

Preliminary Environmental Assessment

DOI-BLM-NV-W010-2015-0012-EA

Twin Creeks Vista VIII Pit Expansion Project

Newmont Mining Corporation

September 2015

U. S. Department of the Interior Bureau of Land Management
Humboldt River Field Office
5100 E. Winnemucca Blvd. Winnemucca, NV 89445
Phone: 775-623-1500



Preliminary Environmental Assessment

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

BLM/NV/WN/EA/15-15+1792

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ACRONYMS

ACEC	Area of Critical Environmental Concern
ACHP	Advisory Council of Historic Preservation
af/yr	Acre-feet per year
AMSL	above mean sea level
ARPA	Archaeological Resources Protection Act
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
CWA	Clean Water Act
E-cell	Evaporation cell
EA	Environmental Assessment
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
ET	evapotranspiration
FEMA	Federal Emergency Management Agency
FLPMA	Federal Land Policy and Management Act
FPCP	Final Permanent Closure Plan
GFMC	Gold Fields Mining Company
GHG	greenhouse gas
gpm	gallons per minute
H	Horizontal
HAP	Hazardous Air Pollutant
HLF	Heap Leach Facility
HLP	Heap Leach Pad
HMA	Herd Management Area
IDA	International Dark Sky Association
IDT	Interdisciplinary Team
LED	Light Emitting Diode
LR2000	BLM's Land and Mineral Legacy Rehost 2000 System
MBTA	Migratory Bird Treaty Act
mg/L	milligrams per liter
Mt	million tons
NAAQS	national ambient air quality standards
NAC	Nevada Administrative Code
NAGPRA	Native American Graves Protection and Repatriation Act
NBMG	Nevada Bureau of Mining and Geology
NDEP	Nevada Division of Environmental Protection
NDOW	Nevada Division of Wildlife
NDWR	Nevada Division of Water Resources
NEPA	National Environmental Policy Act

NHPA	Title 54 U.S.C. §300101, et. seq., commonly known as the National Historic Preservation Act of 1966, as amended (NHPA), and Title 54 U.S.C. §306108, commonly known as Section 106 of the NHPA (Section 106)
NPDES	National Pollution Discharge Elimination System
NRHP	National Register of Historic Places
OISA	Overburden/Interburden Storage Area
PFYC	Potential Fossil Yield Category
Plan	Plan of Operations
PFS	Process Fluid Stabilization
RCRA	Resource Conservation and Recovery Act of 1976
RFFA	Reasonably Foreseeable Future Actions
SFPGC	Santa Fe Pacific Gold Company
SHPO	State Historic Preservation Act
SLERA	Screening Level Ecological Risk Assessment
TCM	Twin Creeks Mine
TDS	Total Dissolved Solids
TSF	Tailings Storage Facility
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
V	Vertical
WAD	weak acid dissociable
WPCP	Water Pollution Control Permit
µ/L	micrograms per liter

1.0 INTRODUCTION

The Winnemucca District Office of the United States Department of the Interior (DOI) Bureau of Land Management (BLM) received a modification to Newmont Mining Corporation's (Newmont) Twin Creeks Mine (TCM) Plan of Operations (Plan) (NVN-064094) and Reclamation Plan (Permit No. 0058) in September 2014. The proposed modification would occur on 161 acres of public and private land within the existing Twin Creeks Mine Plan boundary. The amendment to the Plan proposes an expansion of the already approved Vista Pit toward the east and to deepen it below pre-mining levels, resulting in a pit lake. The expanded pit would affect existing haul roads, the test and Snowstorm heap leach pads, and surfaces already approved for disturbance.

1.1 Identifying Information

1.1.1 Title, EA number, and type of project

Name of Proposed Action: Newmont Twin Creeks Vista VIII Pit Expansion

Environmental Assessment (EA) #: DOI-BLM-NV-W010-2015-0012-EA

Type of Project: Mine pit expansion

1.1.2 Location of Proposed Action

The TCM is physically situated on private and public land in Humboldt County, approximately 26 air miles northeast of Golconda and about 35 miles northeast of Winnemucca, Nevada (Figures 1.1 and 1.2). The TCM is primarily accessed by Interstate 80 from the Golconda exit (Exit 194), then northeast approximately 15 miles on State Route 789, and continuing 12 miles northeast on unpaved County Road 513 (Figure 1.1). The TCM is also accessed by State Route 226 northwest of Elko by turning west onto unpaved County Road 18 (also referred to as Midas – Tuscarora County Road) and travelling west approximately 71 miles, and continuing 12 miles northeast on unpaved County Road 513.

The proposed Project Area would be contained entirely within the existing TCM Plan boundary (Figure 2.1). The planned pit enlargement is located immediately east and adjacent to the existing Vista Pit Phase VII expansion area (Figure 2.2).

1.1.3 Name and Location of Preparing Office

This Environmental Assessment is being prepared by the following BLM Office:

United States Department of the Interior
Bureau of Land Management
Winnemucca BLM Humboldt River Field Office
5100 E. Winnemucca Blvd.
Winnemucca, NV. 89445

1.1.4 Case file number

Twin Creeks Mine Plan, BLM case file number NVN-064094.

1.1.5 Applicant Name

Newmont USA Limited, doing business as Newmont Mining Corporation, is the applicant for the Proposed Action.

1.2 Project Overview

Site History

Organized gold mining has been present in the TCM region since the early 1900s. This includes the adjacent Potosi-Getchell Mining District. TCM was formed in 1993 by the consolidation of the Rabbit Creek Mine and the Chimney Creek Mine by Santa Fe Pacific Gold Company (SFPGC), following the purchase of Chimney Creek Mine from Goldfields Operating Company. The former Rabbit Creek Mine is located in the southern portion of the TCM, including what are now known as the Mega Pit and the Pinon Mill. The former Chimney Creek Mine is located immediately north of and adjacent to the former Rabbit Creek Mine, and includes what are now known as Vista Pit and Sage/Juniper Mills.

TCM History

The original TCM Plan was reviewed by BLM through the National Environmental Policy Act (NEPA) process resulting in an approval issued in a Record of Decision in January 1997. At that time the mine was owned by SFPGC. Later in 1997, Newmont acquired TCM and has been the owner and operator since that time.

Current mining operations at TCM use conventional open-pit mining methods including drilling, blasting, loading, hauling, processing, and refining. Concurrent reclamation efforts are conducted as site conditions and mine planning allows. The existing TCM Plan boundary encompasses approximately 7,278 acres of public land administered by the BLM and approximately 6,001 acres of private land owned by Newmont which include (Figure 1.2):

- ✓ Two open-pits;
- ✓ Overburden/Interburden Storage Areas (OISA);
- ✓ Autoclave and three milling facilities;
- ✓ Two tailings storage facilities (Pinon is in closure);
- ✓ Process solution ponds and fresh water ponds;
- ✓ Haul and access roads;
- ✓ Shops, warehouses, and other buildings;
- ✓ Six permitted heap leach facilities; N6, Sonoma, Snowstorm, Test Heap, Izzengood, and Osgood (Test Heap and Osgood are in closure) and;
- ✓ Ancillary and support facilities.

In 2002 open pit mining in the Vista Pit was halted at a point necessary to maintain a bottom elevation above the pre-mining water table elevation, which eliminated the occurrence of a pit lake. Mining has remained ongoing in the nearby Mega Pit, which has been divided by in-pit backfill material into the North and South pits (Figure 2.2). Mining of the Mega Pit is scheduled to continue into 2021, with operations in the southern portion (South Pit) completed in 2011.

From 2009 through 2011 TCM developed a Plan Amendment called the Vista Pit Expansion Project (also referred to as Vista VII). Vista VII was designed to expand the Vista Pit to allow for the resumption of operations in the Vista Pit. The Vista Pit Expansion Project was approved through the completion of the NEPA Environmental Assessment (EA) process in 2011. Mining activities in the Vista VII area are presently active and are expected to continue until 2019 although mining itself is expected to be completed in 2016.

Plan Modification

The currently proposed Modification to the Plan is entitled the Vista Pit Expansion Phase VIII (also known as Vista VIII, Proposed Action, or Project). The Proposed Action would occur entirely within the existing Twin Creeks Mine Plan boundary and, if approved, within all or part of Township 39 North, Range 43 East, (T39N R43E) sections 7 and 8 Mount Diablo Base and Meridian (Figure 1.2). The Proposed Action is projected to commence in 2016, at the completion of the Vista VII phase of operations. Vista VIII operations are projected to cease in 2021. Mining and mineral processing related activities have, and would continue to take place within, and adjacent to, the immediate vicinity of the proposed Project Area.

The TCM is operated in conformance with the approved TCM Plan (Westec 1996). All subsequent amendments and modifications were also developed to be in accordance with approved Operating Plans and Permits.

1.3 Purpose and Need for Action

The BLM's purpose for the Federal Action is to allow Newmont to expand mining operations on public lands within the Plan boundary.

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 Code of Federal Regulations (CFR) §3809, to respond to a Plan and to take any action necessary to prevent unnecessary or undue degradation of public land administered by BLM.

1.4 Decision to be Made

The decision the BLM would make based in large part on this EA includes the following: whether or not to approve the proposed Plan Modification to authorize the mining activities without modifications and or additional mitigation measures; approval of the Plan Modification with modifications and or additional mitigation measures that are deemed necessary by the

BLM; or deny approval of the Plan Modification and not authorize the mining activities if it is found that the proposal does not comply with the 43 CFR §3809 regulations and the FLPMA mandate to prevent unnecessary or undue degradation.

1.5 Scoping, Public Involvement and Issues

The scoping process for the Proposed Action began with a series of interdisciplinary team (IDT) meetings held at the BLM office in Winnemucca. The IDT process is utilized as a way to focus the scoping process by gathering project specific guidance from resource specialists who are trained in areas specific to a particular project. Based on these internal scoping meetings, the BLM defined appropriate issues and developed initial determinations of what specific information would be analyzed in this EA. This included key resources identified as potentially affected by the project, data needs, and the necessary public outreach features.

Public involvement in the EA process includes certain steps deemed necessary to identify and address public concerns and needs. The public involvement process assists the agencies in:

- ✓ Broadening the information base for decision making;
- ✓ Informing the public about the Proposed Action and the potential impacts that could result from the implementation of a project; and
- ✓ Ensuring that public needs are understood by the agencies.

As part of the preparation of the Newmont Twin Creeks Vista VIII Pit Expansion EA, BLM solicited comments in writing from numerous agencies, organizations, and the general public from January 6, 2015 through February 5, 2015.

Following this period, a meeting was held on April 1, 2015, to review comments received on the Proposed Action and to discuss potential alternative actions. During the meeting, public comments received were reviewed and discussed. The BLM received a total of seven comment letters within the public comment period. Comments were received from the City of Winnemucca, the Humboldt Development Authority, two private citizens, the Humboldt County Board of Commissioners, the Great Basin Resource Watch, and the American Wild Horse Preservation Campaign.

One comment letter questioned the potential effects of the Proposed Action on local wild horses. The Proposed Action would not present any changes to traffic patterns or access. There is exclusionary fencing around the Project Area (Figure 2.1), watering ponds located to the north of the fenced operation area boundary, and there are no Herd Management Areas (HMA) near the project boundary.

The remainder of the comments received consisted of a request for a copy of the Plan and viewpoints with respect to the Proposed Actions implementation. Table 1.1 contains the issues with regard to the Proposed Action that were identified during the scoping process.

Table 1.1 Scoping, Public Involvement and Issues

Scoping Topic	Section Addressed
Migratory Birds	
What is the potential effect on migratory birds that would access the pit lake?	3.2, 4.1.1, 4.2.4.1
Native American Religious Concerns	
Would the Proposed Action impact the Shoshone Mike Massacre Site?	3.3, 4.1.2
Water Resources	
What is the potential impact to surface water and groundwater quantity and quality from dewatering activities?	3.4, 4.1.3, 4.2.4.2

2.0 PROPOSED ACTION AND ALTERNATIVES

This chapter describes Newmont's proposed modification to the Plan (the Proposed Action). Also described is the No Action Alternative, as well as alternatives considered but eliminated from further analysis.

2.1 Description of the Proposed Action

The Proposed Action referred to throughout this EA is Newmont's proposed modification to the Plan for the Twin Creeks Mine and consists of the following components:

- ✓ The Project would occupy a total surface disturbance footprint of approximately 161 acres; of which 66 acres is Public Land administered by the BLM, while 95 acres is private land;
- ✓ Expansion of the existing Vista Pit (Vista Pit Phase VIII) by approximately 30 acres;
- ✓ Placement of alluvium, non-Potentially Acid Generating (PAG) and PAG O/I material in OISA N (W22), Vista Pit Backfill, or other approved OISAs;/pit backfill areas within existing authorizations;
- ✓ Placement of alluvium, non-PAG O/I material and/or spent heap leach pad ore for construction on the Juniper TSF;
- ✓ Placement of ore on existing stockpile pads, milling ore at the Sage/Juniper Mills and depositing tailings slurry into the Juniper TSF;
- ✓ Leaching of ore at approved heap leach facilities (HLF) within existing authorizations;
- ✓ Development of Pit expansion areas onto currently utilized HLF areas.
- ✓ Re-alignment and operation of existing haul roads;
- ✓ Dewatering the Vista Pit at a rate of up to 9,500 gallons per minute (gpm);
- ✓ Use of dewatering water for mining and processing purposes, and/or treatment and discharge; and
- ✓ Reclamation and closure of Project facilities.

2.1.1 Proposed Disturbance

Vista Pit Disturbance Areas

The Proposed Action would reclassify approximately 30 acres of existing disturbance to open pit surface disturbance. The Project Area would reclassify approximately 24 acres of road disturbance, approximately four acres of heap leach disturbance, and approximately two acres of OISA disturbance (Newmont 2014).

All existing open pits are included in the current Twin Creeks Reclamation Plan (Westec 1996), and reclamation methods for the proposed action would be unchanged. As previously approved, open pits would not be reclaimed. However public safety, and MSHA compliance, would be addressed through a combination of berms, fences, and signs (Newmont 2014).

**Table 2.1 Proposed Project Area Surface Disturbance (acres)
Proposed Surface Disturbance Changes - Vista Pit Phase VIII Expansion**

Pre-Project Classification	Post-Project Classification	Land Ownership Private Lands	Land Ownership Public Lands
Structures / Buildings	Haul Road	1	0
Haul Road	Open-Pit: Vista VIII Expansion	6	18
Leach I (Snowstorm)	Haul Road	4	2
Leach K (Test Heap)	Haul Road	5	7
Leach K (Test Heap)	Open-Pit: Vista VIII Expansion	1	3
OISA N: W22	Open-Pit: Vista VIII Expansion	2	0
Subtotal by Landowner		19	30
Total Acres		49	

Overburden/Interburden Storage Area Disturbances

The Proposed Action would reduce OISA surface disturbance by approximately two acres and convert it to open pit. Additionally, the OISA Area N (W-22) and other areas used for OISA would increase in height to accommodate O/I material (Newmont 2014). Materials placement detailed in the Proposed Action would be managed in accordance with the MHP (Newmont 2002; PTI Environmental Services 1996). All existing (pre-Project) OISAs are included in the current Twin Creeks Reclamation Plan (Westec 1996).

The benched slopes associated with OISAs would be graded to an intermediate slope of 2.5H:1.0V (horizontal to vertical) and an overall slope of 3.0H:1.0V. Grading would be done to minimize erosion, facilitate reclamation activities, and provide a surface that would support vegetation. OISA surfaces would be graded as necessary to control runoff and engineered diversions would be installed as necessary for erosion control and rerouting of surface water. OISAs would be visually monitored to ensure drainage and sediment control measures are effective.

During closure and reclamation, lifts would be stepped back to allow re-contouring to a maximum 3.0H:1.0V slope. Cover layer materials would be constructed to a thickness of five feet using acid-neutralizing materials.

Heap Leach Facility Disturbance Areas

The Proposed Action would reduce areas classified as heap leach disturbance by 22 acres and convert it to approximately four acres of open pit disturbance and approximately 18 acres of road disturbance (Newmont 2014). All existing (pre-Project) heap leach pads are managed according to the current Twin Creeks Reclamation Plan (Westec 1996, Newmont 2011). Reclamation methods would be unchanged and subsequent updates specify the treatment of heaps during closure and reclamation (Newmont 2014).

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 to eliminate areas that may 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.

Road Disturbance

The Proposed Action would reclassify approximately 24 acres of existing road disturbance and convert this acreage to open pit disturbance classification. Additionally, approximately 19 acres of road disturbance would be reclassified by the conversion of approximately 18 acres of heap leach area disturbance and approximately one acre of structures area. The net change is a decrease of approximately five acres of road disturbance (Newmont 2014). All existing (pre-Project roads are included in the current Twin Creeks Reclamation Plan (Westec 1996, Newmont 2014).

Roads associated with the Vista Pit Expansion VIII Project would be reclaimed concurrently after 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 their respective disposal areas. Haul roads not located on the OISAs would be reclaimed by grading to provide proper drainage, ripping to reduce compaction, and seeding. During reclamation, roads, culverts and associated features would be contoured to reestablish approximate natural topography and drainage values of the site, and to control erosion.

Ancillary Facility Disturbance Areas

No new ancillary facilities are needed, or would be constructed, within the proposed Project Area. Ancillary facilities that would be used to support the Proposed Action are located in the Twin Creeks Mine Area. Reclamation of existing facilities would be in accordance with Nevada Division of Environmental Protection (NDEP) Reclamation Permit No. 0058 and BLM approved Plan.

2.1.2 Vista Pit Expansion

Mining in Vista Pit is currently underway in the Vista Phase VII operational area, as approved in the Vista VII modification to the TCM Plan (Newmont 2011). These operations commenced in November 2011 and are planned to continue until approximately 2016. Mining in the Vista VII portion of the pit would be completed before Vista VIII begins construction. At completion of Vista Phase VII, the lowest mined elevation is projected to be 4,280 feet above mean sea level (AMSL) and pit dimensions would be approximately 3,000 feet in length (north-south) and approximately 2,500 feet wide (east-west). The Proposed Action would increase the dimensions of the Vista Pit by 500 feet to the south and 200 feet to the east. This would result in final

dimensions of approximately 3,500 feet in length (north-south) and approximately 2,700 feet in width (east-west). The Proposed Action would also deepen the pit by an additional 280 feet AMSL; this would result in a post-mining pit-floor elevation of 4,000 feet AMSL.

Approximately 75Mt of material, including 17Mt of ore and 58Mt of overburden/interburden, would be mined over a five year period during expansion of the Vista Pit. Ore and overburden/interburden production is summarized in Table 2.2. Newmont would use conventional open pit mining methods (truck and shovel), consistent with current mining at the TCM.

Table 2.2 Ore and Overburden/Interburden Production Vista VIII Pit Expansion

Period	Ore, Oxide Leach (Tons)	Ore, Oxide Mill (Tons)	Waste, Alluvium (Tons)	Waste, Oxide (Tons)	Waste, Sulfide (Tons)
Year 1	146,000	69,000	18,164,000	7,864,000	-
Year 2	2,008,000	1,192,000	1,667,000	14,993,000	3,432,000
Year 3	4,608,000	3,359,000	-	7,215,000	1,662,000
Year 4	1,068,000	1,160,000	-	1,026,000	928,000
Year 5	1,180,000	1,994,000	-	760,000	404,000
Total	9,010,000	7,774,000	19,831,000	31,858,000	6,426,000

Removal of approximately 2Mt of spent ore from the currently used HLF would be necessary to accommodate expansion of the Vista Pit. NDEP Water Pollution Control Permit (WPCP) NEV86018 currently authorizes the use of spent ore for construction activities at the Juniper TSF. The remaining spent ore on the leach pad would be left at an angle no steeper than 2.5H:1.0V to facilitate reclamation.

2.1.3 Ore Processing

Expansion of the Vista Pit would generate two types of oxide ore: 1) oxide leach ore, and 2) oxide mill ore. Depending on economic constraints, approximately 46 percent of the ore resulting from the Project would be oxide mill-grade ore and would be processed at the Sage/Juniper Mill. The remaining 54 percent of the ore would be run-of-mine, oxide leach and may be placed on the approved heap leach facilities at TCM.

2.1.4 Water Supply and Management

Potable water and fresh water for dust suppression activities would continue to be supplied from existing facilities at TCM. Water trucks would continue to use existing water stands. Potable water would continue to be supplied from the existing potable water well. Mine dewatering is currently used to support the existing Vista Pit Phase VII operations and is accomplished with the use of dewatering wells located adjacent to the Vista Pit. The Proposed Action may require the termination of certain existing wells along with the installation of additional new wells to enhance and support dewatering requirements. Additionally, as with the existing Vista Pit Phase VII operation, a pit lake is expected to form in the Vista Pit Phase VIII area when dewatering

efforts terminate and groundwater recovery begins. Mining and post-mining water management assessments are based on the numerical groundwater flow model developed by Itasca in 2014 and updated in 2015 to simulate groundwater conditions at the TCM and surrounding region.

Mining Phase – Dewatering and Disposal

The following activities apply to the Project during the mining process. Groundwater dewatering and non-process water discharge are currently permitted at TCM in accordance with National Pollution Discharge Elimination System (NPDES) Permit NV0021725. The following actions represent a continuation and/or expansion of existing actions (Westec 1996; Newmont 2011).

Open pit mining of the Vista Pit for the current Phase VII and/or the proposed Phase VIII would continue to require dewatering. As of May 2014, groundwater occurs at 4,343 feet AMSL. Development of the Vista Pit Expansion Phase VIII would require approximately 363 feet of drawdown in advance of mining to ensure safe and economically feasible mining conditions. Water produced from pumping would be used to supply TCM's mining, process and/or general operations. Water that is pumped and not used for mining, process, and/or general operations would be treated to meet NDEP Profile I standards prior to discharge.

Newmont predicts the Project would require three to five dewatering wells that would likely be constructed adjacent to the Vista Pit. Each well would occupy approximately one acre of existing surface disturbance. As mining progresses it may be necessary to construct one or more wells within the pit itself. Wells would be completed to an approximate depth of 1,300 feet and may vary in diameter from 8-inch to 24-inch completions. Each well would be designed to have a pumping rate between 500 and 2,500 gpm. If geologic conditions require it, horizontal drains may be used to increase high wall stability.

Dewatering rates would increase from the currently permitted rate of 8,400 gpm up to a maximum of 9,500 gpm which may be required to allow for safe mining of the Project Area. Over the approximately five years of active mining, dewatering efforts would remove up to an estimated 24.2 billion gallons of water. Active dewatering would end concurrently with the end of mining in the expansion area. Table 2.3 outlines the tentative dewatering schedule for the Project.

Table 2.3 Dewatering Schedule

Mining Year	1	2	3	4	5
GPM	8,812	9,339	9,310	9,310	9,310

Water produced from wells would be pumped via existing pipelines to the existing Water Distribution Pond or directly to the process facilities. Existing pipelines may be realigned to facilitate water distribution. From the Water Distribution Pond, water would be distributed through existing pipelines to TCM operations for use in mining and processing. Additionally, non-process water could be sent to TCM's south water treatment plant for treatment (removal) of arsenic (if necessary) and discharged in accordance with NPDES Permit NV0021725.

Post-Mining Phase - Groundwater Recovery and Pit Lake Formation

The proposed Project would result in a pit that is 280 feet deeper than is currently approved in the Vista VII Plan (Newmont 2011). The bottom elevation of the pit is planned at approximately 4,000 feet AMSL. The Proposed Action would excavate below the pre-mining (currently dewatered) and predicted (future recovery) groundwater elevations and would require dewatering to ensure safe mining conditions. Once dewatering efforts are terminated, groundwater recovery and infilling of the pit is predicted to begin immediately (Itasca 2014, 2015) and would create a pit lake in the Vista Phase VIII pit (Figure 2.3). The pit lake is predicted to recover to an ultimate elevation of approximately 4,567 feet AMSL after approximately 400 years of infilling and is predicted to reach its 90 percent recovery threshold at an elevation of approximately 4,510 feet AMSL after approximately 80 years of infilling (Itasca 2014, 2015).

The proposed pit lake is expected to be a flow through system. The groundwater model predicts inflow to the pit from the north and east, and outflow on the west and south side of the pit through the 20K fault zone. Outflows would travel south, and terminate in the North Mega pit, which would act as a terminal pit lake (Itasca 2014, 2015). The 20k fault zone is the most important single feature affecting pit lake water balance and greatly influences pit inflow and outflow. The 20K fault zone is a north-south trending, shallowly dipping (50-60 degrees to the east) open breccia zone ranging from one to ten feet wide. Fault movement has been traced into the overlying gravels, indicating that its formation was long lived and it had time to form an open conduit for ground water flow.

2.1.5 Overburden and Interburden Storage Areas (OISAs)

Expansion of the Vista Pit would generate approximately 58Mt of overburden/interburden (O/I). O/I would primarily consist of oxide and alluvium material; approximately 89 percent is modeled as alluvium/oxide and the remaining 11 percent is modeled as sulfide O/I material. O/I material would be evaluated during mining and material identified as potentially acid generating waste would be handled according to the approved TCM Materials Handling Plan (MHP) and previous authorizations (Newmont 2002; PTI Environmental Services 1996).

Existing OISAs and open pit backfill areas would be used to store oxide and sulfide O/I. Additionally, oxide O/I material may also be used for construction on the existing Juniper TSF, consistent with TCM's WPCP NEV86018. Alluvium may be placed on OISA N (W22), Izenhood heap leach facility, or in other suitable locations for temporary storage until it can be used as growth media for concurrent reclamation and/or closure reclamation.

All O/I material would be placed in accordance with the MHP and previous authorizations (Newmont 2002; PTI Environmental Services 1996). O/I material would be placed by end-dumping into designated areas and lifts would not exceed 200 vertical feet.

OISA surfaces would be graded as necessary to control runoff and engineered diversions would be installed as necessary for erosion control and rerouting of surface water. OISAs would be visually monitored to ensure drainage and sediment control measures are effective.

During closure and reclamation, lifts would be stepped back to allow re-contouring to slope no steeper than 3.0H:1.0V . Cover layer materials would be constructed, where needed, to a thickness of up to five feet using acid-neutralizing materials, which also serve as suitable growth media.

Overburden/Interburden Characterization

The proposed Project remains within the same geologic formations as the current Vista Pit Phase VII pit shell, which was authorized in 2011 and is still in operation. These formations include lower and upper members of the Permian-Pennsylvanian Etchart limestone, the Ordovician Valmy Formation, and Quaternary alluvium.

The technical reports utilized for the review of the proposed Vista Pit Phase VIII (Geomega 2015; Itasca 2014, 2015), serve to update and build upon the materials characterization and pit lake chemo-genesis work which was completed for the Vista Pit Phase VII (Geomega 2011). The materials characterization program represents the dominant geology for ultimate pit surface (UPS) elevations below 4,700 AMSL, namely the Lower Etchart and Valmy Formations, as this coincides with post-mining groundwater recovery.

2.1.6 Stormwater and Sediment Control Structures

The TCM manages stormwater under NDEP General Permit for stormwater discharges associated with Industrial Activity from Metals Mining Activities (NVR300000). The TCM maintains a Stormwater Pollution Prevention Plan (SWPPP; Newmont 2013). The existing SWPPP would be amended to address any changes implemented for the Project. Surface water management and erosion control measures would be completed in accordance with the SWPPP and associated Best Management Practices (BMPs) and would be implemented as necessary during the Project life.

Sediment control measures would be implemented as necessary to reduce soil erosion within the Project area and minimize off-site effects. Where necessary, BMPs would be constructed in accordance with the SWPPP and the Handbook of Best Management Practices (Newmont 2013; Nevada State Conservation Commission 1994). BMPs can include silt traps, fences constructed of certified weed-free straw bales or geotextile fabric, sediment collection basins, and stormwater diversion channels.

Sediment retention basins would be used to capture stormwater runoff and allow the retention and settling of sediment and/or infiltration of water. The retention basins would typically be unlined and sized to accommodate the 2-year, 24-hour storm event. Routine inspections would be conducted to ensure they are functioning properly and to determine if maintenance is required.

Stormwater diversion channels are typically designed to divert run-off from a 100-year, 24-hour storm event away from mining activities and disturbance and toward adjacent undeveloped land via sediment basins. Channels are designed to discharge to undisturbed land via sediment basin outlet protection. The channels are designed, constructed, and maintained in accordance with the SWPPP. Riprap is used to protect culvert outlets and sediment basin overflow channels.

TCM currently maintains sediment retention basins, stormwater diversion channels, and other stormwater BMPs and controls in and around the Vista Pit as well as all other mining areas including those areas adjacent to the Vista Pit. Additional stormwater controls may be necessary to ensure adequate stormwater runoff containment. These structures would be maintained and inspected throughout the life of the Project as required in the SWPPP (Newmont 2013).

2.1.7 Haul and Access Roads

Existing haul roads in-use currently have been designed to handle the largest pieces of mining equipment associated with the operation. Existing in-pit access and haul roads connect the Vista Pit with the OISAs, HLFs, and process and maintenance facilities. The haul roads also provide access for smaller vehicles used in administrative and support services. Haul roads are typically constructed to approximate widths of 80 feet for in-pit roads and approximate widths of 120 feet for out-of-pit haul roads. In-pit as well as certain out-of-pit roads proposed to be developed by the Proposed Action would be designed to allow ore to be hauled to processing facilities and O/I material to be hauled to OISAs. The Proposed Action would require new haul road alignments; which would be designed to conform to existing specifications.

The Project would re-align portions of the existing haul road to the east of the Vista Pit over land that is currently disturbed and permitted as heap leach facility and structure/buildings surface disturbance. Approximately one acre of permitted and vacant structure/buildings disturbance and approximately 18 acres of permitted and constructed heap leach pad would be used to realign the haul road. Construction of the proposed changes to the haul road would occur entirely on currently permitted disturbance. The realigned haul road would follow the eastern boundary of the Vista Pit in order to haul O/I material and ore and provide access to the northern process facilities. The out-of-pit haul road would have a disturbance width of approximately 120 feet and be approximately 3,900 feet in length (Figure 2.2).

2.1.8 Ancillary Infrastructure

The Project would include placement and operation of pipeline infrastructure and other related ancillary infrastructure to support dewatering and water management. The Project would continue to use existing pipeline infrastructure and realign where necessary, to facilitate water distribution, within permitted surface disturbance.

The Project would be supported by other existing ancillary infrastructure (i.e. maintenance shops, fueling areas, office buildings, warehouses, etc.). Newmont does not anticipate constructing additional ancillary infrastructure as a component of the Project.

2.1.9 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 waived 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. Hazardous Wastes associated with mining and ore processing at the TCM would continue at levels defined by RCRA (40 CFR 260-270), for Large Quantity Generator of hazardous waste. Other hazardous materials, including; fuel, oil and other petroleum products consumption would not increase, since the proposed project would shift existing mining equipment from other areas within the mine to the proposed Vista Pit VIII area. For a list of equipment proposed for use at the Vista VIII Pit Expansion refer to the Environmental Assessment of the Twin Creeks Mine Vista Pit Expansion Project (BLM 2011).

2.1.10 Human Health and Safety

The TCM and Project are subject to the Mine Safety and Health Administration (MSHA) regulations, which set mandatory safety and health standards for metal mines. The purpose of MSHA is to ensure the protection of life, promotion of health and safety, and prevention of accidents. Regulations issued under MSHA are codified at 30 CFR Subchapter N, Part 56. Site access would continue to be restricted to employees and authorized visitors. The TCM and Project would also comply with internal Newmont Global Health and Safety Standards, which are available on the company website.

2.1.11 Noise

Noise levels at TCM would vary during construction, mining, and reclamation activities associated with expansion of the Vista Pit. The closest sensitive receptor is a private residence which is located approximately five miles south of TCM's Mine Plan boundary and approximately nine miles from the Vista VIII Project Area. No other sensitive receptors (*e.g.*, residences, campgrounds, or recreation facilities) are located within a five-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. Noise from mining operations would remain essentially unchanged from current levels as the same equipment currently operating associated with the Vista Pit VII expansion would be relocated slightly to achieve the proposed Vista Pit VIII expansion.

2.1.12 Employment

Newmont directly employs approximately 510 people at the TCM and has an average of 50 contractors working on site each day. Further, Newmont is indirectly responsible for supporting a substantial number of local and regional contractors and business owners.

The Project would maintain existing employment levels through the life of the project. Construction, mining operations, processing operations, and associated activities would be performed primarily by Newmont personnel using Newmont-owned equipment. The Project is vital to continued operation of the TCM processing facilities and would allow Twin Creeks to sustain employment levels required for operating these facilities.

2.1.13 Reclamation

Portions of the following sections have been derived from the Environmental Assessment of the Twin Creeks Mine Vista Pit Expansion Project (BLM 2011) as reclamation activities, with a few exceptions, remain virtually unchanged from the TCM Reclamation Plan (Westec 1996).

Reclamation activities for the Vista Pit VIII Expansion Project are designed to achieve post-mining land uses consistent with the goals of the Winnemucca RMP (BLM 2015). Reclamation is designed to return disturbed land to a level of productivity comparable to pre-mining levels similar to those of adjacent lands. 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 established 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. 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.

This Project would increase open pit surface disturbance by approximately 30 acres. This includes consuming approximately five acres of heap leach disturbance, approximately 24 acres of road disturbance, four acres of heap leach disturbance, and approximately two acres of OISA disturbance. Reclamation methods would be unchanged from the TCM Reclamation Plan (Westec 1996). Open pits would not be reclaimed, however, public safety would be addressed through a combination of berms, fences, and signs.

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 2009). 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 Area is shown at

Figure 2.3. A Final Permanent Closure Plan (FPCP) designed to meet State of Nevada requirements (Nevada Administrative Code (NAC) 445A.447 et.al.) would be filed with the BLM and NDEP two years prior to closure of the mine.

Process Fluid Stabilization and Heap Leach Decommissioning

In Nevada, Process Fluid Stabilization (PFS) operations are regulated under NAC 445A.430, which requires a three-pore volume rinse of heap leach materials in order to provide greater protection to the waters of the State from degradation following mine closure. Pursuant to NAC 445.430.3, Newmont obtained approval for an alternate method for stabilizing leached ore as discussed later in this section, and since that time, it has been successfully utilized to help ensure that spent ore would not degrade waters of the State. This change in closure method decreased the amount of water necessary for the effective three-pore volume rinse of spent ore, which in turn reduced the time and energy required to decommission the heap leach facilities.

Upon completion of active leaching (application of dilute 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 leaching operations cease and drop over time as solution flows out of the 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.

In the 2011 Vista Pit Phase VII modification, Newmont proposed a change to the PFS and decommissioning procedures designed to achieve a more efficient PFS process for HLFs and associated process ponds at the TCM.

Newmont has completed numerous model evaluations of the draindown volume and rate of process fluids for HLFs at TCM (Newmont 2014). 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, and area of historic leaching;
- ✓ Height of heap leach facility;
- ✓ Fluid application rate and 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 determined values for permeability and porosities for the various rock types in the heap leach facility to complete calculations regarding rate of fluid draindown once use of atomizers (e.g., snow-makers) ceases (Newmont 2011a).

Experience and modeling indicate that low precipitation and high evaporation conditions at the site would result in a low equilibrium flow rate (Newmont 2011a). 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 E-cells. 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 2.4.

Table 2.4 Active/Passive Process Solution Management

Heap Leach Facility	Active Draindown Period	Flow Rate (gpm)	Passive Draindown Period	Flow Rate (gpm)
Osgood	Year 1 thru 7	5,800 to 11	Year 8 thru 30	10 to 4
Izenhood	Year 1 thru 8	1,300 to 9	Year 9 thru 30	9 to 5
Snowstorm/Sonoma	Year 1 thru 8	2,500 to 4	Year 9 thru 30	4 to 2
Sonoma	Year 1 thru 7	1,800 to 4	Year 8 thru 30	4 to 2

Sources: Newmont 2011a; BLM 2011.

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 24-inches 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. The passive management of draindown and flow rates for each heap leach facility are shown in Table 2.4.

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 the proposed expansion.

A Materials Handling Plan (MHP) Modification (Newmont 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. The variety of replacement depths would provide different vegetation mosaics on reclaimed areas. Growth media would be ripped and scarified where necessary. Scarification and ripping serve to enhance infiltration and seed bedding success, and at the same time reduce erosional losses from wind and runoff and reduce compaction.

Newmont has implemented other BMPs to help reduce soil loss from stockpiles through the construction of run-off control berms, concurrent reclamation, and interim seeding, or leaving slopes in a roughened condition.

Miscellaneous Features Including but not Limited to Fences, Pipes, Culverts, Power Lines, and Sub-stations

The Project would include placement and operation of pipeline infrastructure and other related ancillary infrastructure to support dewatering and water management. Existing pipelines may be realigned to facilitate water distribution within permitted surface disturbance (Newmont 2014). All existing (pre-project) fences, pipelines, culverts, power lines, and sub-stations are described in the current Twin Creeks Reclamation Plan (Westec 1996).

Reclamation of Roads

The Project would reclassify approximately 24 acres of existing road disturbance and convert this acreage to open pit. Additionally, the Proposed Action would reclassify approximately 19 acres of road disturbance by converting approximately 18 acres of heap leach disturbance and approximately one acre of structures. These disturbance changes are included in the current Twin Creeks Reclamation Plan (Westec 1996).

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 Winnemucca RMP (BLM 2015) and designated post-mining land uses. Plants proposed for use on the OISAs and partially backfilled mine pit are shown in Table 2.5. 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. 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 BLM approved four-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, would 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 2.5 Reclamation Seed Mixture

Species Common Name	Species Scientific Name	Pounds Pure Live Seed Per Acre
Crested wheatgrass	<i>Agropyron cristatum</i>	1
Great Basin wildrye	<i>Leymus cinerus</i>	1.5
Sandberg Bluegrass	<i>Poa sandbergii</i>	1
Bluebunch Wheatgrass	<i>Agropyron spicatum (Psuedoroegneria spicata)</i>	1.5
Fourwing Saltbush	<i>Atriplex canescens</i>	2.5
Shadscale	<i>Atriplex confertifolia</i>	2.5
Big Sagebrush	<i>Artemisia tridentata var. tridentata, wyomingensis</i>	0.3
Antelope Bitterbrush	<i>Purshia tridentata</i>	1
Nevada Mormon Tea	<i>Ephedra nevadensis</i>	0.2
Prostrate Summer Cypress	<i>Kochia prostrata</i>	0.2
Palmer Penstemon	<i>Penstemon palmeri</i>	0.2
Cicer Milkvetch	<i>Astragalus cicer</i>	1
Blue Flax	<i>Linum lewisii</i>	0.5
TOTAL		13.4

Source: Newmont 2011a

Concurrent Reclamation

As various facilities reach the end of their period of use, Newmont would initiate reclamation activities concurrent with ongoing mining operations. Proposed schedule for post mining reclamation activities can be found on page 2-17 in the Environmental Assessment of the Twin Creeks Mine Vista Pit Phase VII Expansion Project (BLM 2011). Vegetation monitoring would continue for a minimum of three years after reclamation activities have been completed, or until no longer deemed necessary by the BLM and NDEP.

2.1.14 Environmental Protection Measures

Newmont Proposed Environmental Protection Measures

The following environmental protection measures and BMPs are from Newmont's Plan for the Vista Pit Phase VIII Expansion Project (Newmont 2014) and brought forward from previous environmental analyses.

- ✓ 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 the 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.
- ✓ Diversion channels, sediment basins, and other surface water (sediment) control structures would be constructed to control stormwater run-on and 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 WPCP (NEV86018) and NPDES discharge permit (NV0021725).
- ✓ 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.
- ✓ Mining activity at the proposed pit expansion would be monitored until the current Golden Eagle nesting season is completed. The Golden Eagle nest on the Vista Pit highwall would be monitored and United States Fish and Wildlife Service (USFWS) and BLM coordinated with regarding the nest prior to the next breeding season. Current mining operations in Vista Pit have not impacted the Golden Eagles during previous breeding seasons. When active, the nests are monitored during the breeding season.
- ✓ Newmont, in cooperation with BLM and NDEP, would evaluate the status of vegetative growth for 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 VII Pit Expansion Project area would be monitored as requested by the agencies.
- ✓ Newmont's Revegetation Plan specifies the use of native grasses, forbs, and shrub species during reclamation. However, non-native plant species may be used during the plant establishment period for soil stabilization. Planting and seeding techniques would be developed in accordance with Newmont's Revegetation Plan and 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 the 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.
- ✓ The existing Emergency Response Plan would be 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 2,000 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 or light emitting diode (LED) types.
- ✓ 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 Permits: AP1014-0723 and AP1041-2218. 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 National Register of Historic Places (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).

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 (NAGPRA) 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 occurrences of invasive noxious weed species. If discovered, appropriate control measures (as recommended by BLM) would be implemented. Only certified 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 WPCP NEV86018.
- ✓ After dewatering operations cease and a pit lake begins to develop, water quality sampling and analyses would be performed in accordance with WPCP NEV86018.
- ✓ Newmont would continue periodic inspections of the Rabbit Creek drainage to identify any occurrence of accelerated channel and bank erosion or gulying resulting from dewatering discharges.
- ✓ Newmont would complete any necessary stabilization activities for drainage pathways affected by dewatering discharge associated with the Vista VIII Pit Expansion Project

Geology and Minerals

- ✓ During operations, stability analysis of 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/Bureau of Mining Regulation and Reclamation (BMRR) in accordance with WPCP NEV86018 and in coordination with BLM.

Paleontology

- ✓ If fossil deposits are located during construction, operation, or reclamation, measures 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 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.

Wildlife

- ✓ All recorded data from monitoring of wildlife mortalities would continue to be submitted to BLM and Nevada Division of Wildlife (NDOW). If the existing HLFs 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.

Monitoring Programs

The following sections describe the monitoring programs from the Environmental Assessment of the Twin Creeks Mine Vista Pit Expansion Project (BLM 2011) that Newmont proposes to implement during the operational and post-operational phases of the Vista VIII Pit Expansion Project.

Operational Monitoring

Air Quality

Emissions would be monitored in accordance with requirements imposed by existing NDEP Air Quality Operating Permits issued for the Twin Creeks Mine (AP1014-0723 and AP1041-2218).

Water Resources

Water resources in the Project area are monitored in accordance with WPCP NEV86018. TCM's 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, NDEP) by samples from monitoring wells, dewatering wells, horizontal drains, and seeps. Sampling frequency varies from quarterly (groundwater) to annually (dewatering) to once every five years (regional).

Additional monitoring wells for the proposed expansion of the Vista Pit Phase VIII may be required by NDEP and BLM and would be evaluated separately from this EA. The location of these wells and the proposed frequency of sampling would be determined during development of the revisions to the current Mitigation and Monitoring Plan. 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 and annually to NDEP and BLM.

Cultural Resources

Cultural resource inventories have been completed in the proposed Vista Pit VIII 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 the National Historic Preservation Act.

Paleontological Resources

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

The study area for paleontological resources includes the proposed expansion to the Vista Pit. Quaternary-age alluvium (average 250 feet thick) and minor basal tuff overlie the proposed Vista Pit VIII 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 Ordovician 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.

In addition, the proposed Vista Pit VIII 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 United States Geological Survey (USGS) locality 15381-PC and contains molluscan fauna.

The second location, registered as USGS D-151-CO, is assigned to the Ordovician Valmy Formation and contains poorly preserved trilobite fauna. Significance and sensitivity for these fossils is rated as low (BLM 1996). 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 and implementation of a BLM-approved plan to avoid or mitigate the fossils.

Migratory Birds

Land clearing and surface disturbance would be timed to prevent disturbance of active bird nests or birds during the avian breeding season (March 1 to August 31, annually) 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 have a qualified biologist survey areas proposed for disturbance to identify active nests, following the current BLM migratory bird survey protocols. If active nests are located, or if other evidence of nesting is observed (mating pairs, territorial defense, carrying nesting material, transporting of food), a buffer will be established and the area would be avoided to prevent destruction or disturbance of nests until the birds are no longer present. Avian surveys would be conducted only during the breeding season and immediately 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 in compliance with the Migratory Bird Treaty Act (MBTA) (Newmont 2014).

Post-Closure Monitoring

Water Resources

Groundwater monitoring associated with the Vista Pit VIII Expansion Project would be conducted in accordance with WPCP NEV86018 and included as part of Newmont's ongoing approved hydrologic monitoring plans for the TCM. 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.

2.2 No Action Alternative

The No Action Alternative provides a description of the current and future environmental conditions in the absence of the Proposed Action. This alternative provides a valuable contrast necessary to evaluate the potential changes in environmental conditions that might result from the Proposed Action. Under the No Action Alternative, Newmont would continue to operate the Twin Creeks Mine in accordance with current authorizations. Mining operations in the current footprint of the Vista Pit would continue through 2016.

The following activities would continue to occur under the No Action Alternative:

- ✓ Process Fluid Stabilization: TCM Process Fluid Stabilization and heap leach decommissioning would continue to operate as currently authorized. This would include the operation of a spray-evaporation system 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 waters of the State. Residual draindown would report to the existing process pond system which would be converted into E-cells. The E-cells would continue to evaporate residual draindown during the post-closure period;
- ✓ Roads: The current haul road which bounds the eastern side of the Vista Pit (Phase VII area) would remain intact and continue to function.
- ✓ HLF's and OISA's: The existing OISAs and HLF areas would continue to operate through the life of the mine and be reclaimed in accordance with the current reclamation plan including ripping and seeding.
- ✓ Dewater: The dewatering system would continue to support the current dewatering (8,400 gpm) of the Vista VII Pit expansion area. The dewatering system currently supports mining operations in the Mega Pit with activities diminishing beginning 2019 and with cessation of mining activities in 2021. Closure of the dewatering well system would include plugging and capping of the well system and removal of infrastructure. In the absence of dewatering activities, over an approximate 80 year period a Pit Lake would form to an approximate depth of 320 feet (4,267 AMSL)
- ✓ Water Quality: Water quality parameters for the Vista Pit would be expected to continue to meet NDEP Profile III water quality requirements. Under the No Action Alternative water chemistry values would not change from the Vista Pit Expansion Project analysis.
- ✓ Employment: In accordance with the current authorized Plan for Twin Creeks Mine, mining operations in Vista Pit would cease in 2016 resulting in the layoff of approximately 300 employees. The layoff would reduce the work force at Twin Creeks Mine to 210 employees.

2.3 Alternatives Considered but not Analyzed in Detail

BLM has not identified any unresolved resource conflicts that would trigger the development of action alternatives. Although there are no concerns with the expected pit water quality, pit backfilling is considered here because it is a natural question that comes up with the public.

2.3.1 Pit Lake Backfill Alternative

A post-mining pit lake backfill alternative was evaluated using potential physical, geotechnical, and economic conditions as documented in a technical memo (Newmont 2015). The ground surface for conditions at the end of mining operations with and without contemplated backfilling is presented in Figure 2.4.

Review elements included:

- ✓ The volume and tonnages required to backfill the pit lake;
- ✓ The associated environmental and economic costs to complete the work; and
- ✓ The schedule for completion.

Review assumptions included:

- ✓ Backfill to 40 feet above the predicted final pit lake water level of 4,567 feet AMSL;
- ✓ Oxide waste material from OISAs would be used as backfill to the mined out Vista VIII Pit Expansion;
- ✓ The adjacent W-22 OISA would be the source of material; and
- ✓ For the estimate of costs, it was assumed that Twin Creeks Mine would conduct the backfilling using their existing fleet.

Physical Constraints

The volume of backfill necessary to eliminate the pit lake void is estimated to be 770,444,000 cubic feet, or 42,802,000 tons of oxide waste (based on 18 cubic feet per ton). An excavation from the top of the W22 OISA was evaluated to provide this volume. Based on an average haul distance of 1.9 miles at a negative 9 percent gradient and 0.5 miles of flat haul and using equipment manufacturer's performance curves for 250-Ton class trucks, an estimate of round trip travel time per load is 23 minutes. The complete backfill of the Vista Pit Lake void would require six 250-Ton class haul trucks working in conjunction with a 27-yd class hydraulic excavator for approximately three years.

Economic and Environmental Conditions

The development of the economic analysis included in the technical memo evaluated operating and maintenance functions associated with loading, hauling, dozing, grading, dust suppression, sustaining capital and administration. Under current economic circumstances, the total backfilling cost exceeds the cash flows generated from Vista VIII Pit Expansion. This alternative would preclude access to future ore reserves and also result in the consumption of over four

million gallons of diesel fuel, while at the same time create emissions of over 50,000 tons of CO₂, and not result in any environmental benefit over the Proposed Action. Representative data from TCM operations statistics result in cost estimates of approximately \$113 Million to complete the backfilling of the Vista VIII Pit Lake void.

Based on this evaluation, it has been concluded that backfilling the Vista VIII Pit Expansion to eliminate the pit lake void is not economically feasible. It also does not provide environmental benefits. Based on this conclusion, this alternative has not been carried forward for a detailed analysis.

2.4 Conformance

The Proposed Action is in conformance with the Record of Decision and Resource Management Plan for the Winnemucca District Planning Area, May 21, 2015.

Locatable Minerals Objective MR 9: Manage locatable mineral operations to provide for the mineral needs of the nation, while assuring compatibility with and protection of other resources and uses. Lands acquired will be managed in a manner consistent with the goals of the acquisition and the resource values present, in accordance with those actions described and considering the management applied to adjacent public lands (BLM 2015).

2.5 Relationship to Laws, Regulations, and Other Plans

The action is in conformance with statutes and implementing regulations, policies, and procedures.

- ✓ The NEPA of 1969, as amended (Public Law 91-190, 42 United States Code §4321) (*et seq.*);
- ✓ 40 CFR §1500 (*et seq.*). Regulations for Implementing the Procedural Provisions of the National Environmental Quality Act;
- ✓ The Council on Environmental Quality's *Considering Cumulative Effects under NEPA*(1997);
- ✓ 43 CFR Part 46, Implementation of NEPA (1969); Final Rule, effective November 14, 2008;
- ✓ BLM NEPA Handbook (H-1790 1), as updated (BLM 2008);
- ✓ 43 CFR §3809: Surface Management;
- ✓ BLM Winnemucca District - Resource Management Plan (BLM 2015), and

2.5.1 Federal

In order to use public land managed by the BLM Winnemucca District Office, Newmont must comply with BLM Surface Management Regulations found at 43 CFR Section 3809. As well as other applicable statutes, including the Mining and Mineral Policy Act of 1970 (as amended) and FLPMA. 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.

2.5.2 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 regulating mining reclamation is defined at 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;
- (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 modification.

The action is consistent with other federal agency, state, and local plans to the maximum extent consistent with federal law and FLPMA provisions.

- ✓ Humboldt County Regional Master Plan (Humboldt County 2013).

3.0 THE AFFECTED ENVIRONMENT

The affected environment section describes the existing conditions and possible trends of issue-related elements that may be affected by the implementation of the Proposed Action. The descriptions of the affected physical, biological, and human resources in this chapter are based upon data gathered from field investigations, BLM and other agency files, and baseline and other technical data, which have been generated for the mine since 1996.

3.1 Geologic Background

TCM lies at the northwest edge of the Kelly Creek drainage and the southeast flank of the Dry Hills, an outlier of the Osgood Mountains within the Getchell Mining District (Figure 1.1). The Dry Hills and Osgood Mountains are comprised of tilted Miocene basalt, and a complexly folded and faulted sequence of early and late Paleozoic sedimentary and basaltic rocks that have been deformed during two major orogenic events. Paleozoic rocks can be subdivided into four groups on the basis of age, lithology, and tectonic history:

- 1) Late Cambrian-early Ordovician paraautochthonous group characterized by black shale, siltstone, silty limestone, and basaltic rocks that comprise the Comus Formation;
- 2) The Ordovician Valmy Formation of highly deformed basalt, chert and argillite in the upper plate of the Roberts Mountains allochthon;
- 3) A relatively undeformed and autochthonous group of Pennsylvanian and Permian limestone and lesser conglomerate, sandstone, and siltstone of the Antler overlap sequence consisting of Etchart Limestone and Battle Conglomerate; and
- 4) Highly deformed Mississippian sandstone, siltstone, and lesser chert of the Havallah Formation in the upper plate of the Golconda allochthon.

A large Cretaceous granodiorite pluton underlies much of the east-central part of the Osgood Mountains, southwest of TCM and in close proximity to the Getchell Mine and Pinson Mine. Miocene basalt caps the northern Dry Hills, and both Eocene and Miocene volcanic rocks make up sizeable igneous centers to the east and north of TCM. Topography descends from a high point in the Dry Hills northwest of TCM, with a gradient of about 100 feet per mile, to the south and east. A blanket of young alluvium thickens southeastward, reaching a thickness of over 700 feet. The Mega gold deposit was overlain by 50-700 feet of unmineralized alluvium. Gold mineralization at the TCM occurs at the northeast end of the Getchell Trend containing several sediment-hosted Carlin-type gold deposits. Gold deposits are hosted in Ordovician Comus, Pennsylvanian-Permian Etchart Formation and Middle Cambrian Preble Formation in order of importance.

The dominant structural feature in the Vista Phase VII/VIII deposit is the North-South trending easterly dipping 20K normal fault (Figure 3.3). In the deposit area the 20K dips between 50 and 60 degrees to the east and displays at least 900 feet of apparent normal displacement. Vista Phase VII/VIII deposit is hosted in a down thrown block of Etchart Formation in the hanging-wall of the 20K fault.

The BLM is required to consider specific elements of the human environment that are subject to regulation by statute or executive order. The following tables (3.1 and 3.2) outline the elements that must be considered in all environmental analyses, as well as additional resources deemed necessary for evaluation by the BLM. These tables provide a concise overview discussion noting whether a resource is “Present”, “Present and Not Affected”, or “Present Affected” along with supporting rationale.

Table 3.1 List of Supplemental Authority Elements Considered for Analysis

Supplemental Authorities	Not Present	Present Not Affected	Present Affected	Rationale/Comments
Air Quality		X		<p>The impacts to air quality incurred during the Vista Pit VIII activities would be essentially the same as analyzed in the Twin Creeks Mine Vista Pit Expansion Project EA. Vista VIII would use the same equipment in essentially the same place and would release the same or less pollutants into the air. Air pollutants as analyzed in the Vista VII EA were determined to be below national ambient air quality standards (NAAQSs) for those pollutants that have been determined to pose a risk to public health or welfare. This would be the case under a Vista VIII implementation as well. Estimated emissions of these pollutants were disclosed in the Vista VII EA including Greenhouse Gasses (GHGs), PM2.5, PM10, and Hazardous Air Pollutants (HAPs) such as mercury.</p> <p>Under the Vista VIII, the duration of operations would continue for five years. Vista VIII would not run concurrently with Vista VII. There are currently no other proposals within the air quality assessment area that would combine with Vista VIII to create a cumulative impact to air quality beyond that analyzed in the Vista VII. The magnitude, intensity and duration of direct, indirect and cumulative impact to air quality would not be substantially different from that analyzed in the Vista VII. Therefore, air quality will not be analyzed in this EA.</p>
Areas of Critical Environmental Concern (ACECs)	X			The Project Area is not in a designated ACEC.

Supplemental Authorities	Not Present	Present Not Affected	Present Affected	Rationale/Comments
Cultural Resources		X		The project vicinity has been extensively surveyed in the past and no resources are present. Analysis of this resource has not been carried forward beyond chapter 3. Refer to 3.1 for additional information.
Environmental Justice	X			The proposed action would not disproportionately affect low income or minority populations.
Floodplains	X			Not applicable - no Federal Emergency Management Agency (FEMA) - mapped special flood hazard areas in the project vicinity.
Historic Trails (Including visual setting)	X			Resource is not present
Invasive, Nonnative Species		X		Invasive, Nonnative species are not expected to be an issue and will not be analyzed in this EA.
Migratory Birds			X	See chapters 3.2, 4.2
Native American Religious Concerns		X		The Shoshone Mike Massacre Site is Present but would not be affected by the Proposed Action. See Chapter 3.3
Prime or Unique Farmlands	X			Resource is not present
Threatened & Endangered Species	X			Based on coordination with the USFWS, no threatened or endangered species or habitat exists within the Vista VIII project area.

Supplemental Authorities	Not Present	Present Not Affected	Present Affected	Rationale/Comments
Wastes, Hazardous or Solid		X		Solid non-hazardous wastes would be disposed of in an existing Class III landfill located at the site. No new hazardous waste generation would result from the pit expansion but would continue at levels defined by RCRA (40 CFR 260-270), for Large Quantity Generator of hazardous waste. Spills of petroleum products would be responded to in the same fashion as described in the TCM's existing Spill Prevention Control and Countermeasure Plan.
Water Quality (Surface and Ground)			X	See chapters 3.4, 4.1.2 (For the purposes of this analysis, Water Quantity will also be analyzed in this section)
Wetlands and Riparian Zones	X			Resource is not Present
Wild and Scenic Rivers	X			Resource is not Present
Wilderness	X			Resource is not Present

Other elements or resources of the human environment, not covered by a supplemental authority, that have been considered for the EA are listed in Table 3.2. The rationale for each element that would not be affected by the Proposed Action or No Action Alternative is listed in the table.

Table 3.2 Additional Affected Resources

Additional Affected Resources	Not Present	Present Not Affected	Present Affected	Rationale/Comments
Energy (Oil and Gas, Geothermal)	X			Resource is not Present
Fisheries	X			Resource is not Present
Geology and Minerals Resource		X		The overall geology and mineral resources in the project vicinity have been well-documented in other analyses (BLM, 1996, and 2011). This project does not expand or vary the scope or intensity of uses of previous analyses. Therefore, additional review is not warranted in this document. Refer to the Chapter 3 introduction for some discussion of the project area setting.
Lands with Wilderness Characteristics	X			The project falls within wilderness characteristic inventory unit NV-020-819. The initial inventory (1979) determined this area did not qualify for further inventory and recommended dropping the unit from further review. A current review of conditions in the unit determined the portion of the unit where the proposed project would be located does not meet the criteria for Lands with Wilderness Characteristics. The proposed action would not have an impact on the remainder of the unit, west of Dry Hills.
Noise		X		Noise levels would remain unchanged from current levels but would extend an additional five years. Refer to Chapter 2.1.11. This element is not expected be an issue for this project.
Paleontology	X			The project falls within areas ranked moderate (Potential Fossil Yield Category (PFYC) 3 and 3b) for potential fossil yields. The Pennsylvanian-Permian Etchart Formation deposits are judged unlikely to produce significant or scientifically important fossils. No known significant or scientifically important fossil sites are located within a 1-mile radius of the project area.
Rangeland Management		X		No affect to rangeland management. The Project is within the existing fenced area in the Plan Boundary.

Additional Affected Resources	Not Present	Present Not Affected	Present Affected	Rationale/Comments
Realty		X		Local Realty resources are not expected to be affected
Recreation	X			No access to recreation areas would be impacted.
Social Values and Economics		X		Newmont directly employs approximately 510 people at the TCM and has an average of 50 contractors working on site each day. TCM employment would continue to provide ongoing economic activity in the area. The magnitude, intensity and duration of direct, indirect and cumulative impact would not be substantially different from that analyzed in the Vista VII. Therefore, this resource will not be analyzed in this EA.
Soils		X		The impacts to soils incurred during the Vista Pit VIII activities would be essentially the same as analyzed in the Vista VII Pit Expansion EA. Vista VIII would use areas previously disturbed or that have been analyzed for surface disturbance most recently in the Twin Creeks Mine Vista Pit Expansion Project EA. Vista VIII involves the reclassification of acreage originally designated for other mine activities. There would be an additional 30 acres of pit expansion that would not be reclaimed. This type of impact has been previously analyzed and the acres proposed here do not present a new level of impact requiring a detailed analysis in this document. There are currently no other proposals within the soil resources assessment area that would combine with Vista VIII to create a cumulative impact to soils beyond those previously analyzed within the Plan boundary. The magnitude and intensity of direct, indirect and cumulative impact to soil resources would not be substantially different from that analyzed in the Vista VII or previous environmental analyses. Environmental protection measures and reclamation standards would apply. Therefore, soil resources will not be analyzed in this EA.

Additional Affected Resources	Not Present	Present Not Affected	Present Affected	Rationale/Comments
Special Status Species	X			<p>Special status species plants and animals have been evaluated in previous environmental analyses within the Plan boundary. Habitat for special status species was not found within the area to be disturbed under Vista VIII. Since the Vista VII environmental analysis was completed, new guidance pertaining to Greater sage-grouse habitat has been released. The Vista VIII project area was evaluated by the BLM in accordance with the new guidance and it was determined that there is no sage-grouse habitat within the Vista VIII project area. The types of impacts associated with Vista VIII have been previously analyzed and do not present a new level of impact requiring a detailed analysis in this document. There are currently no other proposals within the assessment area that would combine with Vista VIII to create cumulative impacts to special status species beyond those previously analyzed within the Plan boundary. The magnitude and intensity of direct, indirect and cumulative impacts to special status species plants and animals would not be substantially different from that analyzed in the Vista VII or previous environmental analyses. Environmental protection measures and reclamation standards would apply. Therefore, special status species would not be analyzed in this EA.</p>
Transportation		X		<p>No change to current transportation or access patterns use or facility requirements.</p>
Vegetation		X		<p>The impacts to vegetation incurred during the Vista Pit VIII activities would be essentially the same as analyzed in the Twin Creeks Mine Vista Pit Expansion Project EA. Vista VIII would use areas previously disturbed or that have been analyzed for loss of vegetation due to surface disturbance most recently in the Vista VII EA. Vista VIII involves the reclassification of acreage originally designated for other mine activities. There would be an additional 30 acres of pit expansion that would not be revegetated. This type of impact has been previously analyzed and does not present a new level of impact requiring a detailed analysis in this document.</p>

Additional Affected Resources	Not Present	Present Not Affected	Present Affected	Rationale/Comments
				There are currently no other proposals within the vegetation assessment area that would combine with Vista VIII to create cumulative impacts to vegetation beyond those previously analyzed within the Plan boundary. The magnitude and intensity of direct, indirect and cumulative impacts to vegetation would not be substantially different from that analyzed in the Vista VII or previous environmental analyses. Environmental protection measures and reclamation standards would apply. Therefore, vegetation would not be analyzed in this EA.
Visual Resources		X		See chapters 2.1.18 for Environmental Protection Measures.
Water Quantity			X	Will be addressed under the Water Quality (Surface and Ground) sections of this EA. See Chapters 3.4, 4.1.2.
Wild Horses and Burros		X		The proposed action is not within an HMA. The Project is within a fenced area within the TCM Plan boundary.
Wildlife		X		<p>The impacts to general wildlife incurred during the Vista Pit VIII activities would be essentially the same as analyzed in the Twin Creeks Mine Vista Pit Expansion Project EA. Vista VIII would use areas previously disturbed or that have been analyzed for loss of vegetation due to surface disturbance most recently in the Vista VII EA. Vista VIII involves the reclassification of acreage originally designated for other mine activities. There would be an additional 30 acres of pit expansion that would not be revegetated. This type of impact has been previously analyzed and does not present a new level of impact requiring a detailed analysis in this document.</p> <p>There are currently no other proposals within the wildlife assessment area that would combine with Vista VIII to create cumulative impacts to wildlife beyond those previously analyzed within the Plan boundary. The magnitude and</p>

Additional Affected Resources	Not Present	Present Not Affected	Present Affected	Rationale/Comments
				intensity of direct, indirect and cumulative impacts to wildlife would not be substantially different from that analyzed in the Vista VII or previous environmental analyses. Environmental protection measures and reclamation standards would apply. Therefore, wildlife would not be analyzed in this EA.
WSA	X			Resource is not Present

3.2 Cultural Resources

3.2.1 Regulatory Framework

Title 54 U.S.C. §300101, et. seq., commonly known as the National Historic Preservation Act of 1966, as amended (NHPA), and Title 54 U.S.C. §306108, commonly known as Section 106 of the NHPA (Section 106) and the Archaeological Resources Protection Act of 1979 (ARPA) are the primary laws regulating preservation of cultural resources. Federal regulations obligate federal agencies to protect and manage cultural resource properties. The NHPA sets forth procedures for considering effects to historic properties and supports and encourages the preservation of prehistoric and historic resources. It directs federal agencies to consider the impacts of their actions on historic properties. The NHPA established the Advisory Council on Historic Preservation (ACHP) and tasked the ACHP with administering and participating in the preservation review process established by Title 54. The NHPA, as amended, requires federal agencies to take into account any action that may adversely affect any structure or object that is, or can be, included in the National Register of Historic Places (NRHP). These regulations, codified at 36 CFR 60.4, provide criteria to determine if a site is eligible. Beyond that, the regulations define how those properties or sites are to be dealt with by federal agencies or other involved parties. These regulations apply to all federal undertakings and all cultural (archaeological, cultural, and historic) resources.

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

3.2.2 Existing Environment

Previous cultural resource inventories (Polk 1985; Environmental Solutions 1986) have documented and evaluated a total of 16 prehistoric and historic resources within the footprint of the Twin Creeks Mine. Of these sites, 14 are prehistoric (dating from 6,000 to 150 years before present, as determined by point typology), and two are historic sites. These sites have been recorded to BLM standards, and the information was integrated into local and statewide data repositories.

The historic sites within the Twin Creeks Mine area are related to early mineral exploration activities. The region experienced growth during the 1860 – 1870 time period associated with mineral prospecting and establishment of mining operations and mills. All of the sites documented within the Project area were determined not eligible for inclusion in the NRHP as they do not meet the Criteria defined in the Guidelines provided in National Register Bulletin 15 (NRHP 1997). No known NRHP eligible sites are located within the Vista VIII Expansion Area and therefore discussions of impacts to cultural sites will not be discussed further in this document.

3.3 Migratory Birds

3.3.1 Regulatory Framework

Migratory birds are protected and managed under the MBTA of 1918, as amended (16 United States Code §703 et. seq.), and Executive Order 13186. The MBTA prohibits the killing or taking of migratory birds without a permit and extends protection to nests of migratory birds if the nest contains nesting birds or their eggs. Executive Order 13186 directs federal agencies to promote the

conservation of migratory bird populations. Additional direction comes from the BLM Instruction Memorandum (IM) 2008-050 (Migratory Bird Treaty Act – Interim Management Guidance), dated December 18, 2007 (BLM 2007).

3.3.2 Assessment Area

The assessment area for migratory birds is the same as the Hydrologic Study Area in order to be consistent with what was used in the Vista Pit Expansion Project.

3.3.3 Existing Environment

Migratory birds may incidentally occur within the Project Area and may colonize the Project Area after reclamation. Golden eagles (*Aquila chrysaetos*) have been observed to have nested and successfully fledged within the Project Area in 2011, 2012 and 2014 (Figure 3.2). Newmont currently has a Golden Eagle Conservation Plan in place (Newmont 2012) which would address activities conducted as part of the Proposed Action.

3.4 Native American Religious Concerns

3.4.1 Regulatory Framework

Numerous laws and regulations require the BLM to consider Native American Religious Concerns. These include the NHPA, the American Indian Religious Freedom Act of 1978, Executive Order 13007 (Indian Sacred Sites), Executive Order 13175 (Consultation and Coordination with Tribal Governments), the Native American Graves Protection and Repatriation Act, the ARPA, as well as NEPA and the FLPMA. Secretarial Order No. 3317, issued in December 2011, updates, expands and clarifies the Department of Interior's policy on consultation with Native American tribes.

The BLM also utilizes H-8120-1 (General Procedural Guidance for Native American Consultation) and National Register Bulletin 38 (Guidelines for Evaluating and Documenting Traditional Cultural Properties).

3.4.2 Existing Environment

The proposed Vista VIII Pit Expansion 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. As part of the Twin Creeks Mine Vista Pit Expansion Project (Vista VII) EA in February 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 then proposed Twin Creeks Mine Vista Pit Expansion Project.

Tribes contacted during the 2011 Vista VII project included the following:

- Battle Mountain 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 Vista VII Pit Expansion 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 Vista VII Expansion Project. No comment was received from Fort McDermitt on the Vista VII Pit Expansion Project until April 28th, 2011. On that day, in an informational meeting, a Fort McDermitt tribal representative on behalf of both the Fort McDermitt and Fort Hall Tribe's expressed concern that there would be mining at the Shoshone-Mike Massacre site. The BLM responded that no mining would occur at the Shoshone Mike Massacre site and that no mining or mining related activities would impact the site either directly or indirectly. The Fort McDermitt Paiute and Shoshone Tribe attended a site visit to TCM and were assured that the project would not impact the Shoshone Mike Massacre site.

Similar to the Vista Pit VII project development of 2011, the BLM has reviewed the current proposed action (Vista Pit VIII) and determined that as the proposed project poses no expansion of Mine infrastructure, footprint, or impacted land resources and is still proposed to be contained entirely within the already approved Project Area boundaries that it would not present any new issues under Native American Religious Concerns.

A consultation meeting was held between the BLM and the Chairman of the Fort McDermitt Paiute and Shoshone Tribe on April 20, 2015 during which the current (VIII) Proposed Action was discussed: The Chairman was informed that the Shoshone Mike Massacre site would not be affected. The Chairman requested an additional project map which was provided in June 2015. Based on this information the Shoshone Mike Massacre site would not be affected by the Vista VIII Expansion Project and further analysis of this issue is not carried forward in this document.

3.5 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 (Figure 3.1) encompasses approximately 650 square miles and includes portions of the Eden Valley, Osgood Mountains, Kelly Creek Basin, and Snowstorm Mountains. 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 4,350 feet AMSL along the Humboldt River to 8,680 feet AMSL along the crest of the Osgood Mountains. Tributaries in the study area drain to three hydrographic sub-basins: Little Humboldt Valley (067), Kelly Creek (066), and Clovers Area (064).

3.5.3 Regulatory Framework

The administration, preservation, and appropriation of water resources in Nevada include both state and federal regulations. NDEP has primacy for administration of the Clean Water Act (CWA). NDEP defines waters of the State of Nevada as water courses, waterways, drainage systems, and groundwater. When a proposed project has the potential to directly or indirectly affect water, the State of Nevada is authorized to implement its own permit programs under the provisions of state law and the federal CWA. Under the authority of the CWA NDEP requires compliance with National Pollution Discharge Elimination System (NPDES) permits which regulate the discharge of wastewater to surface waters from discharge points.

The Nevada Water Pollution Control Law gives the State Environmental Commission authority to require controls on diffuse sources of pollutants, if these sources have the potential to degrade the quality of waters of the State. This same law also provides the state with authority to maintain water quality for public use, agriculture, existing industries, wildlife, and economic development. Nevada has been granted authority by the Environmental Protection Agency (EPA) to enforce drinking water standards established under the CWA. The administration and adjudication of water rights within the state is the responsibility of the Nevada Division of Water Resources (NDWR), State Engineer's Office. Water appropriations are also obtained through the Nevada State Engineer.

Since Santa Fe Pacific Gold's 1994 implementation of a comprehensive surface and groundwater monitoring program, a continuous chain of analytic data has been established and maintained. This ongoing program has established valuable baseline data across a spectrum of analytes. Hydrologic baseline information has been collected from streams, springs, monitoring wells, and dewatering wells from within the hydrologic study area and analyzed for NDEP's required Profile I constituents (NAC 445A.144).

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

3.5.4 Surface Water

Surface Water Quality

Surface water quality in the study area has been characterized based on samples collected from 20 stream and 10 spring locations from 1994 through the present. Streams in the monitoring network include Kelly, Jake, Evans, and Rabbit creeks. Water chemistry in streams and springs in the study area is primarily of a calcium-sodium-bicarbonate type with some exceptions. Rabbit Creek, near the Twin Creeks Mine, consists of treated mine water discharge and contains slightly higher proportions of magnesium and sulfate than other study area surface water but at levels which are substantially below Nevada water quality standards of 150 mg/l and 500 mg/l, respectively. 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. Total dissolved solids (TDS) concentrations of all streams and springs (with the exception of spring SPG-7), are below the secondary standard of 500 milligrams per liter (mg/l). Spring SPG-7 has a natural TDS of approximately 1,500 mg/l (BLM 1996). pH, alkalinity, arsenic, fluoride, iron, phosphorous, and manganese concentrations exceed NDEP water quality standards, but these have been determined to be natural conditions. Elevated concentrations of antimony, arsenic, fluoride, iron, and manganese are not unusual for water in mineralized or geothermal areas (BLM 1996, BLM 2011). Concentrations of other constituents do not exceed water quality standards.

Constituent concentrations for the periods up until 2011 have been presented previously in the Vista VII EA (BLM 2011; Table 3.4, page 50). Refer to Table 3.3 below for the effluent discharge concentrations of constituents for the more recent three-year period.

Table 3.3 Summary of Twin Creeks Mine Effluent Discharge 2011-May 2015

Parameter	n=	Concentrations Max	Concentrations Min	Concentrations Avg	Nevada Effluent Discharge Limit	Nevada Effluent Discharge Limit	Units
					30-day Avg	Daily Max	
TDS	53	433	263	339	500		mg/L
Fluoride	18	0.61	0.41	0.50		1.000	mg/L
Sulfate	18	175	87	130		250	mg/L
Arsenic	53	0.0132	<0.0015	0.0053		0.05	mg/L
Iron	18	0.242	<0.06	0.160		1.000	mg/L
Nickel	18	<0.010	<0.010	<0.010	0.05	0.0134	mg/L
Boron	18	0.165	0.099	0.123		0.750	mg/L

TDS = Total Dissolved Solids, mg/L = milligrams per liter.
Source: Newmont NPDES Permit NV0021725 Reporting Data

Surface Water Quantity

Streams in the Little Humboldt Valley sub-basin drain to the Little Humboldt River. Streams in the Kelly Creek and Clovers sub-basins drain to the main stem of the Humboldt River. Tributaries 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 3.1). Nearly all surface runoff from the Twin Creeks Mine area originates within the Kelly Creek sub-basin, which occupies about 500 square miles. Typically, almost no surface flow from these sub-basins reach the main stem of the Humboldt River due to infiltration and high evapotranspiration losses. The river is perennial throughout the stretch, but flow is variable and ceases during some periods.

3.5.5 Groundwater

The Twin Creeks Mine numerical groundwater flow model (Figure 3.1) was updated in 2010, and updated again in 2014 and 2015, to determine effects of mining and related dewatering associated with expansion of the Vista Pit in 2010 and by the proposed expansion of the Vista Pit (VIII) in 2014 (Itasca 2010, 2014, 2015). The Itasca model includes the Kelly Creek area, parts of the Clovers area, and the Little Humboldt Valley of north-central Nevada. The Twin Creeks Mine is located within the Kelly Creek basin. Both the Kelly Creek and Clovers areas are designated groundwater basins, while the Little Humboldt Valley is a non-designated groundwater basin. In Nevada, groundwater basins are designated where permitted groundwater rights approach or exceed the estimated average annual recharge, and the water resources are being depleted or require additional administration.

The Twin Creeks groundwater model was first presented as part of a study for an Environmental Impact Statement (EIS) for the Twin Creeks mine and was later used for an EA for the Vista pit expansion (Itasca 2010; BLM 2011). While changes have been made to the groundwater model since 1996, the area included in the model domain has not changed.

Numerous geologic faults are located in the vicinity of the Twin Creeks Mine. Water levels measured in wells and piezometers around the Mega and Vista pits have established the current representation of hydrologic structures. These faults generally act as barriers to groundwater flow but hydrologic data suggest that along strike movement of water can occur in the fractured zones adjacent to the faults.

The Vista Phase VIII pit would be larger and deeper than the Vista Phase VII pit that is currently being mined. The 20k Fault separates the Vista Phase VII/VIII deposit from the older portions of the Vista pit with the east side being down-dropped relative to the west. Ore in Vista Phase VIII lies in the Etchart Limestone east of the 20k Fault; however, in order to mine the lowest portions of the ore, mining in the pit would remove a portion of the 20k Fault. The Valmy Formation lies west of the 20k Fault and would be exposed in the western pit wall to an elevation near the bottom of the Phase VIII pit. The Etchart Limestone is divided into upper and lower units, and the upper unit is subdivided based on hydrogeologic responses and the inferred degree of fracturing and dissolution. Bedrock water levels east of the 20k fault have decreased and water levels just west of the 20k fault are slowly declining in response to Mega pit dewatering (Itasca 2015). Upon cessation of pit dewatering, groundwater levels are expected to rebound as described in Section 4.2 of this document.

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. Itasca's 2015 study developed recharge models based on methodologies developed by Maxey and Eakin (1949). Using these methods, 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 2015).

Isotope studies, (which were conducted by Cieutat in 1988, and later cited by Itasca in their 2015 report), indicate that most groundwater recharge-to-alluvium is derived from precipitation in the adjacent mountains at elevations above 5,700 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 model area used precipitation data collected by the Western Regional Climate Center (Itasca 2015) at several precipitation reporting stations. Regression analysis was used to estimate the relationship between elevation and precipitation throughout the model domain. The locations from which precipitation data were used in the regression analysis are reasonably representative of the conditions at the TCM based on their location and topographic conditions and include Winnemucca, Beowawe, Golconda, Battle Mountain, Midas, Buffalo Ranch, Emigrant Pass, and the Carlin Gold mine. Results of the model show recharge across the model area at 30.5 cubic feet per second (cfs) (Itasca 2015). A summary of the steady-state hydrologic budget predicted by the model is shown in Table 3.4

**Table 3.4 Model-Predicted Hydrologic Budget for Steady-State Calibration
Twin Creeks Mine Groundwater Flow Model**

Budget Component	Inflow (+) or Outflow (-) (cfs)
Recharge (R)	+30.5 (31.3)
Evapotranspiration (Et)	-11.5 (-13.9)
Net Groundwater Flow (GW)	-10.8 (-7.6)
Net Surface Water Flow ² (SW)	-8.2 (-10)
Total (or change in storage)	0.0

1. Numbers in parentheses are from the 1996 EIS model; numbers not in parentheses are from the current model.

2. Surface-water flows include the Humboldt River (0.4 cfs, EIS 0.2 cfs), Little Humboldt River (6.0 cfs, EIS 6.7 cfs), Evans Creek (0 cfs, EIS 0 cfs), South Fork of the Little Humboldt River (0.6 cfs, EIS 1.6 cfs), Hot Springs (1.1 cfs, EIS 1.5 cfs), and the unnamed spring in T39N, R43E, Section 1 (north of Kelly Creek Ranch in the Snowstorm Mountains) (0.1 cfs).

Source: Itasca 2015.

Groundwater 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.

Groundwater monitoring within the Twin Creeks Mine Plan boundary is performed in accordance with two Water Pollution Control Permits – NEV86018 and NEV89035. The boundary separating the two permits is the backfilled section dividing the North and South pits within the larger Mega Pit. Groundwater monitoring data for NEV89035 are presented in the previous Vista Pit Expansion Project. The Proposed Action is associated with NEV86018 and therefore the data used to support this analysis focuses on the area covered by this permit.

Groundwater wells are monitored quarterly under this permit for Profile I constituents. Newmont has maintained a renewal permit since 1995 which has been periodically renewed with the latest renewal in 2014. Groundwater monitoring data prior to 2010 are presented in the previous Vista VII EA. Groundwater monitoring data from 2010 through 2014 for NEV86018 are presented in Table 3.5 below:

Table 3.5 Summary of Twin Creeks Mine Groundwater Quality for NEV86018 January 2010-April 2015

Parameter	n =	Concentrations Max	Concentrations Min	Concentrations Avg	Profile I Reference Value	Units
Alkalinity, Bicarbonate (as CaCO ₃)	153	156	85	132.468	NRF	mg/L
Alkalinity, Total (as CaCO ₃)	153	156	103	133.24	NRF	
Antimony	153	<0.00300	<0.00300	<0.00300	0.006	mg/L
Arsenic	153	0.0559	0.0078	0.017547	0.010	mg/L
Barium	153	0.113	0.0078	0.045522	2.0	mg/L
Beryllium	153	<0.0020	<0.0020	<0.0020	0.004	mg/L
Cadmium	153	<0.0020	<0.0020	<0.0020	0.005	mg/L
Calcium	153	41.3	20.5	31.572	NRF	mg/L
Chloride	153	21.1	14.5	17.59	400	mg/L
Chromium	153	<0.0061	<0.0061	<0.0061	0.1	mg/L
Copper	153	<0.010	<0.010	<0.010	1.0	mg/L
Fluoride	153	1.07	0.36	0.64945	4.0	mg/L
Iron	153	0.122	<0.061	<0.061	0.6	mg/L
Lead	153	<0.00300	<0.00300	<0.00300	0.015	mg/L
Magnesium	153	14.7	1.64	6.928667	150	mg/L
Manganese	153	0.0669	0.0042	0.025136	0.10	mg/L
Mercury	153	0.0011	<0.0002	<0.0002	0.002	mg/L
Nickel	153	<0.010	<0.010	<0.010	0.1	mg/L
Nitrate + Nitrite, Total (as N)	153	8.21	0.639	1.76672	10	mg/L
pH	153	8.94	7.59	7.981	6.5-8.5	Standard units
Potassium	153	9.32	3.38	5.746933	NRF	mg/L
Selenium	153	0.00322	<0.00300	<0.00300	0.05	mg/L
Silver	153	<0.0050	<0.0050	<0.0050	0.1	mg/L
Sodium	153	50.3	19.9	33.68067	NRF	mg/L
Sulfate	153	38.6	20	29.172	500	mg/L
Thallium	153	<0.001	<0.001	<0.001	0.002	mg/L
TDS	153	330	205	253.1667	1000	mg/L
Cyanide, WAD	153	0.011	<0.010	<0.010	0.2	mg/L
Zinc	153	0.0384	0.0104	0.015763	5.0	mg/L

Constituents that exceeded applicable Nevada groundwater quality standards in these samples are arsenic and pH. These exceedances are considered to be naturally occurring.

Geomega (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).

In comparison to the groundwater chemistry outside the mining disturbance, the bedrock groundwater chemistry shows a similar range of analyte concentrations as shown below in Table 3.6. Therefore, the bedrock groundwater chemistry is a reasonable proxy for representative inflowing groundwater.

Table 3.6 Comparison of Twin Creeks Mine Average Groundwater Quality for NEV86018 to on-site piezometers January 2010-April 2015

Parameter	NEV86018 Avg	On-site piezometers Avg	Profile I Reference Value	Units
Alkalinity, Bicarbonate (as CaCO ₃)	132	203	NRF	mg/L
Alkalinity, Total (as CaCO ₃)	133		NRF	mg/L
Antimony	<0.003	0.002	0.006	mg/L
Arsenic	0.018	0.015	0.010	mg/L
Barium	0.05	0.08	2.0	mg/L
Beryllium	<0.002	0.001	0.004	mg/L
Cadmium	<0.002	0.001	0.005	mg/L
Calcium	32	43	NRF	mg/L
Chloride	17.6	14.3	400	mg/L
Chromium	<0.0061	0.003	0.1	mg/L
Copper	<0.01	0.01	1.0	mg/L
Fluoride	0.6	0.5	4.0	mg/L
Iron	<0.06	0.1	0.6	mg/L
Lead	<0.003	0.005	0.015	mg/L
Magnesium	6.9	18.6	150	mg/L
Manganese	0.025	0.002	0.10	mg/L
Mercury	0.0002	0.0006	0.002	mg/L
Nickel	0.01	0.01	0.1	mg/L
Nitrate + Nitrite, Total (as N)	1.77	0.05	10	mg/L
pH	7.98	8.0	6.5-8.5	Standard units
Potassium	5.8	3.1	NRF	mg/L
Selenium	<0.003	0.02	0.05	mg/L
Silver	<0.005	0.003	0.1	mg/L
Sodium	34	23	NRF	mg/L
Sulfate	29.2	58.8	500	mg/L

Parameter	NEV86018 Avg	On-site piezometers Avg	Profile I Reference Value	Units
Thallium	<0.001	0.001	0.002	mg/L
TDS	253	203	1000	mg/L
Zinc	0.02	0.01	5.0	mg/L

TDS = Total Dissolved Solids, NRF = No reference value, mg/L = milligrams per liter.

Water Supply and Dewatering Wells

The Final EIS for the Twin Creeks Mine (BLM 1996) reported 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 2.2). Of the 64 water supply and 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 Pumpnickel 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 percent) has a designated use for mining and milling (BLM 1996; NDWR 2011). The project is anticipated to require 3-5 additional monitoring wells but with little change in net output (Table 2.3).

4.0 ENVIRONMENTAL CONSEQUENCES

The following sections describe the direct, indirect, and cumulative environmental consequences which would result from implementation of the Proposed Action, and the No Action Alternative. The existing conditions for each resource below can be found in Chapter 3. This section carries forward the analysis of issues not dismissed from further discussion in Chapter 3:

- ✓ Migratory Birds
- ✓ Water Quality (Surface and Ground)
- ✓ (Note: For purposes of this EA, water quantity is also described in this section.)

4.1 Migratory Birds

4.1.1 Proposed Action

Although the project area does not currently provide ideal habitat for migratory birds, reclaimable land could provide approximately ten acres of habitat for migratory birds once a vegetation community is restored. Under the proposed project, 30 acres of reclaimable land would be permanently converted to pit lake. The Vista Pit Lake would eventually reach a surface area of approximately 67 acres and a depth of 567 feet.

The Vista Pit Lake would be a permanent water feature that would potentially provide migratory birds a valuable watering and resting spot. The Vista Pit Lake water quality is expected to be well below established toxicity thresholds for wildlife (Geomega 2015).

4.1.2 Recommended Mitigation Measures

No new mitigation measures are proposed for migratory birds beyond the current measures in place. TCM has managed, and would continue to manage, Golden Eagle resource issues under the TCM Golden Eagle Conservation Plan (Newmont 2012).

4.1.3 No Action Alternative

Under the No Action alternative there would be no loss of migratory bird habitat.

Under the No Action Alternative projected water chemistry values for the pit lake (which is predicted to be a hydrologic sink) may exceed applicable Nevada water quality standards through the results of evaporation. Evapoconcentration may result in exceedances of applicable Nevada water quality 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). Based on the Screening Level Ecological Risk Assessment (SLERA) ingestion model conducted for the Vista Pit Expansion Project, the resultant water quality would pose negligible risk to migratory birds.

4.2 Water Quality (Surface and Ground)

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

4.2.1 Proposed Action

Similar to previous mining activities in the mine site, the proposed 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 Vista Pit would include incorporation of run-on and run-off surface water control structures and sediment ponds into the existing water management system.

The groundwater flow model (Itasca 2015) predicts that direct and indirect impacts of pit dewatering associated with the proposed expansion of the Vista Pit would include a maximum decrease of baseflow in the Little Humboldt River of 0.7 cfs at 50 years after the end of mining, and a total reduction in spring flow of Hot Springs of 0.2 cfs at 100 years after mining within the study area.

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 (μL). The discharge permit limit is 0.010 μL (Newmont 2011).

4.2.2 Surface Water Direct and Indirect Impacts

The Vista Pit Lake predicted water quality has been analyzed by evaluating infill model simulations (Itasca 2014) and the chemistry and mineralogy of the wall rock. By these model predictions the water quality in the Vista Pit Lake, due to the larger volumes of expected flow through related to the deeper pit levels, would result in improved water chemistry in relation to the Vista VII modeled version.

Projected pit lake water chemistry would largely reflect the chemistry of the groundwater in the area (Geomega 2015). Chemogenesis modeling of projected pit lake chemistry indicates that water quality in the pit lake would remain below NDEP Profile III Pit Lake Water Reference Standard levels and well below established toxicity thresholds for wildlife (Geomega 2015) (see Table 4.1).

Table 4.1 Predicted Vista VIII Total Pit Lake Chemistry (Geomega 2015)

Parameter	NDEP Profile III Pit Lake Water Reference Standard	Years of Infilling 5	Years of Infilling 10	Years of Infilling 25	Years of Infilling 50	Years of Infilling 100	Average Background Groundwater Chemistry from on-Site Piezometers
Aluminum	4.5	0.05	0.05	0.05	0.06	0.09	0.04
Antimony	0.29	0.002	0.002	0.002	0.002	0.004	0.002
Arsenic	0.2	0.02	0.02	0.04	0.04	0.06	0.015
Barium	23.1	0.1	0.1	0.1	0.1	0.2	0.08
Beryllium	2.83	0.0011	0.0011	0.0012	0.0013	0.0021	0.001
Boron	5	0.10	0.11	0.11	0.12	0.19	0.09
Cadmium	0.05	0.001	0.001	0.001	0.001	0.002	0.001
Calcium		49	50	50	55	89	43
Chloride		16	17	17	18	29	14.3
Chromium	1	0.003	0.003	0.004	0.004	0.006	0.003
Copper	0.5	0.006	0.006	0.006	0.007	0.01	0.01
Fluoride	2	0.5	0.5	0.5	0.6	0.9	0.5
Iron		0.10	0.11	0.32	0.32	0.52	0.1
Lead	0.1	0.006	0.006	0.006	0.006	0.01	0.005
Magnesium		21	22	22	24	38	18.6
Manganese	377	0.002	0.002	0.002	0.003	0.004	0.002
Mercury	0.01	0.0006	0.0006	0.0006	0.0007	0.001	0.0006
Nickel	171	0.01	0.01	0.01	0.01	0.01	0.01
Nitrate as N	100	0.05	0.05	0.05	0.1	0.1	0.05

Parameter	NDEP Profile III Pit Lake Water Reference Standard	Years of Infilling 5	Years of Infilling 10	Years of Infilling 25	Years of Infilling 50	Years of Infilling 100	Average Background Groundwater Chemistry from on-Site Piezometers
pH, su	6.5-8.5	8.3	8.3	8.3	8.4	8.5	8.0
Potassium		3.5	3.6	3.6	4.0	6.5	3.1
Selenium	0.05	0.023	0.023	0.023	0.03	0.04	0.02
Silver		0.003	0.003	0.003	0.003	0.005	0.003
Sodium	2000	26	26	26	29	47	23
Sulfate		66	67	68	75	120	58.8
Thalium	0.032	0.0006	0.0006	0.001	0.001	0.001	0.001
Total alkalinity, HCO ₃		229	234	236	259	418	203
Zinc	25	0.007	0.008	0.018	0.017	0.03	0.01

4.2.3 Groundwater Direct and Indirect Impacts

Mine dewatering is currently used to support existing Vista Pit Phase VII operations and is accomplished with the use of dewatering wells located adjacent to the Vista Pit. The maximum dewatering rate for the Vista Pit is estimated to be 9,500 gpm based on the groundwater modeling results (Itasca 2014; Itasca 2015). The Project may include termination of certain existing wells and installation of additional wells to support dewatering requirements of the Project. Additionally, as with the existing Vista Pit Phase VII operation, a pit lake is expected to form in the Vista Pit Phase VIII area when dewatering efforts are terminated and groundwater recovery begins. Mining and post-mining water management assessments are based on the numerical groundwater flow model developed to simulate groundwater conditions at the Twin Creeks Mine and surrounding region (Itasca 2014, 2015).

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 9,500 gpm needed for extending the Vista Pit in accordance with the Proposed Action. 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 4,343 feet AMSL. Direct and indirect impacts from expansion of the Vista Pit would include lowering the groundwater elevation to an ultimate depth of 4,000 feet AMSL and would require dewatering to ensure safe mining conditions (see above). Once dewatering efforts are terminated, groundwater recovery and infilling of the pit is predicted to begin immediately (Itasca 2014, 2015). The Vista Pit Lake is predicted to recover to an ultimate elevation of approximately 4,567 feet AMSL after approximately 400 years of infilling and is predicted to reach its 90 percent recovery threshold at an elevation of approximately 4,510 feet AMSL after approximately 80 years of infilling (Itasca 2014, 2015).

An updated investigation by Geomega (Geomega 2015) coupling field and laboratory data collection with modeling was conducted to predict the water chemistry of the future Vista VIII Pit Lake that would form as a result of the Proposed Action. 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 (0.015 mg/L), which naturally exceeds the standard of 0.01 mg/L.

The relative groundwater flows through the ultimate pit surface (UPS), derived from a regional groundwater model (Itasca 2015), were coupled with the background groundwater chemistry, the surface area, the oxidized thickness of the exposed wall rock, and the cemented rock fill for each geologic model class. These data were used to compute the temporal evolution of the total pit lake water quality (chemogenesis) from a juvenile stage through maturity (100 years), corresponding to 93 percent recovery of the pit lake by elevation.

The modeled total pit lake chemistry (no precipitates allowed) show that all analytes would meet NDEP Profile III pit lake water reference standards even when evapoconcentration is included in the model. The future pit lake would have a flow through component that would exit the west side of the pit through the Valmy Formation. This flow through contains no process water but rather consists entirely of groundwater passing through the pit. This unit has two components, an acid-generating greenstone and a downgradient carbonate-rich propylitic zone 600 feet downgradient from the pit. Chemical reactions in the pit lake would create some common solid phases which would be retained even as the soluble fraction migrates through the Valmy Formation into the surrounding groundwater.

4.2.4 Water Rights

There are no known water rights issues that would be affected by the expansion of the Vista Pit (VIII) and Newmont possesses sufficient water rights for the continued operation of the TCM.

4.2.5 No Action Alternative

Under the No Action Alternative there would be no impacts to surface water resources. Groundwater pumping during mining would continue to occur at a maximum rate of 8,400 gpm. Dewatering for the Vista Pit would be completed in 2016 and groundwater would recover to an elevation of approximately 4,617 AMSL, with 90 percent recovery by 2077. The pit lake would be a hydrologic sink. A pit lake of approximately 41 acres would form (BLM 2011). Evapoconcentration may result in exceedances of applicable Nevada water quality 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).

4.3 Cumulative Impacts

A detailed analysis of the direct and indirect impacts to migratory birds and water resources was conducted earlier in this chapter. Based on the results of the direct and indirect impacts, there are no cumulative impacts expected to migratory birds. Therefore, the cumulative analysis is focused on water resources, specifically water quality and quantity.

The assessment area for the cumulative analysis of water resources as seen on Figure 3.1 Hydrological Study Area, is the same assessment area as used in the 1996 Twin Creeks Mine EIS. The hydrologic modeling for this study area has been updated frequently since that time. BLM most recently studied the potential for cumulative impacts within this study area, in the Twin Creeks Mine Vista Pit Expansion Project EA (Vista VII) (BLM 2011).

The cumulative assessment in the Vista VII EA is incorporated here by reference. The cumulative analysis in that document is found at Chapter 5, beginning on page 5-1, with water resources specifically addressed on pages 5-12 through 5-13.

There has been no change in activity level within the assessment area since Vista VII with respect to those activities that would affect the condition of water resources. Mining under the Vista VII project has commenced since the Vista VII EA was conducted. Therefore, it is now considered a present action versus a proposed action for the purposes of this analysis. It was considered in the Vista VII cumulative analysis, so it does not change the activity level within the assessment area.

To determine how far out into the future to consider cumulative impacts to water resources, the results of the direct and indirect impacts to this resource are used. Dewatering under the proposed action (Vista VIII) would cease after the completion of mining (2021) when groundwater would begin rebounding creating a pit lake. The predicted 90 percent recovery of the pit lake (4,510 feet AMSL) would be complete by the year 2101.

The cumulative impact to water quantity extends the recovery period by 24 years and at 100 percent recovery the water level inside the Vista Pit is projected to be approximately 50 feet lower than was projected under Vista VII. This would be due to mining through the 20K Fault under the proposed action, since the fault acts as a barrier to ground water flow. Throughout the assessment area, groundwater elevations would be similar to the Vista VII levels. The area of predicted additional drawdown does not encompass any areas or surface water features that have not been analyzed in past EIS or EA analyses. Cumulative impacts to surface water are not anticipated.

Water quality in the Vista Pit Lake is predicted to have better quality under this proposed action, than under the Vista VII analyses, since groundwater would flow through the lake versus creating a groundwater sink (Geomega 2015). The groundwater for this lake would flow through the southwestern wall of the pit and terminate in the adjacent Mega Pit Lake, which is predicted to be a groundwater sink. Groundwater quality in the rest of the assessment area would be unchanged from the previous analyses.

5.0 RECOMMENDED MITIGATION and MONITORING

There are no new mitigation or monitoring measures recommended beyond those proposed for implementation under the Proposed Action in Environmental Protection Measures (Section 2.2.18).

6.0 TRIBES, INDIVIDUALS, ORGANIZATIONS, OR AGENCIES CONSULTED

6.1 Native American Consultation

BLM is committed to coordinating and consulting with any affected tribes on all proposed projects on BLM managed public land. For the Vista Pit Expansion Project, BLM contacted 12 tribes seeking input and consultation to identify cultural values, religious beliefs and traditional practices, which could be affected by that project. The following tribes were contacted:

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

The concerns raised from this previous consultation were related to potential impacts to the Shoshone Mike Massacre site. The Fort McDermitt Paiute and Shoshone Tribe attended a site visit to TCM and were assured that the project would not impact the Shoshone Mike Massacre site.

Similar to the Vista Pit VII project development of 2011, the BLM has reviewed the current proposed action (Vista Pit VIII) and determined that as the proposed project poses no expansion of Mine infrastructure, footprint, and is still proposed to be contained entirely within the already approved Project Area boundaries that it would not present any new issues under Native American Religious Concerns.

A consultation meeting was held between the BLM and the Chairman of the Fort McDermitt Paiute and Shoshone Tribe on April 20, 2015 during which the current (Vista Pit VIII) Proposed Action was discussed: The Chairman was informed that the Shoshone Mike Massacre site would not be affected. The Chairman requested an additional project map which was provided in June 2015.

6.2 Coordination and/or Consultation (Agencies)

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

- ✓ US Fish and Wildlife Service
- ✓ Nevada Department of Wildlife
- ✓ Nevada Division of Environmental Protection
- ✓ City of Winnemucca
- ✓ Humboldt County Board of Commissioners

6.3 Individuals and/or Organizations Consulted

- ✓ Humboldt Development Authority
- ✓ Great Basin Resource Watch
- ✓ American Wild Horse Preservation Campaign

6.4 Public Outreach/Involvement

As part of the preparation of the Newmont Twin Creeks Vista VIII Pit Expansion EA, BLM solicited comments in writing from numerous agencies, organizations, and the general public from January 6, 2015 through February 5, 2015.

7.0 LIST OF PREPARERS

7.1 BLM

EA Project Team Leader:	Kathleen Rehberg
Cultural Resources:	Matt Yacubic
Native American Religious Concerns:	Mark E. Hall, Tanner Whetstone
Paleontological Resources:	Matt Yacubic
Minerals:	Kathleen Rehberg
Waste, Hazardous or Solid:	Lorence Busker
Invasive, Non-native Species:	Melanie Rasor
Vegetation:	Rob Burton
Soil:	Rob Burton
Hydrology:	Jeanette Black
Air Quality:	Rob Burton
T&E Species:	Elise Brown
Special Status Species (Plants and Animals):	Elise Brown
General Wildlife Habitat:	Elise Brown
GIS:	Rob Bunkall
Lands with Wilderness Characteristics	Zwaantje Rorex
NEPA Compliance:	Lynn Ricci

7.2 Cooperating Agencies

Other agencies did not request official cooperating agency status on this EA, however there has been ongoing coordination with NDEP and NDOW throughout the development of the EA.

7.3 Third Party Consultants

Cardno, Inc.

Project Manager – Mark Gookin
BSc Civil Engineering
27 Years' Experience

Geology, Minerals – Steve Craig
MSc Economic Geology
40 Years' Experience

Water Quality, Quantity – Jeffrey Davis
MSc Civil and Environmental Engineering
20 Years' Experience

Cultural Resources, Native American Religious Concerns – Harold Brewer

MSc Anthropology

17 Years' Experience

Biological Resource – Chris Hogle

MSc Wildlife Fish and Conservation Biology

12 Years' Experience

NEPA Specialist – Scott Ackert

BSc Environmental Science and Planning

23 Years' Experience

GIS, Graphics – Tyrell Milliron

BA Anthropology

5 Years' Experience

Document Control – Amber Madsen

Project Coordinator

20 Years' Experience

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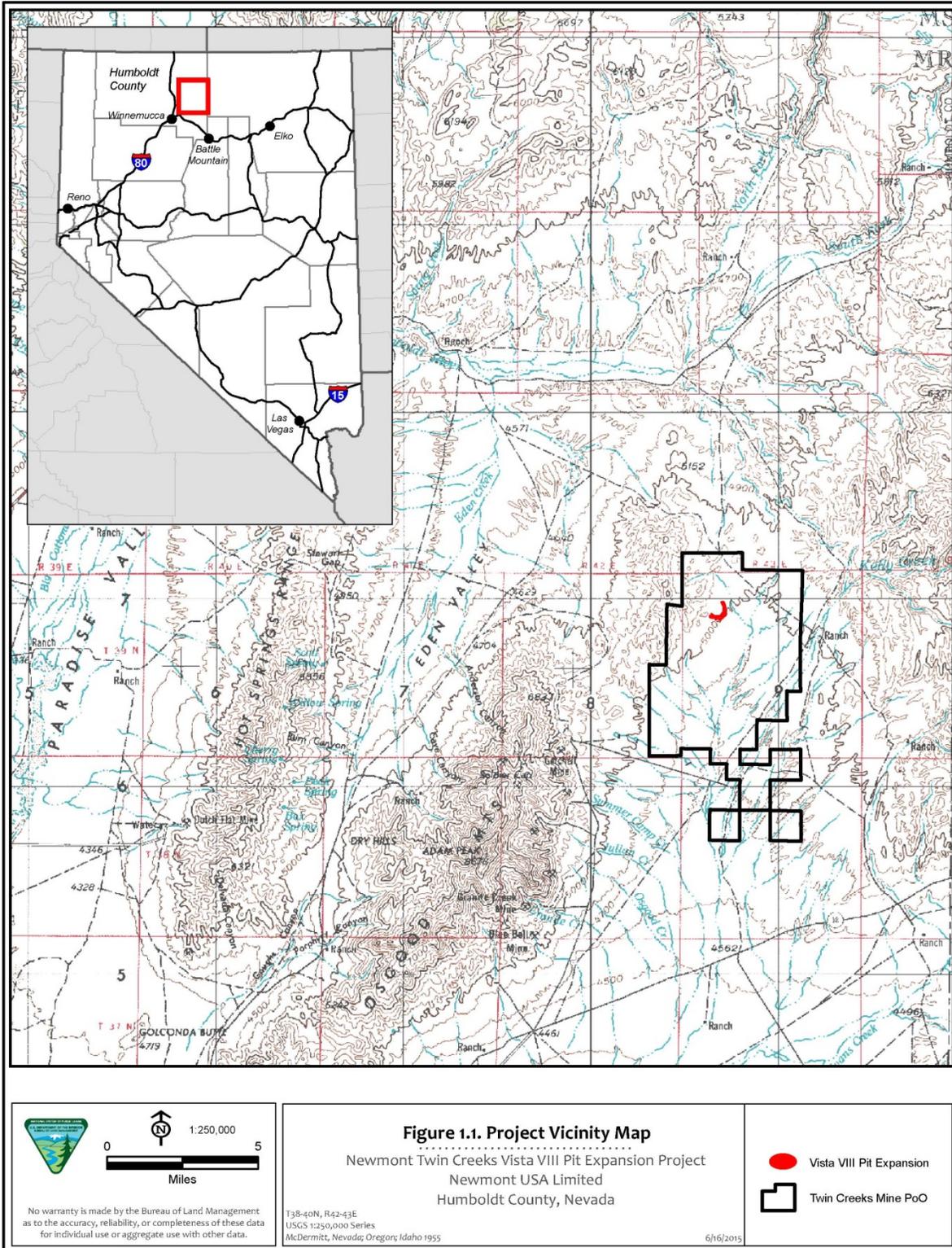
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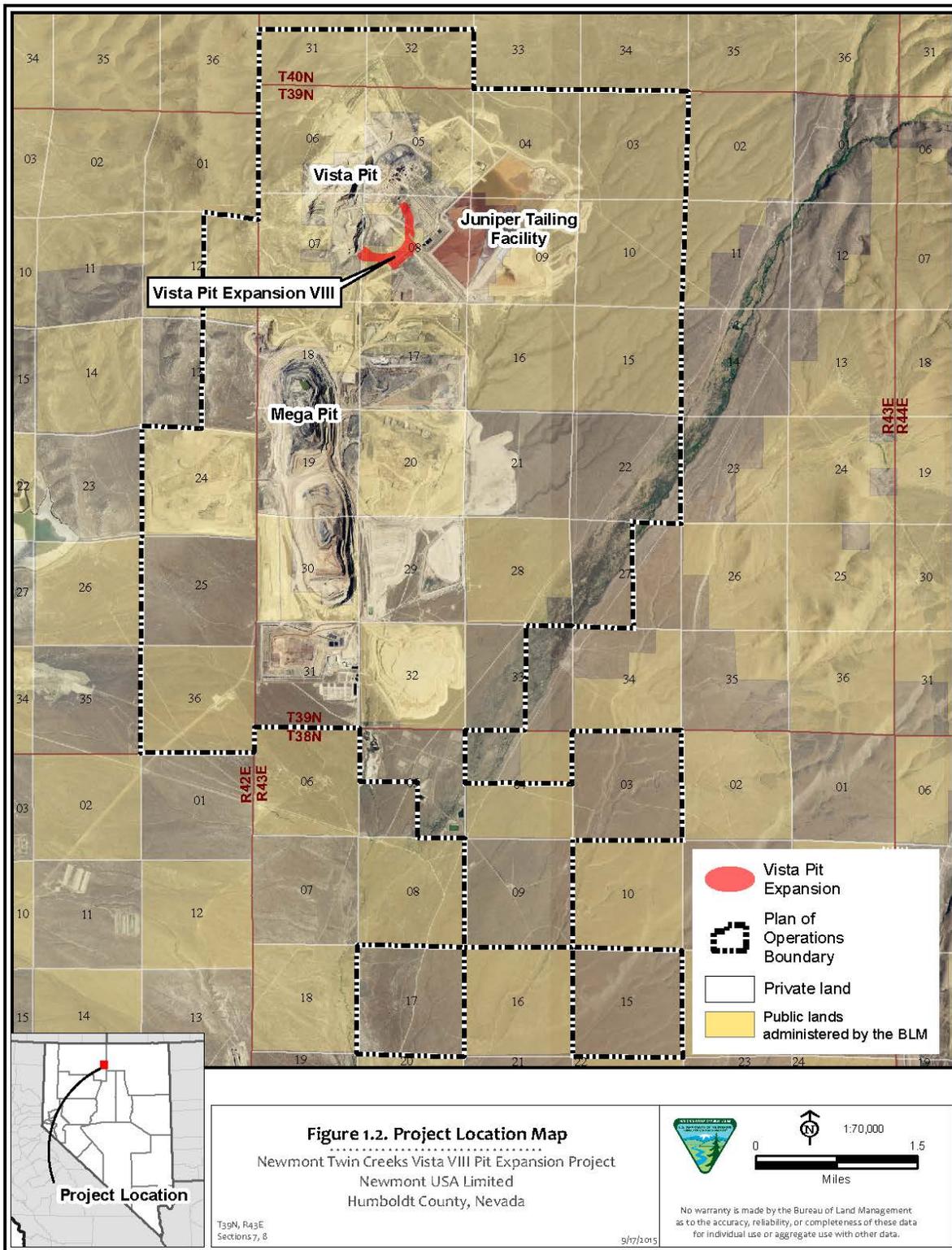
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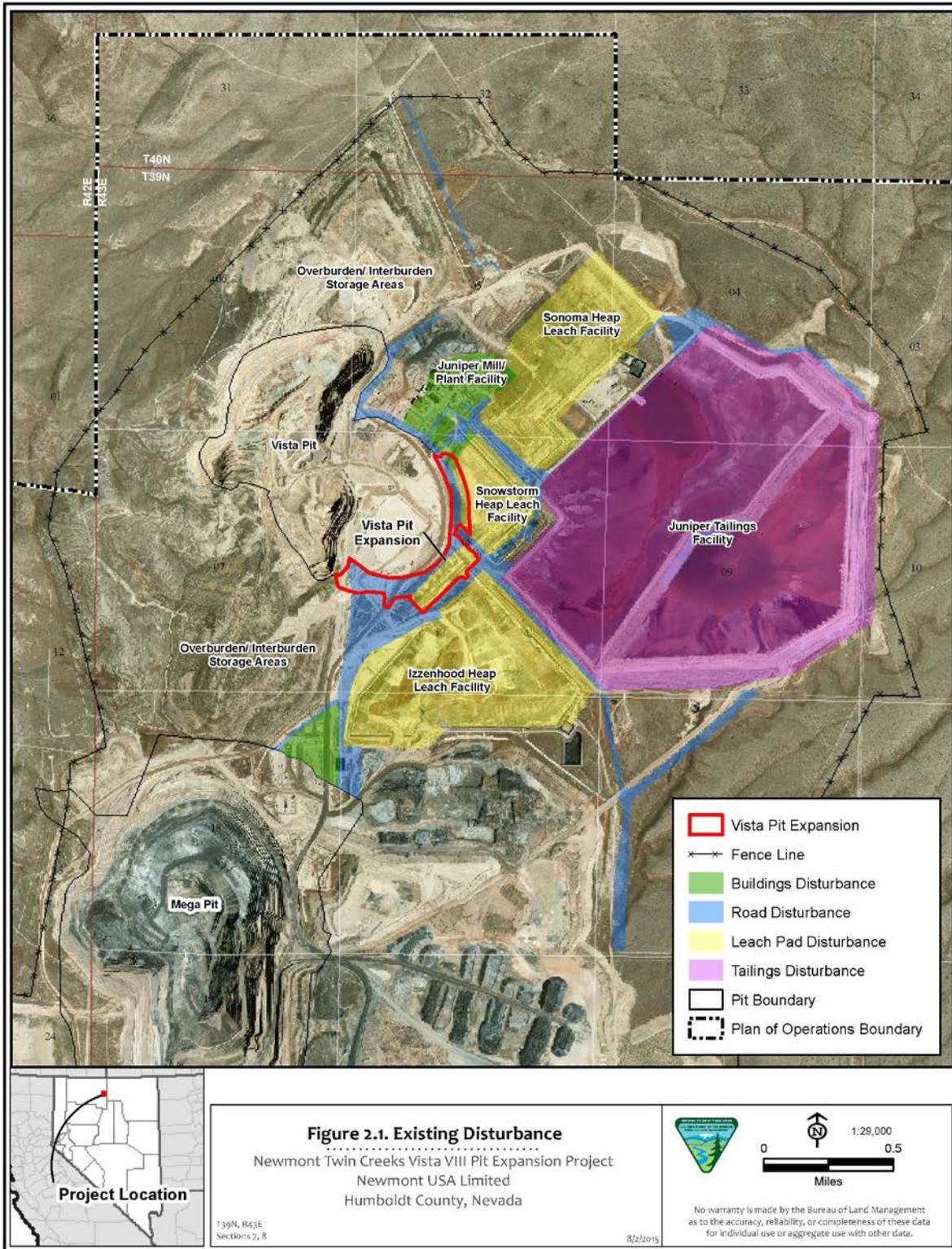
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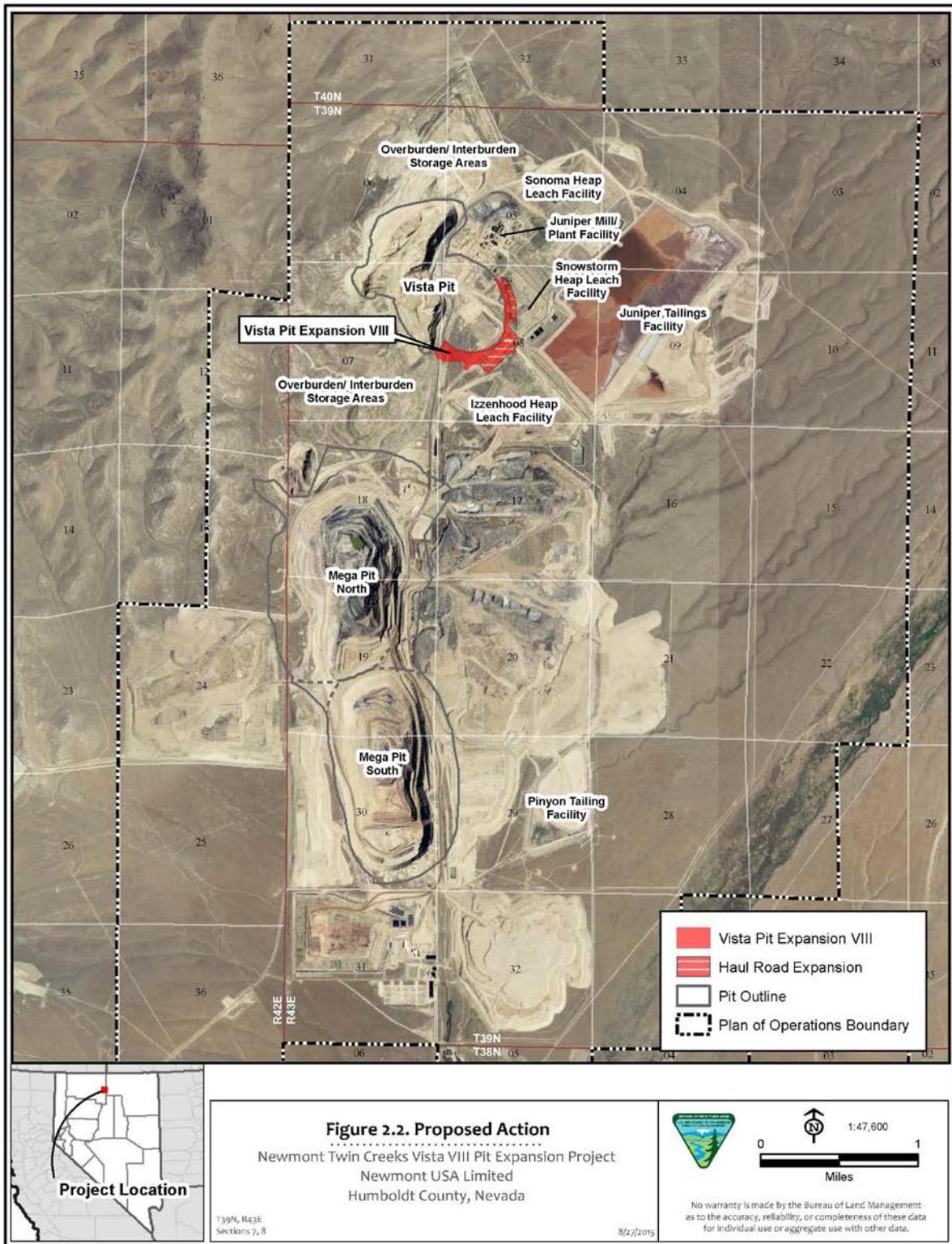
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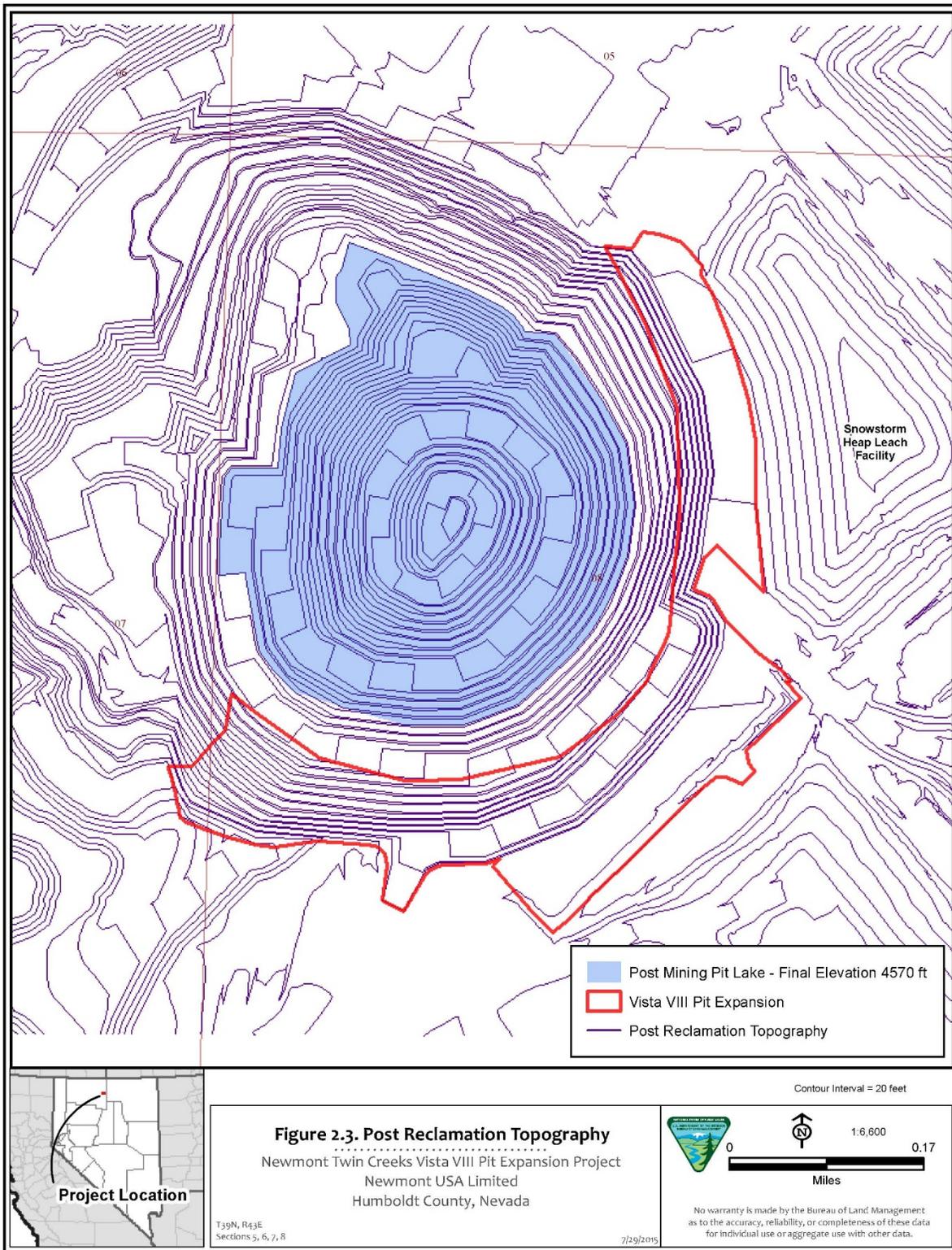
9.0 MAPS











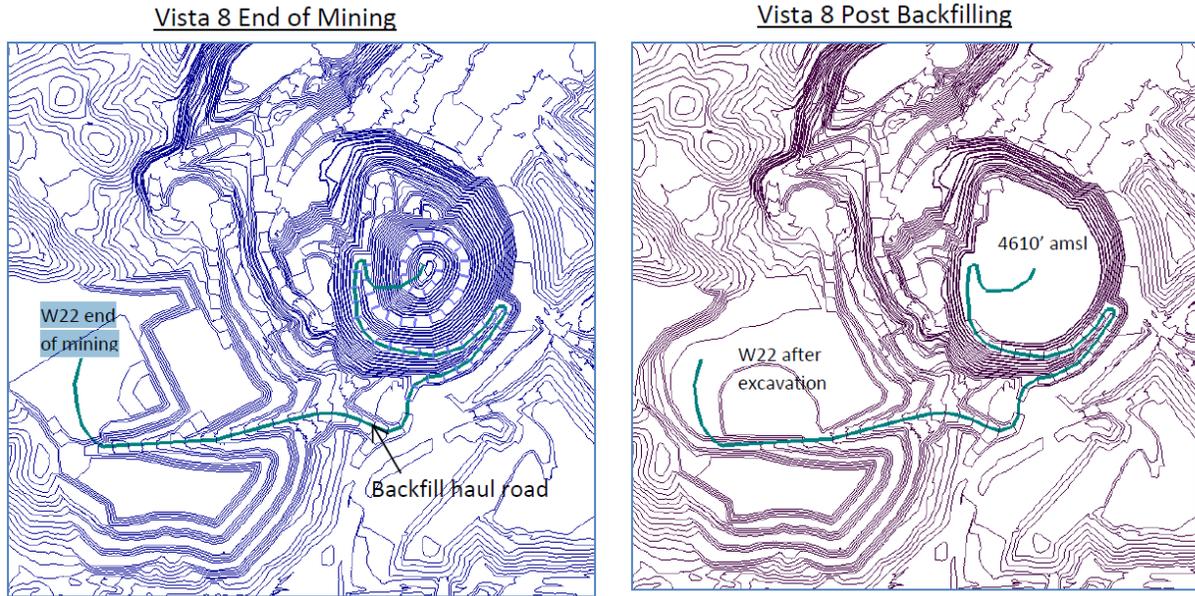
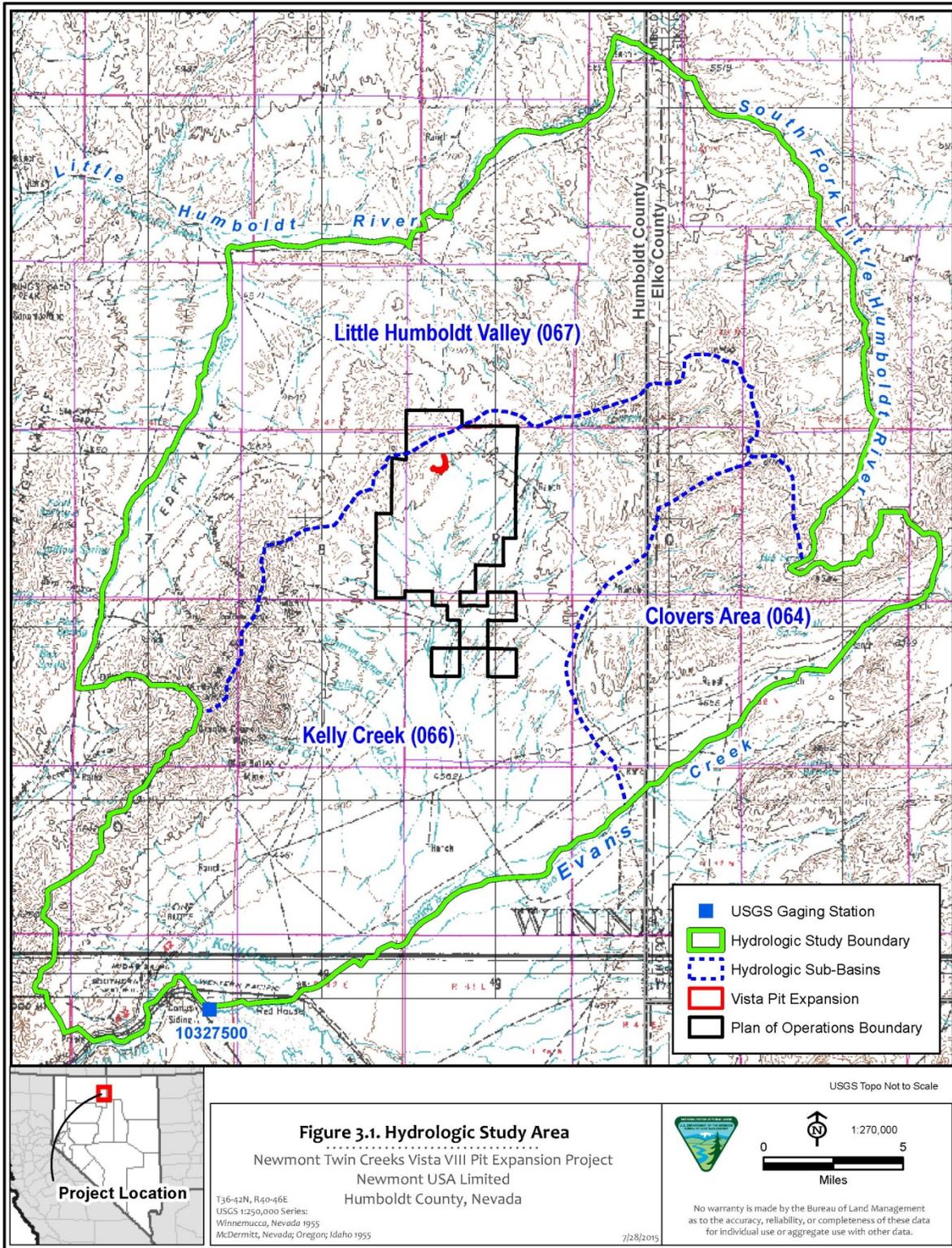


Figure 2.4. Backfill Alternative Ground Surfaces





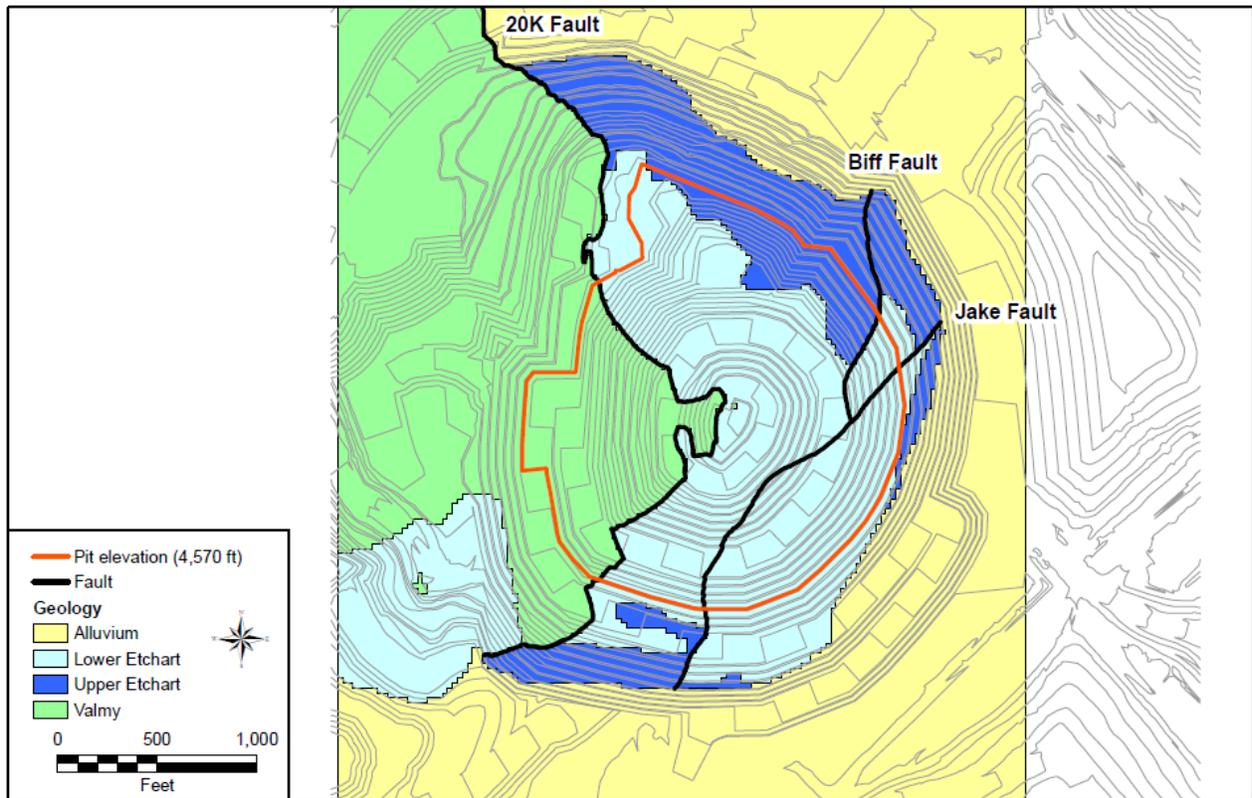


Figure 3.3. Geologic Map of the Vista VIII Ultimate Pit Surface (Geomega 2015).