphic features would not occur as the proposed facilities would not be constructed.
Water Resources and Geochemistry			
Water quality impacts associated with copper HLFs	No impacts to surface water or groundwater during construction, operation, or post-closure fluid management.	Same as the Proposed Action.	No copper leach facilities would be constructed.

Table 2.9-1 Comparison of the Proposed Action and Other Alternatives

Resources	Proposed Action	Reona Copper HLF Elimination Alternative	No Action Alternative
Flooding, erosion, and sedimentation	The results of an evaluation of the geomorphic conditions of the proposed Phoenix Copper HLF relative to Willow Creek indicated that "channel erosion is not anticipated to occur in magnitudes that would endanger or undercut the Phoenix Copper HLF during operation and closure." As a result, no impacts would occur from flooding, erosion, or deposition along Willow Creek during a 100-year, 24-hour runoff event.	Same as the Proposed Action.	No change from current operating conditions.
Soils and Watershed			
Soils	Approximately 902 acres of soils would be disturbed. Suitable topsoil and growth media would be salvaged and stockpiled for reclamation purposes. There would be short-term reductions in soil productivity in areas being reclaimed.	Impacts would be the same as the Proposed Action.	No additional disturbance to soils would occur beyond that which is currently authorized.
Watershed	Approximately 902 acres of soils would be disturbed within Buffalo Valley, an enclosed administrative basin (Hydrographic Area 131) within Hydrographic Basin 10 of Nevada's Central Region.	Impacts would be the same as the Proposed Action.	No additional disturbance to the watershed would occur beyond that is currently authorized.

Table 2.9-1 Comparison of the Proposed Action and Other Alternatives

Resources	Proposed Action	Reona Copper HLF Elimination Alternative	No Action Alternative
Vegetation			
Vegetation communities	Project development and operation would disturb approximately 902 acres of vegetation that subsequently would be reclaimed.	Impacts would be the same as the Proposed Action.	No additional disturbance to vegetation would occur beyond that is currently authorized.
Wetlands and waters of the U.S.	There would be no impacts to wetlands or waters of the U.S.	Impacts would be the same as the Proposed Action.	Impacts would be the same as the Proposed Action.
Noxious weeds and invasive species	No impacts based on the implementation of Newmont's proposed weed management plan.	Impacts would be the same as the Proposed Action.	The potential spread or introduction of noxious weeds and invasive species would not occur as the proposed facilities would not be constructed.
Special status species	No impacts to special status plant species would occur.	Same as the Proposed Action.	No additional disturbance to special status plant species habitat would occur beyond that is currently authorized.
Wildlife and Fisheries Resources			
Wildlife habitat	Approximately 902 acres of terrestrial wildlife habitat would be disturbed. Surface disturbance would result in an increase in habitat fragmentation and displacement until vegetation has been re-established.	Impacts would be the same as the Proposed Action.	No additional disturbance to wildlife habitat would occur beyond that which is currently authorized.
Mule deer	No designated mule deer habitat or important movement corridors would be directly impacted. Impacts to mule deer populations are anticipated to be low.	Same as the Proposed Action.	Same as the Proposed Action.

Table 2.9-1 Comparison of the Proposed Action and Other Alternatives

Resources	Proposed Action	Reona Copper HLF Elimination Alternative	No Action Alternative
Pronghorn	Long-term reduction of approximately 413 acres of year-long pronghorn range; however, no important seasonal ranges would be impacted. Impacts to pronghorn populations are anticipated to be low.	Impacts would be the same as the Proposed Action.	No impacts to pronghorn range would occur as the proposed facilities would not be constructed.
Breeding birds	Impacts would include the loss of approximately 902 acres of potentially suitable breeding, roosting, and foraging habitat, and increased habitat fragmentation. Potential direct impacts (i.e., loss of nest, eggs, or young) to breeding birds would be minimized based on applicant-committed protection measures.	Impacts would be the same as the Proposed Action.	No additional impacts to breeding birds would occur beyond which is currently authorized.
Human presence and noise	The incremental increase in human presence and noise is expected to result in negligible to low impacts to wildlife.	Impacts would be the same as the Proposed Action.	No additional impacts to wildlife would occur beyond which is currently authorized.
Water quality	No significant impacts to wildlife from potential exposure to process solutions would be expected during construction, operation, or post-closure fluid management.	Impacts would be the same as the Proposed Action.	No impacts to wildlife from the exposure to copper process solutions would occur, as the proposed facilities would not be constructed.
Aquatic species	No impacts to aquatic species due to the lack of perennial waters.	Same as the Proposed Action.	Same as the Proposed Action.

Table 2.9-1 Comparison of the Proposed Action and Other Alternatives

Resources	Proposed Action	Reona Copper HLF Elimination Alternative	No Action Alternative
Special status species	Impacts to special status species would parallel those described above for wildlife habitat and breeding birds.	Impacts would be the same as the Proposed Action.	No additional disturbance to special status wildlife habitat would occur beyond that which is currently authorized.
Range Resources	A short-term loss of 15 animal unit months (AUMs) from public land in the Copper Canyon allotment. No impacts to livestock watering sources would occur.	Impacts would be the same as the Proposed Action.	No additional losses to AUMs or livestock watering sources would occur beyond that which is currently authorized.
Paleontological Resources	No impacts to unique or site-specific paleontological resources are anticipated.	Same as the Proposed Action.	Same as the Proposed Action.
Cultural Resources	Per the PA, all eligible or unevaluated archaeological sites shall be avoided. If a site cannot be avoided a treatment plan shall be prepared and accepted by the BLM and State Historic Preservation Officer (SHPO) prior to loss of the site.	Same as the Proposed Action.	No additional adverse effects to NRHP-eligible or unevaluated properties would occur beyond that which is currently authorized.
Native American Traditional Values	No identified traditional cultural properties or places of cultural religious importance to the tribes would be affected.	Same as the Proposed Action.	Same as the Proposed Action.

Table 2.9-1 Comparison of the Proposed Action and Other Alternatives

Resources	Proposed Action	Reona Copper HLF Elimination Alternative	No Action Alternative
Air Quality	Modeling results indicate that criteria pollutants would not exceed applicable state or National Ambient Air Quality Standards (AAQS). Hazardous Air Pollutants (HAPs) emissions (including mercury) would be lower than Title V thresholds.	Impacts would be the same as the Proposed Action.	Impacts to air quality would be limited to ongoing approved mining, mineral processing, and reclamation activities.
Land Use and Access	Approximately 194 acres of public land and 708 acres of private land would be converted to mineral processing/extraction activities for the life of the project. The Proposed Action would comply with adopted government plans and policies. Minimal impacts on traffic levels and road safety conditions are anticipated.	Impacts would be the same as the Proposed Action.	No additional impacts to land use and access would occur beyond that which is currently authorized.
Recreation and Wilderness	Approximately 194 acres of public land would be removed from public access for recreation for the life of the project; effects to dispersed recreations are anticipated to be minimal. No adverse effects to developed recreation facilities are anticipated. No wilderness or Wilderness Study Areas (WSAs) would be adversely affected.	Impacts would be the same as the Proposed Action.	No additional impacts to recreation would occur beyond that which is currently authorized. Impacts to wilderness or WSAs would be the same as the Proposed Action.

Table 2.9-1 Comparison of the Proposed Action and Other Alternatives

Resources	Proposed Action	Reona Copper HLF Elimination Alternative	No Action Alternative
Social and Economic Values			
Employment and population	The direct work force increase during construction would be approximately 150 employees. Direct employment associated with operations would be 40 to 50 employees. Population growth generated by the Proposed Action would be approximately 0.7 percent for the entire study area.	Effects on employment and population would be similar to the Proposed Action.	There would be no change over current mine-related population and employment levels.
Income	Estimated annual operations payroll would be approximately $5.5 million; the annual indirect impact on earnings would be approximately $2.0 million.	Effects on income would be similar to the Proposed Action.	Economic opportunities associated with the Proposed Action would be foregone.
Housing and public services and facilities	No effects on housing. Effects on public services and facilities would be minor.	Effects on housing and public services and facilities would be similar to the Proposed Action.	There would be no change over current mine-related effects.
Public finance	Sales and use taxes for the Proposed Action would average $600,000 per year, with periodic peaks of about $900,000 every 5 years. Business taxes are expected to be approximately $36,000 per year. In total, approximately $2.4 million would be paid annually in local and state taxes.	Effects on public finance would be similar to the Proposed Action.	Revenue opportunities associated with the Proposed Action would be foregone.

Table 2.9-1 Comparison of the Proposed Action and Other Alternatives

Resources	Proposed Action	Reona Copper HLF Elimination Alternative	No Action Alternative
Visual Resources	Visual effects from the key observation points (KOPs) would be moderate. Proposed reclamation would reduce long-term visual effects and achieve the Visual Resource Management (VRM) Class IV objectives.	Impacts would be the same as the Proposed Action.	No additional visual effects would occur beyond those currently authorized.
Environmental Justice	Potential impacts would not be expected to disproportionately affect any particular population.	Impacts would be similar to the Proposed Action.	Impacts would be similar to the Proposed Action.
Hazardous Materials and Solid Wastes			
Transportation	Low probability of an accident involving the release of hazardous materials during the life of the project. The number of potential transportation-related hazardous materials releases that potentially would occur over the life of the project is projected at less than one.	Impacts would be similar to the Proposed Action.	No additional impacts related to the release of hazardous materials would occur beyond those currently authorized.
Storage and use	Implementation of the Emergency Response Plan would minimize the potential impacts if a spill should occur.	Impacts would be similar to the Proposed Action.	No additional impacts related to the storage of hazardous materials would occur beyond those currently authorized.

2.10 BLM-preferred Alternative

In accordance with NEPA, federal agencies are required by CEQ (40 CFR 1502.14) to identify their preferred alternative for a project in the Draft EIS, if a preference has been identified, and in the Final EIS prepared for the project. The preferred alternative is not a final agency decision; rather, it is an indication of the agency's preference. The BLM-preferred Alternative for the Phoenix Copper Leach Project is the Proposed Action.