ENVIRONMENTAL ASSESSMENT DOI-BLM-NV-W010-2011-0004-EA

TWIN CREEKS MINE VISTA PIT EXPANSION PROJECT NEWMONT MINING CORPORATION

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

Winnemucca District Office - Nevada

It is the mission of the Bureau of Land Management to sustain the health, diversity, and productivity of public land for the use and enjoyment of present and future generations.

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HUMBOLDT COUNTY, NEVADA

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ACRONYMS

amsl	above mean sea level
BAPC	Bureau of Air Pollution Control
BLM	Bureau of Land Management
BMPs	Best Management Practices
BMRR	Bureau of Mining Regulation and Reclamation
CEQ	Council on Environmental Quality
CESA	Cumulative Effects Study Area
CFR	Code of Federal Regulations
cfs	cubic feet per second
°F	degrees Fahrenheit
EA	Environmental Assessment
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
ET	evapotranspiration
FLPMA	Federal Land Policy and Management Act
GFMC	Gold Fields Mining Company
GHG	greenhouse gas
gpm	gallons per minute
H	Horizontal
HDPE	high-density polyethylene
ID	Interdisciplinary
MBTA	Migratory Bird Treaty Act
MFP	Management Framework Plan
MOU	Memorandum of Understanding
Mt	million tons
MW	megawatt
NAC	Nevada Administrative Code
NDEP	Nevada Division of Environmental Protection
NEPA	National Environmental Policy Act
NNHP	Nevada Natural Heritage Program
NNPS	Nevada Native Plant Society
NRCS	Natural Resources Conservation Service
NRS	Nevada Revised Statutes
OISA	Overburden/Interburden Storage Area
PFS	Process Fluid Stabilization
ppm	parts per million
RFFA	Reasonably Foreseeable Future Actions
SFPGC	Santa Fe Pacific Gold Company
SLERA	Scanning Level Ecological Risk Assessment
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
V	Vertical

CHAPTER 1
INTRODUCTION

1.1 INTRODUCTION

The Winnemucca District Office of the United States Department of the Interior (USDI) Bureau of Land Management (BLM) received an application to amend Newmont Mining Corporation's (Newmont) Twin Creeks Mine Plan of Operations (N24-86-005P) and Reclamation Plan (Permit No. 0058) in July 2009. The proposed amendment provides for expansion of the existing Vista Pit, partial in-pit backfill of the Vista Pit, mine pit dewatering, continued operation of water treatment/discharge facilities, expansion of the Sonoma Heap Leach Facility, and implementation of a revised method for process fluid stabilization on heap leach facilities (Newmont 2009a). The components of the amendment described above are collectively referred to as the Proposed Action in this document.

The Twin Creeks Mine is located on private and public land in Humboldt County, about 35 miles northeast of Winnemucca, Nevada. Access to the Mine is provided by traveling east on Interstate 80 from Winnemucca to Golconda (Exit 280), then northeast approximately 15 miles on State Route 789, and continuing 12 miles northwest on unpaved County Road 513 (**Figure 1-1**).

The original Plan of Operations for the Twin Creeks Mine was approved by BLM in a Record of Decision (January 1997) when the mine was owned by Santa Fe Pacific Gold Corporation (SFPGC). Newmont subsequently acquired the property from SFPGC later in 1997 and has been the operator since that time. The proposed amendment would occur entirely within the currently permitted Twin Creeks Mine Plan of Operations boundary (**Figure 1-2**).

Mine facilities identified in the Proposed Action are located on public land administered by BLM; consequently, Newmont's proposed amendment to the Plan of Operations must meet requirements contained in Title 43, Code of Federal Regulations, Part 3809 (43 CFR 3809) Surface Management Regulations. BLM's decision regarding the Proposed Action must also conform to requirements of the National Environmental Policy Act of 1969 (NEPA), and be consistent with the Paradise-Denio Management Framework Plan (BLM 1982). Based on a review of potential environmental effects that could result from implementation of the Proposed Action, BLM determined that an Environmental Assessment (EA) level analysis is appropriate; no new significant impacts beyond those analyzed in the Twin Creeks Mine Environmental Impact Statement (EIS) (BLM 1996) have been identified. This EA tiers to the Twin Creeks Mine EIS where appropriate.

Newmont's proposed amendment must also meet requirements of the State of Nevada as administered by the Bureau of Mining Regulation and Reclamation (BMRR), Nevada Division of Environmental Protection (NDEP). The BMRR, in cooperation with other state, federal, and local agencies, regulates mining activities in Nevada under regulations adopted in 1989. The Nevada Administrative Code (NAC) 445A.350-445A.447 and NAC 519A.010-519A.415 were developed to implement requirements of Nevada Revised Statutes (NRS) 445A.300-445A.730 and NRS 519A.010-519A.290.

This document is compiled in accordance with regulations promulgated by the Council on Environmental Quality (CEQ) for implementing procedural provisions of NEPA (40 CFR 1500-1508) and BLM's NEPA Handbook (H-1790-1).

1.2 PURPOSE AND NEED

The purpose of this action is to provide Newmont the opportunity to conduct an expansion at its existing Twin Creeks Mine including expansion of the Vista open pit; dewatering, milling; stockpiling of ore; overburden/interburden disposal; development of access and haul roads; heap leaching; and a revised process fluid stabilization and decommissioning method for the heap leach facilities.

The need for action is established by BLM's responsibility under the 2008 Energy and Mineral Policy, Federal Land Policy and Management Act of 1976 (FLPMA), and BLM Surface Management Regulations in 43 CFR 3809, to respond to a plan of operations and to take any action necessary to prevent unnecessary or undue degradation of public land administered by BLM.

1.3 LAND USE CONFORMANCE STATEMENT

The Proposed Action described in this EA is in conformance with the Paradise-Denio Management Framework Plan (MFP) (BLM 1982), which states that BLM should "make no land use decisions that would interfere with mineral development in areas (mining districts) of significant current and past mining activity."

1.4 RELATIONSHIP TO LAWS, REGULATIONS AND OTHER PLANS

1.4.1 Federal

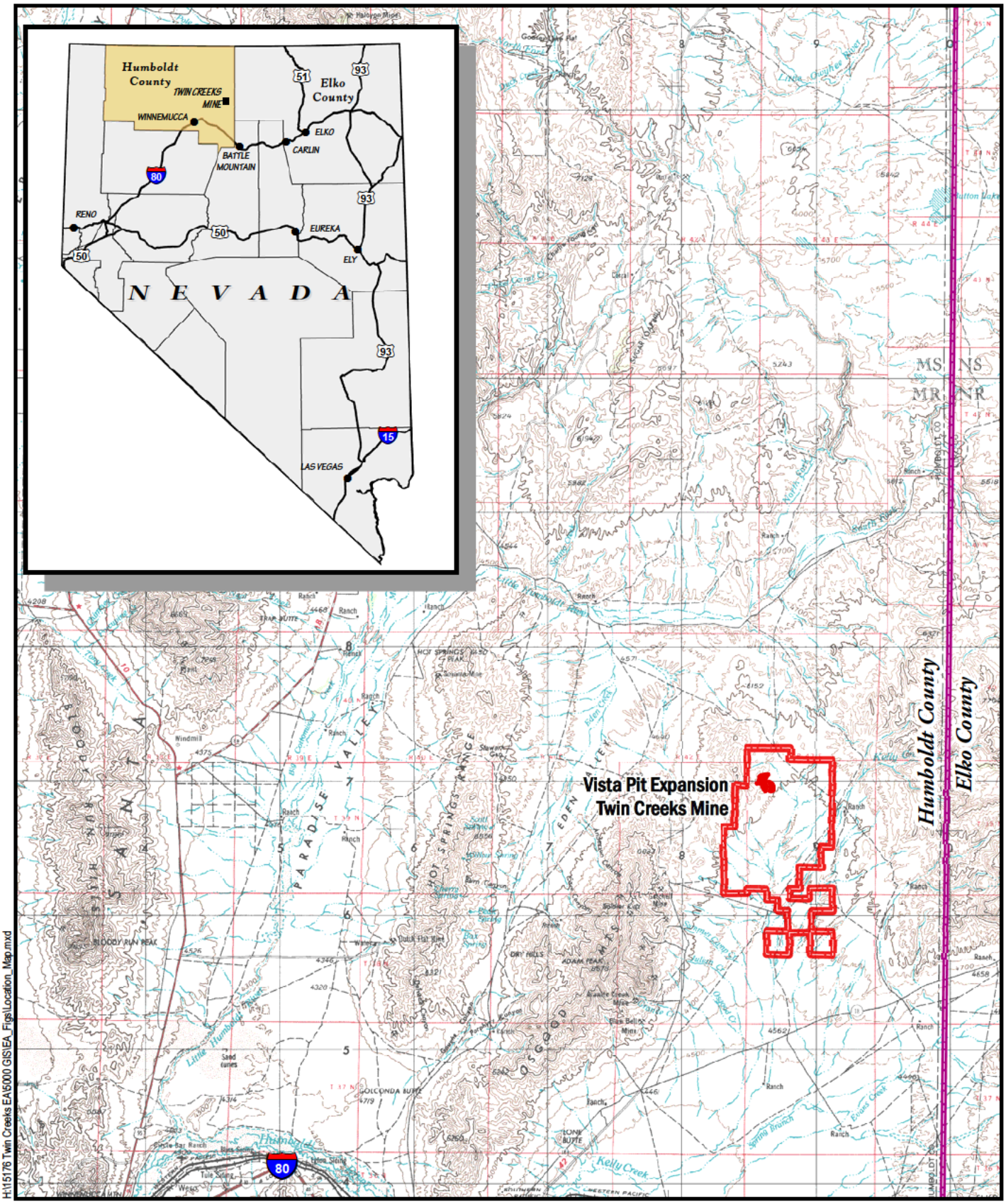
In order to use public land managed by the BLM Winnemucca District Office, Newmont must comply with BLM Surface Management Regulations (43 CFR 3809) and other applicable statutes, including the Mining and Mineral Policy Act of 1970 (as amended) and FLPMA of 1976. BLM must review Newmont's plans to ensure the following:

- Adequate provisions are included to prevent unnecessary or undue degradation of public land and to protect non-mineral resources;
- Measures are included to provide for reclamation of disturbed areas; and
- Compliance with applicable state and federal laws is achieved.

1.4.2 Other Federal, State, and Local Land Use Plans and Policies

The State of Nevada recognizes that mining is an important contributor to the state's economy and encourages development of mineral resources. The State policy towards mining and reclamation is defined in NAC 519A.010 as:

(a) The extraction of minerals by mining is a basic and essential activity making an important contribution to the economy of the State of Nevada;



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General Location Map
Vista Pit Expansion
Twin Creeks Mine
Humboldt County, Nevada
FIGURE 1-1

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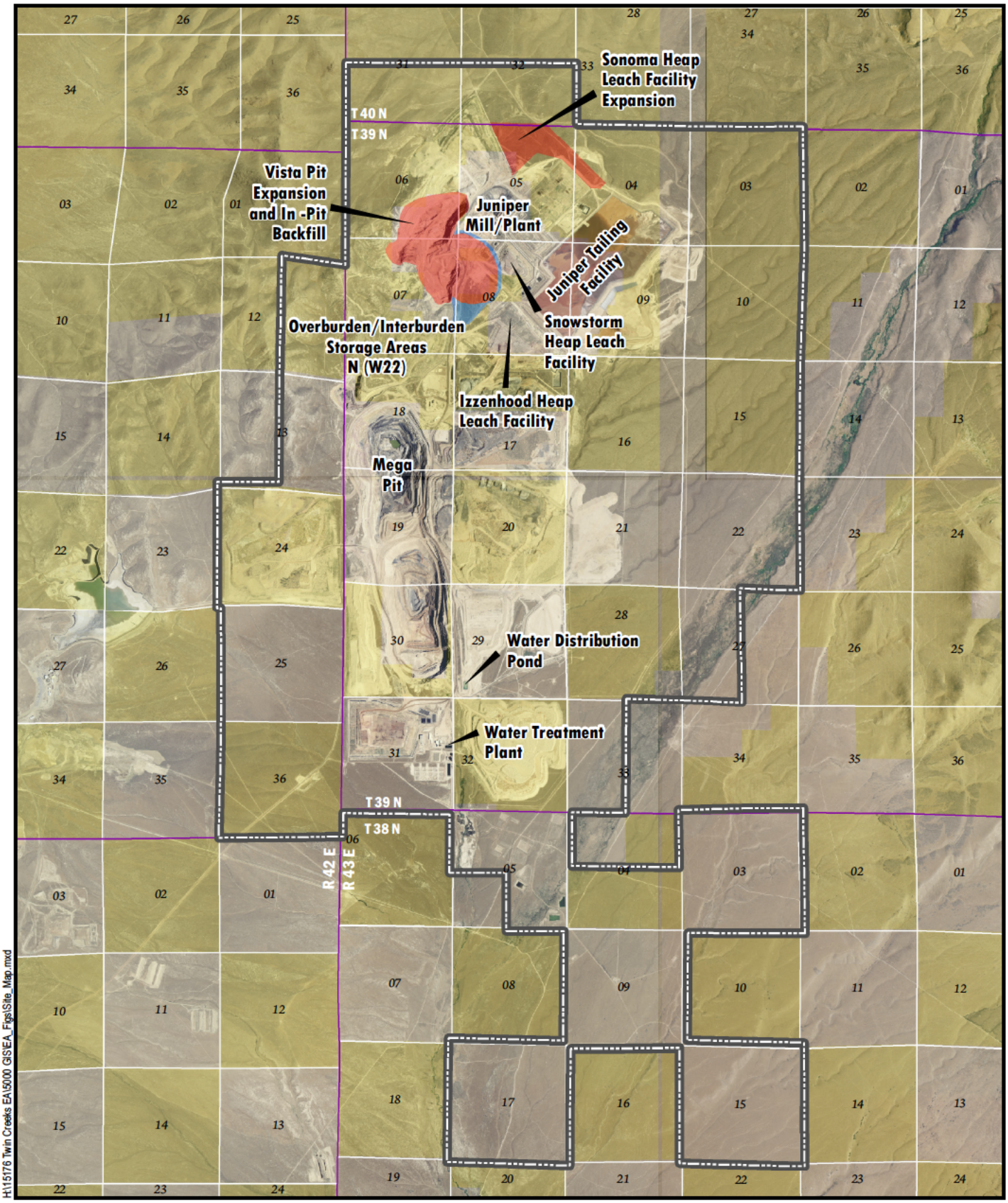

H:\15176 Twin Creeks EA\5000 GIS\EA_Figs\Site_Map.mxd

2006 NAIP Aerial Photography

0 Miles 1.5

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Vista Pit Expansion Project Disturbance Area (Vista Pit Expansion; In-Pit Backfill; and Sonoma Leach Pad Expansion)

Plan of Operations Boundary

Vista Pit Haul Road

Bureau of Land Management

Private

Project Location Area
Vista Pit Expansion
Twin Creeks Mine
Humboldt County, Nevada
FIGURE 1-2

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(b) Proper reclamation of mined land, areas of exploration, and former areas of mining or exploration is necessary to prevent undesirable land and surface water conditions detrimental to the ecology and to the general health, welfare, safety and property rights of the residents of this state; and

(c) The success of reclamation efforts in this state is dependent upon cooperation among state and federal agencies.

The Proposed Action is consistent with state policies. BLM has coordinated with BMRR in reviewing the proposed amendment.

1.5 ISSUES

A scoping process was conducted to determine the scope of this EA. The scoping process began with an interdisciplinary team meeting held at the BLM office in Winnemucca on September 22, 2009. Based on this meeting, the BLM defined issues and made initial determinations of what needed to be analyzed in this EA, data needs, and public outreach needs.

After the end of the public scoping period, a follow-up meeting with the interdisciplinary team was held on December 15, 2009. The purpose of the meeting was to provide an opportunity for BLM to provide their review of comments received to the operator, and third-party contractor and further discuss the scope of the analysis.

The following issues with regard to the Proposed Action were identified during scoping:

- What is the potential effect to air quality?
- What is the potential impact to surface water and/or groundwater quantity and quality from dewatering activities?
- What is the potential effect to wildlife and special status plant and animal species?;
- What is the potential impact resulting from formation of a pit lake following completion of mining activities?
- Is there sufficient and suitable soil cover material available to cover the heap leach pads?
- What is the potential for mercury and mercury release to the environment?
- What is the potential for jurisdictional/non-jurisdictional wetlands affected by the Proposed Action?
- What impact would the Project have on night skies?
- Are only native species of plants to be included in reclamation? and
- Would cumulative impacts associated with the project be evaluated?

1.6 BACKGROUND INFORMATION

Gold was discovered in an outcrop at Chimney Creek, (now known as Vista Pit) by Gold Fields Mining Company (GFMC) in 1984. Mining commenced in 1987, and the first gold was poured in 1987. GFMC subsequently expanded mining operations to the north and south of the original mine site.

Santa Fe Pacific Gold Company (SFPGC) entered the area in 1986 and conducted exploration drilling immediately south of GFMC property. In 1987, SFPGC discovered a large oxide gold reserve, which became the Rabbit Creek Mine. Development of the Rabbit Creek Mine, now known as the Mega Pit, began in 1989.

The Rabbit Creek and Chimney Creek mines operated separately until consolidation of SFPGC railroad fee land and GFMC mining claims in 1993. In 1995, SFPGC submitted a Revised Plan of Operations and Reclamation Plan to BLM and NDEP to consolidate the two mining properties (Chimney Creek Mine and Rabbit Creek Mine) to become the Twin Creeks Mine. In December 1996, BLM published a Final EIS (BLM 1996) for the Twin Creeks Project, followed by a ROD in January 1997. Newmont acquired the property later in 1997 and has operated the Twin Creeks Mine since that time.

The Twin Creeks Mine includes the Vista and Mega pits (Mega Pit consists of the North and South pits), eight overburden/interburden storage areas (OISA), four heap leach facilities, two tailings storage facilities, and ancillary facilities consisting of ore stockpiles, surface water control structures, dewatering wells, ore processing mills, administration buildings, parking areas, access and haul roads, and a water treatment plant. Exploration activities are also authorized under the current mine permit. A summary of disturbed areas by mine component is shown in **Table 1-1.**

TABLE 1-1
Existing Operations
Twin Creeks Mine
Humboldt County, Nevada

Facility	Public (acres)	Private (acres)	Total (acres)
Mine Pits	297	1,442	1,739
OISA	3,523	2,230	5,753
Heap Leach Facilities	685	679	1,364
Tailings Storage Facilities	563	514	1,077
Ancillary Facilities	1,905	850	2,755
Access and Haul Roads	197	194	391
Exploration	100	100	200
TOTAL	**7,270**	**6,009**	**13,279**

Source: Newmont 2009a.

1.6.1 Mining Operations

Open pit mining in the Vista Pit ceased in 2002. The current bottom elevation of the Vista Pit is above the pre-mining water table elevation; no pit lake has developed. Mining is ongoing in the Mega Pit, which is divided by in-pit backfill material into the North and South pits. Mining of the Mega Pit is scheduled to continue into 2019, with operations in the southern portion (South Pit) scheduled to be completed in 2011.

1.6.2 Ore Processing

Oxide ore is processed on four active heap leach facilities. Heap leaching circuits are closed systems and fresh "makeup" water is added to the process solution circuit as needed. Primary mechanisms for process solution loss are evaporation and ore wetting. The heap leach pads and pond systems are designed as zero discharge components whereby all process solution is contained within lined pads, ponds, collection pipes, and lined solution ditches in accordance with applicable regulations.

Approximately 0.48 million tons (Mt) of ore are placed on heap leach pads at the Twin Creeks Mine annually. Total amount of ore to be placed on leach pads under current authorization is approximately 4.8Mt.

Un-oxidized mill-grade ore is processed at the Sage Mill; oxidized mill-grade ore is processed at the Juniper Mill. Approximately 4Mt of un-oxidized ore are processed annually at the Sage Mill, and 0.98Mt of oxidized ore at the Juniper Mill. The Sage Mill also processes ore from other mining operations

Two tailings storage facilities (TSF) are located at the Twin Creeks Mine. The Piñon TSF was taken out of service in 2001, and closure initiated in 2007. Tailings generated by the Sage and Juniper mills are stored in the Juniper TSF which has a total permitted capacity of 97Mt.

1.6.3 Dewatering Activities

Dewatering is a critical component of mining in the Mega Pit, and pit lakes are expected to develop once mining and dewatering operations cease. Dewatering of the South Pit is required to limit the amount of groundwater inflow into the Pit and maintain pit wall stability. Dewatering is currently required for mining the North and South pits, dewatering commenced in 1990 and is projected to continue throughout the life of the mine. Dewatering is accomplished through a system of wells and sumps designed to maintain water levels below the floor of the pit as the pit is deepened.

Twenty-five dewatering wells were installed to allow mining below the water table at the South Pit. Pre-mine groundwater elevation was approximately 4700 feet above mean sea level (amsl). The dewatering rate is permitted up to 12,300 gallons per minute (gpm) but is typically lower and varies seasonally. To date, dewatering has lowered the groundwater level to an elevation of 3700 amsl. On an annual basis, Twin Creeks uses approximately 60 percent (7,400 gpm) of this water for site operations, including process make-up and dust suppression. The remaining 40 percent (4,900 gpm) is treated at the Water Treatment Plant and discharged to Rabbit Creek under a National Pollutant Discharge Elimination System permit (NPDES NV0021725).

1.6.4 Overburden/Interburden Management

Overburden/interburden generated from the North and South pits is placed on OISAs adjacent to the pits and also in the South Pit to eliminate formation of a pit lake. Approximately 8 percent (219Mt) of total overburden/interburden (2.7 billion tons) associated with currently permitted mining operations at the Twin Creeks Mine is classified as acid-generating. Acid-generating overburden/interburden is

encapsulated with acid-neutralizing rock at the OISAs and used for in-pit backfilling (BLM 1996). Overburden/interburden is routinely tested in accordance with Newmont's Water Pollution Control Permits (WPCP NEV86018 and NEV86035) (NDEP 2009a).

1.6.5 Monitoring

Monitoring of surface water and groundwater is ongoing in accordance with Water Pollution Control Permits NEV86018 and NEV86035 and NPDES Permit NV0021725. There are two Water Pollution Control Permits for the Twin Creeks Mine – 1) NEV86018 was issued for the former Chimney Creek Mine, and 2) NEV86035 issued for the Rabbit Creek Mine prior to acquisition and consolidation by Santa Fe Pacific Gold Corporation and subsequently by Newmont. NEV86018 currently covers the north half of the Twin Creeks Mine and NEV86035 the south half with the boundary being the backfilled section separating the North and South pits within the larger Mega Pit. Air emissions (including mercury) from the Sage and Juniper Mills are monitored in accordance with Air Quality Permit No. AP1041-0723 and Mercury Permit AP1041-2218.

1.6.6 Reclamation

Reclamation activities include regrading, placing growth media, and revegetating disturbed areas. OISAs, leach pads, and tailings storage areas will be regraded to an overall slope between 2:5H:1.0V and 3.0H:1.0V, as described in the 1996 Plan of Operations and Reclamation Plan. Surface grading will include creation of undulations, benches, and swales, to allow establishment of diverse plant communities similar to those existing prior to mining operations. Refer to the Reclamation Plan Permit No. 0058 for the Twin Creeks Mine.

Decommissioning of the heap leach facilities will begin when economic recovery of precious metals is no longer feasible. Process solution will gravity drain and be reduced through evaporation in the process ponds and on the leach pads. This procedure will continue until draindown solution volume stabilizes and residual draindown can be managed using evaporation in solution ponds. After the heap leach pads have drained, the heaps will be reclaimed in accordance with the 1997 Record of Decision (BLM 1997).

Process solution used in the tailings storage facilities will free-drain to reclaim ponds where the solutions will evaporate. When moisture content in the tailings reaches a level that allows equipment access, the tailings will be covered with growth media and graded to provide surface drainage, then vegetated.

Diversion structures will be maintained to divert surface water run-on around reclaimed areas and from entering mine pits. Run-off control structures will remain in-place until reclaimed areas have stabilized sufficiently to control sediment. To date, approximately 1,625 acres have been graded and vegetated at the Twin Creeks Mine.

1.6.7 Employment and Taxes

Newmont currently employs 540 workers at the Twin Creeks Mine. In 2010, Newmont paid in excess of $12 million in federal, state, and local taxes for the Twin Creeks Mine. Newmont provides bus transportation from Winnemucca for shift employees at the Mine.

CHAPTER 2
ALTERNATIVES INCLUDING THE PROPOSED ACTION

2.1 INTRODUCTION

This chapter describes Newmont's proposed amendment to the Plan of Operations (Proposed Action), reasonable alternatives to the Proposed Action including the No Action Alternative, alternatives eliminated from further analysis, and summary comparison of impacts among alternatives. The proposal to amend the existing Plan of Operations authorized under BLM N24-86-005P and NDEP Permit No. 0058 for the Twin Creeks Mine is referred to as the Vista Mine Pit Expansion Project (Project) or the Proposed Action in this document.

Alternatives considered in this EA are based on issues or potential impacts to resources identified by BLM and comments received during the public scoping process. Alternatives analyzed in the EA are intended to reduce or minimize potential adverse effects associated with the Proposed Action.

2.2 PROPOSED ACTION

The Proposed Action referred to throughout this EA is Newmont's proposed amendment to the Plan of Operations for the Twin Creeks Mine and includes the following actions:

- Expansion of the existing Vista open pit mine by approximately 117 acres;
- Partial in-pit backfill of the current Vista Pit with approximately 1.7 Mt of acid generating (AG) and non-acid generating (NAG) overburden/interburden totaling approximately 74.3Mt;
- Placement of approximately 38Mt NAG overburden/interburden in OISA N (W22);
- Milling ore at the Juniper Mill;
- Temporarily stockpiling mill ore on the existing ore stockpile pad;
- Development of access and haul roads;
- Placing ore on the Izzenhood and Sonoma Heap Leach facilities;
- Dewatering the Vista Pit at a rate of up to 8,400 gpm;
- Implementation of a revised method for process fluid stabilization of heap leach piles for decommissioning;
- Use of the dewatering water for mining and milling purposes and treatment and discharge to Rabbit Creek;
- Use of spent ore for expansion of Sonoma Heap Leach Facility; and
- Expansion of the Sonoma Heap Leach Facility resulting in conversion of a 145-acre tract of land from use as an equipment/material storage site.

The Proposed Action would be located within the Twin Creeks Mine existing Plan of Operations boundary in Township 39 North; Range 43 East, sections 4, 5, 6, 7, and 8; Mt. Diablo Meridian (**Figure 2-1**). Expansion of the Vista Pit would require reallocation or disturbance of some existing ancillary facilities at the Twin Creeks Mine.

2.2.1 Vista Pit Expansion

At the time of cessation of mining in the Vista Pit (2002), the pit encompassed approximately 269 acres of disturbance. The lowest elevation of the pit bottom is 4660 feet amsl. Current pit dimensions are approximately 4,700 feet in length and 4,300 feet in width. Under the Proposed Action, Newmont would deepen the Vista Pit by 380 feet to an ultimate elevation of 4280 feet amsl and would lay back the pit wall approximately 1,900 feet to the east, resulting in an additional 117 acres of land area being added to the pit, bringing the total footprint of the Vista Pit to 386 acres.

Approximately 130Mt of material, including 15Mt of ore and 114Mt of overburden/interburden, would be mined over a 6-year period during expansion of the Vista Pit. Ore and overburden/interburden production is summarized in **Table 2-1.** Newmont would use conventional open pit mining methods (truck and shovel), consistent with current mining at the Twin Creeks Mine.

TABLE 2-1
Ore and Overburden/Interburden Production
Vista Pit Expansion - Twin Creeks Mine

Period	Oxide Leach Ore (tons)	Oxide Mill Ore (tons)	Total Overburden/ Interburden (tons)	Potential Acid Generating (PAG) Overburden/ Interburden (tons)	Percent PAG of Total Overburden/ Interburden (tons)
Year 1	137,000	0	25,464,000	322,000	1.2
Year 2	1,401,000	687,000	48,408,000	1,395,000	2.9
Year 3	3,646,000	2,210,000	38,849,000	428,000	1.1
Year 4	1,502,000	2,963,000	1,545,000	-	-
Year 5	613,000	1,277,000	120,000	-	-
Year 6	279,000	206,000	72,000	-	-
TOTAL	**7,578,000**	**7,343,000**	**114,458,000**	**2,145,000**	**1.8**

Source: Newmont 2011a.

Removal of spent ore from the Snowstorm Heap Leach Facility would be necessary to accommodate expansion of the Vista Pit. Approximately 3Mt of material has been removed and used in construction of the Juniper Tailings Storage Facility (Water Pollution Control Permit NEV86018). An additional 2.3Mt would be removed and placed as a protective layer over a synthetic liner system for the proposed expansion of the Sonoma Heap Leach Facility. Stability of the remaining portion of the Snowstorm Heap Leach Facility under static and seismic loading conditions was evaluated and found to be stable (AMEC 2008).

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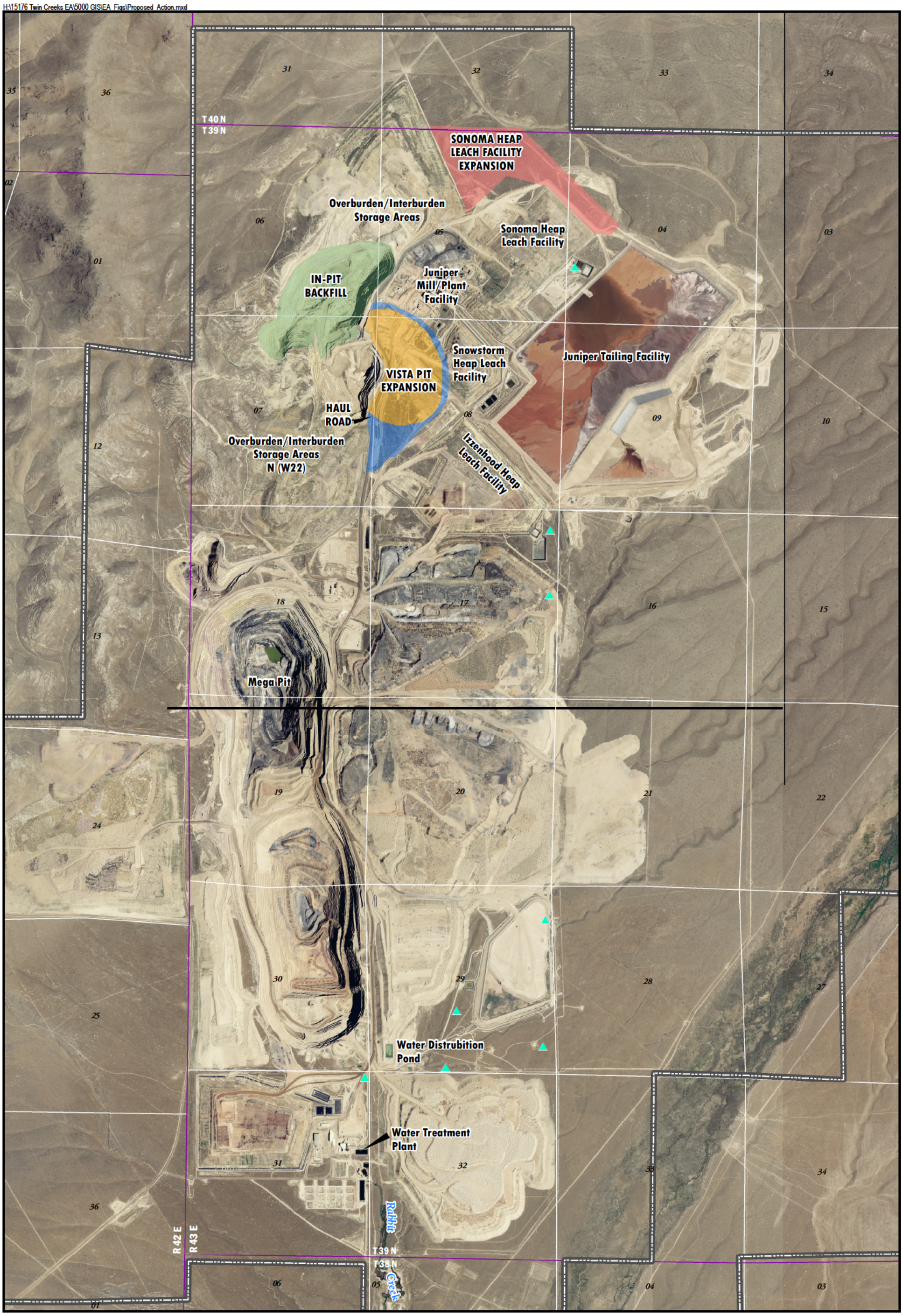

2006 NAIP Aerial Photography

0 Feet 3,000

No warranty is made by the Bureau of Land Management as to the accuracy, reliability, completeness of these data for individual use or aggregate use with other data. Original data were compiled from various sources. This data may not meet National Map Accuracy Standards. This product was developed through digital means and may be updated without notification.

- Monitoring Well
- Road Disturbance
- Vista Pit Expansion
- In-Pit Backfill
- Sonoma Heap Leach Facility Expansion
- Plan of Operations Boundary

Proposed Action
Vista Pit Expansion
Twin Creeks Mine
Humboldt County, Nevada
FIGURE 2-1

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2.2.2 Ore Processing

Expansion of the Vista Pit would generate two types of oxide ore: 1) oxide leach ore, and 2) oxide mill ore. Oxide leach ore would be placed on the Izzenhood and Sonoma Heap Leach facilities and oxide mill ore would be processed at the Juniper Mill.

Sonoma Heap Leach Facility

Expansion of the Sonoma Heap Leach Facility would occur on a 145-acre tract of land located immediately north of the existing leach facility. The tract is comprised of 135 acres of public land and 10 acres of private land controlled by Newmont. Expansion of the Sonoma Heap Leach Facility would represent a change in use from a currently authorized ancillary facility (haul road, drill pads, and equipment and material storage) area to an operating heap leach pad. The area lies within the Twin Creeks Mine permitted disturbance boundary and approximately 105 acres within this tract has been disturbed by the uses described above. About 40 acres of the area remain undisturbed with a sagebrush/grassland vegetative cover.

The expanded heap leach facility would be constructed in accordance with existing approved permits and would be linked to the existing Sonoma Heap Leach liner system, process solution pipelines and ponds, containment, and process facilities. Oxide leach ore from the Vista Pit expansion would be processed at the Izzenhood or Sonoma Heap Leach facilities. Low grade oxide leach ore would be hauled to the leach pad as run-of-mine material.

Izzenhood Heap Leach Facility

Expansion of the Izzenhood Heap Leach Facility was authorized in 2007. Phase S4 (33.5 acres) and Phase S5 (31.5 acres) provided an additional 21Mt of capacity with one placed to an overall height of 300 feet. Some oxide leach ore from the Vista Pit Expansion may be placed on the Izzenhood Heap Leach Facility depending on available capacity within height and liner restrictions imposed by Water Pollution Control Permit NEV86018.

Juniper Mill

Approximately 7.3Mt of oxide mill ore from the Vista Pit expansion would be processed at the existing Juniper Mill. The Juniper Mill processes oxide ore in conventional cyanide carbon-in-pulp process. Gold is recovered on activated carbon, stripped in a low pressure and temperature circuit, and refined into doré bars.

2.2.3 Mine Pit Dewatering

The groundwater table below the Vista Pit is currently at an approximate elevation of 4591 feet amsl (Newmont 2009a). Proposed expansion and deepening of the Vista Pit would require additional groundwater drawdown of approximately 320 feet to an elevation of 4271 feet amsl. Newmont proposes to construct four to seven dewatering wells around the Vista Pit perimeter. As mining progresses, one or more wells may be completed within the pit. Wells would be completed to an

approximate depth of 1,200 feet below ground surface and may vary in diameter. Each well would be designed to achieve a pumping rate between 500 and 3,000 gpm. Newmont estimates Vista Pit dewatering rates up to 8,400 gpm would be required to lower water levels below projected Vista Pit bottom elevation of 4280 feet amsl. Should geologic conditions warrant, horizontal drains may be installed to increase highwall stability.

Water produced from dewatering wells would be pumped via high-density polyethylene (HDPE) pipelines to the existing Water Distribution Pond or directly to heap leach or mill processing facilities. Approximately 4,300 gpm would be used as makeup water for milling and heap leaching processes. Excess water would be treated at the Water Treatment Plant and discharged to Rabbit Creek per NPDES Permit NV0021725. The Vista Pit expansion would require removal and relocation of HDPE piping associated with the existing water distribution system.

Dewatering of the Vista Pit would begin in 2011, with mining and dewatering activities completed by the end of 2016. In early 2017, following cessation of mining, dewatering activities are expected to cease resulting in formation of a pit lake. Water level in the Vista Pit lake is predicted to recover to an elevation of approximately 4617 feet amsl. The groundwater model predicts that 90 percent of pit lake infilling to elevation 4583 feet amsl would be completed by the end of 2077 (Itasca 2010).

2.2.4 Overburden/Interburden Management

Expansion of the Vista Pit would generate approximately 114Mt of overburden/interburden. About 76Mt of overburden/interburden would be used as in-pit backfill in the northwestern portion of the Vista Pit. The bottom of this portion of the pit lies above the predicted post-mining groundwater level (4617 feet amsl). Partial in-pit backfill would provide approximately 170 acres of land surface that would be revegetated. Approximately 38Mt of NAG overburden/interburden would be placed within the existing permitted disturbance boundary of OISA N (W22).

Overburden/Interburden Characterization

Results of static and kinetic testing indicate that approximately 2.1Mt of overburden/interburden mined from expansion of the Vista Pit would be classified as AG (**Table 2-1**). Static testing included an acid-base accounting procedure whereby the acid generation potential and the acid-neutralization potential are expressed as tons of calcium carbonate ($CaCO_3$) per thousand tons of material. This value represents the amount of calcium carbonate needed to neutralize 1,000 tons of material. The net acid-generation potential of the material is determined by subtracting the acid generation potential from the acid neutralization potential, the result of which may be reported as either positive or negative. A negative result indicates a sample can be expected to generate acid at some point in time. A positive result indicates a sample would not be a net acid generator.

Overburden/interburden classified as AG would be placed above the predicted post-mine groundwater elevation as backfill in the previously mined portion of Vista Pit. AG overburden/interburden would be randomly placed with NAG material over a 50-foot thick base layer of net acid-neutralizing overburden/interburden. The random placement of AG and NAG overburden/interburden is designed to blend and encapsulate net acid-generating material with net acid-neutralizing material. The final lift of overburden/interburden would be covered with a minimum of 5 feet of net acid-neutralizing alluvium and revegetated. Only NAG overburden/interburden would be placed in OISA N (W22).

2.2.5 Surface Water and Sediment Controls

Newmont has obtained a stormwater discharge permit from NDEP which includes design criteria, monitoring program, and a Stormwater Pollution Prevention Plan (Newmont 2009b). Stormwater would be controlled using best management practices (BMPs) stipulated in Stormwater General Permit (NVR300000 – MSW-243). These BMPs address material handling procedures that minimize exposure of materials to stormwater; define spill prevention and response measures; identify sediment and erosion control measures; and describe physical stormwater controls.

Pursuant to NAC 445A.429, diversion channels, sediment basins, and other surface water control structures would be constructed upgradient of surface facilities to control stormwater run-on. Ditches would divert uncontaminated run-on water into natural drainages down gradient from disturbed areas. Diversion structures and sediment basins are designed to convey flows from a 100-year, 24-hour storm event. These structures would be maintained until closure of the Project is complete and BLM and NDEP are satisfied as to the stability of the reclaimed landscape.

Berms and ditches would be constructed as appropriate to preclude meteoric water from flowing into mine pits, or onto OISAs. Sediment control structures would include silt traps and fences using certified weed free straw, hay bales, or geotextile fabric, and sediment ponds. Sediment ponds would be removed once vegetation has stabilized on reclaimed areas.

Sediment control measures would be implemented, as necessary to reduce soil movement within the site and to minimize off-site effects. These structures would be monitored following major precipitation events; maintained on a regular basis; and designed to allow access for maintenance throughout the life of the Project. Soil collected in these structures would be periodically removed and placed in the soil stockpile or on reclaimed areas.

2.2.6 Haul and Access Roads

A new haul route would be constructed along the northeast, east, and south boundary of the proposed Vista Pit expansion. The road would have a running width of 120 feet and be approximately 7,200 feet in length (**Figure 2-1**).

2.2.7 Ancillary Facilities

Existing ancillary facilities at the Twin Creeks Mine (maintenance shops, fueling areas, processing plant, offices, warehouse) would be used to support expansion of the Vista Pit. No new ancillary facilities would be needed to serve the Proposed Action.

Night lighting resulting in a visible glow around mining and mill areas would likely continue throughout the life of the Proposed Action and other currently authorized operations at the Twin Creeks Mine complex. Existing mobile light units would be relocated to the Vista Pit Expansion area in response to operational needs. Following mining operations and ore processing, lighting would be removed during reclamation and closure of the site. As existing lighting fixtures age and require maintenance, they would be replaced with components designed to be energy efficient while providing adequate lighting for safety and security purposes. Fixtures with "Dark Sky" features would be installed where practicable.

2.2.8 Energy Use

Annual diesel fuel consumption at the Twin Creeks Mine is approximately 9 million gallons associated with current mining operations in the Mega Pit. Development of the proposed Vista Pit Expansion would gradually shift a portion of mining equipment from the Mega Pit to the Vista Pit. Estimated annual diesel fuel consumption during mining of the Vista Pit would be approximately 3 million gallons. Diesel fuel consumption associated with the Mega Pit and the Vista Pit expansion would continue at the annual rate of 9 million gallons. Equipment proposed for use at the Vista Pit includes the following:

- 3 loading shovels (1 electric, 2 hydraulic);
- 10 Haul trucks (CAT 793B and 793C);
- 5 drill units (IRDM45E and ALTPV271);
- 2 Motor graders (CAT16G and CAT24M);
- 4 Dozers (2 track CATD10, 2 rubber tire CAT834 and CAT854);
- 2 Water trucks (CAT785WT);
- 1 Scraper (CAT637D);
- 3 Explosives/Blasting Units (Peterbilt); and
- 2 Light plants (mobile).

Electrical power consumption associated with processing oxide leach and mill ore at the Twin Creeks Mine is approximately 406 million kilowatt hours (kWh) annually. The volume of diesel consumption and electrical power consumption would be similar to the levels of consumption for current operations.

2.2.9 Solid and Hazardous Waste

Solid Waste

All non-hazardous solid waste generated during expansion of the Vista Pit would be disposed in an existing NDEP approved Class III waivered landfill located at the site. Typical solid waste generated at the Project would include tires, paper and plastic packaging, and household type refuse.

Hazardous Waste

No new hazardous waste would be generated as a result of the Vista Pit expansion. Wastes associated with mining and ore processing at the Twin Creeks Mine would continue at levels defined by RCRA (40 CFR 260-270), for a Large Quantity Generator of hazardous waste.

2.2.10 Human Health and Safety

Human health and safety associated with expansion of the Vista Pit would be regulated under the federal Mine Safety and Health Act (MSHA) of 1977, which sets mandatory safety and health standards for metal mines including open pit mines. The purpose of these health and safety standards is the protection of life, promotion of health and safety, and prevention of accidents. Newmont employees at the Twin Creeks Mine are trained in use of personal protection equipment in accordance with MSHA regulations codified under 30 CFR Subchapter N, Part 56.

2.2.11 Noise

Noise levels at the Twin Creeks Mine would vary during construction, mining, and reclamation activities associated with expansion of the Vista Pit. The closest sensitive receptor is a residence located approximately 3 miles south of the southern boundary of the Twin Creeks Mine. This location is approximately 5 miles from the Vista Pit. With the exception of the residence identified above, no sensitive receptors (*e.g.,* residences, campgrounds, or recreation facilities) are located within a 5-mile radius of the Project area.

Noise sources located within the project area include mining (blasting, loading, and hauling of ore and overburden/interburden, heap-leach and mill processing, reclamation activities, wind-generated noise through grass and shrubs, wildlife, aircraft flying overhead, and vehicles traveling on roads. Noise levels from these sources would continue over the Project life associated with the Proposed Action.

2.2.12 Employment

Three hundred of the 540 current Twin Creeks Mine employees would be employed by the Vista Pit Expansion Project. The Proposed Action, together with other Newmont activities, would provide for long-term operations in this area, with consequent potential for stable employment levels for the duration of the Project. The proposed Vista Pit Expansion Project would not result in hiring new employees, but would extend the mine-life and therefore, employment of personnel.

2.2.13 Reclamation

Reclamation activities for the Vista Pit Expansion Project are designed to achieve post-mining land uses consistent with the Paradise-Denio MFP (BLM 1982). Reclamation is designed to return disturbed land to a level of productivity comparable to pre-mining levels associated with adjacent land. Post-mining land uses include wildlife habitat, livestock grazing, dispersed recreation, mineral exploration and development. Certain mine components (*e.g.*, open mine pit) may have restrictive post-mine land uses.

Short-term reclamation goals would be to stabilize disturbed areas and protect adjacent undisturbed areas from unnecessary or undue degradation. Long-term reclamation goals include public safety, stabilization of the site, and establishment of a productive vegetative community consistent with post-mining land uses.

Proposed reclamation would include placement of 76Mt of overburden/interburden as in-pit backfill in the northwest portion of the Vista Pit. In-pit backfill would reduce the overall height of the highwall by 460 feet. Upon completion of backfilling operations, the area would be graded, covered with growth media, and seeded with an approved seed mixture.

Reclamation activities would include: grading of OISAs; grading disturbed areas (including roads); drainage control; well closure (*e.g.*, piezometers); removal and grading of stockpile areas; replacement of salvaged soil; seeding and planting; and reclamation monitoring (Newmont 2009a). The reclamation schedule would encompass the period between cessation of mining through post-reclamation monitoring. Reclamation would take place concurrent with operations where possible. The proposed

post-reclamation topography for the Project is shown on **Figure 2-2**. A Closure Plan meeting State of Nevada requirements (NAC 445A.447) would be filed with NDEP two years prior to closure of the mine.

Process Fluid Stabilization and Heap Leach Decommissioning

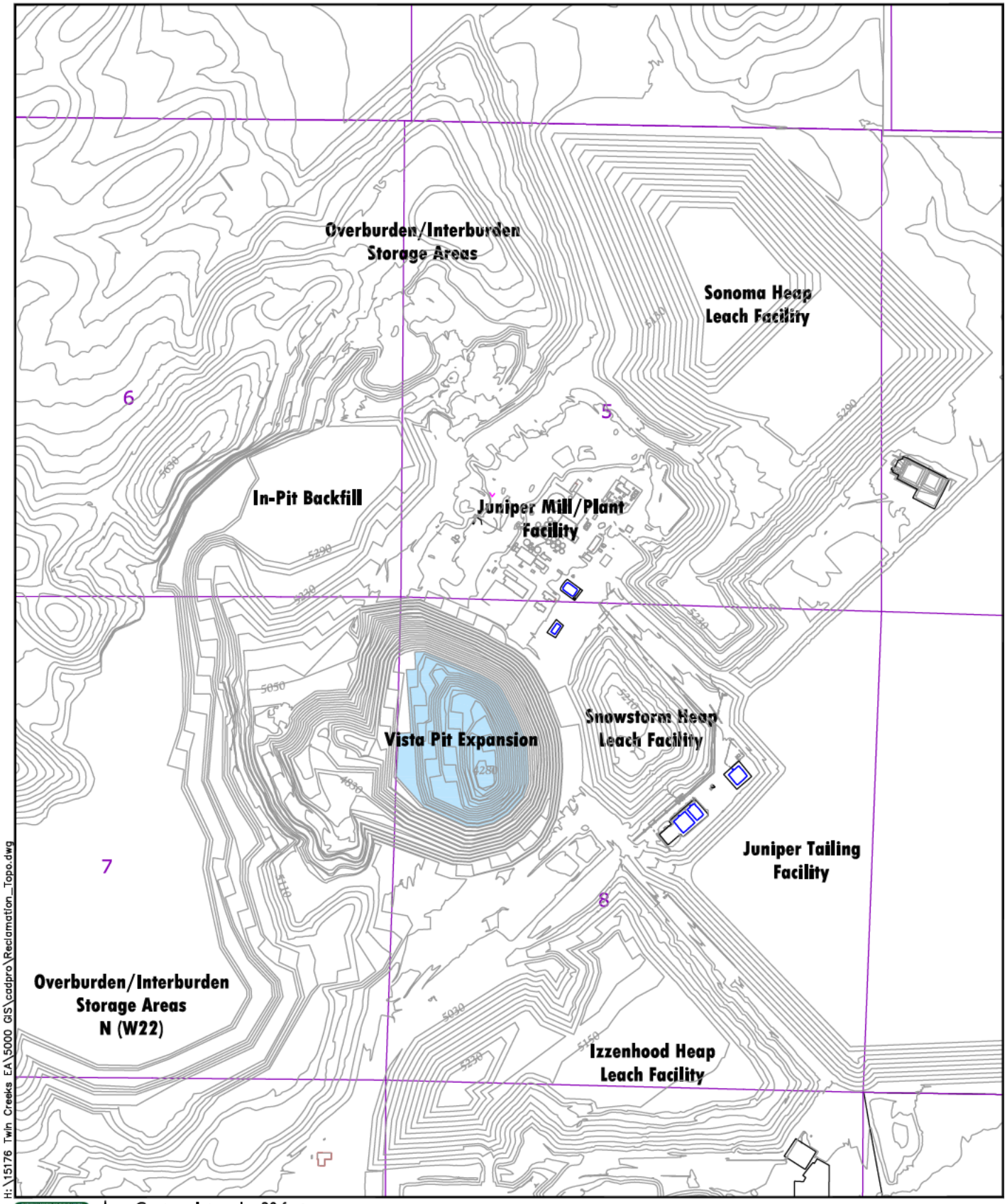
Upon completion of active leaching (application of sodium cyanide solution), process solution contained in the pore space of spent ore on the heap leach facility would drain by gravity to process ponds. Draindown rates would be highest immediately after operations cease and drop quickly as solution flows out of the saturated material (spent ore). As the solution volume is depleted, draindown approaches an equilibrium rate represented by the net influx of water (*i.e.*, precipitation) into the facility.

Newmont proposes a change in process fluid stabilization and decommissioning methodology to achieve process fluid stabilization (PFS) for heap leach facilities and associated process ponds at the Twin Creeks Mine. NAC 445A.430 requires a three-pore volume rinse of heap leach facilities to protect waters of the State from degradation following mine closure. Pursuant to NAC 445.430.3, an alternate method for stabilizing ore that has been leached may be approved if it can be demonstrated that the condition in which the material (spent ore) would be left would not degrade waters of the State. This proposed change in closure method would eliminate pumping the amount of water necessary for the three-pore volume rinse of each spent ore pile, which in return would reduce the time and energy required to decommission the heap leach facilities. This is the only change being proposed to the currently authorized decommissioning process. Newmont is still required to meet NDEP closure standards for process solution of 0.2 mg/L WAD cyanide and pH between 6 and 9.

Newmont completed a model evaluation of the draindown volume and rate of process fluids for heap leach facilities at Twin Creeks Mine (Newmont 2005). The model inputs various hydraulic and material properties associated with rock piles including:

- Saturated and unsaturated hydraulic conductivity;
- Total area of leach pad / area of active leaching / area of historic leaching;
- Height of leach pad ore pile;
- Fluid application rate / operational draindown rate;
- Volume of process fluid/water;
- Specific retention (moisture content of material at a pressure of negative 15 bars);
- Climate data (annual precipitation by month);
- Evaporation rate of evaporators (atomizers) to be used to enhance evaporation of fluid on heaps;
- Fluid management pond system capacities;
- Evaporation cell (E-cell) capacities; and
- Pump capacities.

These inputs are used in conjunction with literature values for permeability and porosities for the various rock types in the heap leach facility to complete calculations regarding rate of fluid draindown once spray application ceases (Newmont 2005; 2008a).



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Post Mining Pit
Lake - Final Elevation 4617 feet

Post Reclamation Topography
Vista Pit Expansion
Twin Creeks Mine
Humboldt County, Nevada
FIGURE 2-2

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Experience and modeling indicate that low precipitation and high evaporation conditions at the site would result in a low equilibrium flow rate (Newmont 2008a). Evapotranspiration (ET) covers on the heap leach facilities would reduce the net influx of water to the facility and further reduce the equilibrium flow rate. This flow rate would continue after other reclamation activities are completed and is referred to as long-term draindown. The proposed PFS plan incorporates two components of solution management: 1) removal of the bulk of solution in inventory, and 2) management of long-term draindown.

Removal of Bulk Solution

Following active leaching, Newmont would begin the process of removing the bulk of the process solution inventory. The goal would be to remove a sufficient volume of solution to allow passive handling of remaining solution in evaporation cells (E-cell). During initial operation, existing process ponds and pumping system would be used to re-circulate process solution to the heap leach facility without the addition of makeup water. To enhance evaporation during the re-circulating phase, atomizers (*e.g.*, snow-makers) would be installed in the existing system. The evaporation rate would vary between the heap leach facilities due to the volume of solution in each heap, number of atomizers used in the system, and surface area of process ponds. The period of active management of draindown and flow rates for each heap leach facility are shown in **Table 2-2**.

TABLE 2-2
Active/Passive Process Solution Management

Heap Leach Facility	Active Draindown Period	Flow Rate (gpm)	Passive Draindown Period	Flow Rate (gpm)
Osgood	Year 1 thru 8	7,000 to 6	Year 9 thru 20	6 to 2
Izzenhood	Year 1 thru 4	2,500 to 10	Year 5 thru 20	8 to 3
Snowstorm/Sonoma	Year 1 thru 7	2,500 to 5	Year 8 thru 20	4 to 2
Sonoma	Year 1 thru 7	2,500 to 4	Year 8 thru 20	3 to 1

Note: gpm = gallons per minute.
Source: Newmont 2005.

Long-Term Draindown

After the bulk of solution inventory has been removed through evaporation, Newmont would construct an ET or "store and release" cover on each of the heap leach facilities. Installation of the ET cover would consist of two feet of growth media placed on the top and slopes of each facility. Prior to placement of the cover material, the spent ore piles would be graded to promote runoff, and eliminate low areas that could pond water. The ET cover design would also minimize infiltration and provide for establishment of vegetation. Most of the precipitation falling on the facility would be entrained in the pore spaces of the cover material and removed through evapotranspiration.

Long-term draindown of solution from each of the heap leach facilities includes conversion of process ponds to function as E-cells. The design of the E-cells involves use of lined ponds (formerly process solution ponds) to store residual draindown water and allow the water to evaporate. Implementation of

E-cell methods would prevent degradation of waters of the State by complete containment. Period of passive management of draindown and flow rates for each heap leach facility are shown in **Table 2-2**.

Grading Disturbed Areas

Prior to replacing growth media, disturbed areas would be graded to create a stable post-mining configuration, establish effective drainage to minimize erosion, and protect surface water resources. To the extent practicable, grading would blend disturbed areas with the surrounding terrain.

Vista Pit

Approximately 76Mt of overburden/interburden would be used as in-pit backfill in the northwestern portion of the Vista Pit. Upon completion of mining operations, the area (approximately 170 acres) would be graded and covered with 6-inches of growth media and seeded. Growth media would not be placed on pit walls or benches of the open pit. Upon cessation of dewatering activities, a pit lake of approximately 41 acres would form in the bottom of the Vista Pit (**Figure 2-2**).

Overburden/Interburden Storage Areas

The benched slopes associated with OISAs would be graded to an intermediate slope of 2.5H:1.0V and an overall slope of 3.0H:1.0V. Grading would be done to minimize erosion, facilitate reclamation activities (seeding, mulching), and provide a surface that would support vegetation. The top of the OISAs would be ripped and graded to an overall 2 percent slope to promote runoff and eliminate ponding of precipitation and snowmelt (Newmont 2009a). Angular features, including tops and edges of OISAs, would be rounded. Overburden/interburden would be graded and ripped (to relieve compaction from mining equipment), covered with 6-inches of growth media, and seeded with an approved seed mixture. OISAs would be reclaimed concurrently where practicable.

Heap Leach Facilities

Heap leach facilities would be recontoured to an intermediate slope of 2.5H:1.0V and an overall slope of 3.0H:1.0V, and eliminate areas that could pond meteoric water. Growth media would be placed as a two-foot thick evapotranspiration or "store and release" cover and seeded. Grading of spent ore to achieve an overall average 3.0H:1.0V slope would not result in spent ore being placed outside of the liner system of the leach pad. The evapotranspiration cover would be designed to limit infiltration into the reclaimed ore pile by storing water during the dormant season so that it is available for plant uptake during the growing season. This cover would minimize the amount of water contacting spent ore.

Roads

Roads associated with the Vista Pit Expansion Project would be reclaimed concurrently with cessation of operations in individual areas. Roads remaining at the end of mining operations would be reclaimed when no longer needed for reclamation and access.

Haul roads associated with OISAs would be reclaimed concurrently with closure of the respective disposal area. Haul roads not located on the OISAs would be reclaimed by grading to provide proper drainage, ripping to reduce compaction, placement of 6-inches of growth media, and seeding. Reclaimed roads would be graded, to the extent practical, to reestablish original topography and drainage of the site and to control erosion. Culverts would be removed and natural drainage reestablished.

Exploration roads, drill pads, sumps, and trenches would be reclaimed in conjunction with ongoing operations. Exploration roads and drill pads would be bladed or shaped using a dozer or excavator. Growth media placed onto the disturbed area to blend with surrounding topography. Trenches would be backfilled and graded to conform to the surrounding topography and drainages reestablished.

Ancillary Facilities

No new ancillary facilities are needed or would be constructed within the proposed Project area. Ancillary facilities that would be used to support the Project are located in the Twin Creeks Mine Area. Reclamation of existing facilities would be in accordance with NDEP Permit 0058 and BLM approved Plan of Operations.

Soil Salvage and Replacement

Soil types were evaluated to determine the suitability, depth of salvage, and use as a growth media for reclamation purposes. Based on these evaluations and soil map unit distribution across the Twin Creeks Mine Area, a weighted-average of approximately 17 inches (10.2 million cubic yards) of suitable growth media material has been salvaged in the Mine area for reclamation purposes (BLM 1996). In addition, approximately 91,000 cubic yards of growth media would be available (based on 17-inch salvage depth) for salvage from 40 undisturbed acres in the proposed Sonoma Heap Leach Facility expansion area. Salvaged growth media would be placed on OISA N (W22) an existing facility located southwest of of the proposed expansion.

A Materials Handling Plan Modification (JBR 2002) indicated that existing alluvium at the Project area would be available as growth media in a greater volume and depth than previously assumed as long as the material is non-acid generating. Newmont would evaluate growth media for potential acid generation. Soil replacement depths would vary according to location, soil type, and mine component. The variety of replacement depths would provide different vegetation mosaics on reclaimed areas. Graded surfaces would be ripped where necessary prior to placement of growth media. Ripping would reduce compaction and provide a uniform seed bed.

Newmont has implemented BMPs to reduce soil loss from stockpiles through construction of run-off control berms, mulching, adding organic matter, concurrent reclamation, interim seeding, or leaving slopes in roughened condition.

Revegetation

The goal of Newmont's revegetation program is to stabilize reclaimed areas, ensure public safety, and establish a productive vegetative community in accordance with the Paradise-Denio MFP (BLM 1982) and designated post-mining land uses (Newmont 2009a). Plants proposed for use on the OISAs and

partially backfilled mine pit are shown in **Table 2-3**. Modifications to the seed list, application rates, cultivation methods, and techniques may change based on success of concurrent reclamation. Site-specific seed mixtures and application rates would be developed through consultation with and approval by BLM and NDEP. Seedlings may be substituted for seeds. The seed mix selected would represent a Reclaimed Desired Plant Community and the mix would be appropriate for each ecological site in the Project area. A 4-strand barbed wire perimeter fence along the permit boundary would remain in place until vegetation is established on reclaimed areas.

Criteria for bond release of revegetated areas would be in accordance with 43 CFR 3809.420 which requires, in part, "…establishment of a stable and long-lasting vegetative cover that is self-sustaining and, considering successional stages, will result in cover that is:

- Comparable in both diversity and density to pre-existing natural vegetation of the surrounding area; or
- Compatible with the approved BLM land use plan or activity."

TABLE 2-3
Reclamation Seed Mixture

Species		Pounds Pure Live Seed per Acre
Common Name	**Scientific Name**	
Crested wheatgrass	*Agropyron cristatum*	2.5
Great Basin wildrye	*Leymus cinerus*	2.5
Fourwing saltbush	*Atriplex canescens*	3
Shadscale	*Atriplex confertifolia*	3
Big sagebrush	*Artemisia tridentata var. tridenta, wyomingensis*	0.1
Prostrate summer cypress	*Kochia prostrate*	0.25
Palmer Penstemon	*Penstemon palmeri*	0.25
White Yarrow	*Achillea millefolium*	0.25
Cicer milkvetch	*Astragalus cicer*	1
TOTAL		**12.85**

Source: Newmont 2009a.

Concurrent Reclamation

As various facilities reach the end of their period of use, Newmont would initiate reclamation activities concurrent with ongoing mining operations. As mining operations progress, the backfilled portion of the Vista Pit would be concurrently graded, growth media placed, and seeded. Proposed schedule for post mining reclamation activities is shown in **Table 2-4**. Vegetation monitoring would continue for a minimum of three years after reclamation activities have been completed.

TABLE 2-4
Reclamation Schedule[1] - Twin Creeks Mine

Name	Year	1				2				3				4				5			
	Quarter	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
OPEN PITS																					
Berms																					
Fencing																					
Revegetation																					
OVERBURDEN/INTERBURDEN STORAGE AREA																					
Earthwork																					
Revegetation																					
Vegetation Monitoring[2]																					
HEAP LEACH PAD																					
Process Fluid Stabilization																					
Earthwork																					
Revegetation																					
Vegetation Monitoring[2]																					
ROADS																					
Earthwork																					
Revegetation																					
Vegetation Monitoring[2]																					

[1] Initiation of reclamation schedule does not coincide with initiation of mining schedule.
[2] Vegetation monitoring would continue for a minimum of three years after reclamation activities are concluded.

2.2.14 Environmental Protection Measures

Newmont Proposed Environmental Protection Measures

The following environmental protection measures and BMPs are included in Newmont's Plan of Operations for the Vista Pit Expansion Project.

- Fugitive emissions would be controlled using BMPs in accordance with Newmont's Fugitive Dust Control Plan and requirements of NDEP Air Quality Permit. Dust emissions would be controlled through use of water, approved chemical binders, or wetting agents, dust collection devices, water sprays, and revegetation of disturbed areas concurrent with operations.

- Gaseous emissions would be controlled through proper operation and maintenance of equipment.

- Mercury emissions would be controlled using Maximum Achievable Control Technology as mandated by the Nevada Mercury Program.

- Overburden/interburden would be managed in accordance with an NDEP approved Materials Handling Plan. A quarterly report that summarizes mining progress and monitoring of overburden/interburden would be submitted to BLM and NDEP.

- Existing diversion channels, sediment basins, and other surface water (sediment) control structures have been constructed to control stormwater run-on/run-off. Sediment control structures include silt traps and fences using certified weed-free straw, hay bales, geotextile fabric, and sediment ponds. Soil recovered from sediment retention ponds would be placed in stockpiles or spread over graded areas. Sediment control structures would remain active during the post-closure period until such time as reclamation has stabilized the land surface and use of these facilities is no longer required.

- Stormwater would be controlled using BMPs stipulated in Stormwater General Permit (NVR300000 – MSW-243). These BMPs address material handling procedures that minimize exposure of materials to stormwater; define spill prevention and response measures; identify sediment and erosion control measures; and describe physical stormwater controls.

- Water resources in the Project area are monitored as part of Newmont's Water Pollution Control Permits (NEV86018 and NEV86035) and discharge permit (NV0021725). Should it become necessary to develop mitigation measures based on monitoring results these mitigations would be coordinated with NDEP and BLM and evaluated under NEPA separate from this document.

- Newmont conducts annual weed surveys to direct weed control efforts. Weed control efforts would continue for the life-of-mine and reclamation period to reduce potential impacts of new infestations.

- New activity at the proposed mine expansion would be avoided until current nesting season is completed. The nest on the Vista Pit highwall would be monitored and U.S. Fish and Wildlife Service (USFWS) and BLM coordinated with regarding the nest prior to the next breeding season.

- Newmont, in cooperation with BLM and NDEP, would evaluate the status of vegetative growth during a minimum of three full growing seasons following completion of planting. Final bond release may be considered at that time. Interim reclamation progress at the Vista Pit Expansion Project area would be monitored as requested by the agencies.

- Revegetation plan that specifies use of native grass, forb, and shrub species. Planting and seeding techniques would be coordinated with BLM.

- The top of OISAs would be graded to create undulations and topographic relief to blend with surrounding undisturbed areas.

- Where possible, Newmont would direct-haul and place growth media on graded areas that have been prepared to receive growth media.

- Vegetate growth media stockpiles during first appropriate season.

- Reclaimed areas would be routinely inspected to assess vegetation establishment and the effectiveness of erosion control. Where warranted, maintenance would be employed to promote vegetation establishment and repair erosional features.

- All hazardous material storage tanks have secondary containment sufficient to hold at least 110 percent of the volume of the largest tank in the containment area. All tanks and containment vessels are positioned on a containment surface designed to route any spilled material to lined collection areas.

- An Emergency Response Plan has been implemented to address accidental spills or releases of hazardous materials to minimize health risk and environmental effects. The plans include procedures for evacuating personnel, maintaining safety, cleanup and neutralization activities, emergency contacts, internal and external notifications to regulatory authorities, and incident documentation.

- All outdoor lighting fixtures would be installed in conformance with the provisions of the Federal Energy Regulatory Commission and the North American Electric Reliability Corporation.

- All lighting would follow the standards for maximum lumens per acre output as recommended by the International Dark-Sky Association (IDA), unless other regulations apply.

- All lighting fixtures over 2000 lumens would be fully shielded, based on the recommended standards by IDA for Environmental Zone E1 lighting.

- Uplighting would not be used except in cases where the fixture is shielded from the sky by a roof overhang or similar structure and where the fixture does not cause light to extend beyond the structural shield.
- To the extent possible, lighting fixtures would be low pressure sodium.
- Project lighting would take into consideration locations, luminary mounting heights, safety, and security lighting structures.

Measures Proposed to be Carried Forward from the 1997 Record of Decision

Air Quality

- Newmont would continue to monitor and control emissions, including fugitive emissions, from sources at the mine site in accordance with Air Quality Permit No. AP1041-0723. Baghouses with control efficiencies exceeding 99 percent would continue to be used on existing facilities, including lime storage silos, conveyors, and crushers where practical. Other operations would continue to use fan dust systems and cyclones to reduce emissions to the atmosphere. Where baghouses are impractical, control systems for screening and the conveying circuit would continue to use fogging water sprays. Fugitive dust from all disturbed areas and unpaved roads would continue to be controlled using water sprays, chemical stabilization, or other controls approved by NDEP.

Cultural Resources

- Should cultural resources be encountered during mining operations Newmont would contact BLM immediately. If NRHP eligible sites or contributing elements are discovered within the proposed Project area and cannot be avoided, they would be mitigated through a data recovery plan approved by BLM in consultation with the State Historic Preservation Office (SHPO). (This bullet reflects 2011 standard operating procedure).

Native American Religious Concerns

- Newmont understands Native American concerns regarding disturbance of human graves and would continue their practice of training all staff members that supervise ground disturbing activities regarding requirements of the federal Native American Graves Protection and Repatriation Act and sections of the Nevada Revised Statutes addressing Native American graves.

Invasive, Non-native Species

- Newmont would continue to monitor disturbed and reclaimed areas for invasion of noxious weed species. If such invasions occur, appropriate control measures (as recommended by BLM and Nevada Division of Agriculture) would be implemented. Only noxious weed-free seeds would be used for reclamation purposes.

Water Resources

- Hydrologic monitoring would continue to be performed to maintain a seasonal surface water and groundwater chemistry database and to report any changing conditions in surface water flow rates, groundwater levels, and water quality. Newmont would continue to monitor water resources in the Project area in accordance with Water Pollution Control Permits (NEV86018 and NEV86035).

- After dewatering operations cease and a pit lake begins to develop, water quality sampling and analyses would be performed in accordance with NDEP requirements and Water Pollution Control Permit NEV86018.

- Newmont would continue periodic inspections of the Rabbit Creek drainage to identify any occurrence of accelerated channel and bank erosion or gullying resulting from dewatering discharges.

- Newmont would complete any necessary stabilization activities for drainage pathways affected by dewatering discharge associated with the Vista Pit Expansion Project

Geology and Minerals

- During operations, stability analysis of the proposed Sonoma Heap Leach Expansion and the modified Snowstorm Leach Pad would be completed on an annual basis. The minimum factor of safety for the leach pad slope design would be determined as part of the design approval by NDEP/BMRR in accordance with Water Pollution Control Permit NEV86018 and in coordination with BLM.

- The monitoring program Newmont currently has in place for land subsidence, slope failures, and earth fissures in the vicinity of solution-bearing facilities would continue to be used for the proposed expansion to the Sonoma Heap Leach Facility.

Paleontology

- If fossil deposits are located during construction, operation, or reclamation, measure would be taken to identify and preserve the fossils, including Newmont contacting BLM immediately.

Soil

- Newmont would use contour ripping and scarifying techniques during reclamation of the Sonoma Heap Leach Facility expansion to minimize compaction and erosion. Reclaimed areas would be visually inspected for flow channels, drainage and erosion controls, and slope stability until reclamation has final approval. Maintenance and/or corrective measures would be implemented, as necessary, during the monitoring period.

Special Status Species

- To protect sage grouse that may breed in the proposed expansion to the Sonoma Heap Leach Facility, an active lek survey would be conducted if construction activities occur between March 1 and May 15.

Wildlife

- All recorded data from monitoring of wildlife mortalities would continue to be submitted to BLM and NDOW. If the heap leach pad or solution ponds cause increased wildlife mortalities, Newmont would consult with BLM and NDOW to develop appropriate protection measures to reduce or eliminate the problem.

2.2.15 Monitoring Programs

The following section describes the monitoring programs Newmont proposes to implement during the operational and post-operational phases of the Vista Pit Expansion Project:

Operational Monitoring

Air Quality

Emissions would be monitored in accordance with requirements imposed by an existing NDEP Air Quality Operating Permit issued for the Twin Creeks Mine (AP1041-0723).

Water Resources

Water resources in the Project area are monitored in accordance with Water Pollution Control Permit NEV86018. The monitoring programs have been developed in conjunction with NDEP to address groundwater and surface water. The purpose of water monitoring is to report changing conditions as mining and ore processing operations are conducted in the area.

Surface water quality has been characterized based on samples collected from 20 stream and 10 spring locations. Springs and streams in the monitoring program are periodically sampled for flow and Profile I constituents.

Groundwater has been characterized (Profile I) by samples from monitoring wells, dewatering wells, horizontal drains, and seeps. Sampling frequency varies from quarterly (groundwater) to annually (dewatering) to once every 5 years (regional). Groundwater monitoring locations are shown on **Figure 2-1**.

Additional monitoring wells for the proposed expansion of the Sonoma Heap Leach Facility may be required by NDEP and BLM and would be evaluated separately from this EA. The location of these wells and frequency of sampling would be determined during development of a Mitigation and Monitoring Plan at that time. Water quality, groundwater levels, and surface water flow would be measured as required at designated monitoring wells, springs and seeps, and surface water stations.

Reports would be prepared by Newmont summarizing water resource monitoring data collected. These reports are and would continue to be submitted quarterly/annually to NDEP and BLM.

Cultural Resources

Cultural resource inventories have been completed in the proposed Vista Pit Expansion Project area. No sites eligible for listing on the National Register of Historic Places would be affected. Unknown sites that may be discovered during proposed surface disturbance activities or by future cultural inventories would either be avoided or mitigated by Newmont in accordance with Section 106 of the National Historic Preservation Act.

Paleontological Resources

Paleontological resources have not been identified within the Vista Pit Expansion Project area. In the event vertebrate fossils are discovered within the Project area during mining operations, Newmont would notify the BLM Authorized Officer immediately. Actions that would occur after notification include cessation of mining activities in the area of discovery; verification and preliminary inspection of the discovery; and development/implementation of a BLM-approved plan to avoid or mitigate the fossils.

Migratory Birds

Land clearing and surface disturbance would be timed to prevent destruction of active bird nests or disturbance of birds during the avian breeding season (March 1 to August 31) to comply with the Migratory Bird Treaty Act. This time frame may be extended or shortened depending upon evaluation of species associated with this habitat. If surface disturbing activities were proposed during this time frame, Newmont would consult with BLM and following BLM survey protocols, Newmont would have a qualified biologist survey areas proposed for disturbance to identify active nests or nesting activity. If active nests are located, or if other evidence of reproductive activity is observed (mating behavior, mating pairs, territorial defense, carrying nesting material, transporting of food, etc.), the area would be avoided per BLM guidelines to prevent destruction or disturbance of nests until the birds are no longer present. Avian surveys would be conducted during the breeding season no more than 10 days and no less than 3 days prior to Newmont's activities that would result in disturbance. After such surveys are performed, and disturbance created (*i.e.*, road construction and drill pad development), Newmont would not disturb additional land during the avian breeding season without first conducting another avian survey (per BLM guidelines) in compliance with the Migratory Bird Treaty Act (Newmont 2009a).

Post-Closure Monitoring

Water Resources

Groundwater monitoring associated with the Vista Pit Expansion Project would be conducted in accordance with Water Pollution Control Permit NEV86018 and included as part of Newmont's ongoing approved hydrologic monitoring plans for the Twin Creeks Mine. Surface water monitoring would continue until vegetation is established and/or until monitoring is determined by BLM and NDEP to no longer be necessary.

Vegetation

Reclamation goals for mining disturbances are to 1) stabilize the site, and 2) establish a productive vegetative community based on the designated post-mining land uses. The goal of revegetation would be to achieve as close to 100 percent of the perennial plant cover of selected comparison areas as possible. The comparison, or reference, areas would be selected from representative plant communities adjacent to the mine site, test plots or demonstration areas or, as appropriate, representative ecological or range site descriptions.

2.3 ACTION ALTERNATIVES

2.3.1 Alternative A – Use Existing Heap Leach Facilities

Under this alternative, Newmont would be required to place approximately 7.5Mt of oxide ore on the Izzenhood Heap Leach Facility to the maximum allowable height in accordance with Water Pollution Control Permit NEV86018. This alternative would reduce the amount of land area that is currently permitted as ancillary facility (145 acres for haul road and equipment/material storage) and converted to a heap leach facility (*i.e.*, proposed expansion of the Sonoma Heap Leach Facility would not be constructed under this alternative).

2.4 NO ACTION ALTERNATIVE

The No Action Alternative is a description of the current and future environmental conditions in the absence of the Proposed Action. This alternative provides the basis for evaluating the changes in environmental conditions that would result from the Proposed Action.

Under the No Action Alternative, Newmont would not be authorized to develop and expand defined ore reserves, construct haul and access roads, or vertically expand existing OISAs as described under the Proposed Action. Newmont would continue to operate the Twin Creeks Mine in accordance with current authorizations that were evaluated in the 1996 EIS for the Twin Creeks Mine (BLM 1996). Implementation of the No Action Alternative would affect components of the Proposed Action in the following manner:

- Fluid stabilization and heap leach decommissioning would include operation of a spray-evaporation system with multiple fresh-water rinse cycles to meet closure criteria; the principal criteria include weak acid dissociable (WAD) cyanide concentration of 0.2 mg/L; pH between 6 and 9; and other constituents at concentrations that would not degrade state water. Newmont would continue to spray process solutions and rinse water on the spent ore piles on the leach pads until these criteria are met. Once decommissioning criteria are met, the evaporation spray would continue until the volume of water in the leach circuit has been reduced to residual draindown levels (estimated at 3 to 5 gpm). Residual draindown would report to the existing process pond system which would be converted into evaporation cells (E-cells). The E-cells would continue to evaporate residual draindown during the post-closure period;

- Further modification to the Snowstorm Heap Leach Facility to provide borrow material for construction of an expansion to the tailings storage facility and to prepare the site for expansion of the Visa Pit would be suspended. The site of the proposed Vista Pit expansion would continue to be used as a laydown and equipment storage area and would be reclaimed in accordance with the current reclamation plan including ripping and seeding;

- The Sonoma Heap Leach Facility would not be expanded and the area proposed for the expansion would continue to be used for authorized activities including a haul road, exploration roads and drill pads, and equipment storage. Approximately 40 acres of the total 145-acre tract would remain undisturbed. The remaining portion (105 acres) would be reclaimed in accordance with the current reclamation plan for the Twin Creeks Mine including grading, ripping, growth media placement, and seeding.

- The current dewatering system would not be modified or expanded to support dewatering of the Vista Pit expansion area. The dewatering system currently supports Mega Pit mining operations and would continue to be active until 2021. Closure of the dewatering well system would include plugging and capping of the well system and removal of infrastructure;

- In accordance with the current authorized mine plan for Twin Creeks Mine, mining operations would begin to reduce in 2017 and would cease by 2019 resulting in layoff of approximately 300 employees. The layoff would reduce the work force at Twin Creeks Mine to 240 employees.

Mining operations and exploration activities for the Twin Creeks Mine would continue under current authorizations as described in Section 1.6 – *Background Information* and the Final Twin Creeks Mine EIS (BLM 1996). Mine life would not be extended. As mining activities decrease, reclamation and closure activities would increase, employment would decrease and taxes paid would decrease.

Potential impacts predicted to result from development of the Project would not occur. Newmont could revise the Vista Pit Expansion amendment to address issues identified by BLM that resulted in selection of the No Action Alternative and re-submit the amendment for consideration by BLM.

2.5 ALTERNATIVES CONSIDERED BUT ELIMINATED FROM DETAILED ANALYSIS

This section describes alternatives to the Proposed Action that were eliminated from further review in the EA. These alternatives were identified during the public scoping process or by BLM during review and analysis of the Proposed Action. These alternatives would not meet the purpose and need for the Proposed Action or were considered technically infeasible, and/or provided no environmental advantage over the Proposed Action. The rationale for dismissing these alternatives is provided.

2.5.1 Backfill Portion of Vista Pit to Eliminate Pit Lake

This alternative would require Newmont to backfill that portion of the Vista Pit mined below elevation 4660 feet amsl to eliminate formation of a post-mine pit lake. This alternative was eliminated from further analysis as backfilling that portion of the Vista Pit expansion below 4660 feet amsl would

preclude access to future ore reserves. In addition, approximately 1.18 million gallons of diesel would be consumed during re-handling of 9 to 10Mt of overburden/interburden, emitting over 13,000 tons of CO_2.

2.5.2 Backfill Portions of Mega Pit

This alternative would require Newmont to transport overburden/interburden generated from expansion of the Vista Pit for use as backfill in portions of the Mega Pit. This alternative was eliminated from further analysis due to mine sequencing issues and the increased haul distance which would consume approximately 6 million gallons of diesel fuel emitting 67,000 tons of CO_2 and does not provide any environmental benefit over the Proposed Action.

2.6 COMPARISON OF ALTERNATIVES

A comparison of the Proposed Action, Alternative A, and No Action Alternative is contained in **Table 2-5**. Potential impacts resulting from implementation of the Proposed Action and applicant proposed environmental protection measures are also summarized in **Table 2-5**. Environmental protection measures are footnoted to denote whether the protection measure is consistent with the Record of Decision for the Twin Creeks Mine (BLM 1997) or is a new measure included in the Proposed Action.

TABLE 2-5
Potential Impacts and Applicant Proposed Environmental Protection Measures
Twin Creeks Mine - Vista Pit Expansion Project

Resource	Potential Impact			Applicant Proposed Environmental Protection Measures
	Proposed Action	Alternative A (use existing heap leach facilities)	No Action Alternative	
Mining Operations	Removal of 114Mt of overburden/interburden and 15Mt of ore over a 6-year mine life. Incremental increase of 117 acres to existing pit	Same as Proposed Action	Recovery of 15Mt of ore and incremental expansion of 117 acres to existing pit would not occur.	Materials Handling Plan[1]
	Partial backfill of previously mined potions of Vista Pit would reduce overall height of highwall by 460 feet.	Same as Proposed Action	About 269 acres remaining as open pit	
	Formation of a pit lake about 41 acres	Same as Proposed Action	Pit lake would not form	
Reclamation Activities	Revegetation of 170 acres of partially backfilled pit that would have remained as open pit.	Same as Proposed Action	About 269 acres of open mine pit would remain and not be revegetated	Revegetation plan calls for use of native grass, forb, and shrub species[1]
	Reclamation of heap leach facilities would include placement of 2-feet of growth media to provide a store and release evapotranspiration cover system; decommissioning of heap leach facilities would use evaporation of process solution and evaporation cells to manage long-term residual draindown.	Same as Proposed Action	Disturbed areas would be reclaimed in accordance with existing approved plans. Decommissioning of heap leach pads would employ rinse cycles to treat ore piles and process solutions to applicable standards.	Tops of OISAs would be regraded to provide undulations and topographic relief to blend with surrounding undisturbed areas.[1]

TABLE 2-5
Potential Impacts and Applicant Proposed Environmental Protection Measures
Twin Creeks Mine - Vista Pit Expansion Project

Resource	Potential Impact			Applicant Proposed Environmental Protection Measures
	Proposed Action	Alternative A (use existing heap leach facilities)	No Action Alternative	
Air Quality	Sulfur dioxide (SO_2), carbon monoxide (CO), oxides of nitrogen (NO_X), volatile organic compounds (VOCs), and particulate emissions (PM_{10} and $PM_{2.5}$) would continue over the 9-year Project life.	Same as Proposed Action	Gaseous and particulate emissions would remain at current levels as described below.	Monitoring of gaseous emissions (NO_x, CO, and SO_2) is not required by existing NDEP Air Quality Operating Permit issued for Newmont's Twin Creeks Mine Operation (AP1041-0723.02).
Gaseous Emissions	The Vista Pit Expansion Project would be a source of gaseous air pollutants associated with consumption of diesel fuel including 0.3 tons/year SO_2, 243 tons/year CO, 351 tons/year NO_x, and 44 tons/year VOCs. The primary source of these emissions would be exhaust from diesel engines used to power mining equipment and haul trucks.	Same as Proposed Action	Emissions of approximately 1,494 tons/year of CO, 1,214 tons/year of NO_X, 298 tons/year of SO_2 and 154 tons/year of VOCs would occur annually from diesel and non-diesel combustion sources associated with current authorizations.	Emissions would be controlled through proper operation and maintenance of equipment[1]

TABLE 2-5
Potential Impacts and Applicant Proposed Environmental Protection Measures
Twin Creeks Mine - Vista Pit Expansion Project

Resource	Potential Impact			Applicant Proposed Environmental Protection Measures
	Proposed Action	Alternative A (use existing heap leach facilities)	No Action Alternative	
Particulate Emissions	Particulate emissions associated with consumption of diesel fuel would be 22.9 tons/yr of PM_{10} and 22.3 tons/yr of $PM_{2.5}$ during initial development of the Vista Pit. Particulate emissions for the Twin Creeks Mine associated with non-diesel sources would be 2,259 tons/yr of PM_{10} and 340 tons/yr of $PM_{2.5}$. Estimated emissions of fugitive dust from drilling, blasting, loading, and hauling activities would be approximately 400 tons/yr including 111 tons of PM_{10} and 8 tons of $PM_{2.5}$	Same as Proposed Action	Particulate emissions of 2,335 tons/yr of PM_{10} and 414 tons/yr of $PM_{2.5}$ would occur annually from diesel and non-diesel combustion sources associated with current authorizations. Estimated emissions of fugitive dust from drilling, blasting, loading, and hauling activities associated with current operations would be similar to those modeled for the Proposed Action.	Fugitive dust would be controlled using BMPs stipulated in Air Quality Permit No. AP1041-0723.02 and Newmont's Fugitive Dust Control Plan Dust emissions would be controlled through use of water, approved chemical binders or wetting agents, dust collection devices, water sprays, and revegetation of disturbed areas concurrent with operations.[2]
Greenhouse Gas Emissions	Approximately 37,348 tons/year of CO_2 would be emitted annually from consumption of approximately 3 million gallons of diesel fuel during mining of the Vista Pit.	Same as Proposed Action	Emissions of approximately 112,043 tons of CO_2 would occur annually from diesel and non-diesel combustion sources associated with current authorizations	Emissions would be controlled through proper operation and maintenance of equipment[1]
Mercury Emissions	Based on 2010 source testing data approximately 19 lbs/year of mercury would be associated with the oxide mill ore processed annually at the Juniper Mill (Newmont 2011).	Same as Proposed Action	Mercury emissions (approximately 425 lbs/year) from ore mined under current permits would continue.	Mercury emissions would be controlled using existing systems – Emissions levels would not exceed state of Nevada specified levels.[1]

TABLE 2-5
Potential Impacts and Applicant Proposed Environmental Protection Measures
Twin Creeks Mine - Vista Pit Expansion Project

Resource	Potential Impact			Applicant Proposed Environmental Protection Measures
	Proposed Action	Alternative A (use existing heap leach facilities)	No Action Alternative	
Cultural Resources	No effect on cultural resources	No effect on cultural resources	No effect on cultural resources	Prehistoric and historic sites/components determined eligible for the National Register of Historic Places by BLM and Nevada State Historic Preservation Office have been recorded to BLM standards and the information integrated into local and statewide data repositories. Should cultural resources be encountered during mining operations Newmont would contact BLM immediately.[2]
Invasive, Non-native Species	Invasive, non-native species may spread to newly disturbed areas. Ongoing weed control program would limit impacts.	Invasive, non-native infestations would be monitored and controlled under ongoing weed control program.	Invasive, non-native infestations would be monitored and controlled under ongoing weed control program.	Newmont would conduct annual weed surveys to direct weed control efforts. Weed control efforts would continue for the life-of-mine and reclamation period to reduce potential impacts of new infestations.[1] Certified weed free straw bales would be used for sediment control.[1]

TABLE 2-5
Potential Impacts and Applicant Proposed Environmental Protection Measures
Twin Creeks Mine - Vista Pit Expansion Project

Resource	Potential Impact			Applicant Proposed Environmental Protection Measures
	Proposed Action	Alternative A (use existing heap leach facilities)	No Action Alternative	
Migratory Birds	Formation of pit lake in Vista Pit may attract waterfowl. Given the low frequency of use by migratory birds and the extent of exceedances of toxic reference values and limited expected bioavailability of chemicals of potential concern identified in a Screening Level ecological Risk Assessment (Integral 2011), it is unlikely these concentrations represent risks to migratory birds.	Same as Proposed Action	No pit lake would form.	
Native American Religious Concerns	No effect on Native American Religious Concerns	No effect on Native American Religious Concerns	No effect on Native American Religious Concerns	
Water Quality	The Proposed Action would not result in a modification of surface water conditions in the Project area. No perennially or ephemeral flowing streams or drainages are located within the footprint of the Proposed Action.	Same as Proposed Action	No perennial or ephemeral flowing streams or drainages are located within the footprint of existing permitted activities.	Existing diversion channels, sediment basins, and other surface water (sediment) control structures have been constructed to control stormwater run-on/run-off; Sediment control structures include silt traps and fences using certified weed free straw, hay bales, or geotextile fabric, and sediment ponds.[2]

TABLE 2-5
Potential Impacts and Applicant Proposed Environmental Protection Measures
Twin Creeks Mine - Vista Pit Expansion Project

Resource	Potential Impact			Applicant Proposed Environmental Protection Measures
	Proposed Action	Alternative A (use existing heap leach facilities)	No Action Alternative	
	Additional dewatering of up 8,400 gpm attributable to the Vista Pit Expansion would occur. Approximately 4,300 gpm would be consumed by operations; remaining volume would be treated and discharged under existing permits.		No dewatering of the Vista Pit would occur. Dewatering of Mega Pit would continue.	Water resources in the Project area are monitored as part of Newmont's Water Pollution Control Permits (NEV86018 and NEV86035). The monitoring programs have been developed in conjunction with the NDEP to address groundwater, springs/seeps, and streams/rivers.[2]
	Partially backfilled portions of the Vista Pit would be above the pre-mining groundwater level.		Groundwater level beneath the Vista Pit would not be affected.	Monitor groundwater and surface water quality in accordance with Water Pollution Control Permits (NEV86018 and NEV86035)[2] Overburden/interburden (including AG overburden/interburden) would be managed in accordance with an NDEP approved Materials Handling Plan.[1]
	A pit lake (about 41 acres) would form in the expanded portion of the Vista Pit approximately 200 years after cessation of mine dewatering activities.		No pit lake would form	Monitor pit lake water quality[2]

TABLE 2-5
Potential Impacts and Applicant Proposed Environmental Protection Measures
Twin Creeks Mine - Vista Pit Expansion Project

Resource	Potential Impact			Applicant Proposed Environmental Protection Measures
	Proposed Action	Alternative A (use existing heap leach facilities)	No Action Alternative	
Geology and Minerals	Overburden/interburden associated with the Vista Pit Expansion would be used to partially backfill previously mined portions of the Pit or placed in the OISA N (W22). Depending on residual ore reserves in the Vista Pit, backfilling mined-out portions of the Pit at current gold prices would result in limiting access to remaining ore reserves. Placement of overburden/interburden generated from the Project would not result in decreased stability of existing disposal facilities in the Project area.	Same as Proposed Action	Recovery of 15Mt of ore and incremental expansion of 117 acres to existing pit would not occur. Under current authorization and closure plans approximately 269 acres of the Vista Pit would remain as an open pit.	
	A pit lake (about 41 acres) would form in the expanded portion of the Vista Pit approximately 200 years after cessation of mine dewatering activities.		No pit lake would form.	
	Acid-generating overburden/interburden would be encapsulated in cells constructed above the predicted post-mining groundwater elevation within the backfilled portion of the Vista Pit.		No overburden/interburden would be generated as no mining would occur	Overburden/interburden would be managed in accordance with an NDEP approved Materials Handling Plan. A quarterly report that summarizes mining progress and monitoring of overburden/interburden would be submitted to BLM and NDEP.[2]

TABLE 2-5
Potential Impacts and Applicant Proposed Environmental Protection Measures
Twin Creeks Mine - Vista Pit Expansion Project

Resource	Potential Impact			Applicant Proposed Environmental Protection Measures
	Proposed Action	Alternative A (use existing heap leach facilities)	No Action Alternative	
Paleontology	Geologic formations in the proposed Project area have a low potential (Class 1) for containing vertebrate fossils or noteworthy occurrence of invertebrate or plant fossils. Potential direct and indirect impacts to paleontological resources would be minimal as a result of the Vista Pit Expansion Project	Same as Proposed Action	Same as Proposed Action	Should paleontological resources be encountered during mining operations Newmont would contact BLM immediately.[2]
Social Values and Economics	The proposed Project would not result in hiring new employees, but would provide extended employment for approximately 300 employees over the Project life and average annual earnings of $25 million.	Same as Proposed Action	Mine operation employees would decrease from the current level of 540 by 157 in 2018 and an additional 150 in 2019.	None
	Support continuation of about 250 secondary jobs in Humboldt County economy during the 6 years of operation, providing an additional $10 million of indirect and induced wages annually.	Same as Proposed Action	Reduced wages spent in the local economy, decreased revenue to local and state jurisdictions, increased stress on public assistance programs, and decreased quality-of-life for some residents.	
	Sales, property, and net proceeds taxes would continue to be paid to Humboldt County. Continued mine employment at the Project would maintain quality-of-life for workers and their families.	Same as Proposed Action		

TABLE 2-5
Potential Impacts and Applicant Proposed Environmental Protection Measures
Twin Creeks Mine - Vista Pit Expansion Project

Resource	Potential Impact			Applicant Proposed Environmental Protection Measures
	Proposed Action	Alternative A (use existing heap leach facilities)	No Action Alternative	
Soil	Impacts associated with 40 acres of disturbance from expansion of the Sonoma Heap leach Facility include: • soil loss during salvaging, when growth media is stockpiled and stabilized in stockpile areas; • loss between final redistribution and completion of reclamation; • modification of chemical and physical characteristics; • wind erosion; and • decreased biological activity. Expansion of the Vista Pit would involve relocating spent ore from a portion of the Snowstorm Heap Leach Facility.	Conversion of 145 acres of land currently permitted as ancillary mine facilities (*i.e.*, equipment/material storage) associated with expansion of the Sonoma Heap leach Facility would not occur.	Impacts associated with the Proposed Action would not occur. Mine related disturbance would be reclaimed in accordance with existing permits. Existing growth media would be placed over areas with coarse material and little or no fines. Areas with adequate fines would be direct seeded.	Direct haul and placement of growth media on graded disturbed areas where possible.[2] Revegetate growth media stockpiles during first appropriate season. Soil excavated from sediment retention ponds would be placed in stockpiles or spread over graded areas.[2] Sediment control structures would remain active during the post-closure period until such time as reclamation has stabilized and their use is no longer required.[2] Sediment (soil) would be periodically removed from sediment control structures and returned to reclaimed areas or stockpiles.[1] Reclaimed areas would be routinely inspected to assess vegetation establishment and the effectiveness of erosion control. Where warranted, maintenance would be employed to promote vegetation reestablishment and repair erosional features.[2]
Special Status Species	No additional impacts to special status plant or wildlife species or their habitat would occur.	No impacts to special status plant or wildlife species would occur.	No impacts to special status plant or wildlife species would occur.	

TABLE 2-5
Potential Impacts and Applicant Proposed Environmental Protection Measures
Twin Creeks Mine - Vista Pit Expansion Project

Resource	Potential Impact			Applicant Proposed Environmental Protection Measures
	Proposed Action	Alternative A (use existing heap leach facilities)	No Action Alternative	
Vegetation	Disturbance to approximately 40 acres of permitted/undisturbed sagebrush/grassland habitat associated with expansion of the Sonoma Heap Leach Facility.	Conversion of 145 acres of land currently permitted (105 acres currently disturbed) as ancillary mine facilities (*i.e.*, equipment/material storage) associated with expansion of the Sonoma Heap leach Facility would not occur.	No new disturbance	Revegetation plan calls for use of native grass, forb, and shrub species. Planting and seeding techniques would be coordinated with BLM.[1]
	Partial in-pit backfill would provide approximately 170 acres of land surface that would be revegetated to support wildlife habitat.	Same as Proposed Action	About 269 acres of open mine pit would remain and not be revegetated.	
	Approximately 49 acres associated with access and haul roads would be revegetated.	Disturbance (49 acres) associated with access and haul roads would not occur.	Disturbance (49 acres) associated with access and haul roads would not occur.	
Wildlife	Proposed Project would affect 145 acres (105 acres currently disturbed and 40 acres of undisturbed sagebrush/grassland habitat).	Conversion of 145 acres of land currently permitted (105 acres currently disturbed) as ancillary mine facilities (*i.e.*, equipment/material storage) associated with expansion of the Sonoma Heap leach Facility would not occur.	Impacts associated with disturbance to 40 acres of sagebrush/grassland habitat within the 145-acre tract habitat would not occur.	Concurrent reclamation of disturbed areas would be conducted where possible.[2]
	Partial in-pit backfill would provide approximately 170 acres of land surface that would be revegetated.	About 276 acres of open mine pit would remain and not be revegetated.	About 269 acres of open mine pit would remain and not be revegetated.	

TABLE 2-5
Potential Impacts and Applicant Proposed Environmental Protection Measures
Twin Creeks Mine - Vista Pit Expansion Project

Resource	Potential Impact			Applicant Proposed Environmental Protection Measures
	Proposed Action	Alternative A (use existing heap leach facilities)	No Action Alternative	
	Potentially acid-generating overburden/interburden would be encapsulated in cells constructed above the predicted post-mining groundwater elevation within the backfilled portion of the Vista Pit.		No overburden/interburden would be generated as no mining would occur	Overburden/interburden would be managed in accordance with an NDEP approved Materials Handling Plan. A quarterly report that summarizes mining progress and monitoring of overburden/interburden would be submitted to BLM and NDEP.

Note: Mt = million tons; gpm = gallons per minute
[1] New protection measure included in the Proposed Action.
[2] Protection measure is consistent with Record of Decision for Twin Creeks Mine (BLM 1997).

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CHAPTER 3
AFFECTED ENVIRONMENT

3.1 INTRODUCTION

This chapter describes the affected environment in the proposed Vista Mine Pit Expansion Project area. In general, "Project area" refers to land associated with the Proposed Action located within the Twin Creeks Mine Operations Area permit boundary.

Baseline information presented in this chapter was obtained from: Final EIS for the Twin Creeks Mine (BLM 1996); discussions with federal, state, and local agencies; field and laboratory studies conducted in the Project area; and on-site experience with mining and reclamation. The affected environment for individual resources was delineated based on the area of potential direct and indirect environmental impacts for the proposed Project. Each resource analysis in this chapter includes a description of the geographic area considered to be the study area for that resource, and the rationale for the designation.

Existing permitted mining operations, including mine pits, OISAs, heap leach facilities, tailings storage facilities, and haul roads have altered the landscape and represent the characteristic environment in the Project area. Components of the Proposed Action that would alter the existing landscape at the Twin Creeks Mine include expansion of the Vista Pit into an area currently occupied by a heap leach facility (Snowstorm); vertical expansion of an existing OISA N (W22); expansion of the existing Sonoma Heap Leach Facility; and relocation of access and haul roads within previously disturbed areas of the Twin Creeks Mine. A detailed description of the Proposed Action is included in Chapter 2 – *Alternatives Including the Proposed Action.*

3.2 AFFECTED RESOURCES

Table 3-1 identifies the supplemental authorities (formerly referred to as critical elements of the human environment) and whether each is present, present and not affected, or present and potentially affected. **Table 3-2** identifies additional affected resources that are present and potentially affected.

TABLE 3-1
Potentially Affected Resources and Resource Uses
Vista Pit Expansion – Twin Creeks Mine

Supplemental Authority	Not Present	Present Not Affected	Present Affected	Rationale and/or Reference Section
Air Quality			X	Section 3.2.1
Cultural Resources		X		Section 3.2.2
Areas of Critical Environmental Concern	X			Not applicable
Environmental Justice	X			Minority populations would not be affected.
Floodplains	X			Not applicable
Invasive, Nonnative			X	Section 3.2.3
Migratory Birds			X	Section 3.2.4
Native American Religious Concerns		X		Section 3.2.5
Prime or Unique Farmlands				Not applicable
Water Quality (Surface and Ground)			X	Section 3.2.6 (For the purposes of this analysis Water Quantity will be analyzed in this section).
Threatened and Endangered Species	X			No Threatened or Endangered Species (plants or animals) are known to exist in the Project area
Wastes, Hazardous or Solid		X		Section 2.2.9
Wetland and Riparian Zones	X			No Wetlands in Project Area
Wild and Scenic Rivers	X			No designated Wild and Scenic Rivers are located in the vicinity of the Proposed Action.
Wilderness	X			No designated Wilderness Areas are located in the vicinity of the Proposed Action.

TABLE 3-2
Additional Affected Resources

Resource	Present, Potentially Affected	Reference Section
Geology and Minerals	X	Section 3.2.7
Paleontology	X	Section 3.2.8
Social Values and Economics	X	Section 3.2.9
Soil	X	Section 3.2.10
Special Status Species	X	Section 3.2.11
Vegetation	X	Section 3.2.12
Wildlife	X	Section 3.2.13

SUPPLEMENTAL AUTHORITIES

3.2.1 Air Quality

The proposed Vista Pit Expansion Project is located entirely within the Humboldt River hydrographic basin and Kelly Creek Area sub-basin 66. The Study Area for air quality encompasses these hydrographic basins including the Twin Creeks Mine Operations Area (**Figure 3-1**).

The Project area, located approximately 35 miles northeast of Winnemucca, Nevada, is subject to large daily temperature fluctuations, low relative humidity, and limited cloud cover. Wind data collected at the Twin Creeks Meteorological Station indicate the most common wind direction is from the northwest and is attributed to localized orographic and thermally-induced effects caused by the proximity of the site to the Osgood and Snowstorm Mountains.

Mean monthly temperatures recorded at the Twin Creeks Meteorological Station for the period 1992-2010 vary from 28 to 30˚F in December and January, to 69 to 72˚F in July and August. Monthly mean minimum and maximum daily temperature values from the Project area demonstrate that the range of temperatures within a month typically vary by approximately 20˚F (BLM 1996).

Mean average annual precipitation for the area ranges from 6.75 inches at Golconda to 8.24 inches at Winnemucca (Itasca 2010). Heaviest precipitation occurs as snow from November through January, and as rain in May and June. Summer precipitation occurs mostly as scattered showers and thunderstorms that contribute little to overall precipitation.

The amount of precipitation that occurs in an area is influenced by elevation of the landscape. A precipitation gradient develops where an air mass rises from lower elevation in response to mountains or higher elevation areas which typically causes cooling of the air mass, thereby resulting in more precipitation falling at higher elevations. The phenomenon is known as an orographic microclimate and is a function of warmer air holding more moisture than cool air. As air rises and cools, it releases moisture.

Ambient Air Quality Standards

The State of Nevada and federal government have established ambient air quality standards for criteria air pollutants. Criteria pollutants are carbon monoxide (CO), sulfur dioxide (SO_2), particulate matter smaller than 10 microns (PM_{10}), particulate matter smaller than 2.5 microns ($PM_{2.5}$), ozone, nitrogen dioxide (NO_2), and lead (Pb).

Ambient air quality conditions in the Twin Creeks Mine area are described in the Air Quality Assessment Report (EMA 2011a). A comprehensive inventory of potential sources of Twin Creeks Mine and Vista Phase 7 Pit Expansion Project air pollutant emissions identified approximately 280 individual emission units, including stationary "point" sources; "fugitive" sources; and mobile and non-road combustion sources. Estimates were made of the emission rates from each emission unit for: 1) five criteria air pollutants (particulate matter [including particulate matter smaller than 10 microns in aerodynamic diameter (PM_{10}) and particulate matter smaller than 2.5 microns in aerodynamic diameter ($PM_{2.5}$)], carbon monoxide (CO), nitrogen oxides (NO_X), sulfur dioxide (SO_2); 2) two criteria air pollutant precursors [nitrogen oxides (NO_X) and volatile organic compounds (VOCs)]; and 3) carbon dioxide (CO_2) (EMA 2011). The current U.S. Environmental Protection Agency approved AMS/EPA Regulatory Model (AERMOD Version 09292) was used to conduct the ambient air quality modeling.

Most emissions from the Twin Creeks Mine are from combustion of diesel fuel used to power mining equipment and haul trucks. Additional modeled data provided by EMA (2011b, 2011c) estimates air pollutants emitted from combustion of diesel fuel and those emitted from non-diesel combustion sources (*e.g.* ore processing components). Results are shown in **Table 3-3.**

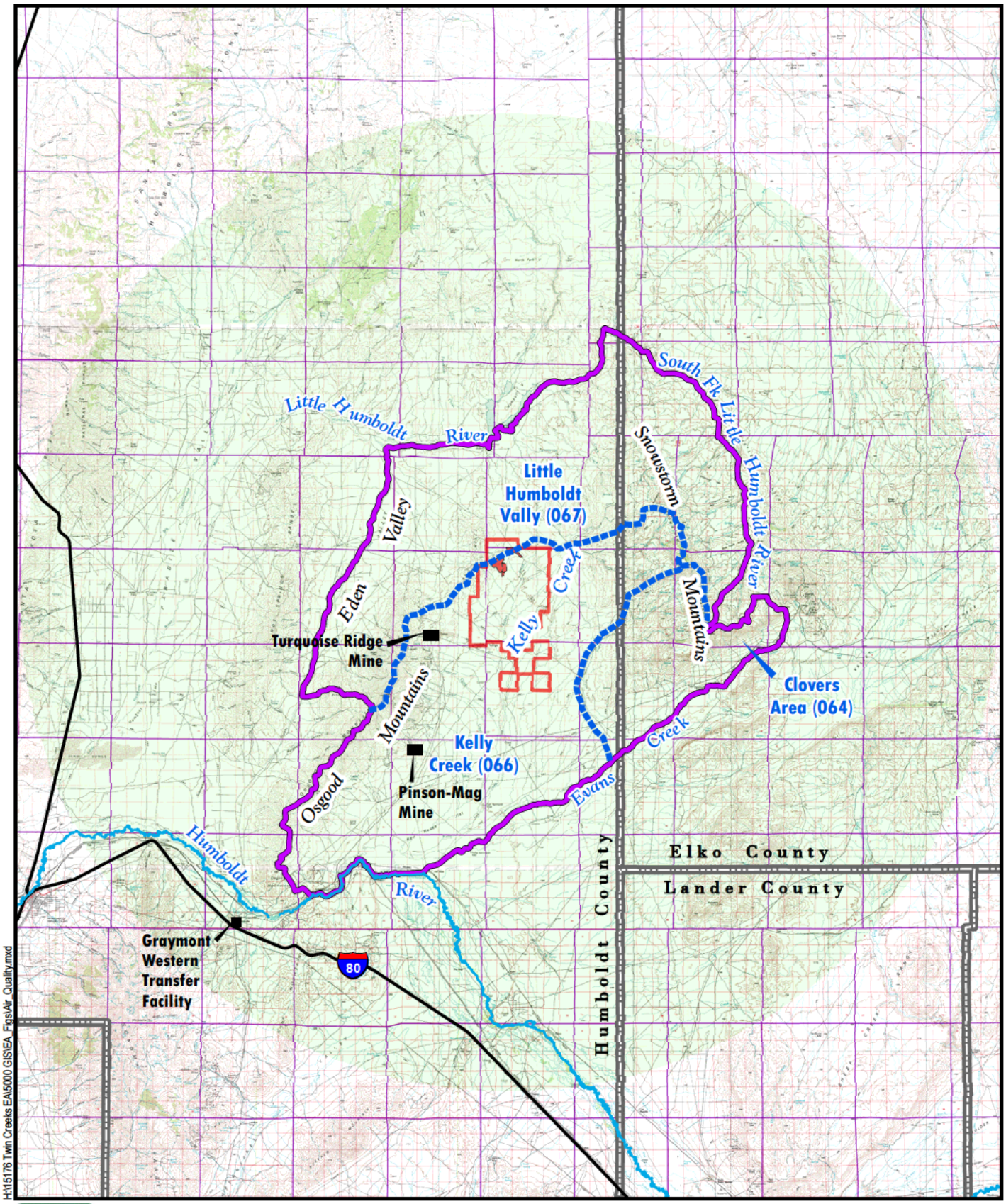
TABLE 3-3
Diesel and Non-Diesel Related Air Pollutants (tons/year)
Twin Creeks Mine

	PM_{10}	$PM_{2.5}$	SO_2	CO	NO_x	VOCs	CO_2
Diesel	76	74	1	728	1,053	131	108,443
Non-Diesel	2259	340	297	766	161	23	3,600
TOTAL	**2,335**	**414**	**298**	**1,494**	**1,214**	**154**	**112,043**

PM_{10} = particulate matter smaller than 10 microns in aerodynamic diameter; $PM_{2.5}$ = particulate matter smaller than 2.5 microns in aerodynamic diameter; SO_2 = sulfur dioxide; CO = carbon monoxide; NOx = nitrogen oxides; VOCs = volatile organic compounds; CO_2 = carbon dioxide.
Source. EMA 2011b, 2011c.

Ambient air quality standards must not be exceeded in areas accessible to the general public. National primary standards are the levels of air quality necessary, with an adequate margin of safety, to protect public health including sensitive populations. National secondary standards are levels of air quality necessary to protect public welfare from known or anticipated adverse effects of a regulated air pollutant. Twin Creeks Mine operations are in compliance with Class I Air Quality Operating Permit No. 1041-0723 issued by NDEP.

Attainment status for pollutants within the Project area is determined by monitoring levels of criteria pollutants for which National Ambient Air Quality Standards (NAAQS) and Nevada State Ambient Air Quality Standards (NSAAQS) exist. Standards for PM_{10} are 150 micrograms per cubic meter ($\mu g/m^3$) for a 24-hour average and 50 $\mu g/m^3$ for the annual mean. Ambient monitoring of gaseous emissions (SO_2, CO, NO_x) is not required under air quality permits. Accordingly, no measured data are available to characterize existing air quality. The Twin Creeks Mine is located within an area classified by NDEP as an Attainment Area, indicating air pollution levels in the area do not exceed ambient standards.



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- Hydrologic Sub-Basins
- Air Quality Study Boundary
- Vista Pit Expansion Project
- Plan of Operations Boundary
- Air Quality Buffer Radius (50 Kilometer)

Air Quality and Hydrologic Sub-Basins
Vista Pit Expansion
Twin Creeks Mine
Humboldt County, Nevada
FIGURE 3-1

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Particulate matter PM_{10} is principally regulated under the Nevada Air Quality standards at most mine projects. PM_{10} particles are in the respirable size range for humans and are typically associated with fugitive dust and engine exhaust. Controlling PM_{10} is required for stationary sources such as mills, crushers, and diesel-powered generator sets. Mobile equipment (*e.g.,* loaders, haul trucks, light vehicles) are not regulated like stationary sources under current regulations. Fugitive dust from wheel traffic is controlled as a condition of air quality permits (road watering or chemical binding agents). Combustion emissions from mobile equipment engines are regulated by engine manufacturing standards.

On July 18, 1997, EPA promulgated a revised NAAQS for particulate matter in the 2.5 micron size ($PM_{2.5}$). On December 13, 2009, USEPA designated all of Nevada's 15 Rural counties as attainment/unclassifiable for the revised 2006 24-hour $PM_{2.5}$ NAAQS. The effective date of this rule is November 21, 2008, which requires states to complete an infrastructure State Implementation Plan (SIP) to implement $PM_{2.5}$ rules for areas in attainment and a nonattainment SIP for areas not in attainment. The State of Nevada has submitted an infrastructure SIP to comply with the 1997 ($PM_{2.5}$) NAAQS, but as of the date of this document, EPA has not acted on all parts of the plan.

The Bureau of Air Pollution Control (BAPC) is the agency in the State of Nevada that has been delegated the responsibility for implementing a State Implementation Plan (SIP) for air quality (excluding Washoe and Clark Counties, which have their own SIPs). Included in a SIP are the State of Nevada air quality permit programs (NAC 445B.001 through 445B.3485, inclusive). Also as part of a SIP are the NSAAQS. The NSAAQS are generally identical to the NAAQS, with the exception of the following: (a) an additional standard for carbon monoxide in areas with an elevation in excess of 5,000 feet amsl; (b) the recently implemented NSAAQS for particulate matter of aerodynamic diameter less than 2.5 microns ($PM_{2.5}$); c) the revised NAAQS for particulate matter of aerodynamic diameter less than ten microns (PM_{10}); (d) ozone (Nevada has yet to adopt the new and revised federal standards); and (e) a violation of a state standard occurs with the first annual exceedance of an ambient standard, while federal standards are generally not violated until the second annual exceedance. In addition to establishing the NSAAQS, the BAPC is responsible for the Prevention of Significant Deterioration (PSD) program; enforcing the New Source Performance Standards; and implementing the Federal Operating Permit Program (Title V) throughout the State of Nevada. TCM is in compliance with air quality permits issued by BAPC for its current operations.

Refractory ore mined from expansion of the Vista Pit would be processed at the Sage Mill. Processing of refractory ore would result in emissions of SO_2, hydrogen sulfide, sulfuric acid mist, and particulate sulfur. Emissions from the Juniper Mill and other sources in the Twin Creeks Operations Area are regulated under Class I Air Quality Operating Permit No. 1041-0723 issued by NDEP. All emissions are in compliance with the NDEP permit and do not represent an environmental concern.

Prevention of Significant Deterioration Classification

The area surrounding the Twin Creeks Mine is a designated Class II area as defined by the federal Prevention of Significant Deterioration of Air Quality program. The Class II designation allows moderate growth or degradation of air quality within certain limits above baseline air quality. Industrial sources proposing construction or modifications must demonstrate that emissions would not cause deterioration of air quality in all areas. Standards for deterioration are stricter for Class I areas than Class II areas. The nearest Class I area is the Jarbidge Wilderness, located approximately 100 miles east

of the proposed Project (BLM 1996). As a federal mandatory Class I area, the Jarbidge Wilderness receives visibility protection through the air quality permitting process. No designated Integral Vistas (view perceived from within the mandatory federal Class I area of a specific landmark or panorama located outside the boundary of the mandatory Class I area) are associated with the Jarbidge Wilderness (BLM 2002).

The closest designated wilderness is the Santa Rosa-Paradise Wilderness area located 32 miles west-northwest of the Project area. Two Wilderness Study Areas are located 10 miles north (North Fork Little Humboldt) and northeast (Little Humboldt River) of the Project area. Neither, the Santa Rosa-Paradise Wilderness or the two Wilderness Study Areas are mandatory federal Class I airsheds.

Mercury Emissions

The Study Area for mercury emissions encompasses the hydrographic basins shown on **Figure 3-1** including the Twin Creeks Mine Operations Area. The Nevada Mercury Air Emissions Control Program adopted in 2006 requires reporting of mercury emissions from stationary sources that process gold or silver ore (NAC 445B.2–445B.41). In 2009, Newmont reported 425 pounds of mercury emissions to the Nevada BAPC from all point sources at the Twin Creeks Mine (NDEP 2011). Mercury emissions from Newmont's Twin Creeks Mine are subject to controls listed in NAC 445B.3651 as constituting presumptive Nevada Maximum Achievable Control Technology for controlling mercury emissions from these processes under Nevada's Mercury Air Emissions Control program. Mercury emissions from Newmont's Twin Creeks Mine are regulated under Class I Air Quality Permit No. 1041-0723 and Mercury Permit AP1041-2218 issued by NDEP. There are no current emissions of mercury attributable to Vista Pit ore as the pit has been inactive since 2002. There are no other sources of mercury emissions in the Study Area.

Greenhouse Gas (GHG) Emissions

The six key greenhouse gases include carbon dioxide, methane, nitrous oxide, hydroflourocarbons, perfluorocarbons and sulfur hexafluoride. The Project has potential to only emit quantities of carbon dioxide (EMA 2011a). Annual CO_2 emissions from the Twin Creeks Mine are 112,043 tons/year. The primary source of these emissions is from combustion of diesel fuel used to power mining equipment and haul trucks (EMA 2011a). Newmont estimates that 9 million gallons of diesel fuel are consumed annually at the Twin Creeks Mine (Newmont 2011a). Other sources of greenhouse gas emissions within the study area include Barrick's Turquoise Ridge Joint Venture and Graymont Western US, Inc., lime transfer facility at Golconda (EMA 2011a).

3.2.2 Cultural Resources

From the late 1960s to the present day, about 30 cultural resource inventories have documented and evaluated a total of 290 prehistoric and historic resources in the Twin Creeks Mine Project area. Of these sites, 57 prehistoric (9,000 to 10,000 years before present as determined by point typology) and three historic sites/components have been determined eligible for the National Register of Historic Places by BLM and the Nevada State Historic Preservation Office. These sites have been recorded to BLM standards, and the information integrated into local and statewide data repositories.

All remaining sites documented in the Project area have been determined not eligible for the National Register due to a lack of appropriate datasets suitable for augmenting the regional record, lack of assemblage integrity, or the absence of archaeological integrity (*i.e.*, the site has been disturbed by natural or historic-era events).

Primary historic features in the region include first presence of Euro-Americans associated with fur-trapping. This activity led to establishment of the Emigrant Trail – an east-west route that followed the Humboldt River and ultimately crossed the Sierra. The region experienced growth during 1860 – 1870 time period associated with mineral prospecting and establishment of mining operations and mills.

3.2.3 Invasive, Non-Native Species

The Study Area for invasive and non-native plant species is the Vista Pit Expansion Project area. As described in Chapter 2 – *Alternatives Including the Proposed Action*, approximately 105 acres of the 145-acre site proposed for expansion of the leach facility is presently disturbed for authorized uses including haul road, equipment storage, soil stockpile, and exploration drill sites and roads.

Noxious weeds identified on undisturbed areas of the proposed Sonoma Heap Leach Facility expansion area include cheatgrass and Russian thistle. Other invasive species include tansy mustard, blue mustard, and tumble mustard. These species are most common on road margins and on topsoil stockpiles in the proposed leach pad expansion site (AMEC 2011).

Noxious weeds are defined under Nevada law (NRS 555.005) and the federal Noxious Weed Act of 1974 (amended by Section 15 of the U.S. Farm Bill, Management of Undesirable Plants on Federal Lands) as any species of plant that is or is likely to be detrimental or destructive and difficult to control or eradicate. The State of Nevada lists 52 species of plants as noxious weeks. Noxious weeds are damaging to the environment and local economy, and replace desirable vegetation. Noxious weeds often proliferate where native vegetation has been removed or disturbed.

3.2.4 Migratory Birds

Migratory birds observed in the proposed Sonoma Heap Leach Facility expansion area during spring surveys in 2011 included lark sparrow, chipping sparrow, Brewer's sparrow, sage thrasher, tree swallow, killdeer, and loggerhead shrike (AMEC 2011). Observations of migratory birds also included areas adjacent to the proposed expansion area.

Migratory bird species are protected under the Migratory Bird Treaty Act (MBTA) (16 USC 703-711) and Executive Order (EO) 13186 (66 Federal Register [FR] 3853). Pursuant to EO 13186, a draft Memorandum of Understanding (MOU) among the BLM, USFS, and USFWS was drafted in order to promote conservation and protection of migrating birds. Specific measures to protect migratory bird species and their habitats have not been identified within EO 13186, but instead, the EO provides guidance to agencies to promote BMPs for conservation of migratory birds. As a result, the BLM Nevada State Office prepared Migratory Bird BMPs for the Sagebrush Biome to assist BLM field offices in consideration of migratory birds in land management activities (BLM no date).

3.2.5 Native American Religious Concerns

The proposed Project is located in the traditional territory of the Northern Paiute and Western Shoshone tribes. BLM is committed to coordinating and consulting with any affected tribes on all proposed projects on BLM managed public land. On February 26, 2010, BLM sent a letter to 12 tribes seeking input and consultation to identify cultural values, religious beliefs and traditional practices, which could be affected by the Proposed Action. Tribes contacted include the following:

- Battle Mountain Band Colony
- Fort McDermitt Paiute and Shoshone Tribe
- Lovelock Paiute Tribe
- Pyramid Lake Paiute Tribe
- Summit Lake Tribe
- Winnemucca Indian Colony
- Fallon Paiute Shoshone
- Fort Hall Indian Reservation
- Susanville Indian Reservation
- Reno-Sparks Indian Colony
- Cedarville Rancheria
- Fort Bidwell Indian Community Council

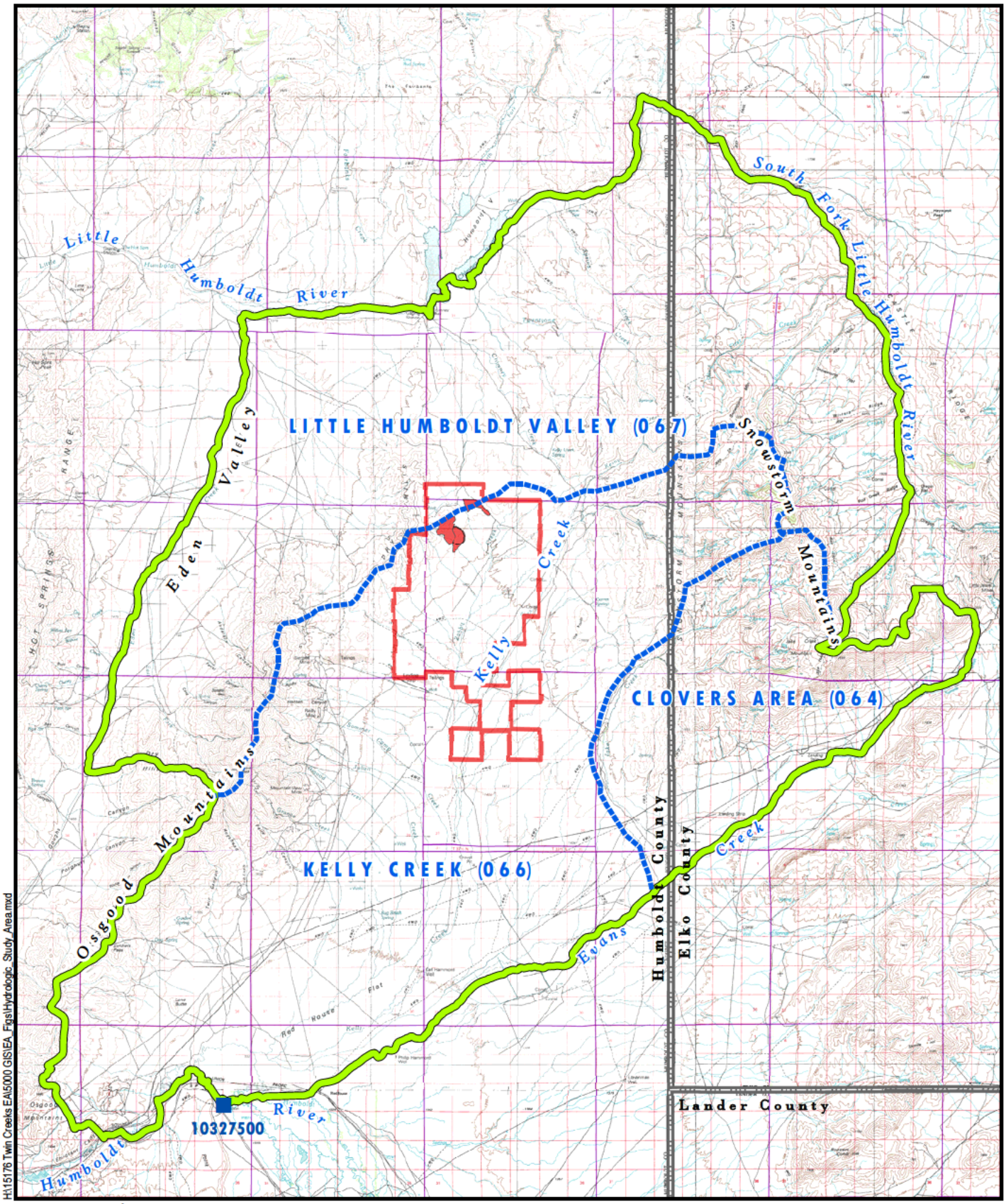
A consultation meeting was held with Fort McDermitt on March 8, 2010 and the project was introduced to them. The tribes were notified at that time that the Shoshone Mike Massacre site is located inside the mine boundary, but would not be affected by the expansion project. No further comment was received from Fort McDermitt on this project until April 28th, 2011. On that day, in an informational meeting, a Fort McDermitt representative on behalf of Fort McDermitt and Fort Hall expressed concern that there would be mining at the Shoshone Mike Massacre site. The BLM re-iterated that would not be the case for the expansion project.

Newmont arranged for a site visit for the Fort McDermitt Paiute and Shoshone tribe on June 9 2011. It was reportedly discussed during the site visit that no mining would occur at the Shoshone Mike Massacre site under this Proposed Action. A copy of the Preliminary EA was sent to both Fort McDermitt and Fort Hall on August 4, 2011. It is unlikely that the proposed activities would impact Native American religious beliefs and traditional practices, including those associated with the Shoshone Mike site.

3.2.6 Water Quality (Surface and Ground)

(Note: For purposes of this EA, water quantity is also described in this section)

The Twin Creeks Mine is located within the Humboldt River Basin in north-central Nevada. The hydrologic Study Area encompasses approximately 650 square miles and includes portions of the Eden Valley, Osgood Mountains, Kelly Creek Basin, and Snowstorm Mountains (**Figure 3-2**). The Study Area is bounded by the Little Humboldt River on the north, South Fork of the Little Humboldt River on the east, Evans Creek and Humboldt River on the south, and the crest of the Osgood Mountains and Eden Creek on the west. Elevation in the area ranges from 4350 feet amsl along the Humboldt River to 8680 feet amsl along the crest of the Osgood Mountains. Tributaries in the Study Area drain to three sub-basins: Little Humboldt Valley (067), Kelly Creek (066), and Clovers Area (064). Streams in the Kelly Creek and Clovers sub-basins drain to the main stem of the Humboldt River. Streams in the Little Humboldt Valley sub-basin drain to the Little Humboldt River.



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- Hydrologic Sub-Basins
- Hydrologic Study Boundary
- Vista Pit Expansion Project
- Plan of Operations Boundary
- USGS Gaging Station

Hydrologic Study Area
Vista Pit Expansion
Twin Creeks Mine
Humboldt County, Nevada
FIGURE 3-2

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In March 1994, Santa Fe Pacific Gold Co. implemented a regional surface water and groundwater monitoring program to establish baseline data and report changing conditions as mining and ore processing operations are conducted in the area. Hydrologic baseline information was collected from streams, springs, monitoring wells, and dewatering wells from within the hydrologic Study Area (**Figure 3-2**) and analyzed for the following Profile I constituents (NAC 445A.144).

Metals

- Aluminum
- Antimony
- Arsenic
- Barium
- Beryllium
- Boron
- Cadmium
- Chromium
- Copper
- Iron
- Lead
- Manganese
- Mercury
- Molybdenum
- Nickel
- Selenium
- Silver
- Thallium
- Zinc

General Parameters, Common Ions, & Nutrients

- Cyanide (WAD)
- Chloride
- Dissolved Oxygen
- Fluoride
- Nitrate+Nitrite (N)
- pH
- Sulfate
- Total Dissolved Solids (TDS)
- Turbidity
- Total Suspend Solids (TSS)

Since implementation of the program, sampling frequency and number of monitoring sites has been modified in response to analytical results and mining operations. Water resources in the Project area are monitored in accordance with Water Pollution Control Permits NEV86018 and NEV86035 and NPDES Permit NV0021725. The monitoring programs have been developed in conjunction with NDEP to address groundwater, springs/seeps, and streams/rivers.

Surface Water

Quantity

Tributaries originating in the Study Area join the main stem of the Humboldt River between the USGS stream gage at Comus on the east and the town of Winnemucca on the west (**Figure 3-2**). The river is perennial throughout the stretch, but flow is variable and nearly ceases during some periods. Nearly all surface runoff from the Twin Creeks Mine area originates within the Kelly Creek watershed, which occupies about 500 square miles. Typically, almost no surface flow from these sub-watersheds reach the main stem of the Humboldt River due to infiltration and high evapotranspiration losses.

Surface water monitoring has been ongoing since 1994. Monitoring sites are located upstream and downstream of the Twin Creeks Mine complex on Kelly, Jake, Evans, and Rabbit creeks. Treated water from dewatering activities is discharged to Rabbit Creek and monitored in accordance with NPDES Permit NV0021725. Flow data and results of surface water quality sampling are contained in the Twin Creeks Mine Water Monitoring Plan on file at the Winnemucca BLM Field Office.

Quality

Surface water quality in the Study Area has been characterized based on samples collected from 20 stream and 10 spring locations. Streams in the monitoring network include Kelly, Jake, Evans, and Rabbit creeks. Water in streams and springs in the Study Area is primarily a calcium-sodium-bicarbonate type with some exceptions. Rabbit Creek, near the Twin Creeks Mine, consists of treated mine water discharge and contains higher proportions of magnesium and sulfate than other Project area surface water. Kelly and Evans creeks are calcium-sodium-bicarbonate types in the upper reaches, but change to sodium-calcium-bicarbonate in down-gradient stretches due to inflow from Alkali Spring to Kelly Creek and the Hot Springs discharge to Evans Creek which contains elevated sodium-bicarbonate levels (BLM 1996).

Springs and streams in the monitoring program are periodically sampled for flow and Profile I constituents. Trends in the surface water compliance data with respect to effluent discharge limitations (EDL), and how these data have changed since the Environmental Impact Statement (EIS) was published in 1996 (BLM 1996) are shown in **Table 3-4**. Exceedances of the EDL reported in **Table 3-4** do not necessarily represent the quality of discharge from Newmont's water treatment plant; the EDL is presented for purposes of comparison to water quality over the period of record for surface water stations.

Table 3-4 presents a summary of eight (8) constituents that exceeded the EDL of NPDES Permit NV0021725. These constituents include total dissolved solids (TDS), fluoride (F), sulfate (SO_4), arsenic (As), Iron (Fe), nickel (Ni), pH, and boron (B). Summary statistics are presented for two periods 1) from 1994 to 1997, and 2) 1997 to 2011. Parameters that did not exceed EDL at any time are not included in **Table 3-4**. Five of the eight constituents demonstrated more exceedances between 1997 and 2011 compared to the period between 1994 and 1997. These include TDS, SO_4 (slight increase), Fe, Ni (slight increase), and B (slight increase). The number of exceedances for the other three analytes (F, As, pH) decreased or remained the same. The slight increases in the number of exceedances for some analytes (*i.e.,* SO_4, Ni, and B) appear to be related to outliers occurring in the larger dataset during the period 1997 to 2011. These analytes are therefore not discussed.

TABLE 3-4
Summary of Surface Water Quality
Twin Creeks Mine

Parameter	n=	Sample Concentration		Exceedances[1]			Effluent Discharge Limit		
		Max	Min	30-d avg	Daily Max	% of n[2]	30-d avg	Daily Max	Units
Surface Water Data (1994 to 1997)									
TDS	10	297	38	0	-	0	500		mg/L
Flouride	10	2.7	0.2	-	3	30		1,000	mg/L
Sulfate	10	102	4.2	-	0	0		250	mg/L
Arsenic	51	0.08	0.04	-	3	6		0.05	mg/L
Iron	51	1.21	0.025	-	1	2		1.000	mg/L
Nickel	51	0	0	0	0	0	0.05	0.0134	mg/L
pH[3]	51	9.11	7.09	-	2	4		>8.7	pH unit
pH	51	9.11	7.09	5	-	10	>8.5		pH unit
pH	51	9.11	7.09	-	0	0		<7.0	pH unit
Boron	51	0.68	0.02	-	0	0		0.750	mg/L

TABLE 3-4
Summary of Surface Water Quality
Twin Creeks Mine

Parameter	n=	Sample Concentration		Exceedances[1]			Effluent Discharge Limit		
		Max	Min	30-d avg	Daily Max	% of n[2]	30-d avg	Daily Max	Units
Surface Water Data (1997 to 2011)									
TDS	222	2310	24	16	-	7	500		mg/L
Flouride	190	12.8	0.1	-	50	26		1.000	mg/L
Sulfate	190	638	2.36	-	7	4		250	mg/L
Arsenic	222	0.296	0.001	-	7	3		0.05	mg/L
Iron	222	31.5	0.02	-	41	18		1.000	mg/L
Nickel	222	0.028	0.018	0	7	3	0.05	0.0134	mg/L
pH[3]	222	9.73	6.71	-	21	9		>8.7	pH unit
pH	222	9.73	6.71	34	-	15	>8.5		pH unit
pH	222	9.73	6.71	-	3	1		<7.0	pH unit
Boron	222	1.7	0.03	-	7	3		0.750	mg/L

n = total number of samples analyzed, d= day, EDL = Effluent discharge limit, TDS = Total Dissolved Solids, mg/L = milligrams per liter.
[1] Represents the number of exceedances with respect to the 30-day average or the daily max EDL
[2] "Exceedances % of n" represents the percent of exceedances with respect to the total number of samples analyzed
[3] Three rows are designated to represent pH because data were analyzed separately for pH greater than 8.7, or 8.5 and less than 7.0
Source: Newmont 2011b.

Groundwater

The Twin Creeks Mine numerical groundwater flow model was updated in 2010 to determine effects of mining/dewatering associated with expansion of the Vista Pit (Itasca 2010). The model includes the Kelly Creek area, parts of the Clovers area, and the Little Humboldt Valley of north-central Nevada. The Twin Creeks mine complex is located within the Kelly Creek area. The model domain is bounded by the South Fork of the Little Humboldt River on the east, Little Humboldt River and South Fork of the Little Humboldt River on the north, Eden Creek and the Osgood Mountains on the west, and Evans Creek and Humboldt River on the south (**Figure 3-2**). Both the Kelly Creek and Clovers areas are designated groundwater basins, while the Little Humboldt Valley is a non-designated groundwater basin. In Nevada, designated groundwater basins are where permitted groundwater rights approach or exceed the estimated average annual recharge, and the water resources are being depleted or require additional administration.

Numerous geologic faults are located in the vicinity of the Twin Creeks Mine. Water levels measured in wells around the Mega and Vista mine pits have established the current representation of hydrologic structures. These faults, originally thought to be barriers to groundwater flow, demonstrate some leakage in response to current dewatering in the Twin Creeks Mine area. Bedrock water levels west of the "20,000 fault" have decreased by about 800 to 1,100 feet in and around the Mega pit from 1989 to early 2010. Water levels just east of the "20,000 fault" are slowly declining in response to Mega pit dewatering, and as of early 2010, groundwater levels in bedrock at Vista Pit had decreased approximately 100 feet from pre-mining water levels (Itasca 2010). Groundwater below the Vista Pit is currently at an approximate elevation of 4590 feet amsl (Newmont 2009a).

Precipitation, in the form of both rainfall and snowmelt, is the primary source of recharge to the groundwater flow system in the Study Area. Distribution of precipitation in the Humboldt River watershed is orographically controlled and varies widely in time and space. Recharge to the model domain was estimated using the methodology developed by Maxey and Eakin (1949 *in* Itasca 2010). Using this method, net recharge to the groundwater system is estimated as a percentage of total precipitation that falls in several orographically controlled precipitation zones. The balance of precipitation does not reach the groundwater system and is assumed to become runoff or is consumed by evapotranspiration (Itasca 2010).

Isotope studies conducted by Cieutat (1988 *in* Itasca 2010) indicate that most groundwater recharge to alluvium is derived from precipitation in the adjacent mountains at elevations above 5700 feet amsl. Cieutat's results also indicate that streams originating in the mountains, such as Kelly and Jake creeks, convey a major portion of recharge that would be assigned to the mountainous areas by the Maxey-Eakin method to the alluvial fans that emanate from the mountains. Conceptually, these streams collect and divert mountain recharge to the alluvial fans, thus producing a form of direct recharge to the alluvium rather than via groundwater flow from the mountainous bedrock to the alluvium.

The orographic relationship developed for the Twin Creeks groundwater flow model area used precipitation data collected from several precipitation reporting stations across the region. Results of the model show recharge across the model area at 31.2 cubic feet per second (cfs) (Itasca 2010). A summary of the steady-state hydrologic budget predicted by the model is shown in **Table 3-5**.

TABLE 3-5
Model-Predicted Hydrologic Budget for Steady-State Calibration
Twin Creeks Mine Groundwater Flow Model

Budget Component	Inflow (+) or Outflow (-) (cfs)
Recharge	+31.2
Evapotranspiration	-11.4
Net Groundwater Flow	-11.3
Net Surface Water Flow[1]	-8.5
Total (or change in storage)	**0.0**

cfs = cubic feet per second
[1] Surface water flows include the Humboldt River (0.4 cfs); Little Humboldt River (5.8 cfs); Evans Creek (0 cfs); South Fork of Little Humboldt River (0.7 cfs); Hot Springs (1.5 cfs); and unnamed spring (0.1 cfs).
Source: Itasca 2010.

Quality

Groundwater in the Study Area has been characterized by samples from monitoring wells, dewatering wells, horizontal drains, and seeps located in the Study Area, and from within the Twin Creeks Mine permit boundary**.** Wells and drains are completed in alluvium, oxidized bedrock, and non-oxidized bedrock.

Newmont continues to monitor seven wells as part of the regional monitoring program, all but one of which lie outside the Twin Creeks Mine Project boundary. Sampling frequency varies from quarterly to annually to once every 5 years. Groundwater monitoring within the Twin Creeks Mine Project

boundary is performed in accordance with two Water Pollution Control Permits – NEV86018 for the North half and NEV86035 for the south half of the operation. The boundary separating the two permits is the backfilled section dividing the North and South pits within the larger Mega Pit.

The proposed Vista Pit Expansion Project is covered under Water Pollution Control Permit NEV86018. Seven groundwater wells are monitored quarterly under this permit for Profile I constituents listed above. Newmont submitted a renewal application for this permit in February 2011 and is awaiting approval by NDEP.

Thirteen groundwater wells are currently monitored in the south half of the Twin Creeks Mine under Water Pollution Control Permit NEV86035 and analyzed for Profile I constituents listed above. Monitoring well locations and depths vary in response to operational requirements. Since 1994, many wells have either been removed by mining operations, gone dry, or otherwise abandoned. New wells are completed through coordination and approval of NDEP. This permit is effective until December 2012. Trends in groundwater data with respect to water quality standards are shown in **Table 3-6.**

TABLE 3-6
Summary of Water Quality for
Water Pollution Control Permits No. NEV86018 and NEV86035
Twin Creeks Mine

Available Data up to 1997				1997 to 2009 Data			
Parameter	**Total Samples**	**No. Exceedances**	**Percent Exceedance of Total Samples**	**Parameter**	**Total Samples**	**No. Exceedances**	**Percent Exceedance of Total Samples**
As	60	13	22	As	516	108	21
Mn	42	16	38	Mn	341	38	11
Fe	58	1	2	Fe	565	24	4
Al	17	4	24	Al	565	11	2
				TDS	568	6	1
				NO_2+NO_3	565	6	1.1
				Lab pH	568	10	1.8
Tl	17	1	5.9	Tl	565	1	0.2
				WAD CN	561	2	0.4
Se	58	2	3.4				
F	58	1	1.7				
				Cd	565	1	0.2
Pb	58	1	1.7				
				SO_4	569	1	0.2
				Cl	576	1	0.2

As = arsenic; Mn = manganese; Fe = iron; Al = aluminum; TDS = total dissolved solids; NO_2+NO_3 = nitrate+nitrite;Tl = thallium; WAD CN = weak acid dissociable cyanide; Se = selenium; F = fluoride; Cd = cadmium; SO_4 = sulfate; Cl = chloride
Source: Newmont 2011b.

With the exception of iron, the percent of exceedances of Profile I constituents in groundwater have remained unchanged or decreased since 1997. Iron exhibited a slight increase of two percent more samples reporting exceedance over the period. Reported concentrations of arsenic are not unusual for water in mineralized or geothermal areas (BLM 1996). The following constituents were not evaluated due to the lack of results for either the pre-1997 period or1997-2009 period: TDS, nitrate+nitrite, pH, WAD cyanide, cadmium, sulfate, and chloride.

Geomega (2011a) used groundwater samples collected from piezometers located near the Vista Pit to establish baseline groundwater chemistry in this area. These piezometers are screened in carbonate rocks of the lower Etchart Formation. Groundwater that would flow into the Vista Pit after cessation of mining and dewatering would originate from this formation and, thus, are suitable as a proxy for Project background groundwater chemistry for the Vista Pit expansion (Geomega 2011a).

Groundwater samples collected from piezometers in 2010 are classified as calcium-sodium-magnesium-bicarbonate type (Geomega 2011a). The water samples have moderate alkalinity (190-200 mg/l). pH of 7.9, and TDS of 280-350 mg/l. Concentrations of other selected constituents include arsenic (0.04 – 0.07 mg/l); thallium (<0.001 – 0.0005 mg/l); antimony (0.04 – 0.05 mg/l); and mercury (0.001 – 0.0002 mg/l). Sulfate concentrations in selected samples range from 3.9 to 53 mg/l, in part due to elevated background concentrations of arsenic and antimony. Constituents that exceed applicable Nevada groundwater quality standards in these samples are arsenic and antimony (Geomega 2011a).

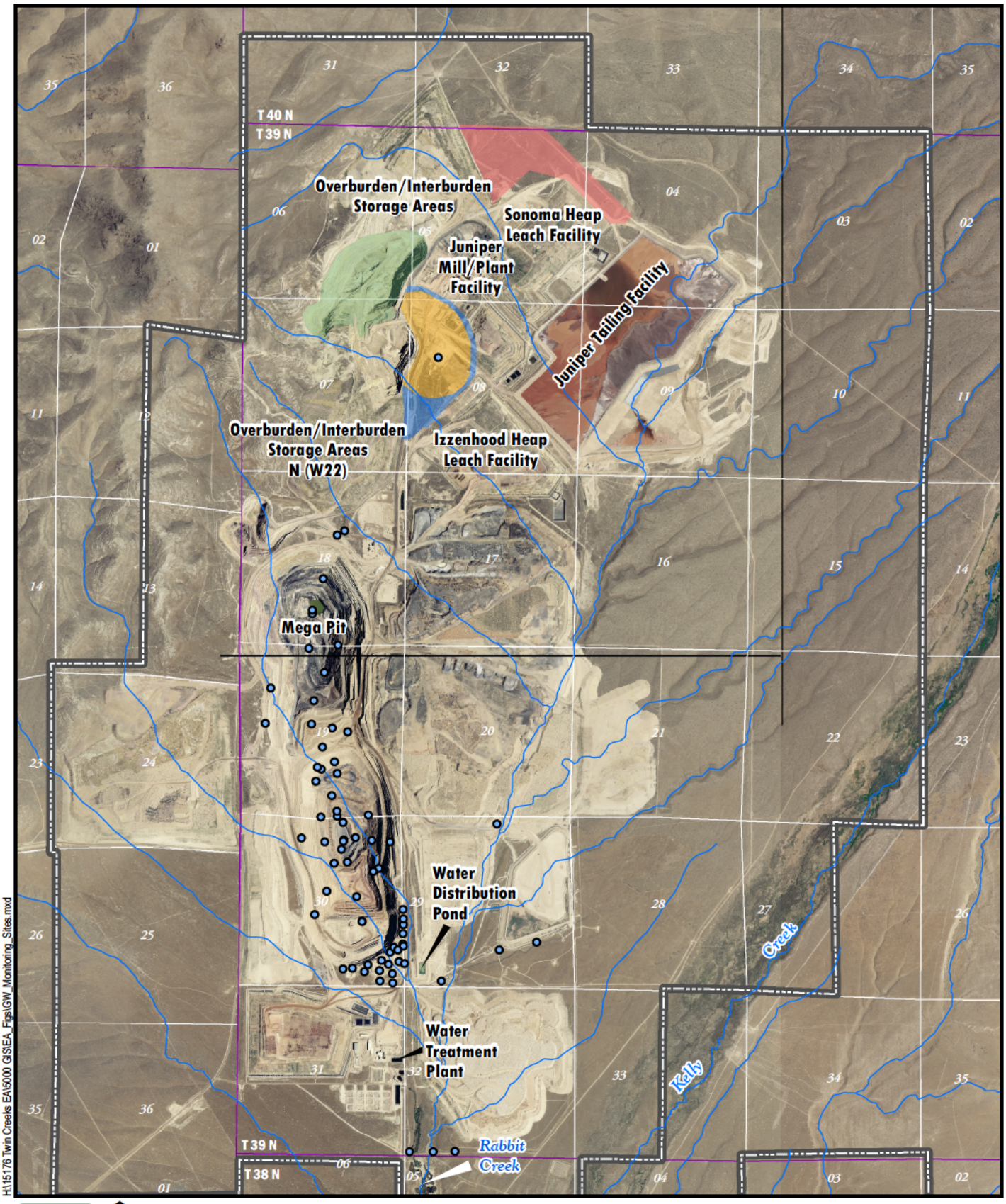
Water Supply and Dewatering Wells

The Final EIS for the Twin Creeks Mine (BLM 1996) reports that 64 water supply and dewatering wells are located in the Kelly Creek sub-basin, of which 30 wells are within the Twin Creeks Mine permit area (**Figure 3-3**). Of the 64 water supply dewatering wells in the Kelly Creek sub-basin, 26 wells reportedly are used for mine dewatering (BLM 1996). Annual yield for Kelly Creek sub-basin (066) is included within two adjacent sub-basins: Clovers Area (064) and Pumpernickel Valley (065). Total combined annual yield of these sub-basins is 72,000 acre-feet per year (af/yr). Total active annual duty for these basins is 80,709 af/yr, of which 30,620 af/yr (38%) has a designated use for mining and milling (BLM 1996; NDWR 2011).

Additional Resources

3.2.7 Geology and Minerals

The Twin Creeks Mine is situated in the Kelly Creek basin adjacent to the eastern flank of the Dry Hills of the Osgood Mountains. This area is located within the Great Basin region of the Basin and Range physiographic province characterized by a series of generally north-trending mountain ranges separated by broad basins. The Basin and Range physiography has developed from normal faulting that began approximately 17 million years ago and continues to the present (BLM 1996). The extensional block faulting uplifted the mountains, which consist of Precambrian to Tertiary age bedrock units. The basins are filled with thick accumulations of unconsolidated-consolidated sediments derived from erosion of the adjacent mountain ranges. Major geologic units from oldest to youngest include Paleozoic sedimentary, metasedimentary, and metavolcanic rocks; Cretaceous granodiorite; Tertiary volcanic tuffs and flows of various composition; Tertiary volcaniclastic sediments; and Tertiary-Quaternary alluvium.



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2006 NAIP Aerial Photography

0 Feet 5,000

No warranty is made by the Bureau of Land Management as to the accuracy, reliability, completeness of these data for individual use or aggregate use with other data. Original data were compiled from various sources. This data may not meet National Map Accuracy Standards. This product was developed through digital means and may be updated without notification.

- Production and Dewatering Wells
- Road Disturbance
- Vista Pit Expansion
- In-Pit Backfill
- Sonoma Heap Leach Facility Expansion
- Plan of Operations Boundary

Production and Dewatering Wells
Vista Pit Expansion
Twin Creeks Mine
Humboldt County, Nevada
FIGURE 3-3

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The Project area lies within a north to northeast trending mineralized zone known as the Getchell Trend or Potosi (Getchell) Mining District. The district extends in a northeast direction along the eastern flank of the Osgood Mountains. Major gold producing mines in the district include the Preble, Pinson, Getchell, and Twin Creeks (formerly Chimney Creek and Rabbit Creek mines). The mineral deposits within the Getchell Trend are primarily hosted in Paleozoic sedimentary rocks.

In the Vista Pit, the Etchart limestone is the primary host rock for oxide mineralization. The Etchart limestone consists of inter-bedded limestone, dolomite, and sandy limestone and dolomite.

Gold and silver mineralization is located preferentially within the calcareous shale and siltstones and is associated with anomalous amounts of arsenic, antimony, and mercury. Mineralization is characterized by a high gold to silver ratio. The highest grades of mineralization are correlated directly with the degree of decalcification in the host sediments. Dolomitic horizons, massive silicified zones, and the underlying greenstones are generally weakly mineralized or non-mineralized (Itasca 2010).

3.2.8 Paleontology

The Study Area for paleontological resources includes the proposed expansions to the Vista Pit and the Sonoma Heap Leach Facility.

BLM has adopted a Potential Fossil Yield Classification system to aid in assessing potential for discovery of paleontological resources or impacts of surface disturbing activities to these resources. Five classes of potential fossil yield have been developed ranging from Class 1 being Very Low Potential and Class 5 being Very High Potential.

Quaternary-age alluvium (average 250 feet thick) and minor basal tuff overlie the proposed Vista Pit Expansion area. The alluvium contains clasts of Miocene basalt, Pennsylvanian-Permian limestone, and Ordovician basalt and chert. The proposed Project area is hosted within a karst-collapse zone between the upper and lower members of the Pennsylvanian-Permian Etchart Formation. The Etchart Formation is composed of gray, thick-bedded limestone and fine-grained calcarenite. The Etchart Formation overlies the Ordivician Valmy Formation. The Valmy Formation consists of lower fault-bounded wedge of siltstone, mudstone and chert, and an upper member of basal flows and pyroclastic rocks with chert and argillite. These rock types likely have a low potential (Class 1) for containing vertebrate fossils or noteworthy occurrence of invertebrate or plant fossils.

The proposed Vista Pit Expansion Project would occur in areas disturbed by ongoing mining activity that have been previously surveyed for paleontological resources. Two fossil localities have been recorded within the Twin Creeks Mine Project area. One is registered as U.S. Geological Survey (USGS) locality 15381-PC and contains molluscan fauna. The second location is assigned to the Ordovician Valmy Formation and contains poorly preserved trilobite fauna and is registered as USGS D-151-CO. Significance and sensitivity for these fossils is rated as low (BLM 1996).

3.2.9 Social Values and Economics

The Study Area for social values and economics includes eastern Humboldt and the northern portion of Lander counties, and the communities of Winnemucca and Battle Mountain. The Study Area is based on the location of the Twin Creeks Mine in Humboldt County and the resident locations of current mine employees.

Population

The population of Nevada has grown approximately 30 percent in the last decade, and Nevada has been one of the fastest growing states (U.S. Census Bureau 2011). Population of cities and counties in the Study Area are shown in **Table 3-7.**

TABLE 3-7
North-Central Nevada Population

Area	Population		
	2000	2009 (Estimate)	Percent Change 2000 - 2009
Winnemucca	7,174[1]	7,593[1]	5.8
Battle Mountain	3,453[1]	2,967[1]	-14.0
Humboldt County	16,106[2]	18,260[2]	13.4
Lander County	5,794[2]	5,159[2]	-11.0
State of Nevada	1,998,260[2]	2,643,085[2]	32.3

Source: [1] Nevada State Demographer 2011. [2] U.S. Census Bureau 2011.

Income, Employment, and Economy

Employment in Nevada is dominated by service industries (72 percent) and, specifically, the leisure and hospitality industries with 27 percent of the workforce in the sector. The gaming industry drives Nevada's economy. Gaming, hotel, and recreation areas employ the largest numbers of workers in the state (308,000). The next largest employment sector is trade, transportation, and utilities with over 18 percent of the jobs statewide. Approximately one percent of jobs statewide are in the natural resource and mining industries (Nevada Department of Employment, Training, and Rehabilitation 2011). Employment by major industry with statewide employment by the same sector is shown in **Table 3-8**.

Mining has been and continues to be important to the economic well-being of Nevada. Nevada leads the nation in production of gold, silver, and barite. Mining provides the highest average salary of any industry in Nevada. Average annual earnings for workers in the metal mining industry in Nevada during 2009 were $81,755. By contrast, the average earnings in 2009 for all industries statewide were $42,746 (Dobra 2009). Average annual wage in Humboldt and Lander counties for an employee in the leisure and hospitality sector was $15,500 in 2009 (Nevada Department of Employment, Training, and Rehabilitation 2011).

Newmont procures a variety of goods and services from local and state vendors. In 2010, Newmont spent approximately $158 million for supplies purchased in Nevada and approximately $19.6 million for contracted labor.

TABLE 3-8
Employment by Sector in 2009
Humboldt and Lander Counties and State of Nevada

Sector	Employment Number		
	Humboldt County	Lander County	State of Nevada
Private Sector Industries			
• Natural Resource & Mining	1,839	1,560	13,866[1]
• Construction	359	28	80,790
• Manufacturing	268	NA	40,209
• Trade, Transportation, & Utilities	1,294	530	213,134[2]
• Information	78	6	13,158
• Financial Activities	103	19	55,474[3]
• Professional & Business Services	391	23	135,442[4]
• Education & Health Services	338	26	97,186
• Leisure & Hospitality	1,119	189	308,007[5]
• Other Services	151	33	27,247
Government	1,427	532	152,388
Undetermined			888
Total All Industries	**7,367**	**2,946**	**1,137,789**

Notes:
[1] Includes Agriculture, Forestry, Fishing & Hunting sectors.
[2] Includes Wholesale & Retail Trade, Transportation & Warehousing, and Utilities sectors.
[3] Includes Real Estate, Rental, & Leasing sectors.
[4] Includes Management of Companies & Enterprises sectors.
[5] Includes Arts, Entertainment, Recreation, Accommodation, and Food Service sectors.
Source: Nevada Department of Employment, Training, and Rehabilitation 2011.

Public Finance

Taxes paid by mining operations are a primary source of revenue for the State of Nevada, counties, and local governments. Based on information from the Nevada Department of Taxation and industry surveys, estimated state and local taxes paid by the mining industry in 2009 were approximately $204 million. This figure includes only taxes paid by mining companies and does not include taxes paid by industry employees or suppliers (Dobra 2009).

Tax categories paid by mining companies include: employment taxes, Net Proceeds of Minerals (NPM) taxes, sales and use taxes on purchases, and property taxes. NPM taxes are paid to the county where the ore is mined. Companies pay property taxes based on the location of the property and sales taxes at the point of purchase. Since most companies providing services to the Twin Creeks Mine are located in Humboldt County, and most mine employees live and purchase products and services in Humboldt County, the county receives substantial mining related tax revenue.

Net proceeds taxes distributed to Humboldt and Lander counties are shown in **Table 3-9**. Future distributions will depend on continued mining and discoveries of new ore deposits.

In 2009 and 2010, net proceeds tax paid to Humboldt County by Newmont for the Twin Creeks Mine amounted to $3.6 million and $5.0 million, respectively. Property taxes paid to Humboldt County in 2009 and 2010, were $2.8 million and $1.6 million, respectively. During the same period (2009-2010), Newmont paid $4.6 million and $6.3 million, respectively, in net proceeds tax to the State of Nevada for the Twin Creeks Mine (Newmont 2011a).

TABLE 3-9
Net Proceeds Tax Distributed to Humboldt and Lander Counties

Fiscal Year	Humboldt	Lander	State of Nevada/Total County Distribution
2007	$2,584,507	$1,141,633	$32,345,089
2008	$5,380,222	$3,067,539	$36,624,590
2009	$7,728,019	$4,774,734	$68,100,856
2010	$8,302,728	$31,669,278	$86,282,227

Source: Nevada Department of Taxation 2011.

Community Facilities and Services

Community service providers for education, law enforcement, fire protection, ambulance services, health care, public assistance, water supply, wastewater treatment, and solid waste are described in detail in the Final EIS for the Twin Creeks Mine Project (BLM 1996).

The Humboldt County School District serves approximately 3,500 students in 11 schools: three K-4 schools, one 5-6 middle school, one 7-8 junior high, and one 9-12 high school located in the community of Winnemucca, and four K-8 schools and one K-12 school in rural areas throughout Humboldt County. Great Basin College has a branch campus in Winnemucca (HDA 2011).

Health care and emergency services are provided by the Humboldt General Hospital and include: acute care, pediatric care, labor and delivery, a surgery center, radiology, laboratory and pharmaceutical services, respiratory therapy, cardio-vascular, and skilled nursing care (HDA 2011).

Municipal and private recreational opportunities in and around Winnemucca include two swimming pools (indoor/outdoor), motor sports race track, tennis courts, golf course, bowling, softball, baseball, soccer fields, shooting range, and skate board park.

Law enforcement is provided through the Humboldt County Sheriff's Department, Winnemucca City Police, and Nevada Highway Patrol. Fire protection is provided by the Winnemucca Volunteer Fire Department.

3.2.10 Soil

The Study Area for soil resources includes the proposed expansion to the Sonoma Heap Leach Facility within the Twin Creeks Mine Operations Area. The proposed expansion of the Vista Pit would not affect soil resources as the pit expansion would occur in an area that has been previously disturbed by the Snowstorm Heap Leach Facility.

The proposed Sonoma Heap Leach Facility expansion consists of approximately 145 acres of which approximately 105 acres have been disturbed by previously permitted activity. Conversion of use for 145 acres to accommodate expansion of the Sonoma Heap Leach Facility would occur in an area currently used for equipment/material storage.

Soil information for the leach pad expansion area is based on Order 2 mapping, profile descriptions, and soil sampling. Information for regional and cumulative effects area is based on Natural Resources Conservation Service (NRCS) Order 3 mapping and descriptions contained in the Soil Survey for Humboldt County, East Part, Nevada described in the Final EIS for the Twin Creeks Mine (BLM 1996).

The Order 2 soil survey (Stoneman-Landers, Inc. 1994 *in* BLM 1996) identifies 40 soil map units based on 17 typifying soil profile descriptions and sampling sets. A listing of soil series, corresponding taxonomic classifications, soil map unit characteristics, and reclamation suitability are established by the NRCS. This information includes map unit name, dominant soil and soil inclusions within each map unit, soil depth, parent material type, water and wind erosion hazard for surface horizons of named components of each map unit, range sites, suitable topsoil salvage depth, and limiting factors. These data are included in the Final EIS (Table 3-22) for the Twin Creeks Mine (BLM 1996), and is hereby incorporated by reference.

3.2.11 Special Status Species

The Study Area for special status species includes the proposed Sonoma Heap Leach Facility expansion area. Other areas that would be affected by the Proposed Action are currently disturbed by past and present mining related activities; therefore, these areas were not surveyed for special status species (AMEC 2011).

Special status species are those species for which state or federal agencies have designated an additional level of protection by law, regulation, or policy. BLM sensitive species include species that are under status review for the Endangered Species Act; species whose numbers are declining so rapidly that federal listing may become necessary; species with small or widely dispersed populations; and species inhabiting ecological refugia or other specialized or unique habitats.

Plants

Twenty-seven plant species are managed as sensitive species in the Winnemucca District of the BLM (**Table 3-10**). Only species with a moderate or high likelihood of occurrence in the proposed Sonoma Heap Leach expansion area, based on known ranges and habitat affinities, are addressed in detail in this EA. Based on habitat characteristics, known distribution, and field surveys conducted by AMEC (2011) in May 2011, there is a low probability that the Osgood Mountain milkvetch may be present in the Project

area. The typical growing substrate of this species appears to be marginal in the area proposed for expansion of the Sonoma Heap Leach Facility. The known local population of this species occurs in the Osgood Mountains west of the Project area. All other sensitive species for the Winnemucca District were determined to be not present in the proposed leach pad expansion area because habitats are not compatible with growing requirements.

TABLE 3-10
Sensitive Plant Species
Documented for the BLM Winnemucca District

Common Name	Scientific Name	Status	Habitat Associations	Likelihood of Occurrence In or Near Project Area
Margaret Rushy Milkvetch	*Astragalus convallarius var. margaretiae*	G5, S2 BLM=Sen	Rocky slopes and flats among sagebrush and pińyon-juniper. Endemic to the Pine Nut and Virginia ranges.	Low, outside probable range
Tonopah Milkvetech	*Astragalus pseudiodanthus*	G2, S2 BLM=Sen	Deep, loose sandy soils	Not Present, habitat not suitable
Lonesome Milkvetch	*Astragalus solitarius*	G3, S1 BLM=Sen	Washes and banks of shallow soils on volcanic flat rock.	Not Present, habitat not suitable
Tiehm Milkvetch	*Astragalus tiehmii*	G3, S3 BLM= Sen	Fluviolacustrine volcanic ash	Not Present, habitat not suitable
Osgood Mountain Milkvetch	*Astragalus yoder-williamsii*	G3, S1 BLM=Sen	Dry, open slopes with granodiorite soils among boulders on flats and gentle slopes. Also on loose, silty soils.	Low, substrate marginal and not found in site surveys
Dainty Moonwort	*Botrychium crenulatum*	G3, S1 BLM=Sen	Wetland habitats	Not Present, habitat not suitable
Schoolcraft Catseye	*Cryptantha schoolcraftii*	G3, S3 BLM=Sen	Fluviolacustrine volcanic ash	Not Present, habitat not suitable
Goodrich Biscuitroot	*Cymopterus goodrichii*	G1, S1 BLM=Sen	Moderate to steep scree and talus slopes	Not Present, habitat not suitable
Wind-loving Buckwheat	*Eriogonum anemophilum*	G2G3, S2S3 BLM=Sen	Dry, barren, wind-blown, gravelly ridges at high elevations	Not Present, habitat not suitable
Beatly Buckwheat	*Eriogonum beatleyae*	G2, S2 BLM=Sen	Dry, volcanic outcrops	Not Present, habitat not suitable
Crosby Buckwheat	*Eriogonum crosbyae*	G3, S3 BLM=Sen	Outcrops of rhyolite and volcanic ash.	Not Present, habitat not suitable
Sand Cholla	*Grusonia pulchella*	G4, S2S3 BLM=Sen	Sand dunes and dry lake borders.	Not Present, habitat not

TABLE 3-10
Sensitive Plant Species
Documented for the BLM Winnemucca District

Common Name	Scientific Name	Status	Habitat Associations	Likelihood of Occurrence In or Near Project Area
				suitable
Grimy Mousetails	*Ivesia rhypara var. rhypara*	G2, S2 BLM=Sen	Mostly on dry, relatively barren outcrops of badlands	Not Present, habitat not suitable
Davis Peppercress	*Lepidium davisii*	G3, S1 BLM=Sen	Hard-bottomed clay playas on volcanic plains	Not Present, habitat not suitable
Pueblo Valley Peppercress	*Lepidium montanum var. nevadense*	G5, S1 BLM=Sen	Sand dunes and deep sand	Not Present, habitat not suitable
Owyhee Prickly Phlox	*Leptodactylon pungens*	BLM=Sen	Crevices in steep vertical, coarse, crumbling volcanic canyon walls.	Not Present, habitat not suitable
Succor Creek Parsley	*Lomatium packardiae*	G2, S1 BLM=Sen	Dry, open rocky soils derived from rhyolite or volcanic ash in sagebrush zone.	Not Present, habitat not suitable
Smooth Stickseed	*Mentzelia mollis*	G2, S1 BLM=Sen	Dry, open, nearly barren eroding shoulder and side slopes of clay badlands	Not Present, habitat not suitable
Oryctes	*Oryctes nevadensis*	G2, G3, S2, S3 BLM=Sen	Deep, loose sand of stabilized dunes, washes and valley flats.	Not Present, habitat not suitable
Nevada Dune Beardtongue	*Penstemon arenarius*	G2, G3, S2, S3 BLM=Sen	Deep loose sandy soils often in alkaline areas.	Not Present, habitat not suitable
Cordelia Beardtongue	*Penstemon floribundus*	G1, S1 BLM=Sen	Dry, open, mostly dark-colored talus or rocky slopes or alluvium.	Not Present, habitat not suitable
Lahontan Beardtongue	*Penstemon palmeri var. macrahthus*	G4, G5, S2, S3 BLM=Sen	Washes, roadsides, and canyon floors, particularly on carbonate-containing substrates, usually where subsurface moisture is available.	Not Present, habitat not suitable
Susanville Beardtongue	*Penstemon sudans*	G3,S1 BLM=Sen	Open sagebrush or woodlands on volcanic rocky slopes or other igneous material	Not Present, habitat not suitable
Obscure Scorpion Flower	*Phacelia inconspicua*	G2, S1 BLM=Sen	Deep, undisturbed organic soils on slopes where snow drifts persist	Not Present, habitat not suitable

TABLE 3-10 Sensitive Plant Species Documented for the BLM Winnemucca District				
Common Name	**Scientific Name**	**Status**	**Habitat Associations**	**Likelihood of Occurrence In or Near Project Area**
			well into spring.	
Playap Phacelia	*Phacelia inundata*	G2, S2 BLM=Sen	Alkaline playas and seasonally inundated areas	Not Present, habitat not suitable
Whitebark Pine	*Pinus albicaulis*	BLM=Sen	Dry, windy alpine and subalpine sites	Not Present, habitat not suitable
Soldier Meadow Cinquefoil	*Potentilla basaltica*	G1, S1 BLM=Sen	Moist salt-crusted clay in alkaline meadows	Not Present, habitat not suitable
Holmgren Smelowskia	*Smelowskia holgrenii*	G2, G3, S2, S3 BLM=Sen	High-elevation ridges	Not Present, habitat not suitable

G = Global Ranking S = State Ranking
1 – Critically Imperiled; 2 – Imperiled, rarity or factors making it vulnerable to extinction; 3 – Rare, uncommon, threatened; 4 – Not Rare, apparently secure; 5 – Widespread, Abundant; B – Breeding (potentially present during breeding season

Wildlife

BLM sensitive species known to be present within the Winnemucca District of the BLM are listed in **Table 3-11**. Based on analysis of known distribution and habitat affinities identified in the proposed Sonoma Heap Leach Facility expansion area, only those species with a moderate or high potential to be present are addressed in detail in this EA.

TABLE 3-11 Sensitive Wildlife Species Documented for the BLM Winnemucca District				
Common Name	**Scientific Name**	**Status**	**Habitat Associations**	**Likelihood of Occurrence In or Near Project Area**
Birds				
Bald Eagle	*Haliaeetus leucocephalus*	BLM=Sen	Nests near water, forages over a variety of habitats.	Low/transient
Bobolink	*Dolichonyx oryzivorus*	BLM=Sen	Tall grass and mixed-grass prairies. Prefers "old" hay fields with high grass-to-legume ratios.	Not present

TABLE 3-11
Sensitive Wildlife Species Documented for the BLM Winnemucca District

Common Name	Scientific Name	Status	Habitat Associations	Likelihood of Occurrence In or Near Project Area
Brewer's Sparrow	*Spizella breweri*	BLM=Sen	Sagebrush habitats and other Great Basin shrublands.	High/observed
Burrowing Owl	*Athene cunicularia*	BLM=Sen	Arid shortgrass prairie, often in association with prairie dog colonies.	Moderate
Ferruginous Hawk	*Buteo regalis*	BLM=Sen	Mixed-grass prairie, shrub-grasslands, grasslands, grass-sagebrush complex, and sagebrush steppe.	Moderate/transient
Black Rosy-Finch	*Leucosticte atrata*	BLM=Sen	Barren rocky and grassy areas in alpine tundra	Not Present
Lewis Woodpecker	*Melanerpes lewis*	BLM=Sen	Nests in open forest and woodlands	Not Present
Golden Eagle	*Aquila chrysaetos*	BLM=Sen	Grasslands and shrublands often associated with cliffs and rock outcrops.	High/Observed
Greater Sage-Grouse	*Centrocercus urophasianus*	BLM=Sen	Obligately linked to sagebrush habitat for nesting and wintering.	Low
Northern Goshawk	*Accipiter gentilis*	BLM=Sen	Mixed conifer, predominantly mature, forests	Not present
Loggerhead Shrike	*Lanius ludovicianus*	BLM=Sen	Open shrub and grassland habitats.	High/Observed
Peregrine Falcon	*Falco peregrinus*	BLM=Sen	Cliffs and canyons, near water.	Moderate/transient
Pinyon Jay	*Gymnorhinus cyanocephalus*	BLM=Sen	Conifer forest.	Low/transient
Sage Thrasher	*Oreoscoptes montanus*	BLM=Sen	Sagebrush habitats and other Great Basin shrublands	High/Observed
Swainson's Hawk	*Buteo swainsoni*	BLM=Sen	Grasslands and riparian areas.	Moderate
Western Snowy Plover	*Charadrius alexandrinus nivosus*	BLM=Sen	Open beaches and salt or mud flats, where vegetation is sparse of absent.	Not Present

TABLE 3-11
Sensitive Wildlife Species Documented for the BLM Winnemucca District

Common Name	Scientific Name	Status	Habitat Associations	Likelihood of Occurrence In or Near Project Area
Mammals				
Preble's Shrew	*Sorex preblei*	BLM=Sen	Dry sage and sage-grasslands. Also riparian shrubs and conifer forest.	Moderate
Pygmy Rabbit	*Brachylagus idahoensis*	BLM=Sen	Dense sagebrush habitats with friable soils	Moderate
Dark Kangaroo Mouse	*Microdipodops megacephalus*	BLM=Sen	Loose sands and gravel in desert shrub communities	Low
Pale Kangaroo Mouse	*Microdipodops pallidus*	BLM=Sen	Fine sands in desert shrub communities	Low
Bighorn Sheep	*Ovis canadensis*	BLM=Sen	Mesic to xeric alpine to desert habitats	Not Present
Pika	*Ochotona priceps*	BLM=Sen	Rocky talus slopes at high elevations	Not Present
Hoary Bat	*Lasiurus cinereus*	BLM=Sen	Forested areas.	Moderate/migrant
Little Brown Bat	*Myotis lucifugus*	BLM=Sen	Variety of habitats including grassland, forest, and riparian areas	Moderate
Silver-haired Bat	*Lasionycteris noctivagans*	BLM=Sen	Forested (frequently coniferous) areas adjacent to lakes, ponds, and streams.	Moderate/migrant
Pallid Bat	*Antrozous pallidus*	BLM=Sen	Arid deserts and grasslands often near rock outcrops and water.	High
Western Pipistrelle	*Pipistrellus hesperus*	BLM=Sen	Deserts and lowlands. Roosts include rock crevices, buildings, and mines.	Moderate
California Myotis	*Myotis californicus*	BLM = Sen	Wide range of habitats. Roosts in desert shrubs, crevices, and on the ground	High
Western Small-footed Myotis	*Myotis ciliolabrum*	BLM=Sen	Desert and semi-arid habitats. Roosts in crevices, caves, mines, and buildings	High
Fringed Myotis	*Myotis thysanodes*	BLM=Sen	Middle elevation desert and grasslands. Roosts in crevices, caves, mines, and buildings	Moderate

TABLE 3-11
Sensitive Wildlife Species Documented for the BLM Winnemucca District

Common Name	Scientific Name	Status	Habitat Associations	Likelihood of Occurrence In or Near Project Area
Long-legged Myotis	*Myotis lucifugus*	BLM=Sen	Primarily in montane coniferous forests, also desert habitats	Moderate
Yuma Myotis	*Myotis yumanensis*	BLM=Sen	Shrubland habitats closely associated with water. Nursery colonies in mines, caves, and buildings	Moderate
Big Brown Bat	*Eptesicus fuscus*	BLM=Sen	Wooded and semi-open habitats	High
Spotted Bat	*Euderma maculatum*	BLM=Sen	Arid habitats with cliffs and crevices	Moderate
Townsend's Big-eared Bat	*Corynorhinus townsendii*	BLM=Sen	Roosts and hibernates in mines and caves; forages over open areas and wetlands	Moderate
Fish				
Desert Dace	*Eremichthys acras*	BLM=Sen Threatened	Warm springs and their outflow creeks in Soldier Meadow area	Not Present
Lahontan Cutthroat Trout	*Onchorynchus clarki heshawi*	BLM=Sen Threatened	Cool, well-oxygenated lakes and streams	Not Present
Inland Columbia Basin Redband Trout	*Onchoryhynchus gairdneri*	BLM=Sen	Mountain streams	Not Present
Amphibians				
Northern Leopard Frog	*Rana pipiens*	BLM=Sen	Springs, streams, ponds, ands wetlands	Not Present
Insects				
Rice's Blue	*Euphilotes pallescens ricei*	BLM=Sen	Dune or deep sand habitats, larvae associated with buckwheat species.	Not present
Denio Sandhill Skipper	*Polites sabuleti sinemaculata*	BLM=Sen	Alkali grasslands, moist meadows, lawns, salt marshes, sagebrush flats, larvae associated with grasses	Low
Humboldt Serican Scarab	*Serica humboldtii*	BLM=Sen	Dunes and deep sand habitats	Not present

TABLE 3-11
Sensitive Wildlife Species Documented for the BLM Winnemucca District

Common Name	Scientific Name	Status	Habitat Associations	Likelihood of Occurrence In or Near Project Area
Molluscs				
Elongate Mud Meadow Pyrg	*Pergulopsis notidicola*	BLM=Sen	Spring systems in Soldier Meadow area	Not present

G = Global Ranking; S = State Ranking; 1 – Critically Imperiled; 2 – Imperiled, rarity or factors making it vulnerable to extinction;
3 – Rare, uncommon, threatened; 4 – Not Rare, apparently secure; 5 – Widespread, Abundant; B – Breeding (potentially present during breeding season.

Mammals

Pygmy Rabbit

The pygmy rabbit is a Great Basin species whose distribution is centered in Montana, Idaho, Nevada, Utah, and Oregon (Foresman 2001). Pygmy rabbits are limited to sagebrush habitats at elevations ranging from 4,500 to 7,000 feet, mainly on plains, toe slopes, or along drainages where deep and loose alluvial soil and the tallest, densest patches of sagebrush are present (Ulmschneider 2004). Primary features of pygmy rabbit habitat are relatively taller and denser big sagebrush and deep soil. Height of sagebrush can vary from 1.5 to 7 feet and density can also vary but commonly the sagebrush habitats occupied by pygmy rabbits are dense and not easy to walk through (> 30 percent cover). At a landscape scale, pygmy rabbits are found in alluvial fans, swales in rolling landscapes, large flat valleys, at the foot of slopes, and along drainages. In more open sagebrush, where one can walk freely, there are usually no pygmy rabbit burrows (Ulmschneider 2004).

Pygmy rabbits are the only rabbit species potentially present in the proposed Sonoma Heap Leach Facility expansion area that construct extensive underground burrows for shelter and raising young. Burrows are typically constructed in dense patches of sagebrush, often hidden at the base of sagebrush plants. Usually the burrow systems have two or more entrances. Burrow entrances are usually three to five inches in diameter but can be larger (Roberts 2001, 2002). Pygmy rabbits also use larger burrows constructed by badgers. An indication that pygmy rabbits are using burrows is the deposition of fecal pellets around the entrance of burrows. Fecal pellets are round and range from two to five millimeters in diameter. Fecal pellets of this size are not entirely diagnostic of pygmy rabbit presence because small cottontail rabbits also produce pellets of this size. Often pygmy rabbits are present in colonies with numerous burrows and trails between burrows. Surveys of sagebrush habitat in the proposed Sonoma Heap Leach Facility expansion area found few burrows (three in sagebrush habitat of the Sonoma expansion area) and no evidence of use by pygmy rabbits (AMEC 2011). In March 2010, a survey was conducted to determine the presence of pygmy rabbits and potential pygmy rabbit habitat within the Twin Creeks Mine permit boundary including the proposed Vista Pit Expansion areas (JBR 2010a, 2010b). Big sagebrush grassland vegetation communities in the north, east, and west portions of the

survey area provide potential pygmy rabbit habitat and was intensely surveyed for recent activity such as fresh pellets and active burrows. No pygmy rabbits or evidence of pygmy rabbits (burrows, pellets) were observed during the surveys.

Preble's shrew

The ecology, life history, and habitat characteristics of Preble's shrew are not well known (Foresman 2001); however, it occurs mostly in sagebrush and grassland habitats and occasionally in coniferous forest, marshes, and riparian areas. Suitable habitat may be present in the area proposed for expansion of the Sonoma Heap Leach Facility (AMEC 2011).

Bats

Most bat species listed in **Table 3-11** have potential to use habitat in the Twin Creeks Mine area for foraging, roosting, and breeding. Rock crevices in mining pit walls likely provide roosting habitat and marginal breeding habitat. Caves, mines, and abandoned buildings present adjacent to the mine area provide potential roosting and breeding areas for bats. Sagebrush communities likely provide foraging habitat and crevices in mine pit highwalls may provide roosting habitat and marginal breeding habitat. There is little in the literature about foraging range for many bat species, and therefore it is difficult to estimate how far bats forage from suitable roosting habitat and water sources. Brazilian free-tailed bats range at least thirty miles from their roost. Presumably, larger bats could routinely fly farther than smaller bats. Pallid and hoary bats could potentially fly several miles between roosting sites and foraging areas. Smaller bats, such as western pipistrelles and Myotis species may not fly as far. Water sources are critical to bats because they drink from open water and insects are more abundant around wetlands and open water. Studies in desert habitats have found that bat activity is 40 times greater near wetlands and riparian areas than in upland areas (Bradley *et al.* 2006). Even high-elevation tree-roosting bats fly to open water, wetlands, and riparian areas to drink and forage. A stock-watering tank is located immediately adjacent to Sonoma heap leach expansion area, which may be attractive to bats.

Pallid Bat

Pallid bats are common in arid desert and grassland areas of the southwest, ranging into central Mexico, and have been documented as far north as British Columbia and Montana, where they are rare. They occur throughout Nevada, primarily at low and middle elevations (under 8500 feet), though they have been documented at over 10000 feet. They are associated with a variety of habitats, including coniferous forest, pińyon-juniper woodland, blackbrush, creosote, sagebrush, and salt desert scrub habitats (Adams 2003; Bradley *et al.* 2006). This species is often associated with canyons and rocky outcrops, particularly near water sources (Harvey *et al.* 1999). Pallid bats roost in rock outcrops, mines, caves, hollow trees, bridges, and buildings. Bradley *et al.* (2006) indicate that populations and habitats for this species are at moderate risk in Nevada.

Hoary Bat

The Hoary bat is the most widespread bat in the Americas, ranging from all of southern Canada, throughout the continental U.S., and southward throughout all of Central and most of South America. It is a summer resident of Nevada, and occurs throughout the state in suitable habitat. This species is

generally associated with forests and woodlands, where it roosts in the foliage of deciduous and coniferous trees. Hoary bats are found primarily in upland forested habitats, gallery-forest riparian areas, and agricultural areas. In Nevada, it has been documented using pure stands of Rocky Mountain juniper and scrub habitats (Adams 2003; Bradley *et al.* 2006). The Hoary bat in Nevada is considered widespread but uncommon. Bradley *et al.* (2006) rated this species' habitat/population risk as Moderate.

Silver-haired Bat

Silver-haired bats range from southeastern Alaska across southern Canada, throughout most of the continental United States, and south into northeastern Mexico in suitable habitat. They have been documented throughout Nevada. This species is typically a migratory, forest-dwelling bat, found in coniferous forests and mixed deciduous/coniferous forests from higher elevation spruce-fir forests to low elevation cottonwood and willow riparian corridors. It has been documented in pińyon-juniper woodlands and aspen groves (Adams 2003; Bradley *et al.* 2006; Harvey *et al.* 1999). This species appears to be most common at higher latitudes, and may be a migrant through Nevada. Migration patterns are poorly understood (Bradley *et al.* 2006). Silver-haired bats roost almost exclusively in trees in summer, typically under loose bark, though they have been found roosting in tree cavities and buildings. It typically forages over streams and woodland ponds. Silver-haired bats are unprotected in Nevada, where it is considered relatively common, at least during migration. This species' habitat/population risk is rated as Moderate (Bradley *et al.* 2006).

Townsend's Big-eared Bat

Townsend's big-eared bats are distributed throughout southwestern Canada, the western United States, including Nevada, and south to southern Mexico. It is found primarily in relatively arid habitats such as ponderosa pine forests, pińyon-juniper woodlands, blackbrush, sagebrush, and salt desert scrub. They have been documented in higher elevation coniferous forests, and in agricultural and urban areas (Adams 2003; Bradley *et al.* 2006; Harvey *et al.* 1999). They are closely associated with mines and caves, though they have been found roosting in buildings and under bridges. This species is highly sensitive to disturbance at roost sites and has undergone population declines throughout much of its range during the past 40 years. Bradley *et al.* (2006) rated this species' habitat/population risk as High.

Big Brown Bat

Big brown bats are widely distributed from southern Canada through Central America into South America. They are common throughout much of the West, including Nevada. They are a year-around resident in Nevada, where they are found in a variety of habitats, including coniferous forests, deciduous woodlands and riparian areas, pińyon-juniper woodlands, sagebrush, agricultural, and urban areas. Day roosts are in caves and abandoned mines, tree cavities, buildings, and under bridges (Adams 2003; Bradley *et al.* 2006). This species' habitat/population risk is rated as Low (Bradley *et al.* 2006).

California Myotis

California myotis are found from southeastern Alaska and western Canada southward through most of Mexico. They are distributed throughout Nevada, primarily at elevations under 5900 feet, though they may occur at higher elevations. This species uses a wide variety of habitats from humid coastal forests to

arid deserts. In arid areas it is usually found near water and roosts in tree cavities, under bark, in rock crevices, caves, abandoned mines, and buildings (Adams 2003; Bradley *et al.* 2006; Harvey *et al.* 1999). This species is considered relatively common in some areas of Nevada, especially in southern Nevada. It is a year-round resident, hibernating during winter months. This species' habitat/population risk is rated as Moderate (Bradley *et al.* 2006).

Fringed Myotis

Fringed myotis range from British Columbia south throughout much of the western U.S. into most of Mexico. They have been recorded through central and southern Nevada, and probably occur in northern Nevada as well. They are found in a wide range of habitats from low-elevation desert scrub to high-elevation coniferous forests. This species appears to be most common in pińyon-juniper, ponderosa pine, Douglas-fir, and oak woodlands in much of its range. It has been documented in sagebrush-rabbitbrush habitat. Day and night roosts are in tree cavities, abandoned mines, and buildings. Hibernacula are generally caves or mines (Adams 2003; Bradley *et al.* 2006; Harvey *et al.* 1999). Fringed myotis are apparently widely distributed in Nevada, but are relatively rare and sensitive to roost disturbance. Bradley *et al.* (2006) rated this species' habitat/population risk as High.

Little Brown Bat

Little brown bats are widely distributed from much of Alaska throughout Canada, most of the continental U.S. to central Mexico. This species is found throughout Nevada, though most records are from the northern part of the state. It is often associated with coniferous forests though it has been documented in riparian corridors (Bradley *et al.* 2006; Harvey *et al.* 1999). It has been suggested that this species is dependent on permanent water sources, and that the presence of water is more important than any particular vegetation assembly (Adams 2003). Day roosts for little brown bats include hollow trees, rock outcrops, beneath rocks, mines, caves, and in buildings; even those occupied by humans (Adams 2003; Harvey *et al.* 1999). This species likely migrates elevationally, hibernating primarily in caves and abandoned mines and is year-round resident in Nevada. It appears to be regionally common in Nevada, and throughout much of its range (Bradley *et al.* 2006), though population declines have been documented in some locations (Adams 2003). Bradley *et al.* (2006) rated the risk to this species population and habitat as Moderate.

Western Small-footed Myotis

The Western small-footed myotis is distributed from southern British Columbia, Alberta, and Saskatchewan south throughout most of the western U.S. to central Mexico. It is found throughout Nevada and is considered regionally widespread and common (Bradley *et al.* 2006). In the central and northern parts of the state it is often associated with valley bottoms under 5900 feet and is generally associated with arid and semi-arid areas. It utilizes a variety of habitats including desert scrub, grasslands, sagebrush, pińyon-juniper woodland, pine-fir forest, and urban areas. It roosts in rock crevices, under boulders, under loose bark, in caves and mines, and in buildings (Adams 2003; Bradley *et al.* 2006; Harvey *et al.* 1999). It is a year-around resident of Nevada, where it hibernates during winter months in caves and mines. Bradley *et al.* (2006) rated this species' habitat/population risk as Moderate in Nevada.

Western Long-eared Myotis

The Western long-eared myotis occurs from southern British Columbia, Alberta, and Saskatchewan south throughout the western U.S. and into Baja, California, Mexico. It is found throughout Nevada, and is more common in the northern half of the state, primarily at higher elevations associated with coniferous forest. This species is found in a variety of mostly dry forested habitats, especially where there is an abundance of rocky outcrops. It also occurs in pińyon-juniper woodlands and in semi-arid shrublands, sagebrush, chaparral, and agricultural areas where suitable roosting sites are available (Adams 2003; Bradley *et al.* 2006; Harvey *et al.* 1999). This species roosts during the day in hollow trees, under bark, in caves and mines, in crevices in rock outcrops, and sometimes in abandoned buildings. It is presumed resident year-round in Nevada (Adams 2003; Bradley *et al.* 2006). Western long-eared myotis are widely distributed in Nevada, and are considered uncommon everywhere. Bradley *et al* (2006) rated this species' habitat/population risk as Moderate. Severe population declines have been reported in the Spring Mountains in southern Nevada (Bradley *et al.* 2006).

Long-legged Myotis

Long-legged myotis are distributed from southeastern Alaska south throughout most of the western U.S. into northern Mexico. They are found throughout Nevada, but are more common in the northern half of the state. This species inhabits a variety of habitats and is known as a forest bat, occupying mountainous-forested habitat from high-elevation spruce-fir forests to ponderosa forests and riparian cottonwood woodlands. However, it has also been documented in pińyon-juniper woodland, mountain shrub, salt desert scrub, and sage habitats (Adams 2003; Bradley *et al.* 2006; Harvey *et al.* 1999). Long-legged myotis roost in snags, rock crevices, tree cavities, and buildings. They may migrate altitudinally and latitudinally between summer range and winter hibernacula, though they are probably resident year-round in Nevada. Bradley *et al.* (2006) rated this species' habitat/population risk as Low. Population declines have been reported in the Spring Mountains in southern Nevada (Bradley *et al.* 2006).

Yuma Myotis

Yuma myotis range from British Columbia throughout much of the western U.S. into central Mexico. They have been documented primarily in the southern and western parts of the state, though recent records suggest a wider distribution (Bradley *et al.* 2006; Harvey *et al.* 1999). This species is found in a variety of habitats from low to mid-elevations and has been documented in spruce and aspen woodlands, ponderosa pine forests, pińyon-juniper woodlands, sagebrush, salt desert scrub, agricultural areas, and urban habitats. An important component of Yuma myotis habitat is open water (Adams 2003; Bradley *et al.* 2006; Harvey *et al.* 1999). This species roosts in tree cavities, rock crevices, mines and caves, and buildings and is tolerant of human disturbance. Bradley *et al.* (2006) rated this species' habitat/population risk as Moderate.

Western Pipistrelle

The Western pipistrelle ranges from southern Washington State south into southern Mexico. It inhabits a variety of primarily desert habitats, including creosote flats, salt desert scrub, and sagebrush, and occasionally occurs in ponderosa pine and pińyon-juniper woodlands. It is almost always associated with rocky canyons, cliffs, and rock outcrops (Adams 2003; Harvey *et al.* 1999). They are found throughout

Nevada, but are most common in the southern and western portions of the state (Bradley *et al.* 2006). Western pipistrelles roost primarily in rock crevices, but will also roost under rocks, in animal burrows, caves and mines, and buildings. They are resident year-round in Nevada. This species is common in much of its range, though population declines have been noted in the Spring Mountains near Las Vegas. The risk to this species' populations/habitats is rated as Moderate (Bradley *et al.* 2006).

Brazilian Free-tailed Bat

The Brazilian free-tailed bat is widely distributed from the southern United States south through Central America to South America. It is a summer resident through most of Nevada, though most common in the southern portions of the State. It is found in a wide variety of habitats, including riparian corridors, agricultural areas, urban areas, open ponderosa pine woodlands, and desert scrub (Adams 2003; Bradley *et al.* 2006; Harvey *et al.* 1999). This species normally roosts in huge numbers, primarily in caves, though it may use abandoned mines, buildings, and bridges. It may fly up to thirty miles between foraging areas and roosting sites (Adams 2003). Though very common in much of their range, large population declines have been documented in some populations. The risk to this species' populations/habitats is rated as Low (Bradley *et al.* 2006).

Birds

Greater Sage-Grouse

The greater sage-grouse is a sagebrush-dependent species and candidate for listing under the Endangered Species Act of 1973. The proposed Sonoma Heap Leach Facility expansion area is on the edge of the overall distribution area for the species (BLM 1996). BLM has identified an area approximately 10 miles north of the Twin Creeks Mine as a sage-grouse general distribution area. No sage grouse leks, nest sites, brooding areas, or winter use areas have been documented within the Twin Creeks Mine permit boundary (BLM 1996). Sage-grouse breed in spring and attend traditional courtship and breeding sites (leks), which are used year after year. Leks are often situated on broad ridge tops, grassy swales, and disturbed sites that have less herbaceous and shrub habitat than surrounding habitats (Schroeder *et al.* 1999). Sage grouse are obligately linked to sagebrush habitats for nesting, foraging, and wintering. Nesting generally occurs within five miles of leks (Schroder *et al.* 1999). Site surveys in May 2011 of the proposed Sonoma Heap Leach Facility expansion area did not detect sage-grouse or evidence of their presence (*e.g.,* fecal pellets or feathers) (AMEC 2011). Twin Creek Mine employees have not observed sage grouse on or near the proposed Sonoma Heap Leach Facility expansion area (Muething 2011). It is unlikely that sage-grouse currently use habitat in the area, although it appears to be suitable to support this species.

Brewer's Sparrow

Like other grassland birds in North America, Brewer's sparrow populations are declining throughout its range, which may be due to degradation of shrubland habitats (Rotenberry *et al.* 1999). Brewer's sparrows breed in shrublands with an average canopy height of less than 5 feet and are most closely associated with habitats dominated by big sagebrush (Rotenberry *et al.* 1999). Hansley and Beuavais (2004) report that shrub patch sizes may be a determinant of this species' presence. In disturbed

patches of sagebrush habitat in Idaho, Brewer's sparrows can nest in patches as small 15 acres even when surrounded by unsuitable habitat. The Brewer's sparrow was observed in Wyoming big sagebrush habitat in the area proposed for expansion of the Sonoma Heap Leach Facility (AMEC 2011).

Sage Thrasher

The sage thrasher is a species of obligately linked to sagebrush habitats and populations of the species have remained stable where sufficient amounts of shrub steppe habitat remain; however, its numbers have been reduced where there has been conversions of sagebrush rangeland to agriculture (Reynolds *et al.* 1999). Sage thrasher numbers are positively correlated with amount of sagebrush cover. Sage thrashers nest in April and May and may have second broods that hatch in July. Incubation typically lasts about 15 days with young fledging in another 12 to 15 days (Reynolds *et al.* 1999). The sage thrasher was observed in Wyoming big sagebrush habitat in the proposed Sonoma leach pad expansion area (AMEC 2011).

Loggerhead Shrike

The loggerhead shrike is widely distributed but populations have declined throughout North America in recent decades. This species is migratory in the northern part of its range in areas that do not accumulate large amounts of snow. It is likely a summer resident in the proposed Sonoma Heap Leach Facility expansion area because of snow accumulation during most years. Migration of this species is not well known (Yosef 1996). The shrike inhabits open country in shrub and grassland habitats and nests in trees and shrubs from March through June, with young fledging in approximately 11 weeks (Yosef 1996). This species was observed in the area proposed for expansion of the Sonoma Heap Leach Facility, but no nests were observed (AMEC 2011).

Burrowing Owl

Burrowing owls nest in underground burrows excavated by ground squirrels, badgers, and other mammals, but are also able to excavate their own burrows. They usually occupy sagebrush and grassland habitats and often use the same nesting burrow for a number of years. Although burrowing owls can often be seen perched on or near their burrow during the day, they forage at night for nocturnal small mammals, spadefoot toads, and insects. Burrowing owls usually migrate south from Nevada in winter, but there are records of them over-wintering in their burrows in a state of torpor (Ryser 1985). Burrowing owls have not been observed in the Study Area (AMEC 2011) but have been identified in the vicinity along Rabbit Creek (BLM 1996).

Golden Eagle

Golden eagles range throughout western North America and parts of northeast Canada and breed and winter widely throughout Nevada. Golden eagles hunt by soaring over open land such as prairie, sagebrush-grassland and open woodland habitats. Golden eagles eat primarily jackrabbits, ground squirrels, and carrion and occasionally prey on deer and antelope fawns, other small mammals, waterfowl and grouse (Montana Natural Heritage Program 2011). Golden eagles generally nest on cliffs, in large trees, or on artificial structures such as power poles and transmission towers (Ryser 1985; Kochert *et al.* 2002). The approximate courtship, nesting, and brood-rearing period is from February

through July (USFS *et al.* 1984). Many golden eagles winter in Nevada. Migrants may arrive March through April, with immature eagles arriving later (Kochert *et al.* 2002). There is concern that golden eagle populations in the western United States may be declining (Pagel *et al.* 2010). The majority of mortality in golden eagles is through human causes, with collisions with vehicles, power lines, and other structures being the leading cause (Kochert *et al.* 2002). Golden eagles were observed in an active nest on a highwall in the Vista Pit (**Figure 3-4**) (AMEC 2011). The nest is approximately 1,600 feet from major mine haul roads, 3,000 feet from the activities of the underground portal, and 3,500 feet from the Juniper Plant and Mill. The pair of golden eagles nesting on the highwall of the Vista Pit appear to be accustomed to high levels of human activity including haul trucks and blasting.

The golden eagle is protected under the federal Bald and Golden Eagle Protection Act, which prohibits the take of bald or golden eagles without a permit. The procedure for obtaining an incidental take permit from the U.S. Fish and Wildlife Service is provided in the Federal Register (Vol. 74, No. 175/Friday September 11, 2009). The Bald and Golden Eagle Protection Act defines "take" as "pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest or disturb". Disturb means to agitate or bother eagles to a degree that causes or is likely to cause, based on the best scientific data available, injury to an eagle; decrease in productivity or nest abandonment by substantially interfering with normal breeding, feeding, or sheltering behavior. The BLM also has policy guidance for addressing potential impacts of projects on golden eagles (Instruction Memorandum No. NV 2010-034). This memorandum indicates that the BLM Field Manager must notify applicants during the permitting process that construction and operation of a facility may result in a take and that it is the applicant's responsibility to consult with the U.S. Fish and Wildlife Service and obtain any applicable permits. The BLM also maintains federal guidelines for inventory and monitoring protocols.

On July 15, 2011, the U.S. Fish and Wildlife Service provided a letter that indicated, based on the conditions at the nest site, the agency did not anticipate disturbance to the nest and birds from ongoing mining activities. The agency recommends that new activity at the proposed mine expansion be avoided until nesting is completed. Newmont would continue to monitor the existing nest and coordinate with the USFWS and BLM regarding the nest prior to the next breeding season.

Ferruginous Hawk

Ferruginous hawks inhabit open grasslands, shrub-steppes and deserts, avoiding interior forest habitats (Bechard and Schmutz 1995). They are summer residents of Nevada. Ferruginous hawks nest in trees, shrubs, and on rocky outcrops, often using the same nest for an extended period (Bechard and Schmutz 1995). In Nevada, ferruginous hawks typically nest in juniper trees (Ryser 1985). They tend to avoid nesting in areas converted to agriculture. Fall migration begins in August and continues through early September (Montana Natural Heritage Program 2011). The approximate nesting period occurs from April through July (USFS *et al.* 1984). Loss of suitable habitat to agricultural conversion and overgrazing by livestock are primary factors causing population decline. Field surveys did not document this species in the area and no nests are present (AMEC 2011); however, this species is present in the vicinity and periodically may forage over the area proposed for expansion of the Sonoma Heap Leach Facility.

Swainson's Hawk

Swainson's hawks are summer residents in Nevada and are most common in grassland/shrubland habitats. They nest in river bottoms, brushy draws or shelterbelts; and forage in open grasslands, sparse shrublands, and small, open woodlands (Ryser 1985; Bechard *et al.* 2010). Swainson's hawk has adapted to foraging in areas of cultivated wheat and alfalfa. Swainson's hawks mainly forage on small mammals and at times may feed almost exclusively on insects, particularly grasshoppers (Bechard *et al.* 2010). They are a gregarious species, often migrating in flocks (Bechard *et al.* 2010). The approximate nesting period occurs from May through mid-September (USFS *et al.* 1984). Field surveys did not document this species in the proposed Sonoma Heap Leach Facility expansion area and no nests are present (AMEC 2011); however, this species is present in the vicinity and may forage over the area proposed for expansion of the Sonoma Heap Leach Facility.

3.2.12 Vegetation

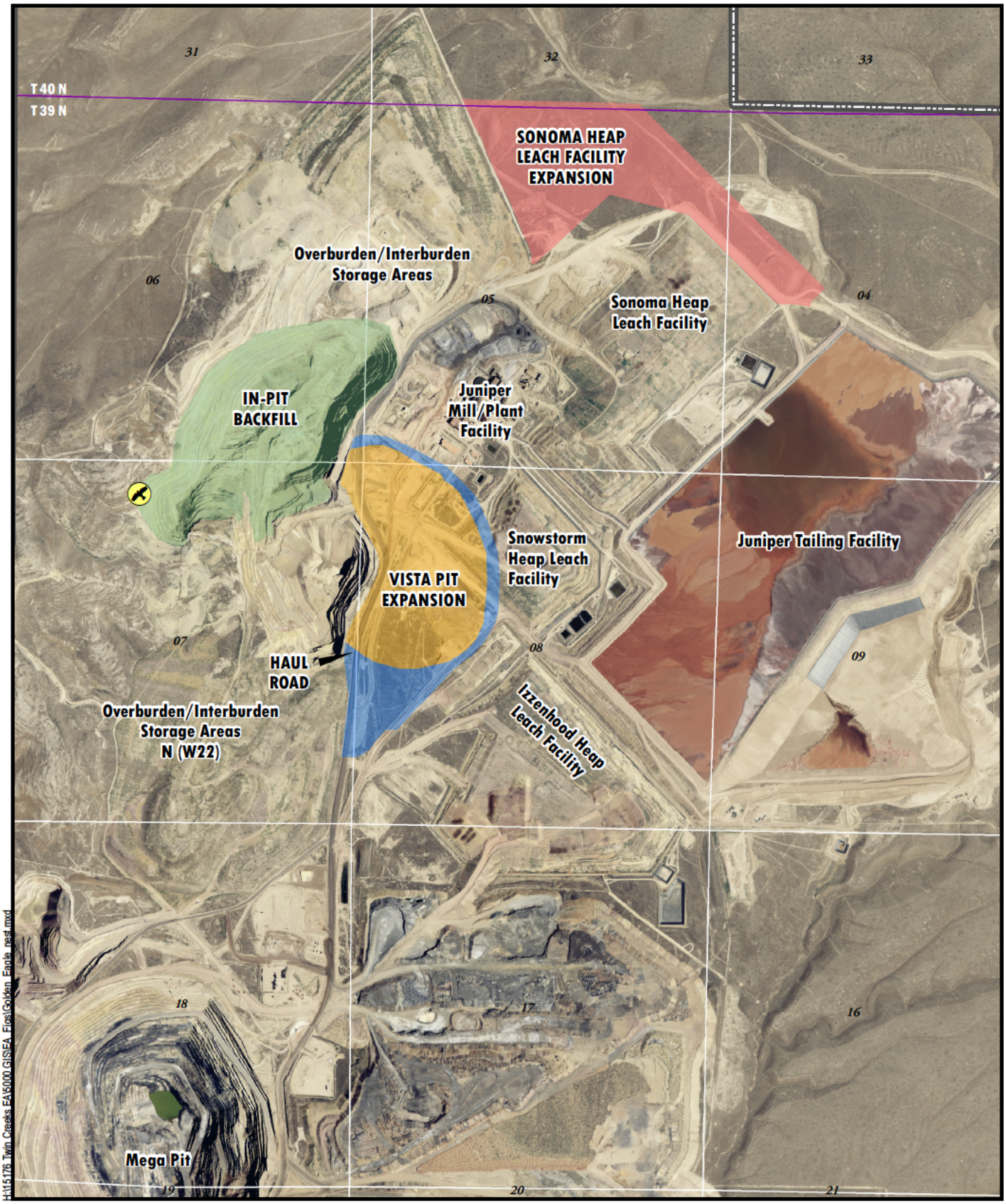
The Twin Creeks Mine lies within the general Great Basin sagebrush-grassland ecosystem, which is common throughout northern Nevada. Approximately 110 acres of big sagebrush steppe habitat and 14 acres of weedy vegetation on the topsoil stockpiles are present within the 145-acre parcel currently permitted for equipment/material storage and proposed for expansion of the Sonoma Heap Leach Facility. This community type consists predominantly of Wyoming big sagebrush and rabbitbrush. Understory vegetation is comprised mostly of mixed bunch grasses and native forbs. No tree-dominated or wetland/riparian plant communities are present in proposed expansion area for the Sonoma Heap Leach Facility. No vegetation is present within the area proposed for expansion of the Vista Pit. Plant species identified during the site surveys in May are listed in **Table 3-12**.

3.2.13 Wildlife

The Nevada Department of Wildlife (NDOW), BLM, and Nevada Natural Heritage Program (NNHP) collect information on Nevada's wildlife including at-risk, rare, endangered, and threatened species. Wildlife species addressed in this EA include game animals, nongame animals, and species typical of the Great Basin. The Study Area for wildlife includes the existing Vista Pit Mine, area proposed for expansion of the Vista Pit and Sonoma Heap Leach Facility, and a 1320-foot wide buffer (0.25 miles) around the proposed expansion to the Sonoma leach pad.

Wildlife habitat characteristics in the Twin Creeks Mine area have been degraded by development of mining-related facilities. Existing environmental conditions include open mine pits, OISAs, heap leach facilities, tailings storage facilities, exploration roads and drill pads, haul roads, and other ancillary facilities used in conjunction with previously authorized and ongoing mining operations. Wildlife species and habitats within the area proposed for expansion of the Sonoma Heap Leach Facility are typical of the Great Basin region (AMEC 2011).

A prominent ecological factor on land adjacent to the proposed Sonoma leach pad expansion area is the presence of large numbers of wild horses. During site visits in May 2011, approximately 40 wild horses were observed near a stock-watering tank near the northwest corner of the area proposed for expansion of the Sonoma Heap Leach Facility. Heavy use by horses has removed much of the vegetation around the stock watering tank and numerous trails radiate out from the tank.



H:\15176 Twin Creeks EA\5000 GIS\EA_Figs\Golden_Eagle_nest.mxd

2006 NAIP Aerial Photography

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No warranty is made by the Bureau of Land Management as to the accuracy, reliability, completeness of these data for individual use or aggregate use with other data. Original data were compiled from various sources. This data may not meet National Map Accuracy Standards. This product was developed through digital means and may be updated without notification.

- Golden Eagle Nest
- Road Disturbance
- Vista Pit Expansion
- In-Pit Backfill
- Sonoma Heap Leach Facility Expansion
- Plan of Operations Boundary

Golden Eagle Nest
Vista Pit Expansion
Twin Creeks Mine
Humboldt County, Nevada
FIGURE 3-4

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Table 3-12
Plant Species Identified in Sonoma Heap Leach Facility Area

Scientific Name	Common Name
Shrubs	
Artemisia tridentata wyomingensis	Wyoming big sagebrush
Atriplex nuttallii	Nuttall's salt brush
Chrysothamnus nauseosus	Rubber rabbitbrush
Chrysothamnus viscidiflorus	Green rabbitbrush
Gutierrezia sarothrae	Broom snakeweed
Forbs	
Agoseris nutans	False-dandelion
Allium acuminatum	Taper-tip onion
Alysum desertorum	*Alysum*
Amsinckia menziesii	Small-flowered amsinckia
Antenaria sp.	Pussytoes
Arabis holboellii	Rock cress
Astragalus cicer	Cicer milkvetch
Astragalus lentiginosus	Specklepod milkvetch
Astragalus purshii	Wooly pod milkvetch
Calachortus sp.	Sego lilly
Chorispora tenella	Blue mustard
Collinsia parviflora	Blue-eyed Mary
Crepis acuminata	Hawksbeard
Crepis modocensis	Hawksbeard
Delphinium nutallianum	Upland larkspur
Descurainia pennata	Tansy mustard
Descurainia sophia	Tansy mustard
Eriastrum sparsiflorum	Eriastrum
Eriogonum ovalifolium	Cushion buckwheat
Kochia prostrata	Prostrate kochia
Lepidium perfoliatum	Peppercress
Lomatium spp.	Biscuit root
Lupinus sericeus	Silky lupine
Microsteris gracilis	Microsteris
Phlox hoodii	Hood's phlox
Phlox longifolia	Long-leaf phlox
Ranunculus testiculatus	Hornseed buttercup
Salsola iberica	Russian thistle
Sisymbrium altissisimum	Tumble mustard
Taraxacum officinalis	Dandelion
Grasses	
Agropyron cristatum	Crested wheatgrass
Agropyron dasystachyum	Thick-spiked wheatgrass
Agropyron spicatum	Bluebunch wheatgrass
Bromus tectorum	Cheatgrass
Elymus cinereus	Basin wildrye
Oyzopsis hymenoides	Indian ricegrass
Poa scabrella	Rough bluegrass
Pos secunda	Sandberg's bluegrass
Sitanion hystrix	Squirreltail
Stipa thurberiana	Thurber's needlegrass

Source: AMEC 2011.

Big Game Species

Mule deer are distributed throughout Nevada and are found in open forested regions, plains, and desert habitats. Mule deer also inhabit alpine, subalpine, montane, and foothill zones. In seasonally harsh environments, mule deer tend to migrate between seasonal ranges (Foresman 2001). Winter range is associated with areas accumulating minimal amounts of snow and tends to occur at lower elevation, south and west facing slopes, and wind-blown ridges. Mule deer migration is correlated to severity of winter with high fidelity to winter ranges. Typically, mule deer winter in the foothills, move onto the flats once green-up begins in the spring, and then move upslope to their summer ranges. Winter range is particularly important for maintaining healthy mule deer populations because of the lack of high quality forage, cold temperatures, and increased energy demand associated with the winter season tends to limit and stress populations. Mule deer feed on about equal amounts of woody browse and herbaceous native and introduced forbs, including crops. Species such as bitterbrush, mountain mahogany, sagebrush, juniper, and skunkbush sumac are favored in winter. Herbaceous species become an important part of their diet in late spring and summer, while shrubs are critical in the fall and winter. Mule deer are common year-round in the area proposed for expansion of the Sonoma Heap Leach Facility, but increase in abundance during winter. Approximately 30 to 50 mule deer winter on the mine site, primarily on areas that have been reclaimed. Closure of the mine site to hunting provides a refuge for mule deer and encourages use of habitats on the mine site and expansion area. The Twin Creek Mine site is not located within a mule deer migration route (Pirkle 2011).

Pronghorn antelope are common in and around the proposed Sonoma Heap Leach Facility expansion area in croplands, grasslands, and sagebrush steppe habitats. Antelope have distinct summer and winter ranges (Foresman 2001). Generally, during winter, pronghorns aggregate into large groups but break into smaller groups in spring and summer. Sagebrush and forbs are essential in the year-round pronghorn diet (Compton *et al.* 1971). Approximately, 10 to 20 antelope spend the summer on the mine site. Antelope populations in northern and central Nevada have been increasing over the last decade (Pirkle 2011).

Mountain lions are periodically present on and near the mine site. A favored prey species, mule deer, may attract this predator to the area. Mountain lions are classified as a big game species in Nevada. Mountain lions are fairly common in north-central Nevada and occur in higher elevations and often travel between mountain ranges and valleys depending on prey availability (NDOW 2008).

Population estimates for California bighorn sheep in game management unit 051 are approximately 20 animals. The population has been slowly increasing since a die-off that occurred in 2003 (NDOW 2008). Crucial range has been designated for California bighorn sheep from the Snowstorm Mountains down to the foothills region east of the Twin Creeks Mine.

Small Game Species

Game Birds

Upland game birds are not abundant but may occupy portions of the area proposed for expansion of the Sonoma Heap Leach Facility. Species that may be present include chukar and mourning dove. Small flocks of chukar, an introduced species, occur in dry sagebrush, grasslands, and deserts, often along rocky slopes, mesic areas, and rugged canyons. Mourning doves are transitory during spring and fall migration and are not known to nest within the proposed Sonoma Heap Leach Facility expansion area.

Fur Bearers

Furbearers that occur within the area proposed for expansion of the Sonoma Heap Leach Facility include the badger, coyote, and bobcat. Other mammals that may be found within the area include coyote, long-tailed weasel, short-tailed weasel, spotted skunk, and striped skunk.

Nongame Species

Nongame species (*e.g.,* small mammals, passerines, raptors, amphibians, and reptiles) that likely occur within the area include deer mouse, Merriam's shrew, sagebrush vole, golden-mantled ground squirrel, least chipmunk, and woodrat. Rodent populations represent a prey base for the area's predators.

Passerine or songbird species occupy the suitable habitats that occur in the proposed Sonoma Heap Leach Facility expansion area. Several raptor species have been documented within the vicinity of the Twin Creeks Mine site including golden eagle, prairie falcon, American kestrel, northern harrier, turkey vulture, ferruginous hawk, Swainson's hawk, red-tailed hawk, short-eared owl, and western burrowing owl (BLM 1996). Surveys in May 2011 found ravens and a pair of golden eagles nesting on the Vista Pit highwall (AMEC 2011). A pair of redtail hawks also perch and soar on thermals associated with Vista Pit highwall and may nest on the rock faces of the highwall.

Reptile species that likely occur in Project area include the Great basin gopher snake, western whiptail lizard, desert spiny lizard, Pacific treefrog, and Great Basin spadefoot toad (BLM 1996).

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CHAPTER 4
ENVIRONMENTAL CONSEQUENCES

4.1 INTRODUCTION

This chapter describes the potential direct and indirect impacts that could result from the Proposed Action, Alternative A, and the No Action Alternative.

4.2 PROPOSED ACTION

4.2.1 Air Quality

An air quality assessment was conducted by Environmental Management Associates (EMA 2011a) to estimate the potential emissions of criteria air pollutants from the proposed Vista Pit Expansion Project.

The current U.S. EPA-approved AMS/EPA Regulatory Model (AERMOD) (Version 09292) was used to conduct ambient air quality modeling. The modeling results demonstrate that calculated emissions of air pollutants from the proposed Vista Pit Expansion Project, when added to the representative background air pollutant concentrations, would not exceed National or Nevada ambient air quality standards (EMA 2011a).

Most emissions from the proposed Vista Pit Expansion Project would be from combustion of diesel fuel used to power mining equipment and haul trucks. Additional modeled data provided by EMA (2011b, 2011c) estimates air pollutants that would be emitted by the proposed Vista Project from diesel combustion during the initial phase of development. These modeled data are shown in **Table 4-1**.

TABLE 4-1
Diesel Combustion Air Pollutants (tons/year*)
Vista Pit Expansion Project

	$PM_{2.5}$	PM_{10}	SO_2	CO	NO_x	VOCs	CO_2
Diesel	22.9	22.3	0.3	243	351	44	37,348

* During initial phase of Vista Pit development. $PM_{2.5}$ = particulate matter smaller than 2.5 microns in aerodynamic diameter; PM_{10} = particulate matter smaller than 10 microns in aerodynamic diameter; SO_2 = sulfur dioxide; CO = carbon monoxide; NOx = nitrogen oxides; VOCs = volatile organic compounds; CO_2 = carbon dioxide. These Vista Pit Expansion estimates are based on consumption of 3 million gallons of diesel fuel annually.
Source. EMA 2011b, 2011c.

As the Vista Pit Expansion Project becomes operational, equipment tasked to the Mega Pit would gradually begin to shift to the Vista Pit. Once active mining of the Mega Pit ceases emissions of particulate matter (PM_{10} and $PM_{2.5}$) from diesel combustion sources would be as described in Section 2.2.8 – *Energy Use* and as shown in **Table 3-3.**

Non-diesel combustion air pollutants related to the Vista Pit Expansion Project are not available as these sources are primarily associated with ore processing components. Ore processed at the Twin Creeks Mine is from several sources and data for air pollutants associated with a single ore source are not available. Total emissions associated with non-diesel combustion sources for the Twin Creeks Mine are shown in **Table 3-3.**

Gaseous Emissions

The Vista Pit Expansion Project would be a source of gaseous air pollutants from combustion of diesel fuel including 0.3 tons/year SO_2, 243 tons/year CO, 351 tons/year NO_x, and 44 tons/year VOCs. The primary source of these emissions would be exhaust from diesel engines used to power mining equipment and haul trucks.

Ammonium nitrate and fuel oil (ANFO) are used as blasting agents and would be a source of gaseous pollutants. The use of ANFO can result in uncontrolled fugitive emissions of NO_x, CO, and SO_2.

Particulate Emissions

Existing mining and exploration operations in the Project area produce criteria pollutant emissions, most notably from particulate matter. Emissions of particulate matter less than 10 microns (PM_{10}) are the prevalent type of air pollutant associated with mining activities. Fugitive particulate matter emissions are created during drilling, blasting, crushing, hauling rock, and road dust. Fugitive dust would also be generated during stripping and salvaging of growth media during construction of the proposed expansion to the Sonoma Heap Leach Facility and loading and hauling spent ore from the Snowstorm Heap Leach Facility for placement as a protective layer over the synthetic liner system on the new leach pad. Estimated annual particulate emissions (PM_{10} and $PM_{2.5}$) for the proposed Vista Project are included in the total emissions for the Twin Creeks Mine as shown in **Table 3-3**.

Fugitive dust emissions would be generated from wind erosion of disturbed areas and road dust. Haul roads would be maintained on a continuous basis for safe and efficient haulage and to minimize fugitive dust emissions. Generation of fugitive dust from ore handling activities would be controlled using BMPs stipulated in Air Quality Permit No. AP1041-0723.02 and Newmont's Fugitive Dust Control Plan, which could include direct water application, use of approved chemical binders or wetting agents, water spray, and revegetation of disturbed areas concurrent with operations (Newmont 2008b). Reclamation of surface disturbance would gradually reduce or eliminate potential fugitive dust from wind erosion.

Fugitive dust emissions from haul truck traffic associated with expansion of the Vista Pit include hauling to OISAs, Juniper Mill, and heap leach facilities. Average one-way haul distance to the Juniper Mill from the Vista Pit would be 0.3 miles, the Izzenhood Heap Leach Facility is 0.5 miles from the Vista Pit, round-trip haul distance to the Sonoma Heap Leach Facility would be 2 miles, and haul distances to OISAs from the Vista Pit is 0.3 miles. Estimated emissions of fugitive dust from drilling, blasting, loading, and hauling activities associated with expansion of the Vista Pit would be approximately 400 tons per year including 111 tons of PM_{10} and 8 tons of $PM_{2.5}$ (EMA 2011d).

Mercury Emissions

Average mercury concentration in Vista Pit oxide leach grade ore is 3.90 parts per million (ppm). Approximately 1.25Mt of run-of-mine oxide leach ore from the Vista Pit would be placed annually on the Izzenhood/Sonoma leach facilities (a total of 7.5Mt over the six-year life-of-mine). Approximately 9,750 lbs of mercury from run-of-mine oxide leach ore would load to carbon columns annually during the leaching circuit. The impregnated carbon would be processed at the Juniper Mill for recovery of gold, silver, and mercury. The carbon regeneration procedure also results in recovery of mercury.

Approximately 1.5Mt of oxide mill ore from the Vista Pit would be processed annually at the Juniper Mill. A total of 7.3Mt of oxide mill ore would be mined and processed during a five year period within the six-year Project life (**Table 2-1**). Newmont has implemented emission controls for mercury, with 98 percent efficiency ratings, at the Juniper Mill facility. Based on 2010 source testing data approximately 19 lbs/year of mercury would be associated with the oxide mill ore processed annually at the Juniper Mill (Newmont 2011a).

Processing Vista oxide mill ore as a batch or blended with other ore would not increase annual mercury emissions from the Juniper Mill, but would extend the period of emissions. Total annual emissions of mercury from the Juniper Mill would vary depending on the ratio of oxide leach and oxide mill ore that is blended together during the processing circuit; however, emission controls currently in-place at the Twin Creeks Mine ore processing facilities ensure that mercury emissions would not exceed approved standards.

Greenhouse Gas (GHG) Emissions

Greenhouse gases include carbon dioxide, methane, nitrous oxide, hydroflourocarbons, perfluorocarbons and sulfur hexafluoride. The Project has potential to only emit quantities of CO_2 (EMA 2011a). The primary source of CO_2 emissions would be from consumption of diesel fuel used to power mining equipment and haul trucks. The estimated annual emission of CO_2 from the Vista Project would be 37,348 tons/year (EMA 2011b).

4.2.2 Cultural Resources

The Proposed Action would occur on areas previously disturbed by mining activities. No National Register of Historic Places (NRHP) eligible sites and/or contributing elements of eligible sites have been identified within the Proposed Action area. Prehistoric and historic sites/components determined eligible for the NRHP by the BLM and Nevada State Historic Preservation Office have been recorded to BLM standards and the information integrated into local and statewide data repositories. If NRHP eligible sites or contributing elements are discovered within the proposed Project area and cannot be avoided, they would be mitigated through a data recovery plan approved by BLM in consultation with the State Historic Preservation Office (SHPO). Implementation of the Proposed Action would have no direct or indirect impacts on Cultural Resources (including the Shoshone Mike site).

4.2.3 Invasive, Non-Native Species

Disturbed sites and recently seeded areas are candidates for invasion by undesirable species such as noxious weeds and cheatgrass. Indirect impacts of the Proposed Action would include potential introduction of species from disturbed or reclaimed areas to adjacent areas of native vegetation.

Newmont's weed control program is described in **Table 2-5** and Section 2.2.14 – *Environmental Protection Measures*. Monitoring weed infestations and weed control are ongoing and would continue until reclamation is complete and potential for weed invasion is minimized. Noxious weed control methods associated with the Proposed Action would control the invasion of weeds onto the mine area and reduce the potential for the mine area to be a source of noxious weed seed for adjacent, un-infested areas. Successful reclamation would result in a vegetation community that would be less susceptible to weed invasion.

4.2.4 Migratory Birds

Potential direct and indirect impacts to migratory birds would result from vegetation removal and other activities associated with the Proposed Action if these activities disturb habitats in the nesting and brood-rearing period. Most species that inhabit sagebrush steppe habitats would experience a long-term loss of suitable habitat; however, sagebrush habitats are common and widespread in Nevada. The small loss of sagebrush habitat from expansion of the Sonoma Heap Leach Facility would have a negligible impact on migratory birds displaced from suitable habitat as a result of the Proposed Action. Implementation of best management practices included in Section 2.2.14 – *Environmental Protection Measures* would reduce impacts to migratory birds.

4.2.5 Native American Religious Concerns

On February 26, 2010, the BLM contacted 12 tribes requesting comments and offered a consultation meeting on the proposed Vista Pit Expansion Project at Newmont's Twin Creeks Mine. No concerns were brought forward until April 28, 2011. The concern was that mining would occur at the Shoshone Mike Massacre site. As described in Section 3.2.5, a site visit was conducted for the Fort McDermitt Paiute and Shoshone tribe. No mining would occur at the Shoshone Mike Massacre site. No comments or concerns were provided to the BLM from the Native American groups contacted regarding review of the Preliminary EA. It is unlikely that the proposed activities would impact Native American religious beliefs and traditional practices, including those associated with the Shoshone Mike site.

Newmont does not intend to do any mining at the Shoshone Mike Massacre site as part of the Vista Pit expansion; therefore, there would be no direct or indirect impacts to Native American Religious Concerns from the Proposed Action.

4.2.6 Water Quality (Surface and Ground)

(Note: For purposes of this EA, water quantity is also described in this section).

Surface Water

Expansion of the Vista Pit would have no direct or indirect impacts on surface water resources in the Project area. Surface water control structures have been constructed and remain in-place under previous authorizations. Expansion of the Sonoma Heap Leach Facility would include incorporation of run-on/run-off surface water control ditches and sediment ponds into the existing water management system.

Emissions of mercury associated with ore processing operations at Twin Creeks Mine have not resulted in impacts to surface water resources in the Project area. The maximum concentrations of mercury in samples collected from Rabbit Creek average 0.000455 micrograms per liter (µ/L). The discharge permit limit is 0.012 µ/L (Newmont 2011a).

Groundwater

Dewatering of the Vista Pit would require four to seven new dewatering wells installed around the perimeter of the Pit. As mining progresses, it may be necessary to construct one or more wells within the Pit. Itasca (2010) updated the Twin Creeks numerical groundwater flow model to include the proposed Vista Pit expansion. Two aquifer tests conducted in the Vista Pit area were used to refine hydraulic properties of the Etchart Limestone. The model assumes that some dewatering would continue at the South Mega Pit through mid-2011, and dewatering would continue at the North Mega Pit area through mid-2017. Total maximum future dewatering rate for the South and North Mega Pits is predicted to be approximately 5,000 gpm (Itasca 2010). By mid-2011, this rate is predicted to decrease to about 3,800 gpm.

Each dewatering well at the Vista Pit would have a designed pumping rate between 500 and 3,000 gpm, with a predicted maximum combined dewatering rate of approximately 8,400 gpm needed for extending the Vista Pit in accordance with the Proposed Action. Dewatering for the Vista Pit would start in 2011 at a rate of about 2,400 gpm, increasing to the maximum rate of 8,400 gpm over the next year as more dewatering wells are added to the system (Itasca 2010). Dewatering water would be piped to the existing Water Distribution Pond where it would be redirected to processing facilities or piped to the water treatment plant for treatment prior to discharge into Rabbit Creek under the existing NPDES permit.

Groundwater in the Vista Pit area is currently at an elevation of about 4590 feet amsl. Direct and indirect impacts from expansion of the Vista Pit would include lowering the groundwater elevation approximately 320 feet to an ultimate depth of 4270 feet amsl; approximately 10 feet below the projected ultimate depth of the expanded mine pit. Dewatering for the Vista Pit would begin in 2011, with mining and dewatering activities completed by the end of 2016. The largest area of predicted additional 10-ft groundwater drawdown at the Twin Creeks Mine site due to Vista Pit dewatering is relatively small and does not encompass any new areas that have not been previously analyzed (Itasca 2010).

Once mining and dewatering cease at the Vista Pit at the end of 2016, the groundwater table would begin to rise and form a lake in the Vista Pit. Using updated groundwater flow model results for the Twin Creeks Mine (Itasca 2010), the lake level is predicted to recover to an elevation of approximately 4617 feet amsl, with 90 percent of this recovery occurring by the end of 2077 (Itasca 2010). The final recovered pit lake elevation of 4617 feet amsl is predicted to be approximately 60 feet below the pre-mine groundwater surface elevation. As such, the final Vista Pit lake would be a groundwater "sink" or depressed water table where evaporation exceeds groundwater inflow.

An investigation by Geomega (2011b) coupling field and laboratory data collection with modeling was conducted to predict the water chemistry of the future pit lake that would form as a result of the proposed Project. Background groundwater chemistry from samples collected and analyzed from two piezometers was used as the starting composition for water infilling the Vista Pit. Background groundwater is alkaline and a calcium–sodium-magnesium-bicarbonate type. Concentrations of measured analytes meet applicable Nevada water quality standards, with the exception of arsenic and antimony (0.07 and 0.05 mg/L, respectively).

Groundwater flow through the ultimate pit surface, derived from the groundwater flow model (Itasca 2010), was coupled with background groundwater chemistry, the oxidized thickness of exposed wall rock from the modified Davis-Ritchie code, and chemical release functions for each geologic model class. These data were used to compute the evolution of pit lake water quality from a juvenile stage through maturity (200 years).

The pit lake chemogenetic pathways indicate a benign water quality. Direct and indirect impacts to water quality in the predicted mature pit lake (at 200 years) would be a pH of 9.0 and TDS of about 2,000 mg/L. Evapoconcentration may result in exceedance of applicable Nevada water standards for arsenic, antimony, mercury, and selenium (predicted to be 0.18, 0.22, 0.009, and 0.1 mg/L, respectively) at the end of the simulation period (Geomega 2011a).

Attenuation tests using spiked solutions of these solutes at various concentrations with fresh samples from the lower Etchart Formation were undertaken to assess the adsorption capacity of the native materials (Geomega 2011b). The lower Etchart demonstrated adsorption capacity for all constituents, ranging from 77 percent to 100 percent for arsenic, 62 percent to 71percent for antimony, 94 percent to 100 percent for selenium, and 99.9 percent to 100 percent adsorption for mercury. The highest adsorption rates for arsenic, selenium, and mercury were associated with concentrations comparable to those predicted in the pit lake model, indicating that the lower Etchart Formation would attenuate those constituents to levels comparable to background with the exception of antimony which would attenuate from 0.22 to 0.085 mg/L, close to the background level of 0.045 mg/L entering the pit lake from native groundwater. Groundwater exiting the pit would be entirely captured by the terminal pit lake formed in the Mega Pit approximately one mile downgradient of the Vista Pit (Geomega 2011b).

The groundwater flow model (Itasca 2010) predicts that direct and indirect impacts of pit dewatering associated with proposed expansion of the Vista Pit would include a maximum decrease of baseflow in the Little Humboldt River of 0.45 cfs at 50 years after the end of mining, and a total reduction in spring flow of Hot Springs of 0.04 cfs at 100 years after mining. These modeled changes to surface water baseflow are in addition to other baseflow changes predicted to occur from the other dewatering activities at the Twin Creeks Mine.

Operation and closure of the heap leach facilities would have no direct or indirect impacts on water quality because the facilities are designed to operate as zero discharge. Process solution would be disposed of through re-circulating solution onto leach piles until initial draindown volume is lost to evaporation (see **Table 2-2**). Residual draindown would report to the existing solution pond system which would be converted to evapotranspiration cells (ET-cells).

4.2.7 Geology and Minerals

Direct and indirect impacts resulting from expansion of the Vista Pit would include removal of approximately 15Mt of ore and 114Mt of overburden/interburden over a 6-year period. Approximately 7.5Mt of ore would be placed on the Izzenhood and/or Sonoma Heap Leach facilities and 7.3Mt transported to the Juniper Mill for processing.

Newmont constructed a total of forty bulk composite samples of overburden/interburden and ore material in order to investigate and characterize the materials uniquely associated with the Vista Project. Geochemical characteristics of the samples were determined using a combination of the following analysis; semi-quantitative x-ray diffraction, inductively-coupled plasma/inductively coupled plasma mass spectrometry, acid base accounting, meteoric water mobility procedure, Profile II analysis, humidity cell testing, and Nevada Modified Sobek (Newmont 2010). With concurrence from BLM the humidity cell test terminations occurred between weeks 28 and 32.

Approximately 76Mt of overburden/interburden associated with the proposed Project would be used to backfill the northwest portion of the Vista Pit. Geochemical testing shows that 1.8 percent (2.1Mt) of overburden/interburden to be generated during expansion of the Vista Pit would be managed as acid-generating (AG). Acid-generating overburden/interburden would be placed on non acid-generating (NAG) overburden/interburden previously placed as backfill in the northwest portion of the Vista Pit at an elevation of 4920 feet amsl, which would be approximately 260 feet above the predicted post-mining groundwater rebound elevation. Backfilling a portion of the Vista Pit would increase the future cost of mining/developing any ore resources that might remain beneath that portion of the Pit.

Approximately 40Mt of NAG overburden/interburden would be placed as additional lifts on the OISA N (W22). Potential direct and indirect impacts from trace metal release and resultant predicted geochemical effects on the environment from placement of overburden/interburden in mined-out pits and in OISAs are discussed in Section 4.2.6 - *Water Quality*.

4.2.8 Paleontology

Geologic formations in the proposed Project area have a low potential (Class 1) for containing vertebrate fossils or noteworthy occurrence of invertebrate or plant fossils. Potential direct and indirect impacts to scientifically important paleontological resources should not occur as a result of the Vista Pit Expansion Project.

4.2.9 Social Values and Economics

Employment and expenditures in the mining industry have cascading effects (local, national, and international) on other employment and business activity. These effects were quantified through use of the IMPLAN® model cited by Ciciliano *et al.* (2008). The model estimates creation of an additional 0.85 jobs for every direct mining job, and $0.37 earned by those jobs for every $1.00 earned by mine workers. Multiplier estimates vary by economic model and geographic location as well as industry. The multiplier effect of 0.85 used for this analysis is considered conservative. The actual economic impact may be greater than estimated.

Direct impacts resulting from the Vista Pit Expansion Project would include extended employment for approximately 300 workers generating labor income of $25 million annually over the 9-year Project life. Indirect impacts from secondary employment using a multiplier of 0.85 would create or maintain about 250 jobs in the area generating $10 million in average annual income over the Project life. Net mineral proceeds, property, and sales and use taxes would generate approximately $3 to $4 million annually for Humboldt County. The State of Nevada would also benefit from approximately $4 to $5 million in annual net mineral proceeds taxes.

4.2.10 Soil

The proposed Project would result in a conversion of use for 145 acres currently used as an equipment/material storage and haul road area to construction of an expansion of the Sonoma Heap Leach Facility. At the present time, approximately 40 acres within this tract of land has not been disturbed.

Impacts to soil occur in two separate stages during mining operations: 1) during salvaging operations when growth media is stockpiled and stabilized in stockpile areas and 2) during final redistribution and completion of reclamation. Most impacts to soil occur during salvage and stockpile operations. Erosion that occurs during and after redistribution of growth media would have a greater effect on final reclamation.

Direct impacts to soil would include modification of chemical and physical characteristics, loss of soil to wind erosion, and decreased biological activity. Chemical changes would result from mixing surface soil with subsoil during salvaging operations. This mixing could reduce organic matter content of surface soil and increase the probability of undesirable salt in subsoil materials being added to surface soil. These changes would lower soil quality. Impacts on physical characteristics of soil during salvage, stockpiling, and redistribution would include mixing, compaction, and pulverization from equipment and traffic. Soil compaction and pulverization would lead to loss of structure; decreased infiltration, permeability, available water-holding capacity; and loss of finer-grained soil material due to effects of erosion. Soil mixing would reduce organic material and increase coarse fragments in the surface soil.

Soil stockpile locations are selected based on the following criteria: 1) proximity to areas that are to be reclaimed to limit haul distance both during salvage and reclamation operations; 2) areas that are not scheduled for disturbance during the life of mine; 3) areas where sufficient storage capacity is available to hold the volume of growth media to be stockpiled; and 4) adequate area to construct toe berms, run-off control ditches, and sediment pond systems to trap soil.

No estimate of growth media movement from disturbance areas is available because a determination of an amount is dependent on a variety of factors. The time period of bare soil exposure, coarse fragment content of upper material exposed, storm event severity and frequency, amount of wind and direction/aspect/speed of the wind to any given tract, and areas that have been disturbed are components of calculating growth media movement. Since these factors vary throughout the life of the mine including the timing of ongoing or concurrent reclamation, it is not possible to provide a meaningful assessment of soil movement from the mining landscape.

Soil losses from wind erosion are potentially high in Nevada's arid, windy climate. The highest potential for loss of salvaged soil would occur during reclamation after redistribution of soil on regraded areas and before revegetation. The volume of soil loss would depend on wind velocity, size and condition of exposed areas, and soil texture.

Soil movement from the reclaimed mine area is expected to exceed pre-mine conditions until vegetation is established on the reclaimed landscape. During the reclamation period, reclaimed areas would be monitored for areas of poor vegetation establishment or excess erosion and maintenance would be performed to establish the desired plant cover and control erosion. As described in Section 2.2.5 - *Surface Water and Sediment Controls*, sediment captured in run-off control ditches and sediment ponds would be periodically returned to soil stockpiles or to reclaimed areas. Capacity of sediment control pond systems would be maintained throughout the mine life and during the post-closure period. Run-off controls would remain in place during the post-closure period until sufficient vegetative cover has been established and growth media and fines have stabilized on slopes. Removal of these run-off control systems would only occur upon concurrence with BLM and NDEP.

Water erosion potential of soil could occur during heavy precipitation or run-off events due to exposed soil, fine soil texture, soil surface conditions, and slope. As proposed, soil would be placed in a "roughened" condition and/or with exposed surface coarse fragments; effectively reducing wind and water erosion potential.

Redistributed growth media would have lower organic matter content as a result of salvage and stockpiling. Soil biological activity would be reduced or eliminated during stockpiling as a result of anaerobic conditions created in deeper areas of stockpiles. Redistribution of growth media during reclamation would result in decreased quantity and quality due to compaction from loading, hauling, and placement activities. Movement of growth media down slopes would continue after placement until vegetation is established. As described previously, growth media and fines would be trapped by the run-off control ditch and sediment pond system. Growth media and fines trapped by the run-off control system would be returned to reclaimed areas. Compaction would be reduced by scarifying soil after placement. Scarification would be completed on the contour, which would help reduce potential for sheet erosion.

The proposed Vista Pit Expansion would remain as an open pit following cessation of mining operations. Soil previously salvaged during development of the Twin Creeks Mine would not be redistributed over mine pit footprint, but would be used during reclamation of associated haul roads and OISAs.

4.2.11 Special Status Species

Plants

No special status plant species have been identified in or are likely to occur in the Project area; therefore the Proposed Action would not affect special status plant species.

Wildlife

Sensitive wildlife species that have been documented in the Project area and would likely be affected by the Proposed Action are golden eagle, Brewer's sparrow, sage thrasher, and loggerhead shrike. Species that periodically may forage within the Project area or for which habitat appears to be suitable include the ferruginous hawk, Swainson's hawk, greater sage-grouse, pygmy rabbit, burrowing owl, and Preble's shrew (AMEC 2011).

Removal of sagebrush steppe habitat in the area proposed for expansion of the Sonoma Heap Leach Facility would reduce habitat for the Brewer's sparrow and sage thrasher, obligate sagebrush species, and loggerhead shrike, a species widely distributed in arid habitats with shrubs. The relatively small amount of sagebrush habitat removed would not affect these species as this habitat type is common and widespread throughout the Great Basin in Nevada and surrounding the Project area.

Potential pygmy rabbit habitat would be removed under the Proposed Action; however, surveys for pygmy rabbits have not detected their presences in the Project area. Proposed reclamation would not likely establish sagebrush communities with densities similar to pre-mining conditions; therefore there would be a decrease in quality of potential pygmy rabbit habitat in the areas disturbed by mining activities. The loss of sagebrush habitat would be a small incremental reduction locally. This would not affect the viability of this species or increase the probability that the pygmy rabbit would be become endangered or threatened.

The Proposed Action would remove foraging habitat for Swainson's and ferruginous hawks, but no known nest sites would be affected. The incremental reduction in the prey base of these species by the Proposed Action would slightly reduce the foraging area for these raptors, but this reduction would be negligible in a regional context and would not likely affect population density or viability.

Surveys did not detect sage grouse or their sign in the Project area and no historical sage grouse courtship sites (leks) would be affected by the Proposed Action; however, sagebrush and grassland that may be potential habitat would be removed. The loss of a relatively small area of potential sage-grouse habitat would have a negligible effect on the species.

Potential habitat for Preble's shrew would be removed by the Proposed Action. It is not known if the Preble's shrew is present on the Project area; if present the Proposed Action could result in direct mortality through excavation and other construction activities. Because the Preble's shrew has a large range of occurrence and is able to exploit diverse habitats, the small loss of habitat and increased risk of mortality posed by the Proposed Action would not affect this species.

Bats would experience reduced habitat quality through the removal of sagebrush habitat in the area proposed for expansion of the Sonoma Heap Leach Facility and fractured rock faces on parts of the Vista Pit that would be backfilled; however, expansion of the Vista Pit would create potential bat roosting habitat. Bats would experience a loss of roosting habitat (*e.g.,* fractured rock faces of backfilled areas) until high walls are formed on the Vista Pit expansion area. Bat foraging areas over upland habitats would be removed by construction of the proposed expansion to the Sonoma Heap Leach Facility. Based on habitat features and known distribution of bats in Nevada, it is probable that the Project area is periodically used by a diversity of bat species. The small incremental losses in habitat would be inconsequential for local and regional bat populations as there is sagebrush habitat, rocky exposures, abandoned mine adits and other habitat features used by bats available in the vicinity of the Project area.

Potential habitat for the burrowing owl includes sagebrush and grassland habitats in the Project area with sufficient friable soil for burrows to be constructed for nesting. Mine development (*i.e.*, proposed expansion of the Sonoma Heap Leach Facility) would remove potential nesting and foraging habitat until reclamation is achieved. The degree to which nesting habitat would be suitable in reclaimed areas would depend on vegetation characteristics, soil texture, and degree of compaction. The loss of nesting and foraging habitat during mining would have negligible effects on burrowing owls because they do not appear to be present in the Project area and a relatively small area, in a regional context, would be affected by the Proposed Action.

Expansion of the Vista Pit and backfilling of the existing Vista Pit would have potential to affect a pair of golden eagles nesting on the highwall of the Vista Pit (**Figure 3-4**). The pair of eagles appears to be accustomed to existing levels of human activity in the Vista Pit and at adjacent mining process facilities; however, proposed backfilling activities in proximity to the nest would likely increase levels of noise and human presence as trucks haul overburden/interburden from the pit expansion area. Backfilling is proposed to include the part of the pit directly beneath the eagle nest and would increase the elevation of the pit bottom, which would reduce the amount of vertical face separating the nest from lower land surface. Reduction of the vertical face of the pit wall beneath the nest could affect the desirability of the nest for the eagles because of reductions in nest height above the ground. Typically, golden eagles select the highest suitable nest sites in the local landscape.

Other activities associated with the Proposed Action that have the potential to adversely affect the nesting eagles would be blasting on the pit face as the Vista Pit expands eastward. The configuration of the pit may amplify the noise and vibrations from blasting at the nest site. Based on the criteria presented in the Bald and Golden Eagle Protection Act, it appears likely that the backfilling and expansion of the Vista Pit may "disturb" the pair of eagles if the proposed activities take place during the courtship, nesting, brood rearing, and fledging period (February through July). Past and present activities in the Vista Pit include construction of a portal, blasting, loading, and hauling. Golden eagle occupancy of this nest has taken place during these activities. On July 15, 2011, the USFWS provided a letter that indicated, based on the conditions at the nest site, the agency did not anticipate disturbance to the nest and birds from ongoing mining activities. The agency recommends that new activity at the proposed mine expansion be avoided until nesting is completed. Newmont would continue to monitor the existing nest and coordinate with USFWS and BLM regarding the nest prior to the next breeding season.

Wildlife access to process ponds at the Twin Creeks Mine is currently being managed under Newmont's Industrial Artificial Pond Permits issued by NDOW. No change in operation or wildlife protection measures associated with these facilities would result from the Proposed Action.

4.2.12 Vegetation

Direct and indirect impacts to vegetation would occur from construction of the proposed expansion to the Sonoma Heap Leach Facility. The area is currently authorized for use as an ancillary facility (equipment/material storage) and disturbance has occurred including haul roads and areas where equipment is parked or materials are piled and stored. Most of the leach pad area supports a sagebrush/grassland vegetative cover that would be affected by proposed expansion of the existing Sonoma Heap Leach Facility. Areas associated with expansion of the Sonoma Heap Leach Facility, OISA N (W22), and access and haul roads would be reclaimed to attain a desired plant community to support wildlife.

Approximately 170 acres in the northwestern portion of the existing Vista Pit would be partially backfilled to an elevation above the predicted post-mining water level of 4660 feet amsl. The backfilled portion would be revegetated to provide habitat for wildlife.
Dust from roads and mining activities could coat vegetation in areas adjacent to or downwind from dust sources. Dust on vegetation predisposes some species to insect infestation. Control of fugitive dust on haul and access roads through use of water and chemical binders as proposed would reduce the amount of dust that would settle on vegetation.

With the exception of areas revegetated with sagebrush, concurrent revegetation during and after mining would likely reestablish permanent and stable vegetation cover within five to ten years, assuming livestock use in the area is deferred and noxious weeds are controlled. Sagebrush takes longer to reestablish. Typically, communities of sagebrush have proven difficult to re-establish on reclaimed land (Schuman *et al.* 1998; Vicklund *et al.* 2004). Reclaimed plant communities would likely differ in species composition from native pre-mining communities. Grasses with low densities of forbs and shrubs would dominate reclaimed areas. Wyoming big sagebrush, a dominant shrub in the Project area, would likely be present at lower densities following mining.

4.2.13 Wildlife

Potential direct and indirect impacts to wildlife would result from removal of 145 acres of sagebrush steppe habitat of which all but 40 acres has been previously disturbed for ancillary mine facilities (AMEC 2011). Loss of habitat would reduce local availability of forage, security, and breeding cover for wildlife inhabiting the area. All species dependent on these disturbed sites may be killed or displaced. Displaced animals may be incorporated into adjacent populations, depending on variables such as species behavior, density, and habitat quality. Adjacent populations may experience increased mortality, decreased reproductive rates, or other compensatory or additive responses.

Species that would experience the greatest impacts from loss of sagebrush habitats include Brewer's sparrow, sage thrasher, black-tailed jackrabbit, coyote, mule deer, and pronghorn antelope. These species depend on sagebrush and other shrubs for food and cover, especially in winter. During spring and early summer when newly planted grasses and forbs on reclaimed areas are succulent and rapidly

growing, mule deer, pronghorn, rabbits and other small mammals would be attracted to reclaimed areas because of the seasonably abundant forage. During late summer, fall, and winter reclaimed areas would become desiccated and provide less forage or cover; however, shrubs and some perennial forbs (*e.g.* prostrate kochia) provide winter forage for mule deer and other species. The availability of adequate shrub-dominated habitat in winter is critical to survival of mule deer, pronghorns, sage grouse, and rabbits.

Small mammals, lizards, snakes, and insects may be killed by construction activities and vehicle traffic. Often lizards and snakes seek cover underground and removal of soil and rock would result in direct mortality. There have been no reptiles identified in the Study Area for which reduced population viability or reduction in habitat poses a threat to their continued existence regionally and locally.

Raptors that forage over sagebrush and grassland habitats would experience a reduced prey base due to a reduction in sagebrush habitats until successful reclamation is achieved. Because most raptors usually range over a large area, this loss would not result in a change in raptor density or diversity. Typically, small mammals rapidly invade reclaimed land, often within one to two years following the start of reclamation (Hingten and Clark 1984a, 1984b). Populations of small mammals on reclaimed land would provide a prey base for raptors, even during early stages of reclamation.

A screening-level ecological risk assessment (SLERA) was conducted for the pit lake predicted to form upon closure of the proposed Project (Integral 2011). A SLERA uses conservative assumptions and simple assessment models to identify constituents of potential concern (COPC), to rule out constituents in the pit lake that do not have potential to cause adverse effects on ecological endpoints, and to rule out receptors that are not exposed and exposure pathways that do not serve as routes of exposure (BLM 2008).

The screening process uses conservative assumptions for both toxicity and exposure. A subset of site data focusing on maximum values for sediment and surface water quality data was used for the pit lake water chemistry modeling efforts (Geomega 2010a) and additional soil data provided in core samples collected by Newmont and analyzed for Profile I constituents.

Based on the screening exercise, the following analytes were identified as soil constituents of potential concern for the plant community (arsenic, chromium, selenium, and zinc); invertebrates (arsenic, chromium, and mercury); and, for benthic invertebrates (antimony, arsenic, lead, mercury, nickel, and silver) (Integral 2011).

Following closure and infill from groundwater, the Vista Pit Expansion would likely function as a deep, mesotrophic lake. Opportunities for development of habitats capable of supporting wildlife in the pit lake would likely be limited due to the steep-walled profile of the lake that would limit access and restrict near shore littoral habitat. In addition, the low level of nutrients and organic particles in surface water and coarse pit wall material would be unlikely to support substantive substrate favorable for development of abundant vegetation or that would attract or sustain wildlife. The pit lake may function as a stopover or resting area for avian species or a source of drinking water. Results of the SLERA ingestion models indicate concentrations of chemicals of interest (aluminum, antimony, arsenic, chromium, lead, mercury, nickel, selenium, and zinc) in soil and surface water would be at levels that pose negligible risks to wildlife (Integral 2011).

Human Presence and Noise

The most common wildlife responses to noise and human presence are avoidance or accommodation. Avoidance would result in displacement of animals from an area larger than the actual disturbance area. The total extent of habitat loss as a result of the wildlife avoidance response is impossible to predict since the degree of this response varies from species to species and can even vary between individuals of the same species. Also, after initial avoidance of human activity and noise-producing areas, certain wildlife species may acclimate to the activity and begin to reoccupy areas formerly avoided. Big game species have demonstrated the ability to acclimate to a variety of activities as long as human harassment levels do not increase substantially (Ward 1976). Therefore, it is possible that the extent of displacement would approximate the actual disturbance area after the first few years of mine operation (Ward 1976). In addition to avoidance response, increased human presence intensifies the potential for wildlife/human interactions ranging from harassment of wildlife to poaching and legal harvest. Newmont provides instruction and training to employees regarding local wildlife interaction.

Potential impacts related to increased human presence in the Study Area include: expansion of an existing mine site where human activity associated with mining operations is ongoing; and the location of the mine site is in close proximity to a number of other mining operations in the Project vicinity (*e.g.,* Turquoise Ridge Mine) that currently experience relatively high human presence and noise levels.

The number of personnel traveling to and from the proposed Project would likely remain at existing levels, and the potential for wildlife mortalities from collisions with mine-related vehicles would not likely increase.

Hazardous Materials Spill

Potential direct and indirect impacts to wildlife from exposure to hazardous materials as a result of a transportation-related spill would be greatest if an accident were to occur near aquatic habitats. Spills on dry land habitat would pose only minimal risk to most wildlife species since these spills would be adjacent to access roads and highways and could be rapidly contained and cleaned up.

Direct and indirect impacts resulting from a diesel spill would include contamination of soil, surface water, and groundwater in addition to harming aquatic life and vegetation. Although unlikely, such a spill also could ignite from an accident and cause a range fire. Since cleanup actions would take place immediately, diesel contamination has a low potential to result in long-term impacts to soil and groundwater.

4.3 ALTERNATIVE A – USE EXISTING HEAP LEACH FACILITIES

Issue: The capacity of existing heap leach facilities associated with the Twin Creeks Mine would allow placement of oxide grade leach ore that would be generated by expansion of the Vista Pit; thereby eliminating the need to expand the Sonoma Heap Leach Facility. Elimination of the expansion to the Sonoma Heap Leach Facility would leave the proposed leach pad expansion area in its current condition.

Under Alternative A, Newmont would be required to place approximately 7.5Mt of oxide ore on the Izzenhood Heap Leach Facility in accordance with stipulations of Water Pollution Control Permit NEV86018. Implementation of this alternative would preclude construction of the proposed expansion to the Sonoma Heap Leach Facility. The area (approximately 145 acres) lies within the Twin Creeks Mine permitted disturbance boundary and is currently authorized for use as an ancillary facility (equipment/material storage). Under Alternative A, use of this area would continue in accordance with current authorizations.

4.3.1 Air Quality

Direct and indirect impacts to air quality associated with implementation of Alternative A would be a decrease in fugitive dust due to shorter haul distance between the Vista Pit and Izzenhood heap leach facilities. Dust generated during stripping and salvaging of growth media from the proposed expansion of the Sonoma Heap Leach Facility would not occur. Fugitive dust generated during loading and hauling of spent ore from the Snowstorm Heap Leach Facility for placement as a protective layer over the synthetic liner system on the proposed expansion of the Sonoma Heap Leach Facility would be avoided under Alternative A.

4.3.2 Cultural Resources

Potential direct and indirect impacts to cultural resources as a result of implementation of Alternative A would be the same as those described under the Proposed Action.

4.3.3 Invasive, Non-Native Species

Potential for increased infestations of invasive, non-native species would be reduced under Alternative A. Conversion of the 145-acre tract associated with construction of the proposed expansion to the Sonoma Heap Leach Facility would not occur thereby reducing potential for infestation of invasive, non-native species. Newmont would continue monitoring weed infestations and weed control programs until reclamation of currently authorized disturbances is complete and potential for weed invasion is minimized.

4.3.4 Migratory Birds

Potential direct and indirect impacts associated with formation of a pit lake following completion of mining operations in the Vista Pit would not change under Alternative A. Disturbance to sagebrush/grassland vegetation on approximately 40 acres of the 145 acre parcel proposed for expansion of the Sonoma Heap Leach Facility that could provide potential habitat for some species of migratory birds would not occur.

All other aspects of the Project would have no impacts to migratory birds beyond those occurring under existing conditions. No historic nesting or foraging areas for waterfowl or shorebirds have been identified in the Study Area. Natural springs, perennial drainages, stock ponds, and the Rabbit Creek discharge area that provide resting, foraging, nesting and brood rearing habitat for birds would not be affected.

4.3.5 Native American Religious Concerns

No potential direct or indirect impacts to Native American Religious Concerns resulting from implementation of Alternative A have been identified.

4.3.6 Water Quality (Surface and Ground)

(Note: For purposes of this EA, water quantity is also described in this section).

Direct and indirect impacts to water quantity and quality under Alternative A would be the same as those described for the Proposed Action. Existing leach solution management systems associated with ongoing leach operations would be used to manage solutions used in leaching new ore placed on the Izzenhood Heap Leach Facility. Potential impacts associated with dewatering and discharge systems to support the Vista Pit expansion would not change under Alternative A.

4.3.7 Geology and Minerals

Direct and indirect impacts to geology and minerals under Alternative A would be the same as those described for the Proposed Action.

4.3.8 Paleontology

Direct and indirect impacts to scientifically important paleontological resources resulting from implementation of Alternative A would be the same as those described for the Proposed Action.

4.3.9 Social Values and Economics

Potential direct and indirect impacts to social values and economics as a result of implementation of Alternative A would be the same as those described for the Proposed Action.

4.3.10 Soil

Implementation of Alternative A would eliminate the need for construction of the proposed expansion of the Sonoma Heap Leach Facility. Potential direct and indirect impacts to soil (as described for the Proposed Action) on undisturbed portions of the area would not occur.

4.3.11 Special Status Species

Plants

There would be no direct or indirect impacts to special status plant species under Alternative A since no new ground disturbance associated with mining activities would occur.

Wildlife

There would be no direct and indirect impacts to special status and sensitive wildlife species identified in the area proposed for expansion of the Sonoma Heap Leach Facility under Alternative A as construction of the facility would not occur. Potential direct and indirect impacts to special status species (golden eagles) in the Vista Pit expansion area would be the same as described for the Proposed Action.

4.3.12 Vegetation

Removal of sagebrush/grassland vegetation from portions of the area proposed for expansion of the Sonoma Heap Leach Facility would not occur under Alternative A. The area (approximately 145 acres) lies within the Twin Creeks Mine permitted disturbance boundary and is authorized for use as an ancillary facility. Approximately 105 acres of the area have been previously disturbed by construction of roads, equipment/material storage areas, and exploration drill pads. No direct or indirect impacts to vegetation would occur as a result of implementation of Alternative A as surface disturbance associated with other components of the Project (*e.g.*, Vista Pit expansion) would occur on disturbed areas where vegetation has been previously removed.

4.3.13 Wildlife

There would be no direct and indirect impacts to wildlife in the area proposed for expansion of the Sonoma Heap Leach Facility under Alternative A. Disturbance to approximately 40 acres of sagebrush/grassland vegetation within the 145 acre parcel proposed for expansion of the Sonoma Heap Leach Facility would not occur. The area lies within the Twin Creeks Mine permitted disturbance boundary and is authorized for use as an ancillary facility. This use would continue under Alternative A and impacts to wildlife would be the same as those occurring under existing conditions.

Potential impacts associated with pit expansion and overburden/interburden disposal would be the same as those described under the Proposed Action.

4.4 NO ACTION ALTERNATIVE

4.4.1 Air Quality

Potential direct and indirect impacts resulting from implementation of the Proposed Action to air quality would be avoided with selection of the No Action Alternative. Emission sources associated with ongoing operations at the Twin Creeks Mine would continue under approved permits. Under the No Action Alternative estimated annual emissions of criteria air pollutants from the Twin Creeks Mine would continue at approximately the following rates: PM_{10} at 2,335 tons/year, $PM_{2.5,}$ at 414 tons/year, CO at 1,494 tons/year, NO_X at 1,214 tons/year, SO_2 at 298 tons/year; and VOCs at 154 tons/year (EMA 2011a).

The only greenhouse gas emitted from the Twin Creeks Mine is CO_2 (EMA 2011a). Under the No Action Alternative annual CO_2 emissions for the Twin Creeks Mine would remain at approximately 112,043 tons/year.

Under the Nevada Mercury Control Program, Newmont reported 425 pounds of mercury emissions to the Nevada BAPC from all point sources at the Twin Creeks Mine, including ore processed at the Juniper Mill during 2009 (NDEP 2011).

4.4.2 Cultural Resources

Prehistoric and historic sites/components determined eligible for the National Register of Historic Places by BLM and Nevada State Historic Preservation Office have been recorded to BLM standards and the information integrated into local and statewide data repositories. Implementation of the No Action Alternative would have no adverse affect on Cultural Resources.

4.4.3 Invasive, Non-Native Species

Direct and indirect impacts from land disturbance associated with the Proposed Action would not occur reducing the potential for infestation of invasive, non-native species. Under the No Action Alternative Newmont would continue monitoring weed infestations and implementing weed control programs at the current frequency until reclamation of currently authorized disturbances is complete and potential for weed invasion is minimized.

4.4.4 Migratory Birds

Implementation of the No Action Alternative would have no impacts to migratory birds beyond those occurring under existing conditions. Under the No Action Alternative, approximately 40 acres of undisturbed habitat (currently permitted for equipment and material storage) could be affected under existing authorizations. Potential impacts to migratory birds would include habitat fragmentation, loss of foraging area, and displacement of some species. However, the amount of sagebrush steppe habitat that could be removed would not adversely affect the viability of any migratory bird species or the possibility of their becoming endangered or threatened as this habitat type is common and widespread throughout this area of Nevada. No nesting or foraging areas for waterfowl or shorebirds would be affected. Reclamation and closure of mine facilities would restore habitat and allow re-population of disturbed areas.

4.4.5 Native American Religious Concerns

No impacts to Native American Religious Concerns resulting from implementation of the No Action Alternative have been identified.

4.4.6 Water Quality (Surface and Ground)

(Note: For purposes of this EA, water quantity is also described in this section).

Potential impacts under the No Action Alternative would preclude construction and expansion of the Vista Pit and Sonoma Heap Leach Facility. No dewatering activities would occur at the Vista Pit. Mining activities would begin cessation and associated dewatering operations in the South Pit would be suspended during the period of 2017 – 2021. Implementation of the No Action Alternative would preclude direct and indirect impacts associated with formation of a pit lake in the expanded Vista Pit.

Implementation of the current authorized process fluid stabilization plan would be initiated once metal recovery from leach operations is no longer economical. The plan provides for circulation of fresh water through the leach facilities to achieve a three pore-volume rinse of the spent ore piles and evaporation of fluids. Once the rinse water meets decommissioning criteria (i.e., weak acid dissociable cyanide concentration of 0.2 mg/L; pH 6 to 9; and reduction of concentration in other constituents to levels that would not degrade state water), fluid volume within the circuit would be reduced through evaporation to a residual draindown volume (3 to 5 gpm) that can be managed within the evaporation cell (E-cell) system. E-cells would be constructed by conversion of the existing process pond system to evaporation cells. The E-cells would evaporate draindown and prevent discharge to waters of the state.

In comparison to the Proposed Action implementation of the No Action Alternative for process fluid stabilization would increase the consumption of water (*i.e.*, fresh water to meet rinsing needs); increase consumption of energy to maintain pumps and evaporation (atomizers); and extend employment to oversee operations. This method of heap leach decommissioning would not result in a different closure outcome as compared to the Proposed Action.

4.4.7 Geology and Minerals

Potential impacts resulting from implementation of the No Action Alternative would include maintaining access to future ore reserves that could be mined in the future if the open pits were not backfilled. Implementation of the No Action Alternative would result in completion of mining of the Vista Pit under current authorizations and closure plans in 2011. Pit backfill associated with the Proposed Action would not occur.

Because mine pits would remain open (not backfilled) under the current approved closure plan, access would be maintained. Current reserves and other mineralized rock currently classified as resources, which could potentially become reserves if the price of gold is high enough, could be mined in the future if the open pits were not backfilled.

4.4.8 Paleontology

Geologic formations in the Project area have a low potential (Class 1) for containing vertebrate fossils or noteworthy occurrence of invertebrate or plant fossils (BLM 1996). Under the No Action Alternative potential direct and indirect impacts to scientifically important paleontological resources from ongoing mining operations under existing authorizations are not anticipated.

4.4.9 Social Values and Economics

Under the No Action alternative, the Vista Pit Expansion Project would not be approved and mining at the Twin Creeks Mine would cease in 2017. There would be no construction phase associated with this Project. The number of mine employees as operations convert to reclamation and closure would decrease by 157 in 2018 and 150 in 2019 resulting in an estimated decrease of $25 million in employment income. Since most of the work force for the Project would come from the existing mine-related work force in the area, impacts under the No Action Alternative would include increased

unemployment, reduced wages spent in the local economy, decreased revenue to local and state jurisdictions, increased stress on public assistance programs, and decreased quality-of-life for some residents.

4.4.10 Soil

Under existing authorizations, approximately 40 acres of undisturbed area (currently permitted for equipment and material storage) could be affected under the No Action Alternative. Potential direct and indirect impacts to soil resources in this area would include modification of chemical and physical characteristics, loss of soil to wind erosion, and decreased biological activity. Also see Section 4.2.10. – *Soil*. As vegetation becomes established during reclamation the chemical and physical properties and biological activity would be re-established in the soil over time.

Direct and indirect impacts to growth media salvaged from previously authorized mining activity would continue until reclamation is complete. Approximately 269 acres would remain as an open mine pit.

4.4.11 Special Status Species

Plants

There would be no impacts to special status plant species resulting from implementation of the No Action Alternative since no special status plants have been identified in or are likely to occur the area.

Wildlife

Under the No Action Alternative, potential direct and indirect impacts to special status wildlife species from development of the Project would not be realized. Impacts from previously authorized activities would continue under the No Action Alternative. Approximately 40 acres of undisturbed sagebrush steppe habitat (currently permitted for equipment and material storage) could be affected under existing authorizations. Species potentially affected are described in Section 4.2.11 – *Special Status Species*. Removal of 40 acres of sagebrush steppe habitat would reduce habitat for the Brewer's sparrow and sage thrasher, obligate sagebrush species, and loggerhead shrike, a species widely distributed in arid habitats with shrubs. Foraging habitat for Swainson's and ferruginous hawks would be negligible in a regional context and would not affect population density or viability. A pair of golden eagles nesting in the Vista Pit would not be affected under the No Action Alternative. The relatively small amount of sagebrush habitat removed would not affect the viability of these species or the possibility of their becoming endangered or threatened as this habitat type is common and widespread throughout this area of Nevada.

4.4.12 Vegetation

Under the No Action Alternative, impacts to vegetation associated with previously authorized ground disturbing activities in the area would continue. Disturbance to sagebrush/grassland vegetation on approximately 40 acres of the 145 acre parcel associated with expansion of the Sonoma Heap Leach Facility would not occur. Partial backfill of portions of the Vista Pit would not occur. Approximately 269 acres would remain as an open pit and not be reclaimed.

4.4.13 Wildlife

Under the No Action Alternative mining operations would continue in the Mega Pit until 2017. Impacts to wildlife from existing authorizations would include noise and human presence associated with blasting, loading, hauling and dumping of ore and overburden associated with the Mega Pit. Use or disturbance of approximately 40 acres of undisturbed habitat (currently permitted for equipment and material storage) could result in habitat fragmentation, loss of foraging area, displacement or direct mortality of some species or individuals. The small incremental loss of habitat would be inconsequential for local wildlife populations as there is comparable habitat and other habitat features available to wildlife in the vicinity. Reclamation and closure of disturbed areas would restore habitat and allow re-population of wildlife species to the area.

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CHAPTER 5
CUMULATIVE EFFECTS

5.1 INTRODUCTION

This chapter describes the potential cumulative effects that could result from impacts of the Proposed Action, Alternative A, and the No Action Alternative, when combined with past, present, and reasonably foreseeable future activities (RFFA) in the vicinity of the Twin Creeks Mine. In the following sections, "Project area" refers to land associated with the Proposed Action located within the Twin Creeks Mine permit boundary.

The Council on Environmental Quality (CEQ) defines cumulative impact as:

> "…the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions 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 (1508.7)."

5.2 ASSUMPTIONS FOR ANALYSIS

Based on the analysis presented in Chapter 4 - *Environmental Consequences* no direct or indirect impacts on the environment have been identified for the following resources or resource uses: cultural resources, Native American Religious Concerns, and paleontology. Consequently, no cumulative impacts have been identified for these resources.

Existing permitted mining operations including mine pits, OISAs, tailings storage facilities, processing plants, heap leach facilities, and haul roads have altered the landscape and represent the characteristic environment in the Project area. The Proposed Action represents re-disturbance and conversion of use or new disturbance on approximately 580 acres within the currently permitted Plan of Operations boundary of the Twin Creeks Mine Operations Area. A description of existing mining operations is included in Chapter 1, Section 1.6 - *Background Information*. The Proposed Action is described in Chapter 2 – *Alternatives Including the Proposed Action*.

The cumulative effects analysis included in this section is based on a 9-year Project life for the Vista Pit Expansion Project. Cumulative or additive impacts are described for reasonably foreseeable future actions through year 2020.

Description of Cumulative Effects Study Area Boundaries

The extent of the cumulative effects study area (CESA) varies with each resource, based on the geographic or biologic limits of that resource. As a result, the list of projects or actions considered under the cumulative analysis may vary according to the resource being considered. In addition, the

length of time for cumulative effects analysis will vary according to the duration of impacts from the Proposed Action on the particular resource. The general CESA (encompassing all resources except Social Values and Economics) is shown on **Figure 5-1**.

Air Quality

The CESA for analyzing potential cumulative effects of emissions on air quality encompasses an area of 50 kilometers radius of the Twin Creeks Mine area. This area includes the Humboldt River hydrographic basin and Kelly Creek Area sub-basin as shown on **Figure 3-1.** The 50 kilometer distance is consistent with the USEPA's Guideline on Air Quality Models (Appendix W to 40 CFR Part 51), which expresses the USEPA's position that 50 kilometers is the nominal distance to which the USEPA considers most Gaussian models applicable (EMA 2011).

Invasive and Non-Native Species

The CESA for invasive, non-native plant species includes portions of the Eden Valley, Osgood Mountains, Kelly Creek Basin, and the Snowstorm Mountains which encompasses areas potentially affected by dewatering activities and surface disturbance associated with mine operations (**Figure 5-1**).

Migratory Birds

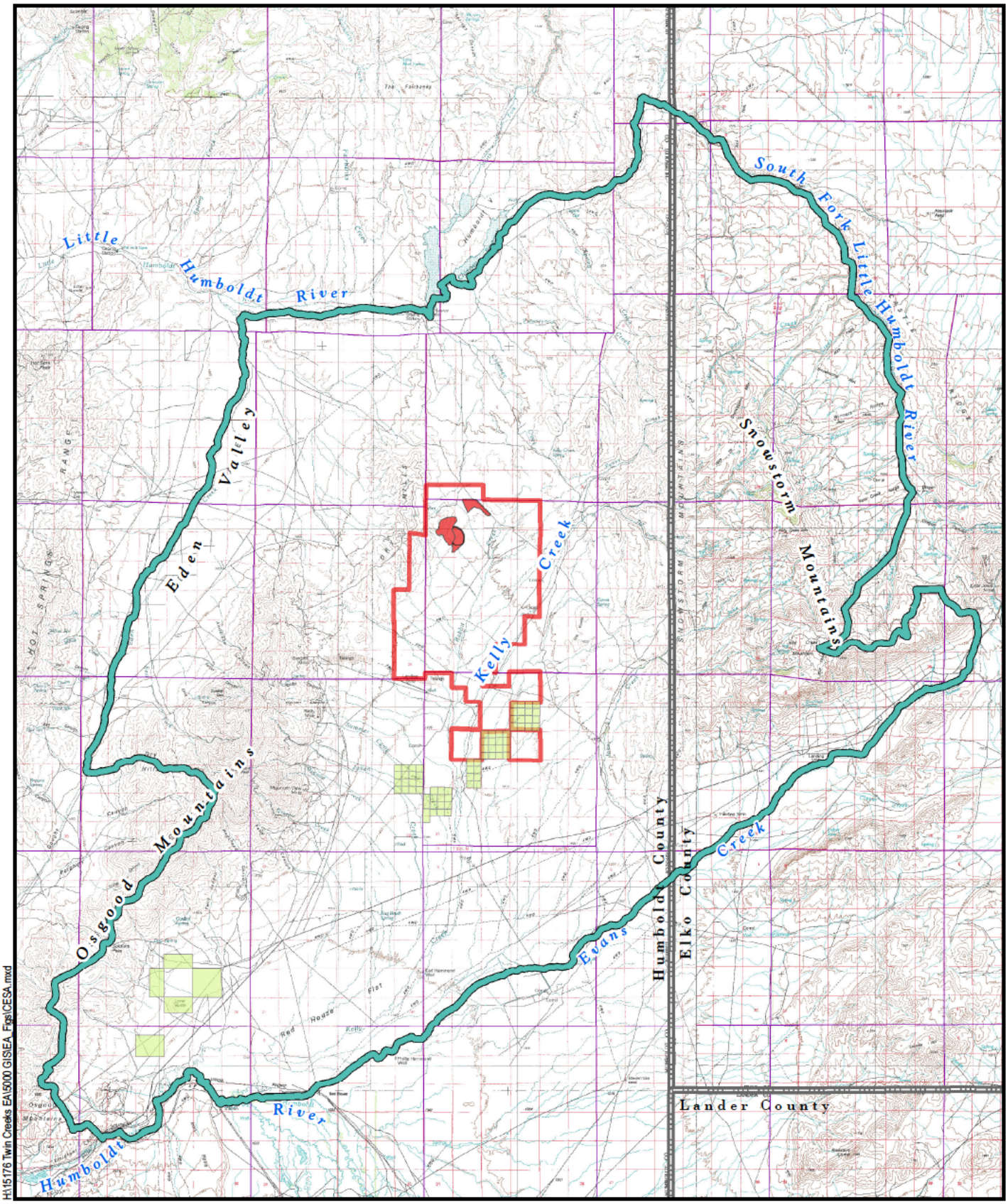
The CESA for migratory birds includes hydrographic basins that contain mine development areas, areas that receive mine discharges, and areas where groundwater drawdown has occurred and will likely expand due to mine dewatering. These hydrographic basins are the Kelly Creek Basin (No. 066), portions of the Little Humboldt River (No. 067), and Clovers Area (No. 064). Incremental increases in dewatering levels in the CESA act cumulatively to potentially reduce surface water flow in streams and springs, thereby reducing habitat available for migratory birds.

Water Quality

The CESA for water resources encompasses surface water and groundwater within an area of approximately 650 square miles of the Twin Creeks Mine, including portions of the Eden Valley, Osgood Mountains, Kelly Creek basin, and Snowstorm Mountains (**Figure 5-1**). Hydrographic basins that contain mine development areas and receive mine discharges, and areas where groundwater drawdown has occurred and would likely expand due to mine dewatering, include the Kelly Creek Basin (No. 066), portions of the Little Humboldt River (No. 067), and Clovers Area (No. 064). All of these basins are tributaries to the Humboldt River, beginning upstream from Golconda and extending downstream to Winnemucca.

Geology and Minerals

The geographic area used for analyzing potential cumulative effects associated with mining, exposure of rock to atmospheric conditions, and resultant release of trace metals to the environment includes the Twin Creeks, Turquoise Ridge Joint Venture, and Pinson mines as shown on **Figure 3-1**. Rationale for selecting this CESA is based on the location and characteristics of rock materials that have been and would be mined, and the potential for creation of additive effects to water quality in the area.



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Cumulative Effects Study Area
Vista Pit Expansion Project
Plan of Operations Boundary
Geothermal Lease Parcels (BLM March 2010/2011)

Cumulative Effects Study Area
Vista Pit Expansion
Twin Creeks Mine
Humboldt County, Nevada
FIGURE 5-1

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Social and Economic Values

The CESA for social values and economics includes the communities of Winnemucca, Golconda, Valmy, and Midas in eastern Humboldt County, and Battle Mountain in Lander County. Rationale for the CESA is that 26 employees currently commute to the Twin Creeks Mine in Humboldt County and, therefore, employment, income, and taxes paid to local governments would be affected in the respective communities and counties.

Soil

The CESA for soil resources encompasses the watersheds that drain the Twin Creeks Mine complex to the confluence with the Humboldt River (Little Humboldt Valley and Kelly Creek) as shown on **Figure 5-1**. This study area is based on natural and manmade impacts to soil resources that result in soil movement or loss, soil fertility and productivity, and areas where additive effects of soil movement could impact other resources (*e.g.*, surface water; fisheries and aquatic resources; riparian and wetland habitat).

Special Status Species

The CESA for special status species includes hydrographic basins that contain mine development, areas that receive mine discharges, and areas where groundwater drawdown has occurred and will likely expand due to mine dewatering. These hydrographic basins are shown on **Figure 5-1**.

Vegetation

The CESA for vegetation includes portions of Eden Valley, Osgood Mountains, Kelly Creek Basin, and Snowstorm Mountains which encompass areas potentially affected by dewatering activities and surface disturbance associated with mine operations (**Figure 5-1**).

Wildlife

The CESA for wildlife includes hydrographic basins that contain mine development, areas that receive mine discharges, and areas where groundwater drawdown has occurred and will likely expand due to mine dewatering. These hydrographic basins are shown on **Figure 5-1**.

5.3 PAST AND PRESENT ACTIONS

5.3.1 Mining and Mineral Development

Twin Creeks Mine

Gold was discovered in an outcrop at Chimney Creek, (now known as Vista Pit) by Gold Fields Mining Company (GFMC) in 1984. Santa Fe Pacific Gold Company (SFPGC) entered the area in 1986 and

conducted exploration drilling immediately south of GFMC property. In 1987, SFPGC discovered a large oxide gold reserve, which became the Rabbit Creek Mine. Development of the Rabbit Creek Mine, now known as the Mega Pit, began in 1989.

In 1995, SFPGC submitted a Revised Plan of Operations and Reclamation Plan to BLM and NDEP to consolidate the two mining properties (Chimney Creek Mine and Rabbit Creek Mine) to become the Twin Creeks Mine. Newmont acquired the property later in 1997 and has operated the Twin Creeks Mine since that time.

The Twin Creeks Mine includes the Vista and Mega pits (Mega Pit consists of the North and South pits), overburden/interburden storage areas, heap leach facilities, tailings storage facilities, and ancillary facilities consisting of ore stockpiles, surface water control structures, dewatering wells, ore processing mills, administration buildings, parking areas, access and haul roads, and a water treatment plant. Total disturbed area at the Twin Creeks Mine is 13,279 acres.

Turquoise Ridge Joint Venture (Getchell Mine)

The Getchell Mine is one of the earliest mines in Nevada with mineralization first discovered in 1883. Sporadic mining for copper, lead, gold, silver, and tungsten continued into the 1930s. From 1939 to 1942, the Getchell Mine was the leading gold producer in Nevada. Surface disturbance at the mine is approximately 2,000 acres, including approximately 200 acres of open mine pits. The operation employees 543 workers and produces approximately 380,000 tons of ore annually. Open pit mining ceased in the mid-1990s. The operation is located adjacent to the southwest corner of the Twin Creeks Mine complex and is owned by both Barrick Goldstrike Mines, Inc. and Newmont Mining Corporation and is referred to as the Turquoise Ridge Joint Venture. The Mine currently consists of two underground mines (the inactive Getchell and active Turquoise Ridge) that produced over 175,000 ounces of gold in 2009 (NBMG 2010).

Pinson Mine

The Pinson Mine is located approximately 5 miles southwest of the Twin Creeks Mine complex and was mined for tungsten until 1945 when gold was discovered. The project consists of ten open mine pits, one of which has been backfilled, two have developed pit lakes, and seven remain open and dry. There is no active mining at the Pinson Mine. The site has undergone final reclamation and closure and is monitored periodically. Disturbance at the site totals approximately 1,046 acres with 717 acres reclaimed. In early 2009, Pinson Mining Company entered into a Mining Venture Agreement with Atna Resources, Ltd. to continue exploration and possible development of underground targets. Results of that work are being evaluated to determine the feasibility of developing a future mine plan for the project. Dewatering of the mine facilities will continue during this decision period to protect the investment and facilitate re-start, if warranted (Atna Resources Ltd. 2011).

Preble Mine

The Preble Mine is located approximately 14 miles southwest of the Twin Creeks Mine. This mine was operated by Pinson Mining Company and consisted of approximately 200 acres of surface disturbance, including a single open pit of approximately 15 acres. Mining was completed in 1991 and the site is in reclamation.

5.3.2 Energy Production and Distribution

A review of the BLM Legacy Rehost 2000 Report System (LR2000) revealed no geothermal nominations within the CESA. The Nevada BLM website (BLM 2011) lists the following geothermal leases within the CESA for the Vista Pit Project;

- Township 38 North, Range 42 East, section 24 and Township 38 North, Range 43 East, sections 10, 16, 20 (w½), and 30; Lease Number NVN 088489;
- Township 36 North, Range 41 East, section 4 (portions) and Township 37 North, Range 41East, all or portions of sections 22, 26, 28, and 34; Lease Number NV-11-03-047.

The most recent exploration activity for oil and gas in Humboldt County occurred in 1998. Potential for oil and gas development in the Twin Creeks Mine CESA is considered low and no oil and gas leases have been issued within the CESA.

5.3.3 Wildfire

Wildfire has affected mature shrub communities throughout the CESA. BLM Fire Management Plans are implemented to reduce adverse impacts through reduction of hazardous fuel loads and provide resource-focused response strategies and new procedural guidelines. Plans identify fire prevention actions such as vegetation manipulation, fuel reduction, green strips, fuel breaks, and thinning that can be maximized through use of prescribed burning, mechanical, chemical, and biological (including grazing) treatments to reduce wildfire fuel hazards.

Approximately 273,000 acres within the CESA have burned since 1990 including areas that have burned more than once. Effects on vegetation include loss or partial removal of upland species, potential removal of below ground biomass, soil hydrophobicity, and potential for increasing spread of noxious weeds and invasive grasses. Following each wildfire event, BLM evaluates and develops appropriate Burned Area Rehabilitation plans to address specific resource concerns. The extent to which a burned area is reseeded is governed by variables which are evaluated on site specific basis such as burn intensity, soil stability, and pre-burn conditions. Site evaluations following wildfire events have determined that unseeded areas could rehabilitate naturally due to pre-fire vegetative conditions, elevation, precipitation zone, and site potentials.

5.3.4 Recreation

Dispersed recreation occurs throughout the CESA; however, there are no data on the level of use.

5.3.5 Transfer Station

A lime transfer facility operated by Graymont Western, USA is located at Golconda. Lime product is transferred from rail cars to a silo and then loaded onto semi-truck and trailer units for transport to the Twin Creeks Mine. Lime is used to maintain pH levels in ore processing.

5.4 REASONABLY FORESEEABLE FUTURE ACTIONS

Reasonably foreseeable future actions are those actions that are known or could reasonably be anticipated to occur within the CESA and within a time frame appropriate to the expected impacts from the Proposed Action. For this Project, the time frame for potential future actions is assumed to be the life-of-mine duration (including reclamation), or approximately 9 years. At the present time, BLM is aware of no information indicating pending actions within the CESAs.

Continuation of Past and Present Actions

Activities/events that are expected to continue are dispersed recreation and wildfire events.

5.5 CUMULATIVE EFFECTS FROM PROPOSED ACTION

5.5.1 Air Quality

The CESA for analyzing potential cumulative effects of emissions on air quality encompasses an area of 50 kilometers radius of the Twin Creeks Mine area. This area includes the Humboldt River hydrographic basin and Kelly Creek Area sub-basin. **Figure 3-1** depicts the CESA for cumulative air modeling.

Past and Present Actions: Present actions within the CESA that are likely to be contributing to air quality impacts include mining activities, wildfires, dispersed recreation, and a lime transfer station. Particulate emissions (PM_{10} and $PM_{2.5}$) were modeled for the 50 km CESA by EMA (2011a). Collective emissions in this area are estimated at 2,335 tons/year of PM_{10} and 414 tons/year of $PM_{2.5}$. There are no ore processing facilities at Turquoise Ridge Joint Venture or Pinson mines that would contribute to particulate matter emissions within the CESA; however, fugitive dust associated with ongoing operations at these facilities is included in the model (EMA 2011a). Particulate emissions associated with the Great Western lime transfer facility at Golconda are also included in the modeled results.

Estimated annual emissions of other criteria air pollutants from the Twin Creeks Mine include CO at 1,494 tons/year, NO_X at 1,214 tons/year, SO_2 at 298 tons/year; and VOCs at 154 tons/year (EMA 2011a).

No mercury emissions are associated with operations of the Turquoise Ridge Joint Venture and Pinson mines as there are no ore processing operations at these sites. Under the Nevada Mercury Control Program, Newmont reported 425 pounds of mercury emissions to the Nevada BAPC from all point sources at the Twin Creeks Mine, including ore processed at the Juniper Mill during 2009 (NDEP 2011).

Annual emissions of CO_2 from the Twin Creeks Mine are approximately 112,043 tons/year. Based on annual consumption of 527,525 gallons of diesel fuel, estimated CO_2 emissions from the Turquoise Ridge Joint Venture are 5,855 tons/year. There is no active mining or diesel consuming equipment at the Pinson Mine and therefore, no emissions of CO_2 are occurring.

RFFAs: Continuation of present actions within the CESA that may contribute to impacts to air quality include mining operations, seasonal wildfires, dispersed recreation, and operation of the lime transfer plant at Golconda. These activities and natural phenomena result in impacts to air quality from the emissions of point source particulate matter, fugitive dust, and gaseous products of combustion.

Newmont has implemented emission controls for mercury, with 98 percent efficiency ratings, at the Juniper Mill facility. Based on 2010 source testing data approximately 19 lbs/year of mercury would be associated with the oxide mill ore processed annually at the Juniper Mill (Newmont 2011).

Greenhouse gas emissions from the Turquoise Ridge Joint Venture are expected to continue at current rates of 5,855 tons/year.

Cumulative Impacts: Cumulative annual particulate emissions for the CESA include 2,335 tons/year of PM_{10} and 414 tons/year of $PM_{2.5}$. These emissions include sources at the Twin Creeks Mine. There are no ore processing facilities at Turquoise Ridge Joint Venture or Pinson mines that would contribute gaseous air pollutants.

Ambient air concentrations of the criteria air pollutants emitted by the Twin Creeks Project were modeled as described in Air Quality Assessment Report (EMA 2011a) using Cartesian grid receptors spaced at 2,000 meter intervals out to 50 kilometers from the center of the Project sources. This 50 kilometer distance is consistent with the USEPA's Guideline on Air Quality Models (Appendix W to 40 CFR Part 51), which expresses the USEPA's position that 50 kilometers is the nominal distance to which the USEPA considers most Gaussian models applicable (EMA 2011a).

Modeled first-high PM_{10} (24-hour and annual), $PM_{2.5}$ (24-hour and annual), NO_X (1-hour and annual) and SO_2 (1-hour) concentrations outside of the Twin Creeks Mine boundary (including Turquoise Ridge Joint Venture and Great Western USA lime transfer facility) exceeded each of the applicable Significant Impact Levels (SIL) concentrations for the indicated regulatory averaging periods. The aerial extent of the SIL concentration for each of these air pollutants for each of the applicable regulatory periods were contoured and are provided in the Air Quality Assessment Report (EMA 2011).

The modeled results demonstrate that, with the exception of the modeled 8th high daily maximum 1-hour NO_X concentration, each of the modeled cumulative concentrations are nearly identical (within 1.6 percent) to the equivalent air pollutant concentrations modeled for the Vista Pit Expansion Project alone. The cumulative modeled 8th high daily maximum 1-hour NO_X concentration increased nearly 29 percent over the concentration modeled for the Vista Pit Expansion Project. However, none of the modeled cumulative ambient air pollutant concentrations, together with the applicable background concentrations, exceed the applicable NAAQS (EMA 2011a).

Mercury Emissions

There are no ore processing facilities at Turquoise Ridge Joint Venture or Pinson mines that would contribute mercury emissions in the air quality CESA. Based on 2010 source testing data approximately 19 lbs/year of mercury would be emitted from processing Vista Pit ore at the Juniper Mill (Newmont 2011). Newmont reported 425 pounds of mercury emissions to the Nevada BAPC from all point sources at the Twin Creeks Mine, including ore processed at the Juniper Mill during 2009 (NDEP 2011).

Processing Vista Pit ore would not result in release of more mercury emissions than the current levels of mercury emissions associated with ore processing and carbon regeneration circuits at the Twin Creeks Mine. The Proposed Action would result in extending the duration of current mercury emission levels at the Twin Creeks Mine. Total annual emissions of mercury from the Juniper Mill would vary depending on the ratio of oxide leach and oxide mill ore that is blended together during the processing circuit. Emission controls currently in-place at the Twin Creeks Mine ore processing facilities ensure that mercury emissions are within applicable regulatory limits and would not adversely affect air quality in the CESA. Mercury emissions associated with that facility are described in Section 4.2.1 – *Air Quality*.

Cumulative effects associated with mercury emissions from ore processing activities associated with expansion of the Vista Pit would remain below the maximum modeled pollutant concentrations for the Twin Creeks Mine. Emission factors based on 2010 source testing for the Twin Creeks Mine indicates that 98 percent of mercury released from ore during processing is retained or removed through emission controls at carbon regeneration, roaster, and retort furnaces.

There are no mercury emissions associated with the Great Western lime transfer facility at Golconda.

Greenhouse Gas (GHG) Emissions

Estimated annual cumulative CO_2 emissions in the Air Quality CESA would include 5,855 tons/year from the Turquoise Ridge Joint Venture, 108,443 tons/year from Twin Creeks Mine, and 37,348 tons/year from the proposed Vista Pit Expansion Project for a total of 151,646 tons/year.

There are no greenhouse gas emissions associated with the Great Western lime transfer plant at Golconda.

5.5.2 Invasive, Non-Native Species

The CESA for invasive, non-native species includes portions of the Eden Valley, Osgood Mountains, Kelly Creek Basin, and the Snowstorm Mountains which encompasses areas potentially affected by dewatering activities and surface disturbance associated with mine operations.

Past and Present Actions: Past and present actions that have increased presence of invasive, nonnative species (noxious weeds) include mining operations, wildfires, and dispersed recreation. These actions have affected various vegetative community and habitat types that support wildlife and livestock grazing, and displacement of wildlife and special status (plants and wildlife) species.

RFFAs: Potential impacts could occur from invasive, nonnative species as a result of continued past and present actions including mining operations, wildfires, and dispersed recreation. These activities could result in continued potential for infestations of invasive, nonnative species. Disturbed sites and recently seeded areas are candidates for invasion by undesirable species, such as noxious weeds and cheatgrass. Aggressive revegetation and weed control programs would help prevent establishment of weed infestations on reclaimed sites.

Cumulative Impacts: Cumulatively, the past and present activities, and RFFAs, in combination with the Proposed Action, would result in potential impacts from invasive, nonnative species that would include infestations following removal of vegetation or on areas previously disturbed, vegetation lost to wildfires, and from dispersed recreation. Cumulative impacts from past, present, and RFFAs would be minimized due to implementation of environmental protection measures outlined in Section 2.2.14 – *Environmental Protection Measures*

5.5.3 Migratory Birds

The CESA for migratory birds includes hydrographic basins that contain mine development areas, areas that receive mine discharges, and areas where groundwater drawdown has occurred and will likely expand due to mine dewatering. These hydrographic basins are the Kelly Creek Basin (No. 066), portions of the Little Humboldt River (No. 067), and Clovers Area (No. 064). Incremental increases in dewatering levels in the CESA would act cumulatively to potentially reduce surface water flow in streams and springs, thereby reducing habitat available for migratory birds.

Past and Present Actions: Past and present actions likely to have impacted migratory birds include mining operations, wildfires, and dispersed recreation. Mining activity has disturbed approximately 16,354 acres in the CESA, which represents about 4 percent of land in the CESA. In addition, wildfires have burned 273,000 acres in the CESA since 1990. These actions are likely to have displaced species, fragmented respective species habitats, and/or caused direct mortality to migratory birds or result in direct impacts to individuals in travel routes.

RFFAs: Potential impacts to migratory birds from continued past and present actions including mining operations, wildfires, and dispersed recreation could occur. In addition, noise could affect migratory birds. These actions would likely contribute to habitat fragmentation, displacement of species, increased likelihood of infestation of invasive, non-native species, or direct mortality to individual species.

Cumulative Impacts: Impacts to migratory birds from past, present, and RFFAs in combination with the Proposed Action would include effects associated with removal of vegetation (foraging, nesting, brood rearing areas), alteration of habitat, noise associated with mining operations, and vehicular collisions.

Upon cessation of dewatering activities, a pit lake having a final surface area of approximately 41 acres would form in the Vista Pit. Development of habitat capable of supporting migratory birds in the pit lake would likely be limited due to the steep-walled profile of the lake, restricting near shore littoral habitat. In addition, the low level of nutrients and organic particles in surface water and coarse pit wall material would be unlikely to support substantive substrate favorable for development of vegetation or that would attract or sustain migratory birds. The pit lake may function as a stopover or resting area for

avian species, or as a source of drinking water. Results of the SLERA ingestion models (see Section 4.2.12) indicate concentrations of constituents of potential concern for migratory birds in soil and surface water would be at levels that pose negligible risks to migratory birds (Integral 2011).

Based on the above analysis and findings from Section 4.2.4, incremental impacts to migratory birds as a result of the Proposed Action, when added to the past and present actions and RFFAs, are expected to be minimal.

5.5.4 Water Quality (Surface and Ground)

(Note: For purposes of this EA, water quantity is also analyzed in this section).

The CESA for water resources encompasses surface water and groundwater within an area of approximately 650 square miles of the Twin Creeks Mine, including portions of the Eden Valley, Osgood Mountains, Kelly Creek basin, and Snowstorm Mountains (**Figure 5-1**). Hydrographic basins that contain mine development areas and receive mine discharges, and areas where groundwater drawdown has occurred and would likely expand due to mine dewatering, include the Kelly Creek Basin (No. 066), portions of the Little Humboldt River (No. 067), and Clovers Area (No. 064). All of these basins are tributaries to the Humboldt River, beginning upstream from Golconda and extending downstream to Winnemucca.

Past and Present Actions: Past actions likely to have impacted or continue to impact water resources include mining operations, wildfires, and dispersed recreation. Portions of the CESA have burned as a consequence of wildfire, which has resulted in a reduction in roots binding soil and subsequent release of sediment to drainages. Reseeding and remediation actions have been implemented by BLM to re-establish vegetation on areas affected by wildfire.

RFFAs: Continuation of past and present actions including mining operations, dispersed recreation, and natural phenomena (*e.g.,* wildfires) would occur. Contribution of sediment from disturbed land to streams, and potential acid generation and/or release of trace metals from newly exposed rock could create an additive effect on surface water quality if conditions conducive to these phenomena are present in the CESA. Any land disturbance activities could affect surface water distribution and/or quantity.

Cumulative Impacts: Four to seven new dewatering wells would be installed for the proposed expansion to the Vista Pit. Pumping rates would vary from 500 to 3,000 gpm with a predicted maximum combined dewatering rate of approximately 8,400 gpm. Dewatering would continue at the North and South Mega pits with rates decreasing from 5,000 gpm to 3,800 gpm by mid-2012. Combined dewatering would not exceed the permitted rate of 12,300 gpm.

Release of constituents from mined rock upon exposure to oxygen and precipitation, which can affect surface water and groundwater quality, is analyzed by regulatory agencies in review of permit applications for mining. Mine developments must comply with regulatory standards for water quality in Nevada. Consequently, expansion of existing mining operations or development of new projects will be reviewed to ensure that water quality standards are not exceeded. Based on results of ongoing water monitoring, and predicted water quality associated with the Proposed Actions, no additive impacts to surface water or groundwater have been identified.

The Turquoise Ridge Joint Venture mine complex is located southwest of the Twin Creeks Mine and has a dewatering operation that was simulated in the Twin Creeks 2001 Groundwater Model transient calibration process. Cones of depression created by the two operations do not overlap and therefore do not create an additive effect in the groundwater table.

5.5.5 Geology and Minerals

The geographic area used for analyzing potential cumulative effects associated with mining, exposure of rock to atmospheric conditions, and resultant release of trace metals to the environment includes the Getchell Mineral Trend. Rationale for selecting this CESA is based on the location and characteristics of rock materials that have been and would be mined, and the potential for creation of additive effects to water quality in the area.

Past and Present Actions: Actions within the CESA that are likely to impact geology and minerals include ongoing mining operations in the Getchell Mineral Trend. Mining activity has disturbed approximately 16,354 acres in the CESA, which represents about 4 percent of land in the CESA.

RFFAs: RFFAs within the CESA that may affect geology and minerals include continued mining at the Twin Creeks, Turquoise Ridge Joint Venture, and Pinson mines.

Cumulative Impacts: Large-scale mining is projected to continue in the Getchell Mineral Trend with ongoing operations expanding individual mine areas to permitted limits. Ongoing and future mine development would result in expansion to and creation of open pits, underground mines, OISAs, heap leach pads, tailings storage facilities, and the construction and operation of ore processing facilities.

Topography of the area would continue to be modified as a result of mine excavation, overburden/interburden and tailings disposal, reclamation, and other mine related surface disturbance. Expansion of the Vista Pit would add incrementally to the alteration of topography and the removal of mineral resources and overburden/interburden within the CESA.

Continued mining may afford the opportunity to backfill mined-out pits with overburden/interburden from future operations. Such opportunities would be judged individually and based upon accessibility as well as influence on future mining activities. Backfilling and subsequent reclamation would restore land to pre-mining uses, but backfilling may preclude access to additional or lower grade mineral resources.
Movement of overburden/interburden and ore as a result of mining results in relocation of rock from natural emplacement to manmade OISAs, heap leach piles, or tailings storage facilities. Rock that contains sulfides can react with oxygen and water (precipitation) to form acid that can liberate trace metals from the rock; providing that sulfides and trace metals are in sufficient concentration and form to be released via this mechanism. As described under Water Quality above, potential release of constituents from mined rock upon exposure to oxygen and precipitation is analyzed by regulatory agencies in review of permit applications for mining to ensure compliance with state of Nevada water quality standards.

5.5.6 Social Values and Economics

The CESA for social values and economics includes the communities of Winnemucca, Golconda, Valmy, and Midas in eastern Humboldt County, and Battle Mountain in Lander County. Rationale for the CESA is that 26 employees currently commute to the Twin Creeks Mine in Humboldt County and, therefore, employment, income, and taxes paid to local governments would be affected in the respective communities and counties.

Past and Present Actions: Past and present actions that are likely to have impacts to social values and economics include mining operations.

RFFAs: Continuation or cessation of mining operations would impact social and economic resources.

Cumulative Impacts: Social values and economics would not be cumulatively affected by the Proposed Action since no increase in employment levels or expenditures by Newmont are anticipated (*e.g.*, goods and services, contract labor). The Proposed Action would extend employment and tax benefits to state and local entities over the 9-year Project life that are currently experienced under existing operations.

Future employment status for other major employers within the CESA (*e.g.*, Turquoise Ridge Joint Venture) would affect the cumulative impact on social and economic values within the CESA. Under current mine plans, no changes in employment have been identified to occur at that Mine within the RFFA time period.

5.5.7 Soil

The CESA for soil resources encompasses the watersheds that drain the Twin Creeks Mine complex to the confluence with the Humboldt River. This study area is based on natural and manmade impacts to soil resources that result in soil movement or loss, soil fertility and productivity, and areas where additive effects of soil movement could impact other resources (*e.g.*, surface water; fisheries and aquatic resources; riparian and wetland habitat).

Past and Present Actions: Actions that could have impacted soil resources or continue to affect soil include mining operations and dispersed recreation that disturbed or impacted soil, or that resulted in increased erosion or sedimentation. Mining activity has disturbed approximately 16,354 acres in the CESA, which represents about 4 percent of land in the CESA. Soil disturbance may also have been associated with 273,000 burned acres from wildfires; however, fire rehabilitation and natural revegetation have occurred in the CESA, stabilizing soil loss.

RFFAs: Potential impacts to soil resources could occur from continuation of past and present actions including mining operations, wildfires, and dispersed recreation assuming that current land uses would continue into the future. These actions would likely contribute to soil loss and movement, increased erosion from wind and water forces, and an increased likelihood of infestation of invasive, non-native species.

Cumulative Impacts: Soil resources are cumulatively impacted through disturbance and/or removal by mining operations, natural phenomena such as wildfire, and dispersed recreation within the CESA. Wildfire damages vegetation that binds the soil together and makes it susceptible to wind erosion. Intense recreation can cause powdering of the soil, making it susceptible to wind and water erosion.

Additive or cumulative effects to soil resources include impacts to soil during salvage, stockpiling, re-distribution, and reclamation efforts associated with approximately 40 acres of new disturbance within the 145-acre tract of land converted to expansion of the Sonoma Leach Facility associated with the Proposed Action. Soil handling and placement during reclamation of land disturbed by previously permitted and future mining activity in the Twin Creeks Mine area would also result in soil loss; primarily due to wind erosion. Soil movement in response to precipitation would be captured in the sediment control system at the Twin Creeks Mine.

5.5.8 Special Status Species

The CESA for special status species includes hydrographic basins that contain mine development, areas that receive mine discharges, and areas where groundwater drawdown has occurred and will likely expand due to mine dewatering. These hydrographic basins are shown on **Figure 5-1**.

Past and Present Actions: Past and present actions within the CESA that have affected or are currently affecting special status wildlife species include mining operations, wildfire, and dispersed recreation. Mining activity has disturbed approximately 16,354 acres in the CESA, which represents about 4 percent of land in the CESA. In addition, wildfires have burned 273,000 acres in the CESA since 1990. These actions are likely to have displaced special status species, fragmented respective species habitats, and/or caused direct mortality to special status species or result in direct impacts to individuals in travel routes.

RFFAs: Potential impacts to special status wildlife species could occur from continuation of past and present activities including mining operations, wildfire, and dispersed recreation. These actions would likely contribute to habitat fragmentation, displacement of species, soil movement and loss, or an increased likelihood of infestation of invasive, non-native species.

Cumulative Impacts: The Proposed Action would result in disturbance and loss of foraging habitat as well as temporary displacement of several sensitive species that occur in the Project area including golden eagle, Brewer's sparrow, sage thrasher, and loggerhead shrike. The disturbance from the Proposed Action would be an incremental contribution to cumulative effects on these species. Because sensitive avian species would likely return to the area after reclamation is complete, and the relatively small amount of sagebrush habitat (approximately 40 acres) removed from proposed expansion of the Sonoma Heap Leach Facility would not have additive impacts to special status species in the CESA as this habitat type is common and widespread throughout the Great Basin in Nevada and surrounding the Project area. The loss of sagebrush habitat would be a small incremental reduction locally. This would not affect the viability of special status species occurring in the area or increase the probability that they would be become endangered or threatened.

5.5.9 Vegetation

The CESA for vegetation includes portions of Eden Valley, Osgood Mountains, Kelly Creek Basin, and Snowstorm Mountains which encompass areas potentially affected by dewatering activities and surface disturbance associated with mine operations (**Figure 5-1**).

Past and Present Actions: Past and present actions that could impact vegetation include mining operations and dispersed recreation and natural phenomena such as wildfires. Mining activity has disturbed approximately 16,354 acres in the CESA, which represents about 4 percent of land in the CESA. In addition, wildfires have burned 273,000 acres since 1990, some of which have burned more than once. These actions likely have affected vegetative community and habitat types that support wildlife and livestock grazing, contributed to soil loss and movement, and an increased likelihood of infestation of invasive, non-native species.

RFFAs: Potential impacts to vegetation could occur from continuation of past and present actions including mining operations, and dispersed recreation and natural phenomena (*e.g.*, wildfire). These actions would likely contribute to habitat fragmentation, displacement of species, soil movement and loss, or an increased likelihood of infestation of invasive, non-native species.

Cumulative Impacts: The cumulative effects discussion for vegetation focuses on changes in dominant plant communities that affect habitat for wildlife (*i.e.*, sagebrush/grassland). Wildfires combined with displacement of native species by invasive annual grasses are the primary factors that have altered the structure, composition, and ecology of plant communities in the CESA.

Vegetation cover types within the CESA include agricultural species, aspen, grassland, greasewood, Great Basin subalpine pine, lowland riparian, mountain riparian, mountain sagebrush, mountain shrub, sagebrush, sagebrush/perennial grass, and salt desert scrub. Distribution of vegetation cover types in these areas is strongly influenced by variations in landscape position, soil type, moisture, elevation, and aspect. Species nomenclature herein is consistent with the USDA NRCS Plants Database (USDA, NRCS 2011).

Approximately 16,354 acres have been disturbed by mining activity in the Getchell Trend. This acreage represents approximately 4 percent of the land area in the CESA. Once dewatering activity ceases, some pit lakes would form from recovery of the groundwater table.

The Proposed Action would increase disturbance to vegetation by removal of approximately 40 acres of land that is currently undisturbed within the 145-acre tract of land that would be used to support expansion of the Sonoma Leach Facility. Once these areas are reclaimed, they would provide habitat for wildlife and, when combined with reclamation in adjacent areas, serve to establish habitat links to other areas. As other portions of the Twin Creeks Mine area are reclaimed per approved plans, reclamation would modify the habitat from predominantly shrub components to grassland. Loss of mature shrubs associated with land disturbed by mining would represent a small percentage of the acres of woody species communities in the CESA.

Wildfire has affected mature shrub communities throughout the CESA. Approximately 273,000 acres have burned since 1990, which includes areas that have burned more than once. Effects on vegetation include loss or partial removal of upland species, potential removal of below ground biomass, soil hydrophobicity, and potential for increasing spread of noxious weeds and invasive grasses. Depending on the severity of the fire at any given location and the success of reseeding and planting programs, reestablishment of shrub communities may take several decades to achieve. Partial re-colonization is occurring in some areas where adjacent seed sources are available.

5.5.10 Wildlife

The CESA for wildlife includes hydrographic basins that contain mine development, areas that receive mine discharges, and areas where groundwater drawdown has occurred and would likely expand due to mine dewatering. These hydrographic basins are shown on **Figure 5-1**.

Past and Present Actions: Actions within the CESA that are likely to affect wildlife include mining operations, dispersed recreation, and natural phenomena such as wildfire. Mining activity has disturbed approximately 16,354 acres in the CESA, which represents about 4 percent of land in the CESA. In addition, wildfires have burned 273,000 acres in the CESA since 1990. These actions are likely to have displaced wildlife, fragmented respective species habitats, increased the likelihood of infestation of invasive, non-native species, caused direct mortality to individuals, or resulted in direct impacts to individuals in travel routes.

RFFAs: Potential impacts to wildlife could occur from continuation of past and present actions including mining operations, dispersed recreation, and natural phenomena such as wildfire. These actions would likely contribute to habitat fragmentation, displacement of species, increased likelihood of infestation of invasive non-native species, or direct mortality to individual species.

Cumulative Impacts: The relatively small amount of sagebrush habitat (approximately 40 acres) removed from proposed expansion of the Sonoma Heap Leach Facility would not have additive impacts to wildlife in the CESA as this habitat type is common and widespread throughout the Great Basin in Nevada and surrounding the Project area.

5.6 CUMULATIVE EFFECTS OF ALTERNATIVE A – USE EXISTING HEAP LEACH FACILITIES

Cumulative effects to cultural resources, migratory birds, Native American Religious Concerns, water resources, paleontology, social and economic values, and geology and minerals as a result of implementation of Alternative A would be the same as those described for the Proposed Action. No direct and indirect impacts to special status species, soil, vegetation, and wildlife resulting from implementation of Alternative A warrant analysis of cumulative effects. Direct and indirect impacts to air quality, and impacts resulting from potential increase in invasive, non-native species, could create additive effects resulting from implementation of Alternative A.

5.6.1 Air Quality

Air emissions would be reduced under Alternative A since the haul distance to the Izzenhood Heap Leach Facility is less than the distance to the proposed expansion of the Sonoma Heap Leach Facility. Stripping, salvaging, and stockpiling of growth media would not occur from construction of the expanded Sonoma Heap Leach Facility. Loading and hauling spent ore from the Snowstorm Heap Leach Facility for placement as a protective layer over the synthetic liner system on the new leach pad would not occur. These reduced or eliminated activities would result in fewer additive gaseous and fugitive emissions to the CESA from implementation of Alternative A.

Cumulative effects to air quality from other sources (wildfires, dispersed recreation, and operation of the Graymont Western lime transfer facility at Golconda) would likely continue as described under Section 5.5.1 – *Air Quality*.

5.6.2 Invasive, Non-Native Species

Implementation of Alternative A would result in an overall reduction in surface disturbance of 40 acres within the 145-acre tract of land that would be converted in use to expansion of the Sonoma Heap Leach Facility. Potential for increased or additive infestations of invasive, non-native species would be reduced in the CESA under Alternative A as a result of this reduced land disturbance.

Cumulative effects to invasive, non-native species from other sources (wildfires, dispersed recreation) would likely continue as described under Section 5.5.2 – *Invasive, Non-native Species*.

5.7 CUMULATIVE EFFECTS OF THE NO ACTION ALTERNATIVE

There would be no incremental or cumulative impact resulting from implementation of the No Action Alternative.

CHAPTER 6
MITIGATION AND MONITORING

6.1 INTRODUCTION

There are no mitigation or monitoring measures recommended beyond those proposed for implementation under the Proposed Action in Section 2.2.14 - *Environmental Protection Measures*. These would also be applicable to the action alternative.

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CHAPTER 7
LIST OF PREPARERS

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CHAPTER 8
CONSULTATION AND COORDINATION

Native American Consultation

BLM is committed to coordinating and consulting with any affected tribes on all proposed projects on BLM managed public land. On February 26, 2010, BLM sent a letter to 12 tribes seeking input and consultation to identify cultural values, religious beliefs and traditional practices, which could be affected by the Proposed Action. Tribes contacted include the following:

- Battle Mountain Band Colony
- Fort McDermitt Paiute and Shoshone Tribe
- Lovelock Paiute Tribe
- Pyramid Lake Paiute Tribe
- Summit Lake Tribe
- Winnemucca Indian Colony
- Fallon Paiute Shoshone
- Fort Hall Indian Reservation
- Susanville Indian Reservation
- Reno-Sparks Indian Colony
- Cedarville Rancheria
- Fort Bidwell Indian Community Council

A consultation meeting was held with Fort McDermitt Paiute and Shoshone tribe on March 8, 2010, and a site visit occurred on June 9, 2011. The Preliminary EA was sent to Fort McDermitt Paiute and Shoshone Tribe and Fort Hall Indian Reservation on August 4, 2011.

Agencies

BLM has contacted the following agencies for input on the Proposed Action:

- US Fish and Wildlife Service
- Nevada Department of Wildlife
- Nevada Division of Environmental Protection

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CHAPTER 9
PUBLIC INVOLVEMENT

Public involvement in the EA process includes the necessary steps to identify and address public concerns and needs. The public involvement process assists the agencies in: (1) broadening the information base for decision making; (2) informing the public about the Proposed Action and the potential long-term impacts that could result from the project; and (3) ensuring that public needs are understood by the agencies.

As part of the preparation of the Newmont Vista Pit Expansion Project EA, BLM solicited comments by letter on the Project from numerous agencies, organizations, and the public from October 22, 2009 through November 4, 2009.

An interdisciplinary (ID) team meeting was held at the BLM office in Winnemucca on September 22, 2009. During the meeting, the ID team identified the resources to be addressed in this document as outlined in Chapter 3. Issues or concerns related to implementation of the Proposed Action identified by BLM and through public scoping are described in Section 1.5 – *Issues* in Chapter 1.

A meeting was held on December 15, 2009, to review comments received on the proposed Vista Pit Expansion Project and discuss the Proposed Action and potential alternative actions. As part of the meeting, public comments received were reviewed and discussed. The Nevada Clearinghouse and the U.S. EPA provided comment letters on the proposed Project. Comments were taken into consideration as part of reviewing the Proposed Action, developing alternatives to the Proposed Action, and developing the environmental analysis.

The Preliminary EA was made available for public comment via mailing and the BLM webpage from August 3, 2011, until September 6, 2011. A copy of the Preliminary EA was also made available in the public room at the BLM Winnemucca District Office. Copies of the Preliminary EA were also sent to both Fort McDermitt Paiute and Shoshone Tribe and Fort Hall Indian Reservation on August 4, 2011.

A total of three letters were received within the comment period and a fourth letter was received the day after the comment period ended. Comments were received from Humboldt County Board of Commissioners, the City of Winnemucca, a private citizen, and Great Basin Resource Watch. A meeting was held on September 8, 2011 to review comments received and evaluate potential modifications to the document.

Public comments focused on the basis and findings for predicted water quality and questions regarding heap leach pad closure. Information was added to the water resources monitoring section of Chapter 2 to address the former and text was modified in Section 2.2.13 - *Reclamation*, and *Water Quality* Sections 4.2.6 and 4.4.6 regarding the latter. In finalizing the EA, the sections on *Native American Religious Concerns* and *Public Involvement* were updated; clarifications were made to Section 2.2.14 - *Environmental Protection Measures* proposed in Chapter 2 under wildlife and water resources monitoring, and information on PM_{10} and $PM_{2.5}$ that would be emitted under the Proposed Action was added to Chapter 4. These modifications did not result in substantial change to the analysis or conclusions made from the analysis but rather provide further and more accurate information for the reader.

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CHAPTER 10
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