3.0 Affected Environment and Environmental Consequences

3.1 Introduction

This chapter describes the affected environment and environmental consequences on the affected environment from the Proposed Action and the alternatives. The baseline information used to describe the affected environment was obtained from published and unpublished materials; interviews with local, state, and federal agencies; and from field and laboratory studies conducted in the study area. The affected environment for individual resources was delineated based on the area of potential direct and indirect environmental impacts for the proposed NOA and SOA projects. For resources such as soils and vegetation, the study area was determined to be the physical location and immediate vicinity of the areas of proposed expanded and new disturbance associated with the proposed NOA and SOA projects. For other resources such as water quality, air quality, wildlife, social and economic values, and the transport of hazardous materials, the affected environment was more extensive (e.g., airshed, local communities, etc.).

The environmental consequences analysis in this chapter includes both the direct and indirect impacts of the Proposed Action and the alternatives, as well as potential cumulative project impacts when considered with other non-related actions affecting the same resources. The analysis of potential direct and indirect impacts from the Proposed Action assumed the implementation of design features and ACEPMs (Section 2.4.3, Design Features and Applicant-committed Environmental Protection Measures for the Proposed North and South Operations Area projects). Additionally, proposed monitoring and mitigation measures developed in response to anticipated impacts are recommended by the BLM for individual resources, as discussed at the end of each resource section. This chapter also identifies the residual adverse impacts that would remain after implementation of mitigation measures.

The analyses of cumulative effects disclose the impacts from the Proposed Action and alternatives when considered cumulatively with the impacts of past and present actions and RFFAs impacting the same resources. The spatial extent of the CESA varies by resource discipline and was determined based the location, extent, and type of resource impact. The temporal extent of potential cumulative effects includes the time period wherein the impacts of past and present actions and RFFAs overlap with time period wherein project impacts would occur (including construction, operation, and reclamation phases). The cumulative effects analysis for each resource addresses the potential cumulative effects within each resource-specific CESA.

This chapter is organized by environmental resource. Sections 3.2 through 3.20 describe the existing conditions and potential environmental impacts associated with each resource. The short-term use of the environment relative to the long-term productivity of resources is discussed in Section 3.21. Unless otherwise noted on a resource-specific basis, short-term is defined as the 25-year construction and operational life of the Proposed Action and also includes the initial years of the reclamation period. For the Reconfiguration Alternative and WRM Alternative, short-term is defined as the 15-year construction and operational life including the initial years of the reclamation period. Long-term impacts are defined as impacts that would include the remainder of reclamation and continue post-reclamation (i.e., beyond 25 years for the Proposed Action; beyond 15 years for the Reconfiguration and WRM alternatives). The NOA- and SOA-specific timelines are presented in Section 2.4, Proposed Action, Section 2.5.1, Reconfiguration Alternative, and Section 2.5.2, WRM Alternative. The irreversible or irretrievable commitment of resources is described in Section 3.22. Energy requirements of the proposed NOA and SOA projects, including the production of GHG emissions is presented in Section 3.23.

To comply with NEPA, and in accordance with the BLM NEPA Handbook (H-1790-1) (2008a) and with further guidance provided in IM No. NV-2009-030, the BLM is required to address specific elements of the human environment that are subject to requirements specified in statute, regulation, or Executive Order (EO) (i.e., supplemental authorities). **Table 3.1-1** lists those resources regulated by supplemental authorities that could be potentially impacted by the proposed NOA and SOA projects. **Table 3.1-2** lists the potentially impacted resources that are not governed by supplemental authorities. These tables also indicate which of the potentially impacted resources are not analyzed in detail in this EIS and the rationale for their elimination from detailed analysis.

Table 3.1-1 Resources Regulated by Supplemental Authorities and Rationale for Analysis in the EIS

Resources Subject to Supplemental Authority[1]	Not Present[2]	Present/Not Affected	Present/May be Affected[3]	EIS Section/Rationale/Authority
Air Quality			X	Section 3.14. Clean Air Act, as amended (42 USC 7401 et seq.); Section 176 (c) CAA – General Conformity.
Area of Critical Environmental Concern	X			Would not be affected. Resource not present in or near the proposed NOA and SOA projects. Federal Land Policy and Management Act of 1976 (43 USC 1701 et seq.).
Cultural/Historical			X	Section 3.12. National Historic Preservation Act, as amended (16 USC 470).
Environmental Justice			X	Section 3.18. EO 12898 “Federal Actions to Address Environmental Justice in Minority and Low-Income Populations” 2/11/94.
Farmlands Prime or Unique	X			Would not be affected. Resource not present in or near the proposed NOA and SOA projects. Surface Mining Control and Reclamation Act of 1977 (30 USC 1201 et seq.). Farmland Protection Policy Act (7 USC 4202 et seq.).
Noxious Weeds/ Invasive Non-native Species			X	Section 3.6. EO 13112 Invasive Species 2/3/99.
Native American Religious Concerns			X	Section 3.13. American Indian Religious Freedom Act of 1978 (42 USC 1996).
Floodplains	X			Would not be affected. Resource not present in or near the proposed NOA and SOA projects. EO 11988, as amended “Floodplain Management” 5/24/77.
Riparian/Wetlands			X	Sections 3.3 and 3.5. EO 11990 “Protection of Wetlands” 5/24/77.

Table 3.1-1 Resources Regulated by Supplemental Authorities and Rationale for Analysis in the EIS

Resources Subject to Supplemental Authority[1]	Not Present[2]	Present/Not Affected	Present/May be Affected[3]	EIS Section/Rationale/Authority
Federally Listed Threatened, Endangered Species including Bald and Golden Eagles			X	Section 3.8. Endangered Species Act of 1973, as amended (16 USC 1531). Bald and Golden Eagle Protection Act (16 USC 668 et seq.)
Migratory Birds			X	Section 3.7. EO 13186 "Migratory Birds"; Migratory Bird Treaty Act (16 USC 703-711).
Waste – Hazardous/Solid			X	Section 3.20. Resource Conservation and Recovery Act of 1976 (42 USC 6901 et seq.); Comprehensive Environmental Response, Compensation, and Liability Act of 190, as amended (42 USC 9615).
Water Quality			X	Section 3.3. Safe Drinking Water Act, as amended (42 USC 300f et seq.); Clean Water Act of 1977 (33 USC 1251 et seq.).
Wild and Scenic Rivers	X			Would not be affected. Resource not present in or near the proposed NOA and SOA projects. Wild and Scenic Rivers Act, as amended (16 USC 1271).
Wilderness			X	Impacts to the Jarbidge Wilderness are analyzed in Section 3.14 as the only impacts to wilderness values may occur from air quality impacts. FLPMA 1976 (43 USC 1701 et seq.); Wilderness Act of 1964 (16 USC 1131 et seq.).
Wild Horses and Burros			X	Section 3.10. Wild Free-Roaming Horse and Burro Act of 1971 (16 USC 1331-1340).
Forests and Rangelands (Healthy Forests Restoration Act only)	X			Would not be affected. Resource not present in or near the proposed NOA and SOA projects. Healthy Forests Restoration Act of 2003 (P.L. 108-148).

Table 3.1-1 Resources Regulated by Supplemental Authorities and Rationale for Analysis in the EIS

Resources Subject to Supplemental Authority[1]	Not Present[2]	Present/Not Affected	Present/May be Affected[3]	EIS Section/Rationale/Authority
Lands with Wilderness Characteristics	X			Would not be affected. Resource not present in or near the proposed NOA and SOA projects. An update was made to the wilderness characteristics inventories for Intensive Inventory unit NV-040-024-1 in 2011, units NV-040-026-1, NV-040-035-1, NV-040-035-2, NV-040-036-1, NV-040-036-2, NV-040-037-2 in 2012, and unit NV-040-023-1 in 2013 by the Ely District Wilderness Planner and the units in which the project occurs were found to not possess wilderness character. FLPMA 1976 (43 USC 1701 et seq.); Wilderness Act of 1964 (16 USC 1131 et seq.).
Human Health and Safety			X	Section 3.20. The transportation and storage of hazardous materials, and the storage of blasting agents and explosives would be performed in accordance with NDEP, MSHA, BATF, Department of Homeland Security, CERCLA, SARA, NDOT, and USDOT regulations (where applicable).

[1] See H-1790-1 (January 2008) Appendix 1 Supplemental Authorities to be Considered (BLM 2008a).

[2] Supplemental authorities determined to be not present or present/not affected need not be carried forward for analysis or discussed further in this EIS.

[3] Supplemental authorities determined to be present/may be affected must be carried forward for analysis in this EIS.

Source: BLM 2008a.

Table 3.1-2 Other Potentially Impacted Resources and Rationale for Analysis in the EIS

Other Resources	Not Present[1]	Present/Not Affected	Present/May be Affected	EIS Section/Rationale
Livestock Management			X	Section 3.9/Present in areas proposed for development
Land Use Authorization			X	Section 3.15/Present in areas proposed for development
Minerals			X	Section 3.2/Present in areas proposed for development
Paleontological Resources			X	Section 3.11/Present in areas proposed for development
Recreation			X	Section 3.16/Present in areas proposed for development
Social and Economic Values			X	Section 3.17/Present in areas proposed for development
Soils			X	Section 3.4/Present in areas proposed for development
Non-federally Listed Special Status Species (includes wildlife and plant species)			X	Section 3.8/Present in areas proposed for development
Vegetation			X	Section 3.5/Present in areas proposed for development
Visual Resources			X	Section 3.19/Present in areas proposed for development
Water Quantity			X	Section 3.3/Present in areas proposed for development
Wildlife			X	Section 3.7/Present in areas proposed for development

[1] Other resources determined to be not present or present/not affected need not be carried forward for analysis or discussed further in this EIS based on the rational provided.

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3.2 Geology and Mineral Resources

The study area for geology and mineral resources is defined as the proposed NOA and SOA projects. The CESA for geology and mineral resources is limited to the Regional Exploration Plan of Operations boundary.

3.2.1 Affected Environment

Mining in the Bald Mountain area began in 1869 with the discovery of copper, antimony, silver and gold adjacent to a Jurassic granitic intrusion south of Big Bald Mountain (Hose and Blake 1976). In 1976, exploration for Carlin-type gold deposits associated with jasperoid resulted in the discovery of disseminated gold deposits in the Devonian-Mississippian Pilot Shale along Alligator Ridge. Exploration and development since 1976 has expanded the gold deposits in the Bald Mountain area and in the Alligator Ridge area to the extent that both mineralized areas are now encompassed by the Bald Mountain-Alligator Ridge mining district. Since 1980, 26 open pits have been developed in the district, with the largest being the Top Pit/Sage deposit in the Bald Mountain area.

The study area includes the existing BMM and Casino/Winrock Mine deposits (located in the NOA), and the existing Alligator Ridge Mine and Yankee Mine deposits (located in the SOA) including the Yankee, Gator, Luxe, and Vantage deposits. The geology and gold deposits within the existing and proposed NOA are distinctly different from those within the existing and proposed SOA. A review of the geology and mineralization within the study area is summarized in the following sections.

3.2.1.1 Physiography and Regional Geology

The study area is located approximately 65 miles northwest of Ely, Nevada, in an area of uplifted Paleozoic through Tertiary rocks. The study area is part of a corridor of northwest-southeast directed Tertiary extension in the Basin and Range province of Nevada. The study area is characterized by two north-trending uplifted blocks, the Bald Mountain-Buck Mountain Ridge on the west and Alligator Ridge on the east, separated by a fault valley that encompasses Mooney Basin, the Alligator Ridge deposits, and the Yankee and Vantage deposits.

Bald Mountain is part of the southern end of the East Humboldt Range-Ruby Mountain core complex (Nutt et al. 2000). Crustal extension began in the Paleocene/Eocene and was followed by rapid uplift of the Ruby Mountain area during the Oligocene and Miocene (McGrew and Snee 1994; Nutt et al. 2000). Uplift in the Ruby Range area has resulted in the exposure of the Jurassic Bald Mountain stock and adjacent Cambrian and Ordovician sedimentary rocks. Later Paleozoic and Tertiary rock units are found in Mooney Basin, a structural basin between the Bald Mountain–Buck Mountain Ridge and Alligator Ridge.

The Bald Mountain Mining District was an area of shallow marine deposition during the Paleozoic Era, but experienced deformation during the late Paleozoic Antler and Humboldt orogenies, plutonic intrusion during the Jurassic Period, deformation during the early Tertiary Sevier orogeny, and Basin and Range crustal extension and volcanism during the Tertiary Period. Jurassic plutonic intrusion, Tertiary extension, uplift of the East Humboldt Range-Ruby Range core complex, and Tertiary volcanism have played the key roles in formation of the gold deposits in the Bald Mountain Mining District.

3.2.1.2 Geology and Mineral Deposits of Bald Mountain Mining District

The Bald Mountain Mining District falls along the southeastern extension of the Carlin trend (Nutt et al. 2000). The district contains two separate but adjacent mineral trends: 1) the northwest-southeast Bida trend that parallels the Carlin trend; and 2) the Yankee-Alligator Ridge-Mooney Basin trend that follows the north-northeast trend of the structural basin between the Bald Mountain-Buck Mountain Ridge and Alligator Ridge. The geology and stratigraphy including alterations and mineralization within the Bald

Mountain Mining District are illustrated in **Figures 3.2-1** and **3.2-2**, respectively. As illustrated in **Figure 3.2-1**, the geology of the district is quite complex and consists of a variety of reactivated folds and faults that serve to localize the gold deposits.

The Bida trend is a northwest-southeast structural trend that encompasses the Bald Mountain stock and gold deposits associated with the intrusion of this Jurassic quartz monzonite stock (Nutt et al. 2000). The gold deposits are disseminated along high-angle structures in the Jurassic stock and in the adjacent Cambrian and Ordovician sedimentary rocks. Gold is associated with pyrite, arsenopyrite, marcasite, and argillic alteration. Mineralized limestones have garnet-epidote skarns with associated tungsten, molybdenum, and zinc (Nutt et al. 2000). The deposits were formed at a depth of 3 to 6 km from magmatic fluids associated with the intrusion of the Bald Mountain stock during the Jurassic. The RBM deposit is a higher level deposit in Mississippian clastic sedimentary rocks. Productive ore zones are found at the contact between the Eldorado Limestone-Geddes Limestone and the Secret Canyon Shale, along the contact between the Hamburg Limestone and the Dunderberg Shale, and in the upper part of the Pogonip Group (**Figure 3.2-2**). Uplift of the Bald Mountain area during the Tertiary exposed these gold deposits to erosion and set the stage for discovery and development of gold resources within the Bald Mountain Mining District. **Figure 3.2-3** illustrates the Bida trend within the study area.

The Mooney Basin-Alligator Ridge-Yankee trend consists of gold deposits that are typical of Carlin-type gold deposits and consist of disseminated gold associated with jasperoid, decalcification, sericite, and clay alteration. Gold is found with pyrite, sphalerite, arsenopyrite, marcasite, realgar, orpiment, stibnite, and barite. The deposits are often associated with reactivated Mesozoic faults and fractures, are localized along the edges of folds, and are stratabound in the Pilot Shale in a zone 100 to 200 feet in thickness (Nutt et al. 2000). Most deposits are associated with jasperoid in the underlying Guilmette Formation. These deposits are Eocene-Oligocene (Tertiary) in age and formed in a shallow, epithermal hot spring environment (Nutt et al. 2000) along a Basin and Range structural basin. Thus, these deposits are considerably younger than the gold deposits with the BMM area. **Figure 3.2-4** illustrates the Mooney Basin-Alligator Ridge-Yankee trend within the study area.

From 1980 to 2006, the deposits within the Bald Mountain Mining District have yielded 2 million ounces of gold from 400 MT of resource mined, of which 80 MT were ore and the rest waste rock (BLM 2009a).

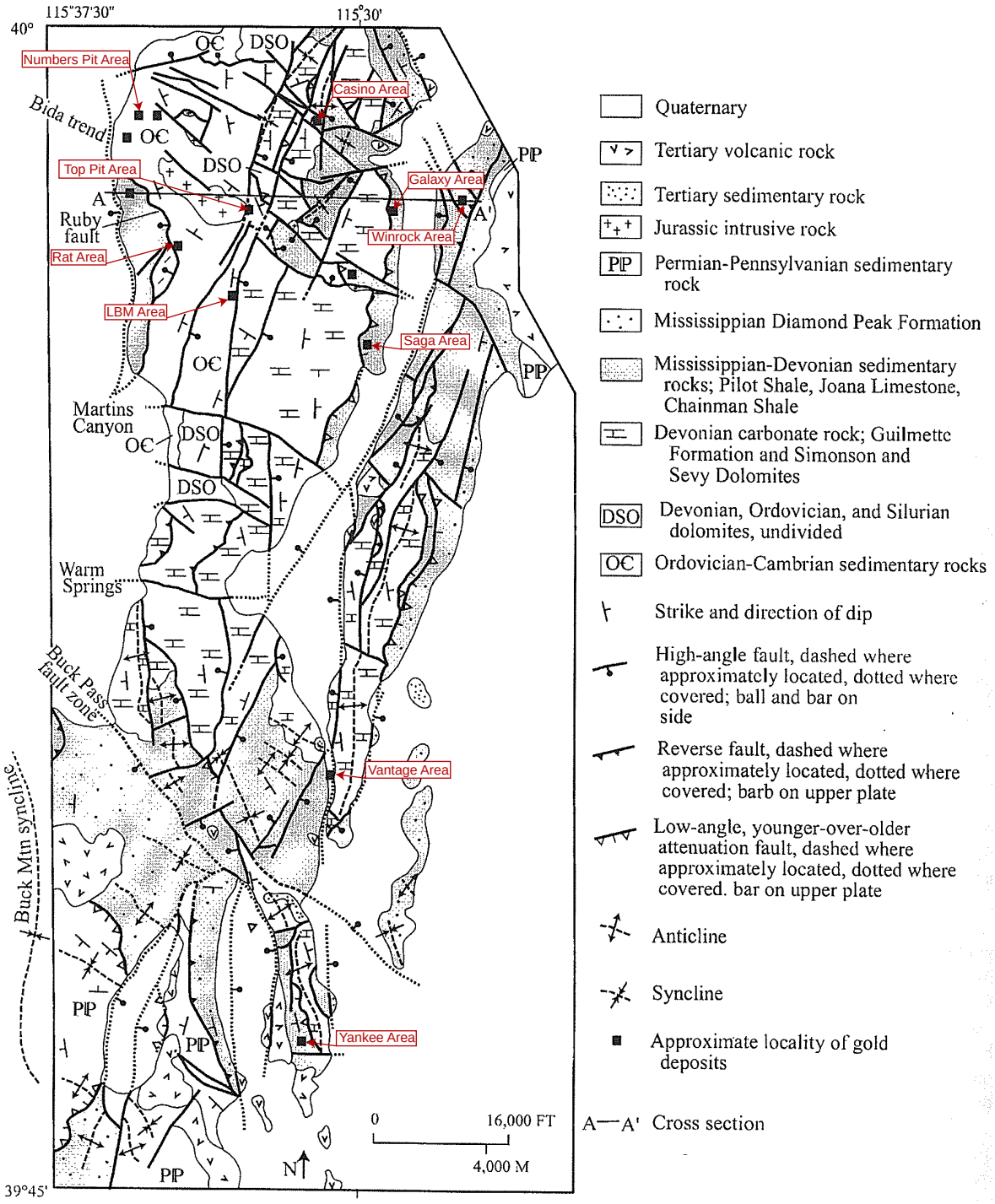
3.2.1.3 Geothermal, Oil and Gas, Coal, and Non-Metallic Mineral Resources

Oil and gas resources have been identified within the Newark and Long valleys. Two types of targets have been identified: 1) unconformity targets where a structural trap is sealed by volcanics; and 2) upper Paleozoic targets in structural traps between the Diamond Peak and Chainman Shale formations (BLM 2009a). Oil seeps have been noted in association with some of the gold deposits in the Yankee area; potential resource estimates include 97 million barrels of oil and 59 billion cubic feet of gas (BLM 1995).

Non-metallic resources are limited to sand and gravel deposits within the Mooney Basin that provide material for local road construction. No geothermal resources or coal resources have been identified within the study area.

3.2.1.4 Geologic Hazards

The main geologic hazard within the study area would be from seismic activity that may affect mine pit wall stability or the stability of RDAs and HLFs. **Figure 3.2-5** illustrates the location of historic seismic activity within the study area. Earthquakes up to a magnitude of 3.99 have occurred within the study area.



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

Bald Mountain Mine North and South Operations Area Projects EIS

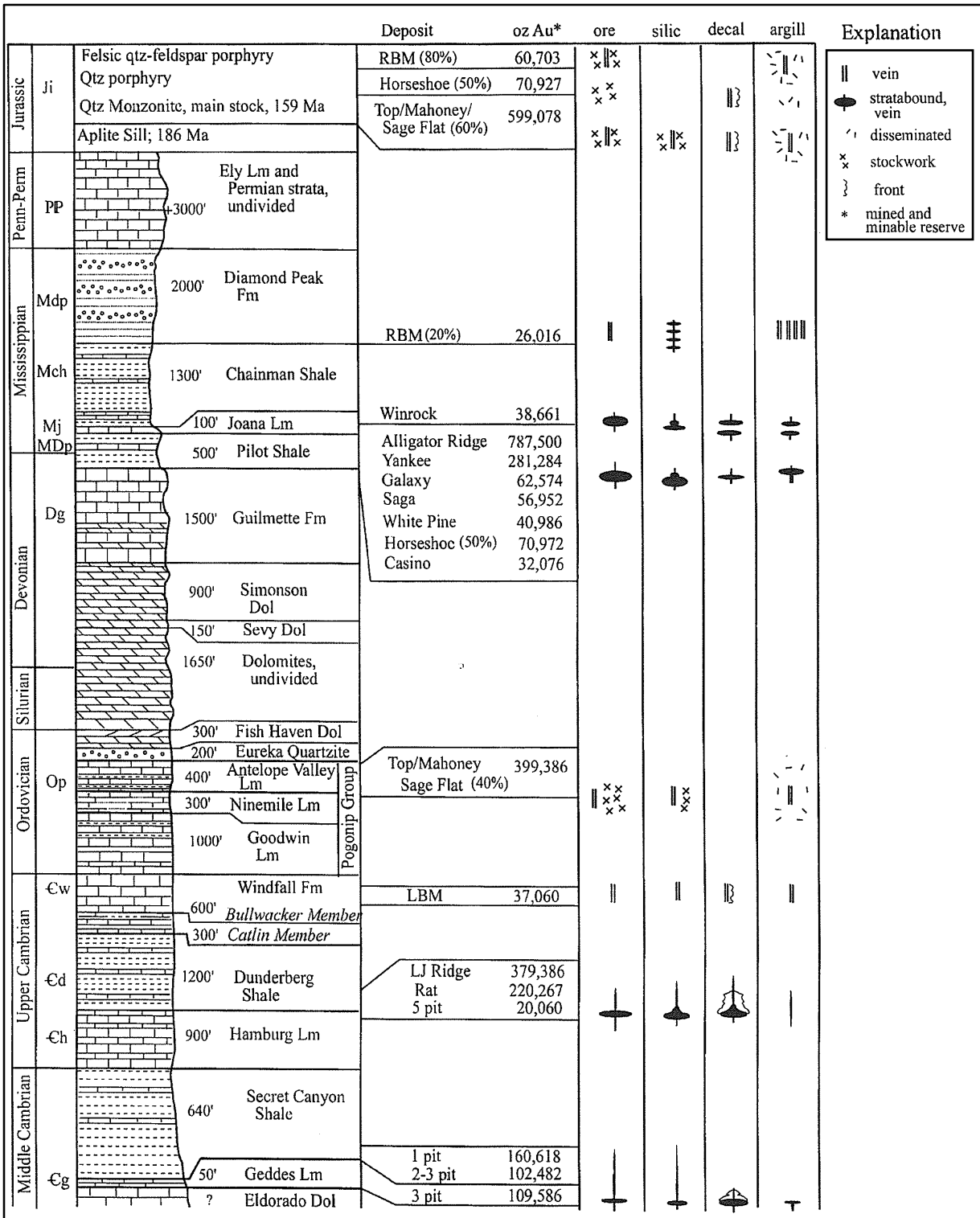
Figure 3.2-1

Geology within the Bald Mountain Mining District

Source: Nutt et al. 2000.

BLM

Ely District Office



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

Bald Mountain Mine North and South Operations Area Projects EIS

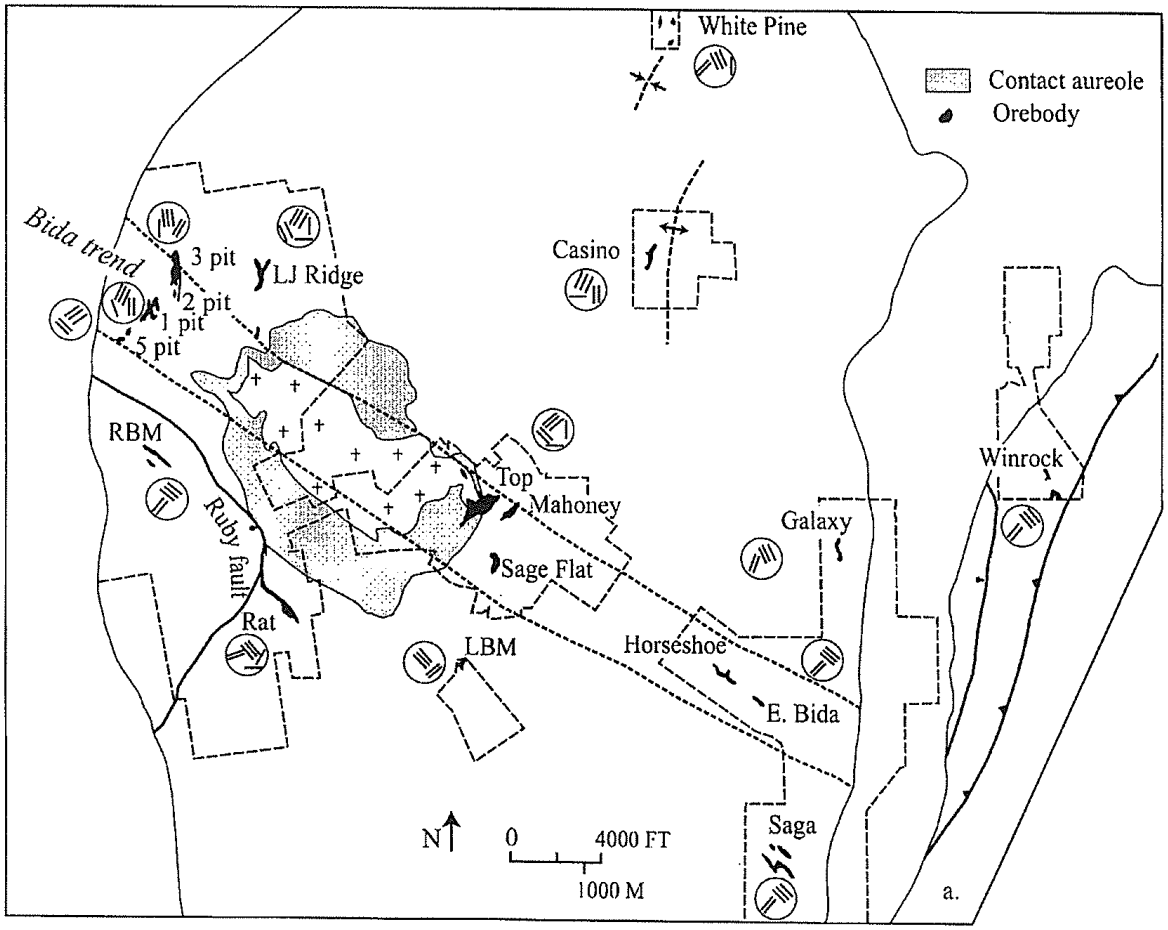
Figure 3.2-2

Stratigraphic Column within the Bald Mountain Mining District

Source: Nutt et al. 2000.

BLM

Ely District Office



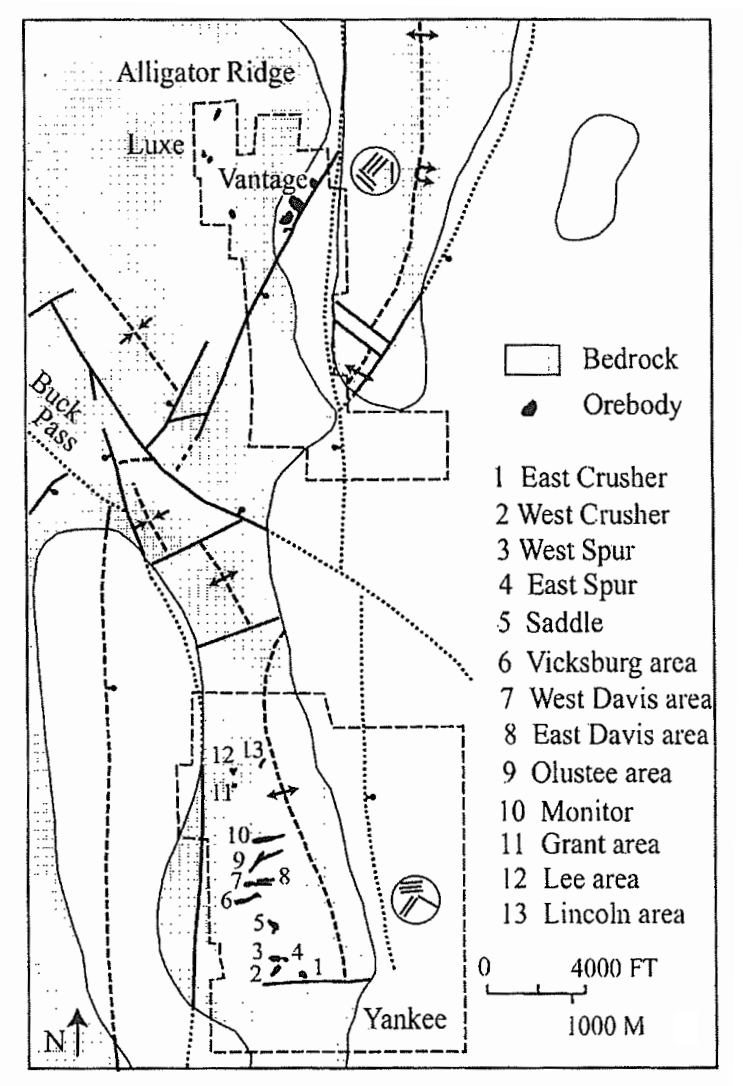
Note: No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual use or aggregate use with other data. Original data were compiled from various sources. This information may not meet National Map Accuracy Standards. This product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

Bald Mountain Mine North and South Operations Area Projects EIS

Figure 3.2-3

Bida Trend within the Study Area

Note: The circle encloses the strike of the structural controls; primary three lines, secondary two lines, tertiary one line.
Source: Nutt et al. 2000.



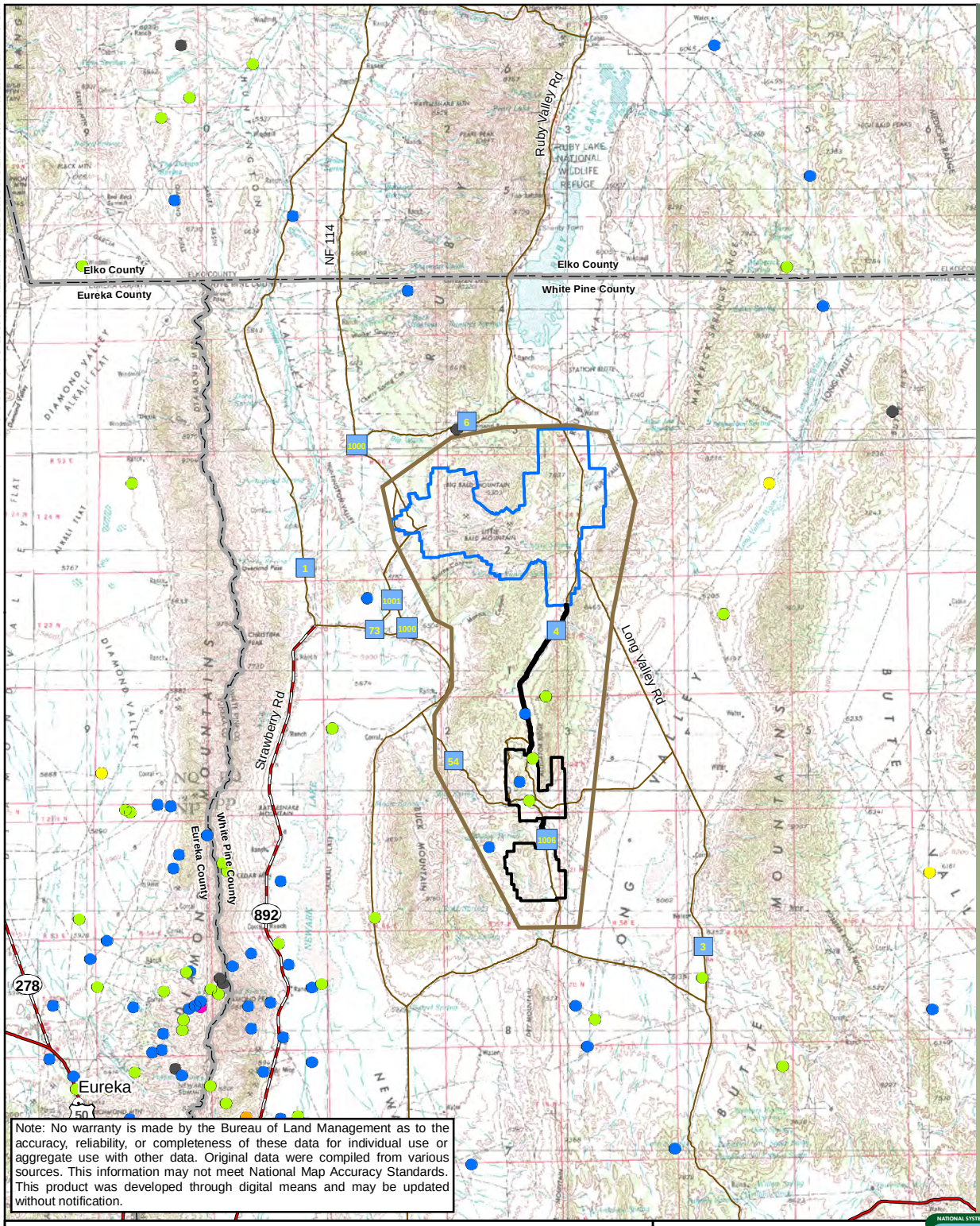
Note: No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual use or aggregate use with other data. Original data were compiled from various sources. This information may not meet National Map Accuracy Standards. This product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

Bald Mountain Mine North and South Operations Area Projects EIS

Figure 3.2-4

Mooney Basin-Alligator Ridge-Yankee Trend within the Study Area

Note: The circle encloses the strike of the structural controls; primary three lines, secondary two lines, tertiary one line.
Source: Nutt et al. 2000.



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

Legend

- Proposed NOA Plan Boundary
- Proposed SOA Plan Boundary
- Regional Exploration Boundary

Magnitude

- 0-.99
- 1-1.99
- 1.99-2.99
- 2.99-3.99
- 3.99-4.99
- 4.99-5.99

Source: BLM 2009a.

Bald Mountain Mine North and South Operations Area Projects EIS

Figure 3.2-5

Seismic Activity within the Project Area

0 1 2 3 4 5 10 Miles

N

BLM

Ely District Office

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12/21/2015

A magnitude 6.0 earthquake occurred in 1872 approximately 82 miles from the study area. In 2008, a magnitude 6.0 earthquake occurred in northern Nevada, placing the epicenter approximately 85 miles north-northeast of the study area. No damage was observed to any of the mine facilities, although the earthquake was felt by some mine employees (BLM 2009a).

The study area has been classified as a Zone II seismic risk area (BLM 2009a; NOAA 1973). A Zone II classification indicates that moderate damage is possible and would include damage to masonry, chimneys, loose bricks, stones, and plaster and possible cave-ins along gravel banks. Pit walls, and HLF and RDA slopes also may be affected. An evaluation of the stability of the 2/3 HLF was conducted by AMEC (AMEC 2000). This analysis indicated that the 2/3 HLF, which is constructed on alluvial material, would safely withstand an operational basis earthquake assumed to be a 10 percent, 100-year event (BLM 2009a). Buildings within the study area are not designed to a specific seismic standard and were inspected following a seismic event felt within the study area and exhibited no damage (BLM 2009a).

3.2.2 Environmental Consequences

This section discusses project-related impacts to geology and mineral resources resulting from the Proposed Action, Reconfiguration Alternative, WRM Alternative and No Action Alternative. Primary issues related to geology and mineral resources include: 1) permanent removal of a mineral resource; 2) permanent disposal of reclaimed RDAs on BLM-administered land; 3) permanent presence of reclaimed HLFs on BLM-administered land; and 4) remaining post-mining open pits.

3.2.2.1 Proposed Action

As summarized in **Table 3.2-1**, under the Proposed Action, 198 MT of ore would be removed from the proposed NOA; and 80 MT of ore would be removed from the proposed SOA. This ore would be placed on leach pads in the HLFs and become leach material. Removal of this ore would entail the extraction of 887 MT of waste rock material within the proposed NOA and 276 MT of waste rock material within the proposed SOA. Processing the ore from the geologic units would result in a permanent loss or reduction in the mineral resource potential of the proposed NOA and SOA. The distribution and estimation of leach material and waste rock material volumes to or from each proposed open pit, RDA, and HLF are presented in Section 2.4.1, North Operations Area Project, and Section 2.4.2, South Operations Area Project.

Under the Proposed Action, implementation of surface disturbance associated with open pits, RDAs, and HLFs would affect approximately 3,181 acres within the proposed NOA; and approximately 1,971 acres within the proposed SOA. Impacts to geology and mineral resources would include the potential loss of access to future mineral resources as a result of permanent placement of the proposed RDAs and HLFs. It is anticipated that these surface disturbances would have a minor effect on potential future access to remaining ore.

Open pit mining disturbances, and construction or expansion of the RDAs, and HLFs would permanently alter the natural topographic and geomorphic features. The open pits would not be reclaimed (the Redbird Pit, Top Pit Complex, and Yankee Pit would be partially backfilled) while the RDAs and HLFs would be reclaimed but still alter the topography and geomorphology of the study area. Temporary facilities such as haul roads, GMSs, process facilities, and ancillary and support facilities would be reclaimed to the approximate pre-mining topography.

Table 3.2-1 Estimated Volumes of Ore and Waste Rock for the Proposed Action, and Reconfiguration and WRM Alternatives

Facility/Area	Proposed Action		Reconfiguration Alternative		WRM Alternative	
	Leach Material (MT)	Waste Rock Material (MT)	Leach Material (MT)	Waste Rock Material (MT)	Leach Material (MT)	Waste Rock Material (MT)
North Operations Area (NOA)						
Redbird Pit	53	367	53	367	3	33
Top Pit	42	303	42	303	42	303
Casino Pit	6	17	0	0	0	0
Royale Pit	16	48	0	0	0	0
Poker Flats Pit	23	28	23	28	23	28
Duke and South Duke Pits[1]	21	74	-	-	-	-
Duke Pit	-	-	9	15	9	15
South Duke Pit	-	-	0	0	0	0
Winrock Pits	34	45	34	45	34	45
Bida Pit	4	5	4	5	4	5
LBM Pit	0	0	0	0	0	0
LJR 1 Pit	0	0	0	0	0	0
LJR 2 Pit	0	0	0	0	0	0
Rat Pit	0	0	0	0	0	0
Total (NOA)	**198**	**887**	**165**	**763**	**115**	**429**
South Operations Area (SOA)						
Vantage and Luxe	48	200	48	200	48	200
Gator	9	4	9	4	9	4
Yankee	23	72	23	72	23	72
Total (SOA)	**80**	**276**	**80**	**276**	**80**	**276**
Total	**279**	**1162**	**245**	**1039**	**195**	**705**

[1] Volumes for Duke and South Duke Pits were grouped together for Proposed Action.

[2] Vantage and Luxe material volumes were grouped together by operation area versus individual pit.

Values rounded to nearest MT.

Pit Slope Stability

The Proposed Action includes the expansion or development of 15 open pits (6 new pits and 9 expanded pits). As described in Section 2.4, some of the pits would be partially backfilled with waste rock prior to closure and other pits would not be backfilled. Barrick would develop the pit slope designs for each pit prior to initiation of mining based on geological and geotechnical information, evaluation of the geologic model and slope stability analysis. Additional data acquisition, management and maintenance activities would occur as mining progresses based on the actual geologic conditions encountered and pit wall performance is verified. Following mining, pit slope monitoring ceases and the pit slopes are allowed to fail over time until they reach a long-term stable configuration.

Open-pit mines can experience periodic slope instability problems due to weak geologic materials; adversely oriented geologic structures, such as bedding, faults, and jointing; and groundwater presence. Ground movement caused by seismic events can trigger failure of slopes that are marginally stable under static conditions. Impacts associated with potential instability of the pit walls could occur during both the operation and post-closure period. Unforeseen conditions in pit walls can sometimes result in major pit wall stability problems during construction and operation. During the post-closure period, progressive slope failure through time is likely to expand the perimeter of the pits and reduce the overall angle of pit slopes particularly in areas underlain by weak or highly fractured bedrock, and areas with adverse dipping geologic structures. If adjacent facilities (such as RDA) are not located a sufficient distance away from the final pit rim, progressive failure of the pit walls during the post closure period could eventually damage the adjacent reclaimed facility. Barrick would install pit berms around the perimeter of the open mine pits as part of the reclamation process for public safety.

RDAs and HLFs Stability

Preliminary stability analysis of the proposed reclaimed RDAs and HLFs was performed by SRK (SRK 2011c). The stability analysis was done using available information and did not include site-specific geotechnical test data collected within the footprint of the proposed facilities. The stability analysis was performed on critical cross-sections selected based on the topography of the existing ground surface and reclaimed surface of the facility. The stability analysis used limit equilibrium methods that require input values for slope geometry, soil shear strength, soil unit weight, and groundwater conditions. Estimates of soil shear strength and soil unit weight were based on assumed properties for soils mapped in each facility area. Groundwater was assumed to be at depths below the facilities that would not influence stability. A seismic stability analysis also was performed assuming a seismic coefficient of 0.05 g. The results of the preliminary slope stability evaluation indicate adequate factors of safety for both static and pseudo-static (i.e., seismic) conditions. Therefore, impacts associated with instability of the RDAs and HLFs under static or seismic loading conditions are not anticipated. SRK's stability analysis does however recommend the following additional stability analysis:

"Stability of the facilities should be re-evaluated during the detailed design process and include soils information obtained from the site investigations. The re-evaluation for detailed design should be done on the life of mine pre-reclamation surface as well as the reclaimed surface and include any regarding of the native ground surface" (SRK 2011c).

3.2.2.2 North and South Operations Area Facilities Reconfiguration Alternative

As summarized in **Table 3.2-1**, under the Reconfiguration Alternative, an estimated 165 and 80 MT of ore would be removed from the NOA and SOA, respectively, and processed at HLFs. The extraction of ore would generate 763 MT and 276 MT of waste rock from the NOA and SOA, respectively. Processing the ore would result in a permanent loss or reduction in mineral resource potential in the NOA and SOA.

Under the Reconfiguration Alternative, several mining facilities (open pits, RDAs, HLFs, and support facilities) would be eliminated or reduced to their current footprint of disturbance compared to the Proposed Action (**Table 2.5-1**). The estimated total new disturbance for this alternative would be approximately 4,113 acres. With consideration of the 1,488 acres of existing authorized disturbance that would not be constructed under the Reconfiguration Alternative, implementation of this alternative would result in a reduction of 1,040 acres of surface disturbance in comparison to the Proposed Action (**Table 2.5-2**).

Compared to the Proposed Action, the reduced mining associated with this alternative would increase the remaining ore reserves and mineral resource potential within the NOA and SOA. In addition, the reduction in the area of disturbance associated with RDAs, and HLFs compared to the Proposed Action could reduce effects associated with potential future access to any mineral resources that may lie beneath the foot print of these smaller facilities.

Open pit mining disturbances, and construction or expansion of the RDAs, and HLFs would permanently alter the natural topographic and geomorphic features. The net surface disturbance associated with open pits, RDAs, and HLFs would decrease from 5,153 acres under the Proposed Action, to 4,113 acres under the Reconfiguration Alternative (a 20 percent reduction) as a result of reduced expansion of some facilities and an elimination of other facilities (see **Tables 2.5-1** and **2.5-2**). Although open pits would not be reclaimed, several pits including the Redbird Pit, Numbers Pit Complex, and Yankee Pit would be partially backfilled. The RDAs and HLFs would be reclaimed but still alter the topography and geomorphology of the study area. Temporary facilities such as haul roads, GMSs, process facilities, and ancillary and support facilities would be reclaimed to the approximate pre-mining topography.

No modifications to the Redbird Pit, or partial backfill volumes necessary to prevent formation of a pit lake, is anticipated beyond those detailed in the Proposed Action. Under the Reconfiguration Alternative, the Numbers Pit Complex would be reconfigured. Additionally, portions of the Numbers Pit Complex would be partially backfilled with carbonate-rich material resulting in the addition of approximately 13 MT of waste rock backfill into the 2/3 Pit as well as the Numbers 10 Pit. Within the SOA, the Yankee Pit would have a larger portion of the south end backfilled, with the addition of 12.5 MT of waste rock, to facilitate the placement of the Yankee South RDA.

Potential impacts associated with the pit slopes, RDAs, and HLFs stability would be the same as described under the Proposed Action.

3.2.2.3 North and South Operations Area Western Redbird Modifications Alternative

The WRM Alternative is essentially the same as the Reconfiguration Alternative except for the modifications to selected facilities located in the western portion of the NOA as described in Section 2.5.2. These modifications include reducing the footprints of the Redbird Pit and Numbers Pit, and several associated RDAs, and other support facilities (**Figure 2.5-6**) as compared to the Reconfiguration Alternative (**Figure 2.5-1**). All other facilities located in the central and eastern portion of the NOA, and located in the SOA would be the same as described for the Reconfiguration Alternative in Section 2.5.1. Because of the similarities between the WRM Alternative and the Reconfiguration Alternative, the potential impacts to geology and mineral resources would be the same as described under the Reconfiguration Alternative with the exception as discussed in the following paragraphs.

As summarized in **Table 3.2-1**, under the WRM Alternative, an estimated 115 MT and 80 MT of ore would be removed from the NOA and SOA, respectively, and processed at HLFs (Barrick 2015c). The extraction of ore would generate 429 MT and 276 of waste rock from the NOA and SOA, respectively (Barrick 2015c). The volume of rock material generated under the WRM Alternative represents a 70 percent reduction in the ore production, and 56 percent reduction in the waste rock generated from the NOA, and no change in ore and waste rock generated from the SOA compared with the Reconfiguration Alternative. Processing the ore would result in a permanent loss or reduction in mineral resource potential in the NOA and SOA.

As discussed for the Proposed Action and Reconfiguration alternatives, open pit mining disturbances, and construction or expansion of the RDAs, and HLFs would permanently alter the natural topographic and geomorphic features. The RDAs and HLFs would be reclaimed but still alter the topography and geomorphology of the study area. Temporary facilities such as haul roads, GMSs, process facilities, and ancillary and support facilities would be reclaimed to the approximate pre-mining topography. The proposed surface disturbance associated with open pits, RDAs, and HLFs would decrease from 4,113 acres (Reconfiguration Alternative) to 3,803 acres (WRM Alternative), an approximate 8 percent reduction as a result of reduced expansion of some open pits and RDAs in the western portion of the NOA.

Mining at the Redbird Pit would be reduced from the estimated generation of 53 MT of leach material and 367 MT of waste rock under the Reconfiguration Alternative to 3 MT of leach material and 33 MT of

waste rock under the WRM Alternative. This relatively large reduction in ore extraction would increase the remaining ore reserves and mineral resource potential within the NOA after this mining operation is completed. The reduction in the area of disturbance associated with RDAs could reduce effects associated with potential future access to any mineral resources that may lie beneath areas that would have been covered by RDAs under the Reconfiguration Alternative. However, the increase in pit backfill in the Numbers Pit Area (compared to the Reconfiguration Alternative) would reduce access for potential future extraction of mineral resources that may remain beneath these backfilled and partially backfilled pit areas.

Under the WRM Alternative, mining would extend to an elevation of 6,620 feet (amsl) in the Redbird Pit. This pit floor elevation is 600 feet higher that the proposed pit floor elevation (6,020 feet amsl) under the Reconfiguration Alternative. The Redbird Pit under the Reconfiguration Alternative is predicted to intercept the pre-mine water table elevation and would be backfilled to preclude pit lake development. In contrast, the shallower depth of mining at the Redbird Pit under the WRM Alternative would not intercept the pre-mining water table and partial pit backfill to prevent formation of a pit lake would not be required.

Potential impacts associated with the pit slopes, RDAs and HLFs stability would be the same as described under the Proposed Action.

3.2.2.4 No Action Alternative

Under the No Action Alternative, the proposed NOA and SOA projects would not be developed and associated impacts to geology and mineral resources would not occur. Barrick would continue its operations, closure, and reclamation activities within the NOA and SOA boundaries under the terms and current permits and approvals as authorized by the BLM and State of Nevada. Under the No Action Alternative, construction of all previously authorized expansion and associated facilities would be implemented and reclaimed as authorized.

3.2.2.5 Cumulative Impacts

The CESA for geology and minerals encompasses the Regional Exploration PoO boundary (**Figure 1-1**). Past and present actions and RFFAs are discussed in Section 2.7, Past, Present, and Reasonably Foreseeable Future Actions; their locations are illustrated in **Figure 2.7-1**.

Past and present actions have resulted, or would result, in approximately 15,457 acres of total surface disturbance within the geology and minerals CESA. The total quantifiable surface disturbances are related to mining, oil and gas development, wind energy development, exploration, land, road, and utility corridor development, and other county and government actions. One RFFA, fuels and vegetation treatments, is proposed within the geology and minerals CESA; however, since this action would not affect geology and mineral resources it will not be included within this cumulative analysis.

The Proposed Action would remove 11 acres of authorized disturbance from the 15,457 acres of past and present actions incrementally increase potential disturbance to geology and minerals by an additional 6,903 acres resulting in a total cumulative disturbance of approximately 22,349 acres (16 percent of the total geology and minerals CESA). The Reconfiguration Alternative incrementally would remove 1,986 acres of authorized disturbance from the 15,457 acres of past and present actions and increase disturbance by an additional 5,175 acres resulting in a total cumulative disturbance of approximately 18,646 acres (13 percent of the total CESA). The WRM Alternative would remove 2,220 acres of authorized disturbance from the 15,457 acres of past and present actions and increase disturbance by an additional 4,773 acres resulting in a total cumulative disturbance of approximately 18,010 acres (13 percent of the total CESA).

Under the No Action Alternative, cumulative impacts to geology and minerals would be the same as those described in the *Final Environmental Impact Statement for the Bald Mountain Mine North*

Operations Area Project (BLM 2009a) and *Environmental Assessment for the Mooney Heap and Little Bald Mountain Expansion Project* (BLM 2011a).

3.2.2.6 Monitoring and Mitigation Measures

No mitigation or monitoring is proposed for these resources.

3.2.2.7 Residual Impacts

Residual impacts to geology and mineral resources as a result of the Proposed Action include: 1) the permanent loss of approximately 279 MT tons of ore within the study area; 2) the permanent disposal of approximately 1.16 billion tons of waste rock material in RDAs within the study area; 3) the permanent disposal of approximately 279 MT of residual leach material in HLFs within the study area; and 4) the permanent modification of the topography associated with the expansion of 5,153 acres affected by open pits, RDAs, and HLFs.

Residual impacts to geology and mineral resources as a result of the Reconfiguration Alternative include: 1) the permanent loss of approximately 245 MT tons of ore within the study area; 2) the permanent disposal of approximately 1.04 billion tons of waste rock material in RDAs within the study area; 3) the permanent disposal of approximately 245 MT of residual leach material in HLFs within the study area; and 4) the permanent modification of the topography associated with expansion of 2,407 acres affected by open pits, RDAs, and HLFs.

Residual impacts to geology and mineral resources as a result of the WRM Alternative would be reduced compared to the Reconfiguration Alternative, Residual impacts to geology and mineral resources as a result of the WRM Alternative include: 1) the permanent loss of approximately 195 MT tons of ore within the study area; 2) the permanent disposal of approximately 705 MT tons of waste rock material in RDAs covering approximately 8 percent less of the study area than under the Reconfiguration Alternative; 3) the permanent disposal of approximately 195 MT of residual leach material in HLFs within the study area; and 4) the permanent modification of the topography associated with expansion of 1,900 acres affected by open pits, RDAs, and HLFs.

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3.3 Water Quality and Quantity

The study area for water quality and quantity is defined as those areas within the four hydrographic basins where groundwater or surface water could be impacted by the proposed project. The CESA for water quality and quantity encompasses the entirety of four hydrographic basins (Huntington Valley and Central Region, Long Valley, Newark Valley, and Ruby Valley) totaling approximately 2,075,520 acres. **Figure 3.3-1** illustrates the study area and CESA for water quality and quantity.

3.3.1 Affected Environment

3.3.1.1 Hydrologic Setting

The study area is located within the boundaries of four hydrographic basins, as delineated by the NDWR. Major features of these basins are summarized in **Table 3.3-1**. Huntington Valley contributes to the Humboldt River, and Ruby Valley contributes to Ruby Lake, adjacent marshes, and the Ruby Lake National Wildlife Refuge. Newark Valley, Long Valley and Ruby basins are all closed basins (i.e., no surface water outflow).

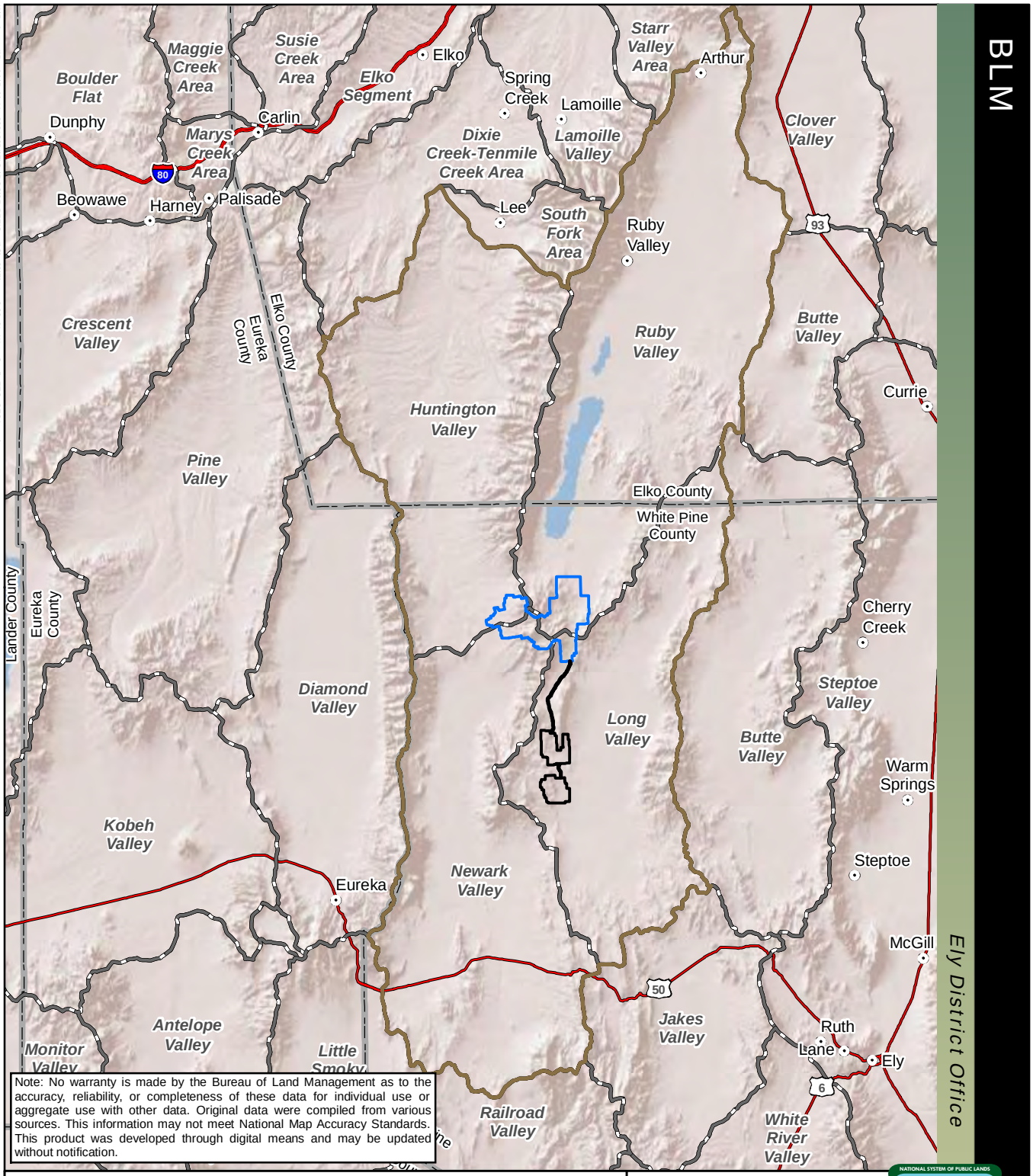
Table 3.3-1 Hydrographic Basins

Basin Name	NDWR Basin Number	NDWR Region	Basin Area (mi^2)	Basin Area (acres)	Estimated Perennial Groundwater Yield (acre-feet/year)
Huntington Valley	47	Humboldt River	787	503,680	15,000
Newark Valley	154	Central	801	512,640	18,000
Long Valley	175	Central	651	416,640	6,000
Ruby Valley	176	Central	1,004	642,560	53,000

Source: NDWR 2012a,b.

The study area is located in an arid to semi-arid environment with low annual precipitation and large daily ranges in temperatures. Climate is largely controlled by rugged topography to the west, specifically the Sierra Nevada Mountains and other features of the Basin and Range. Prevailing westerly winds move warm, moist Pacific air over the western slopes of the Sierra Nevada, where the air cools, condensation takes place, and most of the moisture falls as precipitation far to the west of the project (Geomega 2011a).

In the general locale, mean annual precipitation ranges from approximately 13.2 inches per year at Ruby Lake (Western Regional Climate Center [WRCC] 2012a) to approximately 24 inches per year at the highest mountain elevations along the watershed divides (USDA 1998). The driest months generally extend from June through September, although intense summer thunderstorms may occur during that period. More specific precipitation estimates were derived using the Parameter-elevation Regressions on



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Legend

- Proposed NOA Plan Boundary
- Proposed SOA Plan Boundary
- Hydrographic Basin Boundary
- Cumulative Effects Study Area

Source: NDWR 2010.

Bald Mountain Mine North and South Operations Area Projects EIS

Figure 3.3-1
Water Quality and Quantity, Soils Resources, Vegetation Resources, Special Status Plant Species, Noxious Weeds and Invasive Species, and Air Quality Cumulative Effects Study Area

0 5 10 20 Miles

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Independent Slopes Model climate mapping system. Precipitation in the study area ranges from about 11.5 inches on the lower slopes and fans, to about 20.5 inches just below the summit of Bald Mountain (Mine Mappers 2007). Potential ET rates are estimated at 35 inches per year (Geomega 2015a) in the project area. The estimated average ET flow rates for Long Valley and Newark Valley are on the order of 18,000 to 20,000 acre-feet per year, respectively (Welch et al. 2007). Detailed data from an alluvial slope in southern Ruby Valley indicate that during the 2000 water year, ET was about 12.0 inches per year (Berger 2006). A water-budget evaluation of 14 hydrographic areas in north-central Nevada reported that ET on alluvial slopes may range from 9.0 to 12.0 inches per year, depending on elevation and precipitation (Berger 2006). Annual precipitation appears to be a major limiting factor for ET where the water table is too deep to be reached by vegetation (Berger 2006).

3.3.1.2 Surface Water Resources

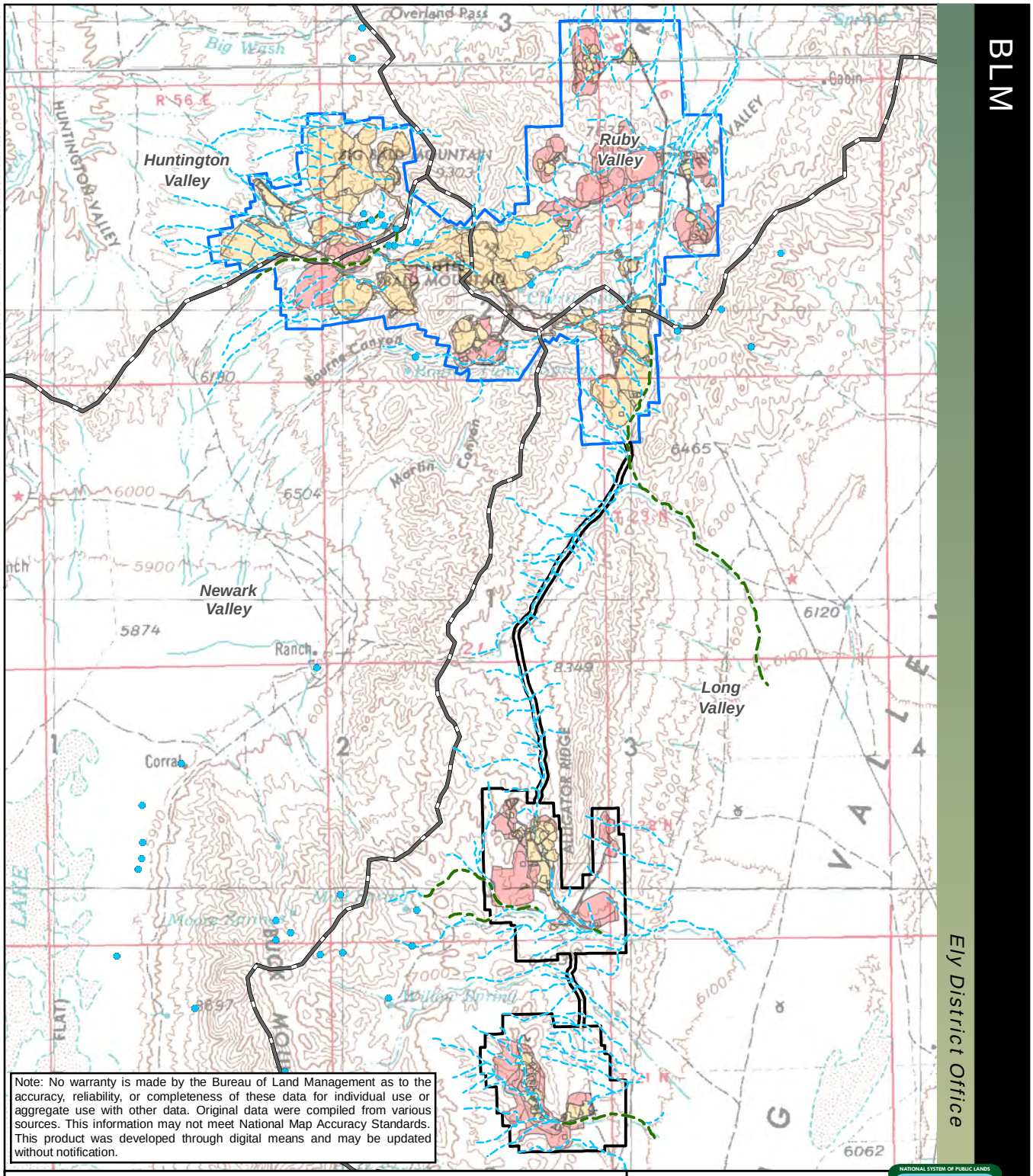
The surface water within the four basins comprising the CESA consists primarily of springs and ephemeral drainages. Perennial surface water within the CESA, include Ruby Lake and associated marshes, Huntington Creek, and Newark Lake. Although springs, seeps and stream channels occur within the CESA, most surface water either evaporates or infiltrates at some point along drainage pathways toward the valley floors.

Three of the four hydrographic basins in the CESA are closed basins (without external drainage). Surface water in Huntington Valley drains outward to Huntington Creek, which then drains outward to the South Fork of the Humboldt River. Huntington Creek is considered a perennial drainage. Ruby Valley, Long Valley, and Newark Valley lack external surface drainage. Surface water in Ruby Valley drains to Ruby and Franklin lakes, where it evaporates or infiltrates. The springs and streams in the northern Ruby Mountains are hydrologically separated from those in the south Ruby Mountains (Berger 2006). In Newark Valley, surface drainage is toward Newark Lake. Ruby Lake and Newark Lake have water year-round, largely due to localized springs near the lakes. Perennial surface water resources are limited in Long Valley, such that the majority of springs and streams in Long Valley are dry by the end of the summer. In Long Valley, surface water drains toward a small playa on the central valley floor, but most flow infiltrates or evaporates before reaching the playa (BLM 2009a).

<u>Streams and Ponds</u>

The locations of drainage features in the study area are depicted in **Figure 3.3-2**. Most drainage channels are dry for most of the year, flowing only during spring runoff and substantial storm events. Short stream reaches near springs may flow for somewhat longer periods, but there are no perennial streams within the study area. Flow rates in the drainages within and near the study area have not been measured due to their ephemeral durations (Geomega 2011a). Most runoff is lost to infiltration as streams traverse permeable rock zones or downslope alluvial deposits. Many drainage pathways lack defined beds and banks (JBR Environmental Consultants, Inc. [JBR] 2011a). Of the 178 drainages investigated by JBR, only a few display identifiable channel features (noted in **Figure 3.3-2** as ‘Defined Drainages’).

Ruby Lake is the major body of surface water closest to the study area and contains the largest area of perennial wetlands in northeastern Nevada and is the site of the Ruby Lake NWR. The refuge encompasses approximately 38,000 acres of wetland that are divided into numerous marsh management units that are separated by earthen dikes. The wetland area covers about 14,000 acres in the spring and declines to about 11,000 acres in the fall (Berger et al. 2001).



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Legend

- Proposed NOA Plan Boundary
- Proposed SOA Plan Boundary
- Existing and Authorized Disturbance
- Proposed New or Modified Disturbance
- Seep or Spring
- Defined Drainages (Ephemeral)
- Other Drainage Features* (Ephemeral)
- Hydrographic Basin Boundary

*Drainages within the survey area that lacked a defined bed and bank, and evidence that the drainage experiences surface water flows on a frequent and regular basis (JBR 2011a).

Source: Geomega 2015b; Barrick 2012a,b; JBR 2012, 2011a.

Bald Mountain Mine North and South Operations Area Projects EIS

Figure 3.3-2

Drainage Features

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The southern part of the lake and associated wetlands complex is approximately 7 miles north of the study area. The principal sources of water for the lake and associated wetlands is springs discharging along the west and southwest side of the refuge and precipitation falling on the lake (Berger et al. 2001). Major spring systems that control flow to the lake and wetlands discharge from the carbonate rocks along the east side of the southern Ruby Mountains (Berger et al. 2001). The USFWS water resource inventory and assessment for the Ruby Lake NWR (USFWS 2014) indicates that the results of a synoptic spring inventory completed in 2012 identified 216 springs that supply water to the refuge and also inferred that other springs likely occur below the lake surface that could not be measured. All of the springs identified that contribute flow to the southern portion of the refuge were located within the refuge boundary (Figure 9, USFWS 2014). Berger (2006) noted that streamflow in the southern Ruby Mountains and Maverick Springs Range is ephemeral; and, no stream flow was observed to reach the lake during the period of their field studies (1999-2003).

Berger et al. (2001) estimated the annual amount of inflow required to sustain the lakes and associated wetlands in the refuge from estimates of water consumed by evapotranspiration (ET). Results indicate that the total estimated water lost from ET from open water and the marsh areas in the refuge was approximately 49,800 acre-feet during the 2000 water year. The 49,000 acre-feet consists of an estimated 7,960 acre-feet of precipitation that falls directly on the open water and wetland areas, and the remaining flow (41,800 acre-feet) derived from other sources (i.e., primarily springs).

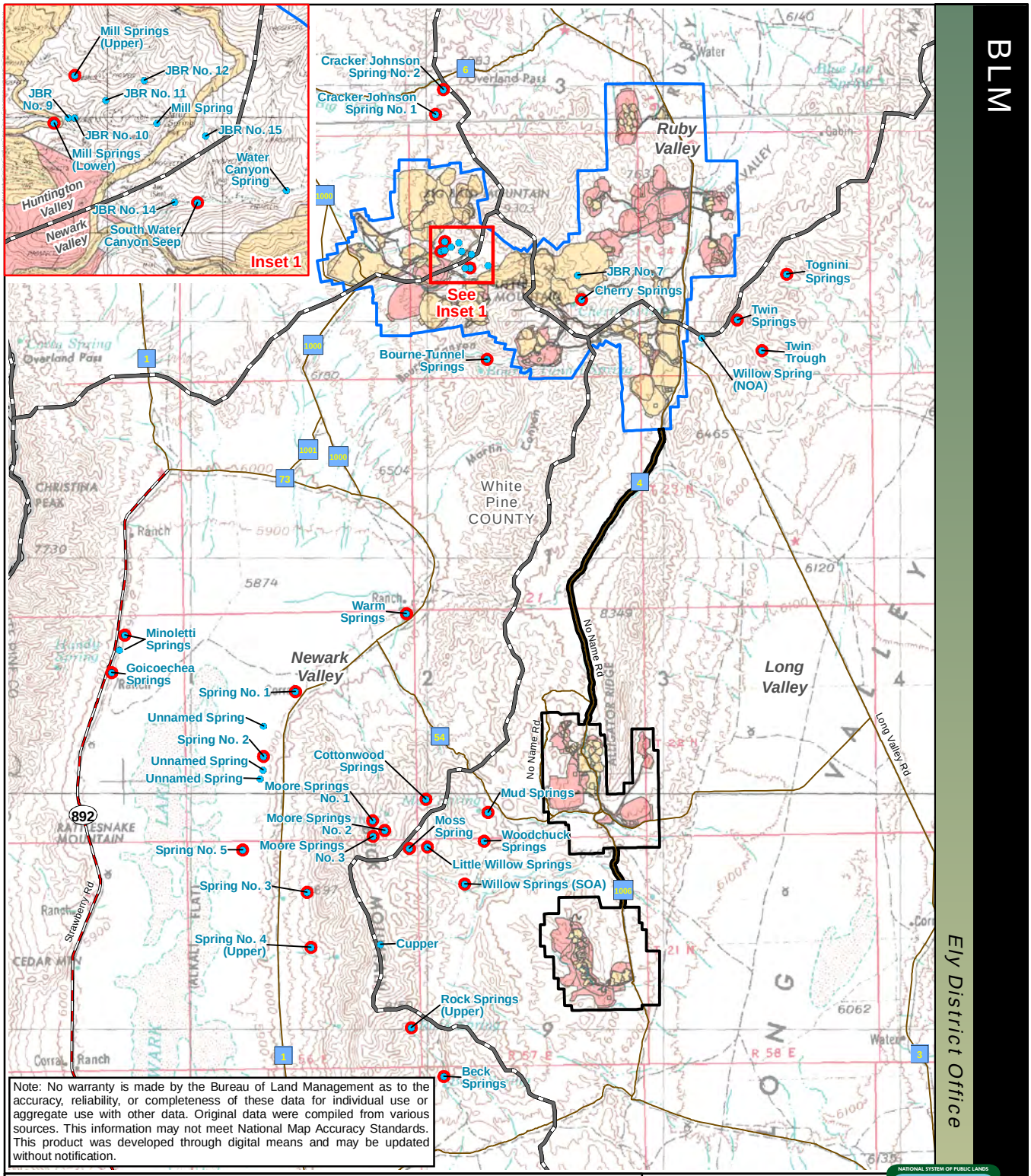
Springs and Seeps

The location of springs and seeps identified within the vicinity of the project site are shown in **Figure 3.3-3**. Available information on these springs and seeps, including data sources, monitoring period, flow range, and acres of associated wetlands are summarized in **Table C-1, Appendix C**. A total of 46 springs and seeps have been identified within the area encompassed in **Figure 3.3-3**. These spring and seeps were compiled from the following sources: 1) Barrick's 2012 annual summary report for spring and seep monitoring for BMM (Tetra Tech 2012); 2) wetland delineation survey for the BMM Expansion (JBR 2011a); and 3) other springs identified in baseline and groundwater modeling studies for the project (Geomega 2015a,b, 2011a).

Seep and spring monitoring of selected springs has been conducted on the project site since 2005. The springs and seeps included in Barrick's 2012 monitoring program are highlighted in **Figure 3.3-3**. Monitoring has consisted of quarterly monitoring between the fourth quarter 2005 through the fourth quarter 2007; and semi annual monitoring (May and October) from 2009 through 2012. Monitoring activities consists of visual observations, measuring flow rates in seeps and springs, measuring field water quality parameters, and collecting water quality samples for laboratory analyses. The flow and water quality data for the 2005–2012 monitoring period are tabulated in the 2012 annual summary report (Tetra Tech 2012) and summarized in **Table C-1, Appendix C**.

A wetland delineation survey was conducted across the project area in 2011 (JBR 2011a). The wetland survey included an effort to identify all mapped and previously unmapped spring locations within the study area. Field investigations were then performed at known or suspected spring locations. The field surveys included physical descriptions of the hydrology and photographs of the site conditions observed at each visited springs. However, no spring and seep flow data was collected. These field investigations also included assessing each spring site for wetland characteristics in accordance with the USACE (USACE 2008, 1987) wetland criteria and defining acres of wetland associated with each spring. The results of this survey included the site observations at 15 potential spring sites 8 of which had associated wetlands.

The two largest wetlands within the proposed project boundary are associated with the South Water Canyon Seep (identified as JBR No. 4 in JBR 2011a); and an unnamed spring identified as JBR No. 14. For discussion purposes, both of these features will be referred to as "springs" for the remainder of this section. The wetlands associated with these two springs occur along the same unnamed drainage and



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Legend

- Proposed NOA Plan Boundary
- Proposed SOA Plan Boundary
- Existing and Authorized Disturbance
- Proposed New or Modified Disturbance
- Seep or Spring
- Baseline Monitoring Site[1]
- Hydrographic Basin Boundary

[1]Monitoring sites reported in seep, spring and well monitoring update annual report (Tetra Tech 2012).
Sources (spring locations): Tetra Tech 2012, JBR 2011a, Geomega 2015a, b, and 2011a.

Bald Mountain Mine North and South Operations Area Projects EIS

Figure 3.3-3

Springs and Seeps

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are separated by approximately 400 feet. In September 2011, the wetlands areas associated with these springs were estimated at 19.20 acres for South Water Canyon Seep and 13.68 acres for JBR Spring No. 14 (**Figure 3.3-4**). Photographs from September 12, 2011, of these two wetland areas are presented in **Figure 3.3-5**. Although, JBR did not measure or estimate the flow rate, they noted that both springs were producing flowing water in September 2011. Flow monitoring conducted as part of the seep and spring monitoring for the mine site indicate that between October 20, 2009 and October 9, 2012, flow at South Water Canyon Seep ranged from 228 gpm to 3.6 gpm (Tetra Tech 2012). The 2012 annual report indicates that the flow measurements were made in a narrow section of stream downstream for a perforated pipe that conveys flow from the source.

In addition to the South Water Canyon Seep, and JBR-14, other springs and seeps identified in the NOA (listed from north to south) include Mill Springs (Upper), JBR-12, JBR-11, JBR-10, JBR-9, Mill Springs (Lower), Mill Springs in the Huntington Valley Hydrographic Area (HA); Water Canyon Spring, in the Newark Valley HA; and JBR 7 and Cherry Springs in the Ruby Valley HA. Mill Springs (Upper) and Mill Springs (Lower) are typically dry in the fall; where as JBR-12, 11, 10, and 9 are characterized as in channel seeps that were reported wet in the fall 2011 and each have associated wetlands (ranging from 0.46 to 0.99 acre). Mill spring was observed to be flowing in the fall of 2012 and has 1.98 acres of wetlands. JBR-7 is a wet area surrounded by berms with no wetlands and is assumed to be a surface water runoff catchment. Cherry Spring is periodically dry and has no associated wetlands.

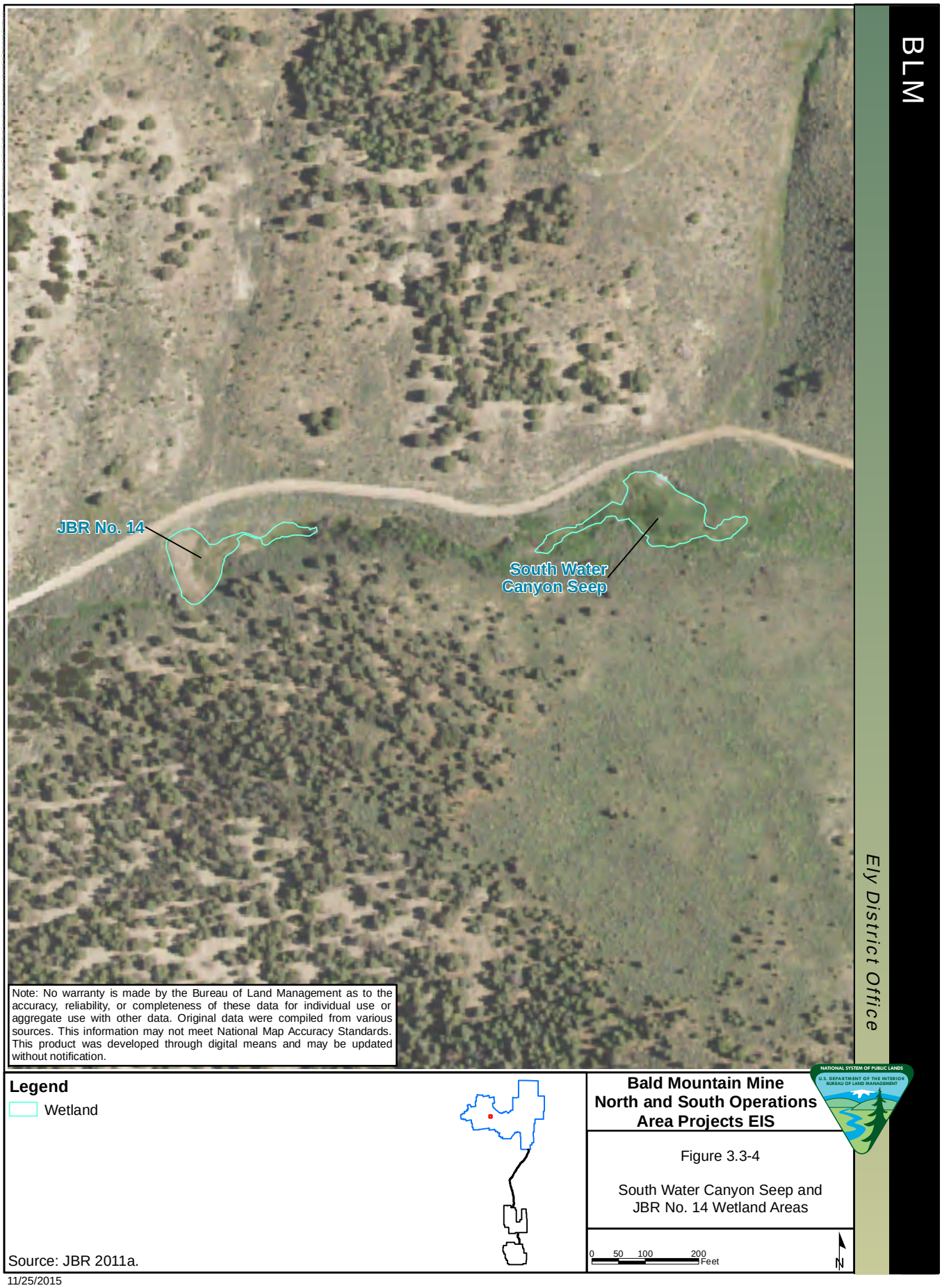
Two additional springs occur outside but within approximately 1 mile of the proposed NOA boundary: Willow Springs (NOA) and Twin Springs located east of the project in the Long Valley HA. Willow Springs (NOA) is a named spring on the USGS 1:24,000 scale map of the area and on the spring map in the baseline report (Geomega 2011a) but is not included in the spring monitoring program or mentioned in the JBR wetland inventory. Twin Springs are described as having insufficient flow for measurement (October 2009), or as a small pool with no visible flow (May 2010).

No springs or seeps have been identified in the SOA. The closest springs to the SOA are Mud Spring, Woodchuck Spring and Willow Spring (SOA) located in the Long Valley HA approximately 2 to 3 miles west of the proposed project boundary (**Figure 3.3-3**). Mud Spring has consistent flow with measured flow rates of 0.4 to 5.9 gpm. Woodchuck Spring was observed to be flowing during site visits between November 2005 to May 2012 with measured flow rates ranging from 0.5 to 4.5 gpm but was reported dry in October 2012. Willow Spring (SOA) also has consistent flow recorded over the monitoring period ranging from 0.3 to 5.0 gpm.

3.3.1.3 Groundwater Resources

Recharge, storage, and movement of groundwater depends on bedrock and alluvial geologic conditions, climate, and topography of a site. Studies of groundwater in the study area include Mine Mappers (2007), Simon Hydro-Search (1994), Tetra Tech (2011), and Geomega (2015a, 2011a). This section summarizes key features of groundwater in the study area from these reports. Studies of groundwater in the surrounding major basins can be found in Berger (2006) for Ruby Valley, Welch et al. (2007) for Newark and Long Valleys, Eakin (1961) for Newark Valley, and Rush and Everett (1966) for Huntington Valley.

The geology, stratigraphy, and structural features of the project area and vicinity are described in Section 3.2, Geology and Mineral Resources. The major hydrogeologic units defined by Geomega (2015a) in the project area and their estimated hydraulic conductivity values determined are summarized in **Table 3.3-2**. A northwest to southeast oriented hydrogeologic cross-section of the generalized hydrogeologic conditions extending from Huntington Valley to Long Valley and intersecting the Big Bald Mountain and Mooney Basin in the project area is presented in **Figure 3.3-6.**



Bald Mountain Mine North and South Operations Area Projects EIS

Figure 3.3-4

South Water Canyon Seep and JBR No. 14 Wetland Areas

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Source: JBR 2011.

South Water Canyon Seep Wetland Area September 12, 2012

Source: JBR 2011.

JBR No. 14 Spring Site Wetland Area September 12, 2012

Figure 3.3-5 South Water Canyon Seep and JBR No. 14 Wetland Photographs

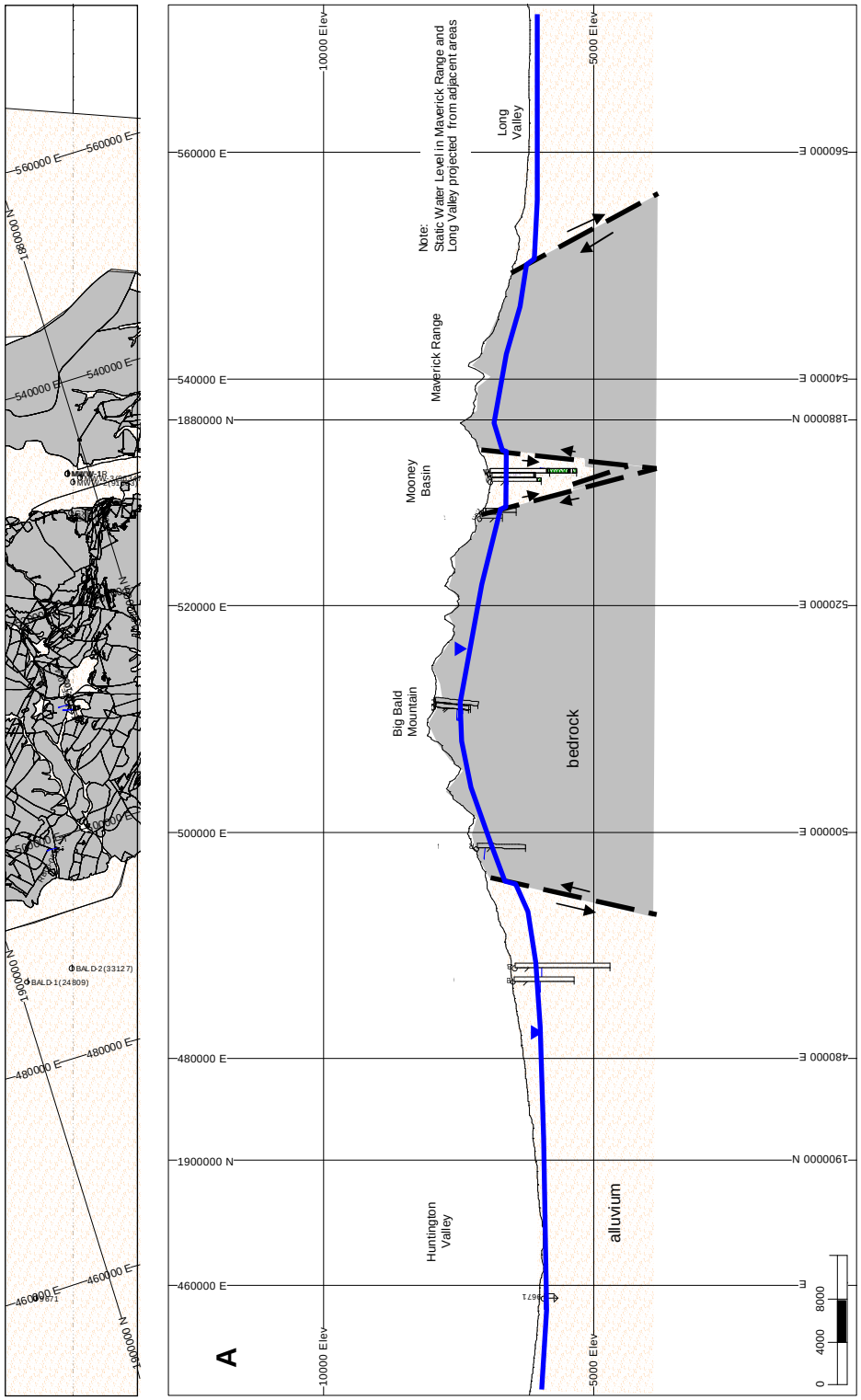

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Figure 3.3-6

Cross-sectional Groundwater View (A)

Source: Mine Mappers 2007.

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Table 3.3-2 Summary of Hydrogeologic Units

Hydrogeologic Unit	Description	Relative Permeability	Estimated Hydraulic Conductivity (feet per day)
Quaternary Alluvium/Colluvium	Unconsolidated silt, sand, gravel basin, colluvial and playa deposits	Low to High	0.1 to >5
Tertiary/Cretaceous Rocks	Primarily basalts, volcanic breccia, tuffs, and jasperiods. Includes the Newark Canyon Formation	Low	0.001
Jurassic Intrusive Rocks	Coarse-grained quartz monzonite (includes the Bald Mountain Stock, and other massive plutons)	Low	<0.001
Pennsylvanian/Permain Rocks	Clastic and carbonate units including the Ely Limestone (interbedded shale and cherty limestones)	High	0.1
Mississippian Shale/ Clastic Rocks	Includes the Chainman Shale, Joana Limestone and Pilot Shale, Diamond Peak Formation and Diamond Peak limestone	Low	<0.001
Silurian/Devonian Carbonate Rocks	Includes Guilmette Formation (limestones); Simonson Formation (dolomites); Sevy Formation, (dolomites); and Nevada Formation	Low to Very High	0.01 to >2,500
Cambrian/Ordovician Carbonate Rocks	Includes Fish Haven Dolomite, Eureka Quarzite, Pogonip Group (limestones), and Windfall Formation	Low to High	Less than Silurian/Devonian Carbonate Rocks
Cambrian Shale	Includes the Dunderberg Shale, Hamburg Limestone and Secret Canyon Shale	Very Low	.001
Lower Cambrian Carbonate Rocks	Highly metamorphosed carbonate rocks that include Geddes limestone and Eldorado Dolomite	Low	<.001
Basement Rocks	Lower Cambrian Clastic rocks that include Pioche Shale and Prospect Mountain Quartzite	Very Low	<0.0001

Sources: Geomega 2015a.

Groundwater Flow Systems

Bedrock groundwater in the study area consists of three separate flow systems (Mine Mappers 2007; Simon Hydro-Search 1994): 1) a perched groundwater system in the upper reaches of valleys in the mountain blocks (perched groundwater systems are hydraulically isolated from deeper bedrock and groundwater flow system); 2) a local bedrock groundwater flow system within the mountain blocks; and 3) a deep regional flow system in the Paleozoic carbonate bedrock of eastern Nevada (Eakin 1961; Welch et al. 2007). The alluvial valleys found in the basins between the major mountain ranges and also in fault-block basins within a mountain range, such as Mooney Basin, constitute the fourth groundwater flow system in the study area. Thus, Long, Ruby, Huntington, and Newark valleys contain separate and individual flow systems, as does Mooney Basin in the study area. Bedrock groundwater flow in the mountain blocks adjacent to the valleys interacts hydraulically with groundwater in the alluvial valleys. The deep regional groundwater flow in the Paleozoic carbonate rocks may interact with deep groundwater in the mountain blocks through major faults. The perched flow system in the upper reaches of mountain block valleys may be locally separate from all the other flow systems and tied to infiltration of precipitation, especially seasonal runoff from snow melt.

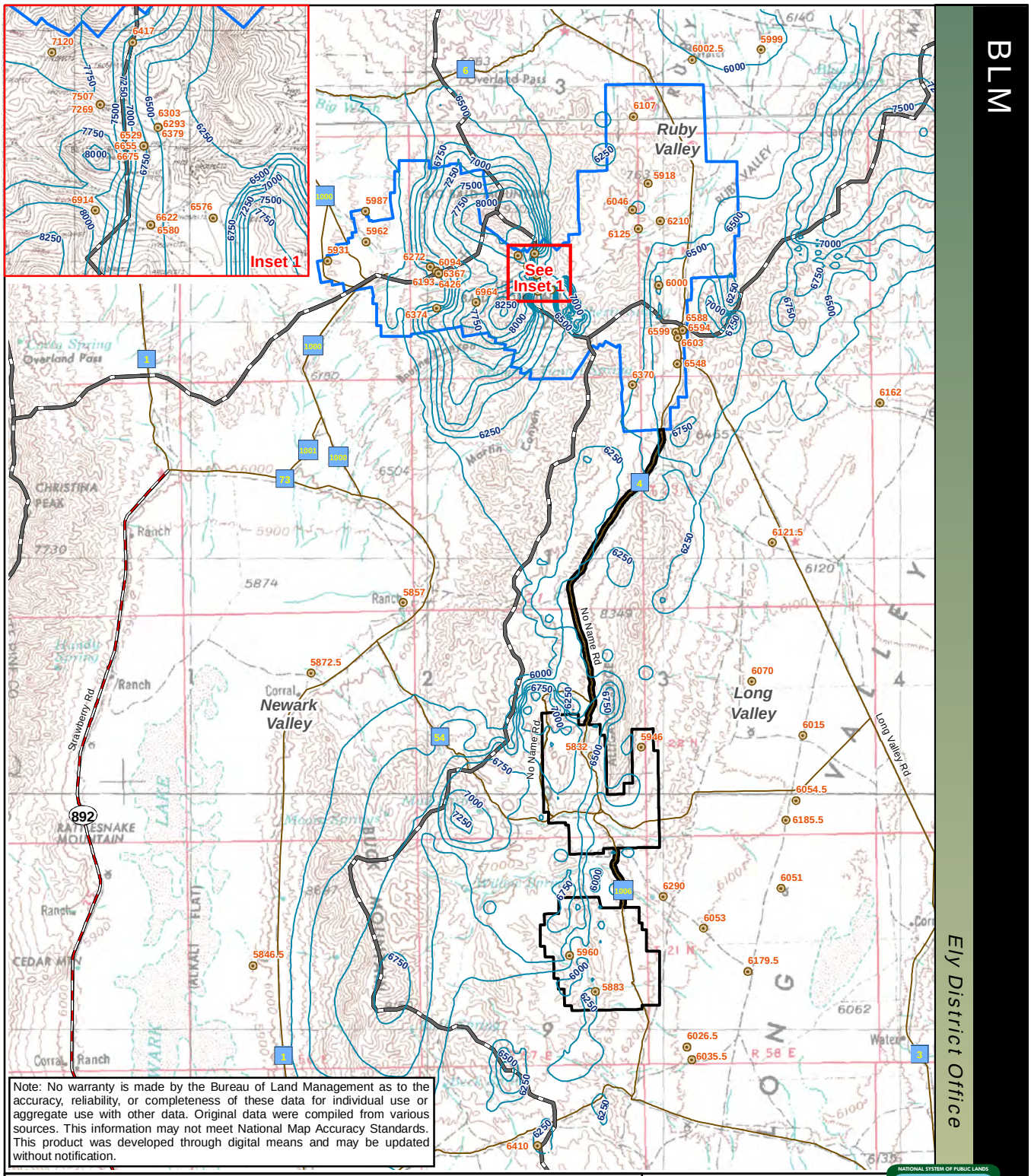
Groundwater Levels and Flow Patterns in the Project Area

The groundwater elevations across the area were estimated using a numerical groundwater flow model developed for the project (Geomega 2015a). The groundwater flow model was calibrated using water level data from 85 groundwater observations points shown in **Figure 3.3-7**. These observations points include Barrick's monitoring wells, and piezometers, other stock wells, and USGS monitoring wells as tabulated in the modeling report (Geomega 2015a). The model simulated groundwater elevations for June 2014 across the project area are presented in **Figure 3.3-7**. The model simulated groundwater elevations and water levels at the specific observation points indicate that groundwater elevations range from approximately 8,250 feet (amsl) in the Bald Mountain area to 5,846 in Newark Valley. These groundwater elevation contours indicate that the groundwater flow generally mimics the topography with steep gradients in the mountains and gentler gradients in the basins.

Groundwater in the NOA flows outward from a regional high Bald Mountain highland area. Groundwater divides exist between Newark and Huntington valleys and between Newark Valley and Ruby Valley. The Tognini Mountains (that includes the Maverick Springs Range) also forms a groundwater divide with groundwater originating on the northwest flank of the range flowing into Ruby Valley or Mooney Basin; while groundwater originating on the southeast flank of the range flows southeast towards Long Valley. In the SOA, the groundwater contours indicate the primary groundwater flow direction is east towards Long Valley with groundwater elevations ranging from approximately 7,000 feet (amsl) to less than 6,000 feet across the project area.

Water Supply Wells

Water supply wells provide all water requirements for the project including process water, dust control, exploration drilling and potable water. As of May 2015, there were 10 water supply wells associated with existing and historic mining operations; however, only 7 of these wells are currently pumped to supply the project. The location of these water supply wells are shown in **Figure 3.3-8** and their average pumping rates are provided in **Table 3.3-3**. The average combined pumping rate for the 3 wells in the Bald Mountain area is 50 gpm; and for the 4 wells in the Mooney Basin area is 528 gpm (Barrick 2015b). Wells CW-1 in the Casino/Winrock area, and YWS-1 and ARW in the Yankee and Aligator Ridge area are not currently in use. The estimated average groundwater pumping rate for the entire project area is 578 gpm. All of the existing water supply wells are completed in alluvial/colluvial materials (Barrick 2014e).



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Legend

- Well with Observation Water Elevation (Model calibration targets)
- Simulated Water Level Contours
- Proposed NOA Plan Boundary
- Proposed SOA Plan Boundary
- Hydrographic Basin Boundary

Source: Geomega 2015a.

Bald Mountain Mine North and South Operations Area Projects EIS

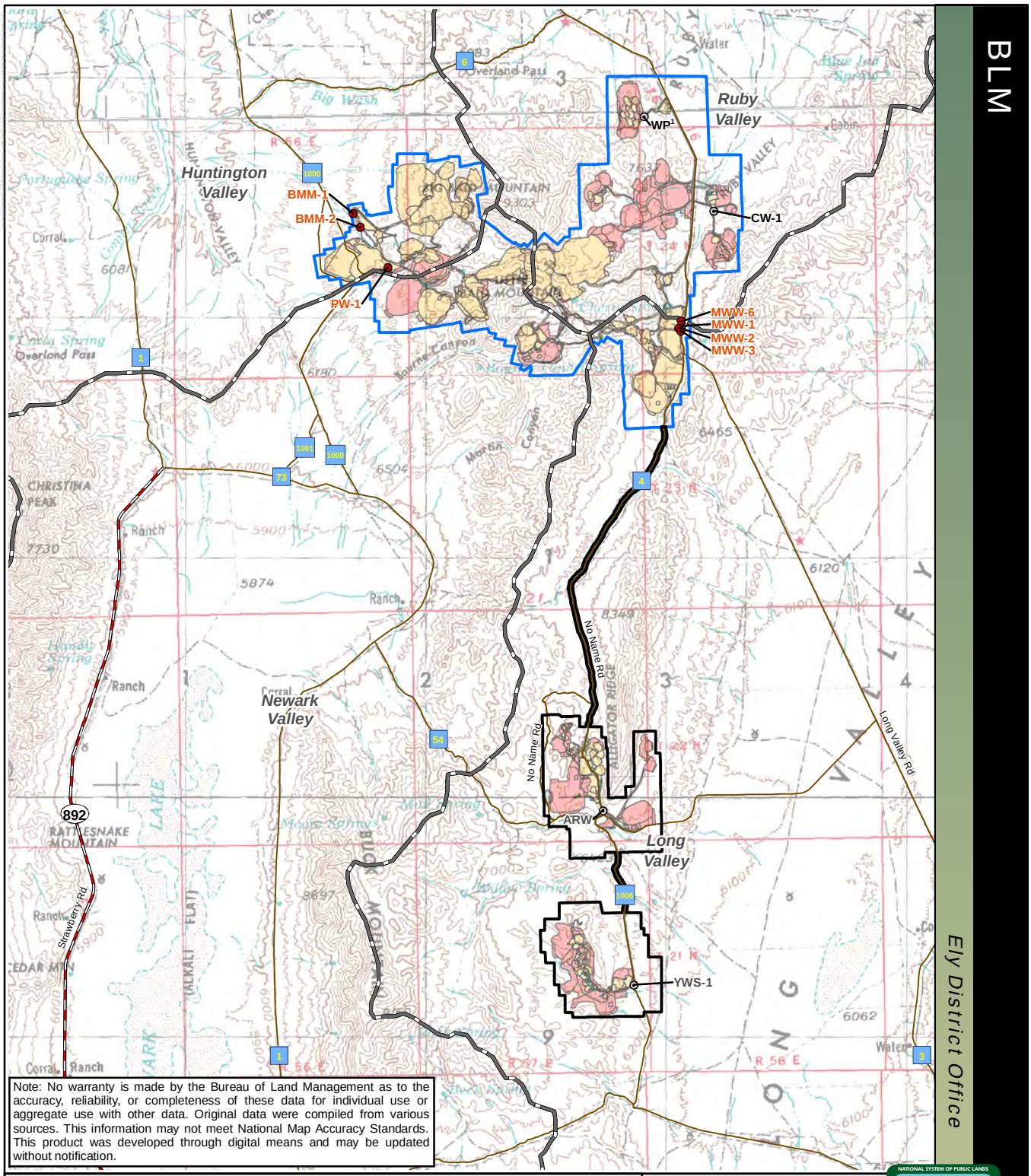
Figure 3.3-7

Project Area Groundwater Elevations June 2014 (Model Simulated)

0 1 2 4 Miles

N

12/21/2015



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

Legend

- Proposed NOA Plan Boundary
- Proposed SOA Plan Boundary
- Existing and Authorized Disturbance
- Proposed New or Modified Disturbance
- Hydrographic Basin Boundary
- Water Supply Well (Active)
- Water Supply Well (Inactive)

[1] The White Pine well is not owned by KG Mining.
Source: SRK 2015; Barrick 2012a,b.

Bald Mountain Mine North and South Operations Area Projects EIS

Figure 3.3-8

Existing Groundwater Production Wells

0 1 2 4 Miles

N

BLM

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2/10/2016

Table 3.3-3 Existing Groundwater Production Wells

Mine Area	Well ID	Production Aquifer	Average Pumping Rate (gpm)
Bald Mountain (Numbers, Redbird, Rat)	BMM-1 BMM-2 PW-1	Alluvium/Colluvium	50
Mooney Basin	MWW-1 MWW-2 MWW-3 MWW-6	Alluvium/Colluvium	528
Casino/Winrock	CW-1	Alluvium/Colluvium	0
Yankee	YWS-1	Alluvium/Colluvium	0
Alligator Ridge	ARW	Alluvium/Colluvium	0

Source: Barrick 2015b.

Aquifer Testing

Aquifer tests were conducted on three Mooney Basin alluvial wells (MWW-1, 2, and 3) and two alluvial wells (BMMW-1 and 2) in Huntington Valley (Mine Mappers, 2007). Testing was conducted over pumping periods ranging from 5- to 24-hour, plus follow-up monitoring of post- pumping water-level recovery. The estimated hydraulic conductivity ranged from 0.55 to 3.82 feet per day (ft/day) with an average value of 1.75 ft/day. Transmissivity values ranged from 274 to 2,800 square feet per day (ft^2/day), with an average value of 1,089 ft^2/day.

Another aquifer test was conducted by Geomega in 2011 when overseeing the installation of a new water supply well, MWW-6, in the Mooney basin. The aquifer test involved eight days of pumping and two days of recovery monitoring. During the pumping phase of the test, MWW-6 was pumped at an approximately constant rate of 500 gpm. Throughout both phases of the test, water levels were monitored in wells MWW-1, MWW-2, MWW-3, and the pumping well MWW-6. The aquifer test indicated that the Mooney basin alluvium is highly permeable with a hydraulic conductivity of 1.9 ft/day, and transmissivity of 1,216 ft^2/day (Barrick 2014e).

3.3.1.4 Water Rights

The study area and CESA occur in hydrographic basins delineated and administered by the NDWR. **Table 3.3-4** summarizes groundwater rights and uses in the study area and adjacent valleys (BLM 2009a). Two of the basins, Huntington Valley and Ruby Valley, are designated groundwater basins. A designated basin is one where permitted groundwater rights approach or exceed the estimated average annual recharge, and the water resources are being depleted or require additional administration. The existing BMM has water rights for groundwater pumping in Huntington Valley, Ruby Valley and Long Valley Hydrographic Basins (Barrick 2014f).

Table 3.3-4 Appropriated Water Rights for Groundwater by Beneficial Use (AFY*)

Basin Name	NDWR Basin Number	Recorded Groundwater Uses	Appropriated Groundwater by Use[1]	Total Appropriated Groundwater[1]
Huntington Valley[2]	47	-	-	9,758
		Commercial	271	-
		Irrigation	8,934	-
		Mining/Milling	329	-
		Stockwater	186	-
		Wildlife	19	-
		Other	18	-
Newark Valley	154	-	-	27,651
		Domestic	11	-
		Industrial	14	-
		Irrigation	24,903	-
		Mining/Milling	2,459	-
		Quasi-Municipal	8	-
		Stockwater	254	-
		Wildlife	2	-
Long Valley	175	-	-	4,749
		Irrigation	480	-
		Mining/Milling	4,000	-
		Stockwater	270	-
Ruby Valley[2]	176	-	-	23,895
		Commercial	4	-
		Domestic	34	-
		Irrigation	21,649	-
		Mining/Milling	1,452	-
		Quasi-Municipal	18	-
		Stockwater	754	-
		Wildlife	1	-
		Other	0	-

[1] Values in acre-feet per year; rounded to the nearest integer acre-foot.

[2] Designated Basin.

* Acre-feet per year.

Sources: NDWR 2014.

Project Area Water Rights

An inventory of active water rights in the region surrounding the proposed project was used to identify the location and status of water rights within potentially affected areas. The inventory was based on

water rights records on file with the NDWR (NDWR 2014). The inventory identified all active water rights located within the vicinity of the proposed project. The locations of the points of diversion for the identified water rights in the project vicinity along with the source type (surface water or groundwater) and beneficial use (such as mining/milling, or stock watering) are shown in **Figure 3.3-9**. A detailed tabulation of all the water rights in the area including the source type, beneficial use, annual duty and owner of record for each water right is provided in **Table C-2, Appendix C**.

According to the NDWR water rights database there are a total of 20 active water rights in the proposed project boundary, which includes 6 surface water right and 14 groundwater rights. Springs are listed as the source water for all of the surface water rights. The water rights owned by Barrick are shown in **Figure 3.3-9**. Barrick is listed as the owner of record for 18 of the 20 water rights. Barrick's water rights include 13 groundwater rights used for mining and milling, and 1 groundwater right and 4 surface water rights used for stock watering. Two other (non-Barrick-owned) water rights occur within the proposed project boundary identified as HV-164 and HV165 on **Figure 3.3-9**. The point of diversions for these two non-Barrick-owned water rights occur at the same location as HV-166 a surface water right owned by Barrick that has a spring source and is used for stock watering. Based on comparison of these three water rights location (HV-164, HV-165, and HV-166) with the spring and seep locations shown on **Figure 3.3-9** suggest the most likely source of water for these three surface water rights is the South Water Canyon Seep.

HV-164 is a "Reserved" water right with a priority date of April 17, 1926, owned by the BLM and used for stock watering. This "Reserved" water right was established by an EO issued by President Coolidge on April 17, 1926, that created Public Water Reserve (PWR) No. 107 to reserve water yields from springs and natural water holes for human and animal consumption over vast tracks of public lands. Because of this, the majority of state-recognized PWRs hold the priority date of the EO. An important distinction of the PWR's is that in accordance with the federal reserved water rights doctrine, is that a PWR water right does not arise by use nor can it be lost by nonuse, and the water is reserved for both present and future needs.

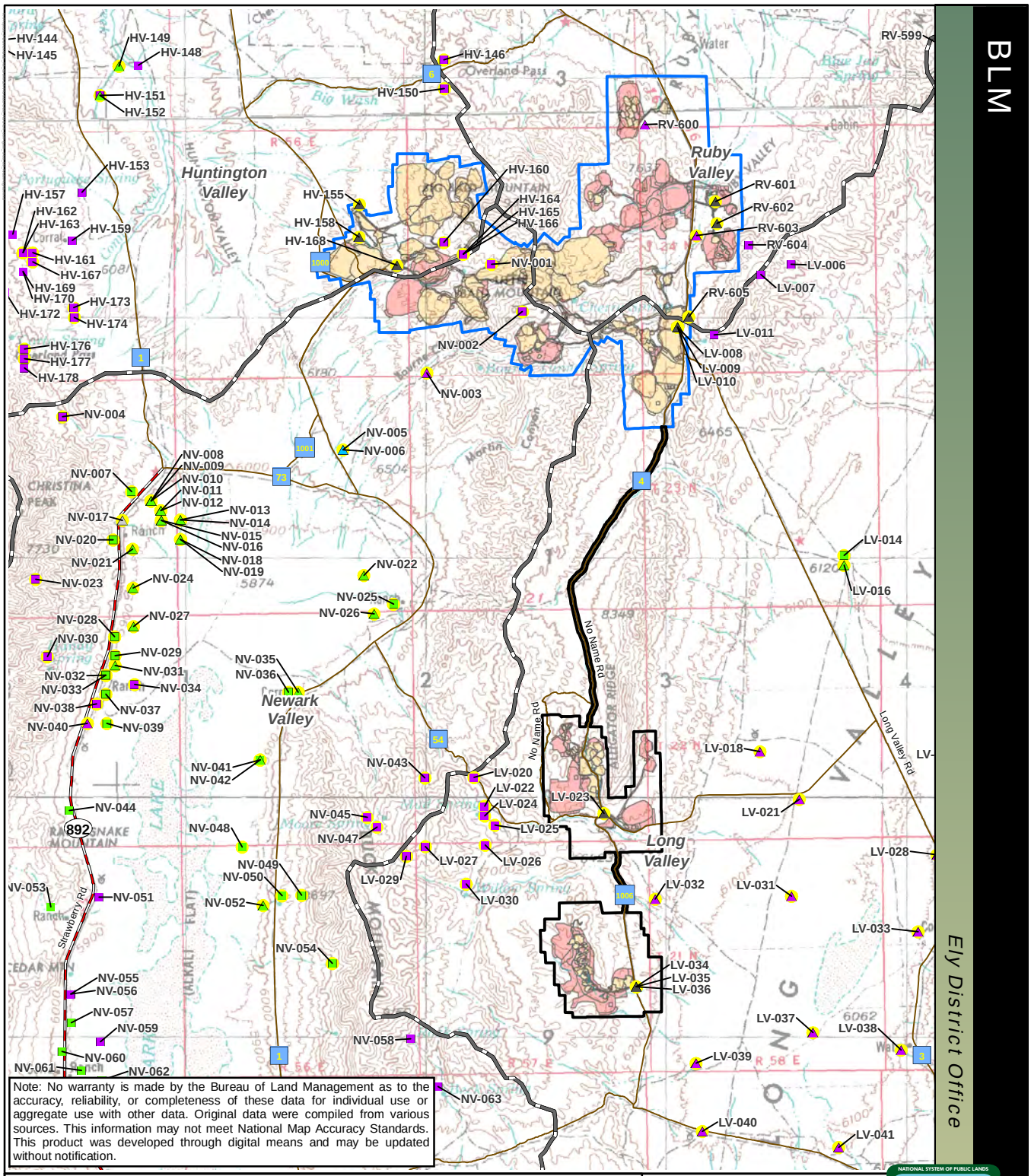
HV-165 is a private owned water "Vested" surface water right listed as a spring source used for stock watering. "Vested" water rights for surface water are those rights for which the work to establish beneficial use was initiated prior to March 1, 1905, the date of adoption of Nevada's Water Law.

Two additional water rights (Map ID's LV-011, and RV-604) occur outside but in close proximity (<1 mile) from the proposed project boundary. LV-011 is a privately owned surface water right with a priority date of July 8, 1914, listed as a spring source used for stock watering. Comparison of this water rights location with the spring and seep locations shown on **Figure 3.3-3** suggest the most likely source of water for this surface water rights is Willow Spring. RV-604 also is a surface water right listed as a spring used for stock watering. The RV-604 location does not correlate to any known or inventoried spring or seep location.

3.3.1.5 Water Quality

Water Quality Standards

Waters of the State of Nevada are defined in the Nevada Revised Statute Chapter 445, Section 445.191 and include, but are not limited to: 1) all streams, lakes, ponds, impounding reservoirs, marshes, watercourses, waterways, wells, springs, irrigation systems, and drainage systems; and 2) all bodies of accumulations of water, surface and underground, natural or artificial.



Legend

- Proposed NOA Plan Boundary
- Proposed SOA Plan Boundary
- Existing and Authorized Disturbance
- Proposed New or Modified Disturbance
- Hydrographic Basin Boundary
- Barrick Gold Water Right

Water Right Water Source

- Surface Water
- Groundwater

Water Right Use Type

- Irrigation
- Mining/Milling
- Quasi-Municipal
- Stock Watering
- Wildlife

Source: NDWR 2014.

Bald Mountain Mine North and South Operations Area Projects EIS

Figure 3.3-9

Water Rights

0 1 2 4 Miles

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Water quality standards for state waters have been established by the State of Nevada under NAC 445A.117 through 445A.128, which adopts by reference the National Primary Drinking Water Regulations as listed in the CFR (40 CFR 141.1, 141.2, 141.4 to 141.42 inclusive, subsections (a) and (d) of 141.43 and 141.60 to 141.722, inclusive). General Nevada water quality standards are summarized in **Table 3.3-5**. NAC 445A.453 establishes primary drinking water quality standards and NAC 445A.455 establishes secondary drinking water standards for water quality. Primary standards are based on the potential use of groundwater for drinking water and are established to protect human health; the secondary standards are for aesthetic qualities. These standards also are referred to as Maximum Contaminant Levels (MCLs). Primary MCL standards are the highest level of a contaminant that is allowed in drinking water. MCLs are enforceable standards. Secondary MCLs are non-enforceable guidelines regarding contaminants that may cause cosmetic effects (such as skin or tooth discoloration) or aesthetic effects (such as taste, odor, or color) in drinking water. Because groundwater downgradient of the study area may have the potential to be used for drinking water, Nevada drinking water standards (MCLs) would apply to project activities that affect groundwater (NAC 445.424).

Table 3.3-5 General Nevada Water Quality Standards

Constituent (mg/L)[1]	Groundwater		Surface Water			
	Nevada Drinking Water Standards		Municipal or Domestic Supply	Nevada Agriculture		Aquatic Life
	Primary MCL[2]	Secondary MCL[2]		Irrigation	Livestock Watering	
Physical Properties						
Dissolved Oxygen	--	--	Aerobic	--	Aerobic	5.0
Color (color units)	--	15[3]	75	--	--	--
Total Dissolved Solids (TDS) (at 180°C)	--	500[4]; 1,000[3]	500[4]; 1,000[3]	--	3,000	--
Turbidity (NTU)	--	--	--	--	--	--
Inorganic Nonmetals						
Ammonia (unionized) (Total NH_3 as N)	--	--	0.5	--	--	--
Chloride	--	250[4]; 400[3]	250[4]; 400[3]	--	1,500	--
Cyanide (as CN)	0.2	--	0.2	--	--	--
Fluoride	4.0	2.0[4]	--	1.0	2.0	0.0052[5]
Nitrate (as N)	10	--	10	--	100	--
Nitrite (as N)	1.0	--	1.0	--	10	--
pH (standard units)	--	6.5-8.5[3]	5.0-9.0	4.5-9.0	6.5-9.0	6.5-9.0
Sulfate	--	250[4]; 500[3]	250[4]; 500[3]	--	--	--
Metals[6]/Elements						
Aluminum	--	0.05[3]-0.2[4]	---	--	--	--
Antimony	0.006	--	0.006	--	--	--
Arsenic (total)	0.01	--	0.01	0.10	0.20	0.18[5,7]

Table 3.3-5 General Nevada Water Quality Standards

Constituent (mg/L)[1]	Groundwater		Surface Water			
	Nevada Drinking Water Standards		Municipal or Domestic Supply	Nevada Agriculture		Aquatic Life
	Primary MCL[2]	Secondary MCL[2]		Irrigation	Livestock Watering	
Barium	2.0	--	2.0	--	--	--
Beryllium	0.004	--	--	0.10	--	--
Boron	--	--	--	0.75	5.0	--
Cadmium	0.005	--	0.005	0.01	0.05	0.0006[5,8]
Chromium (total)	0.1	--	0.1	0.10	1.0	0.015[5,8]
Copper	1.3[9]	1.0[3]	--	0.20	0.50	0.0065[5,8]
Iron	--	0.3[4]; 0.6[3]	--	5.0	--	1.0
Lead	0.015[9]	--	0.05	5.0	0.10	0.0004[5,8]
Magnesium	--	125[4]; 150[3]	--	--	--	--
Manganese	--	0.05[4]; 0.1[3]	--	0.2	--	--
Mercury	0.002	--	0.002	--	0.01	0.00012[5]
Nickel	0.1	--	0.134	0.20	--	0.087[5,8]
Selenium	0.05	--	0.05	0.02	0.05	0.005[5]
Silver	--	0.1[3]	--	--	--	0.0014[5,8]
Thallium	0.002	--	0.013	--	--	--
Zinc	--	5.0[4]	--	2.0	25	0.584[5,8]

[1] Units are milligrams per liter (mg/L) unless otherwise noted.

[2] MCL = Maximum contaminant level. Federal primary standards that existed as of July 1, 2009, are incorporated by reference in NAC 445A.4525.

[3] Nevada secondary MCLs.

[4] Federal secondary MCLs.

[5] 96-hour average.

[6] The standards for metals and metalloids are expressed as total recoverable unless otherwise noted.

[7] Standard for arsenic (III); trivalent (reduced) inorganic form of arsenic, which occurs as a water soluble form.

[8] Standard is dependent on site-specific hardness; displayed value is based on a hardness of 60 mg/L as calcium carbonate. (See NAC 445A.144 for equations.)

[9] Value is action level for treatment technique for lead and copper.

Sources: 40 Code of Federal Regulations (CFR) 141.51; 40 CFR 143.3; NAC 445A.119, 445A.144, 445A.453, and 445A.455.

Surface Water Quality

Runoff is routed around existing disturbance (or otherwise managed) in accordance with permit provisions for exploration, mining, and processing issued by the NDEP. Given the ephemeral nature of streams in the study area and CESA, surface water quality monitoring is oriented to the spring sites described in Section 3.3.1.2. Water quality of the springs in the project vicinity has been monitored since 2005. General water quality characteristics at monitoring sites are summarized in **Table C-3**, **Appendix C**

Most sites have reasonably narrow ranges of water quality constituent values. Sites that somewhat depart from this include Cracker Johnson Spring No. 2, South Water Canyon Seep, and Cherry Spring.

Livestock watering is a common existing and designated beneficial use at most of the monitored spring locations. Exceedences of corresponding NDEP water quality standards for livestock were rare in the sample data, occurring only for arsenic at Cracker Johnson Spring No. 1 (see **Table C-4, Appendix C**). Although surface water is not used for municipal or domestic supply within the study area, it is a designated beneficial use for Ruby Marsh and other waterbodies in the Central Region of the state (NAC 445A.1952). Constituents that occurred at concentrations above municipal or domestic supply standards frequently included aluminum, iron, and occasionally zinc and pH. Levels of these constituents were not consistently elevated at any location. Other constituents that occasionally exceeded drinking water standards included TDS at Cracker Johnson Spring No. 2, and Mud Spring, and sulfate concentrations at the South Water Canyon Seep.

Groundwater Quality

The location of groundwater monitoring wells used to characterize groundwater quality in the project vicinity are shown on **Figure 3.3-10**. Groundwater quality for these wells in the project area is provided in the baseline water resources report for the proposed project (Geomega 2011a and **Appendix C**). The general groundwater quality for all the wells is good with TDS below 350 mg/L, and pH ranging from 7.3 to 8.7. Metals concentrations are below the Nevada MCL for drinking water with the exception of arsenic. One or more of the samples from monitoring wells ARW, BMM Well 1, BMM Well 2, MMW 3, MMW 5, and MMW 14 exceed the Nevada MCL of 0.01 mg/L. Review of the water quality samples for specific monitoring wells provided in **Appendix C** did not indicate any consistent concentration trends over the period of sampling. The average arsenic concentrations in all other monitoring wells are below the Nevada MCL for drinking water.

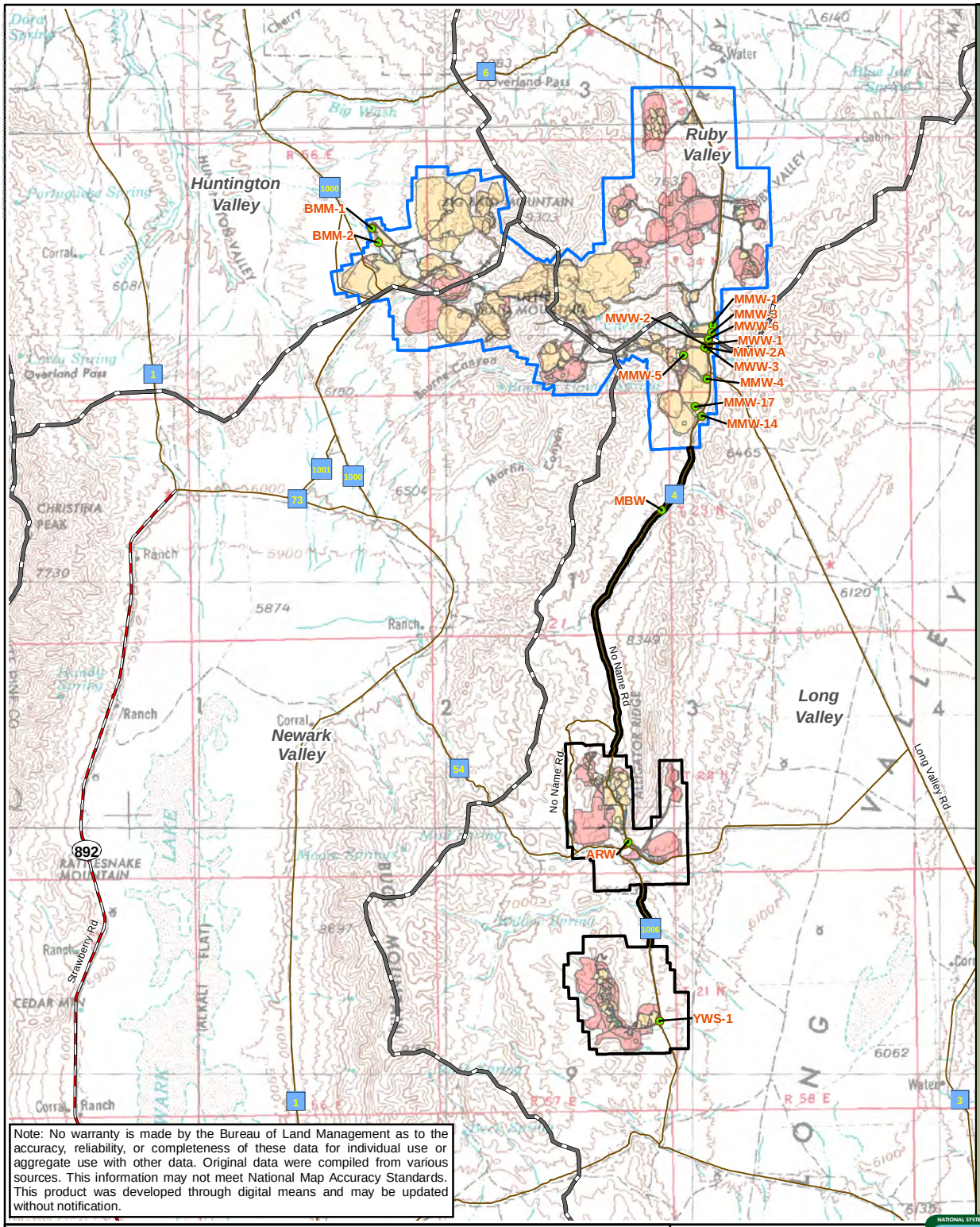
3.3.1.6 Rock Geochemistry

Although the geology and mineralization are somewhat different between the NOA and SOA, there is sufficient overlap in mineralization and lithologic types between the two areas that a discussion of the geochemistry of waste rock can be based on the lithologic units found in the open pits and proposed RDAs (Schafer 2012a,b, 2011, 2009, 2008).

Geochemical Concepts Related to Acid Mine Drainage

In order to assess the potential for acid mine drainage and metals leaching of waste rock, the concept of the NNP was developed (Sobek et al. 1978). Mineralized rocks that contain pyrite have the potential to oxidize and react with water to produce an acid leachate due to the reaction of pyrite with oxygen and water. The potential for acid generation is referred to as the AGP and is determined based on the sulfide sulfur (pyritic sulfur) in the rock. Rocks containing carbonate minerals, such as calcite and dolomite, have the potential to neutralize acidic leachate. This neutralization capacity is referred to as the ANP. Because mineralized rocks can contain both pyrite and other sulfides along with carbonate minerals, the difference between the ANP and the AGP is the key to identifying rocks with the potential for acid generation. This difference is expressed as the NNP where NNP = ANP-AGP. The test to determine AGP, ANP, and NNP is referred to as the static acid-base accounting (static ABA) test (Sobek et al. 1978).

Robertson and Broughton (1992) used the results of the ABA tests to classify rock materials into three types: potentially acid generating, non-acid generating, and uncertain. If the rock materials has an NNP of –20 kg/t (of $CaCO_3$) or less (more negative), the rock material is potentially acid generating. Rocks with an NNP of +20 kg/t or greater are non-acid generating. Rocks that have an NNP between –20 kg/t and +20 kg/t fall into an uncertain category and require additional testing with kinetic humidity cell tests (HCTs).



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Legend

- Proposed NOA Plan Boundary
- Proposed SOA Plan Boundary
- Existing and Authorized Disturbance
- Proposed New or Modified Disturbance
- Hydrographic Basin Boundary
- Groundwater Quality Monitoring Site[1]

[1]Historical water quality data exist for wells ARW, MBW and YWS-1; however these wells are no longer monitored.
Source: SRK 2015; Barrick 2012a,b, 2015.

Bald Mountain Mine North and South Operations Area Projects EIS

Figure 3.3-10

Groundwater Quality Monitoring Sites

0 1 2 4 Miles

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BLM

Ely District Office

12/30/2015

Within the study area, Barrick has developed site specific criteria for identifying rock materials that are potentially acid generating based on extensive waste rock testing (Schafer 2014b, 2012a,b). Static ABA tests at Bald Mountain have been conducted using both the Sobek (Sobek et al. 1978) and Net Carbonate Value (NCV) procedures (Bucknam 1997). The Nevada modified Sobek procedure is preferred by NDEP but Bald Mountain has a historic dataset with NCV analyses. A comparison of 517 samples throughout the NOA and SOA with ABA values from less than zero to over 1,100 kg/t showed strong correlation between the two methods (Schafer 2012a,b). A third method also was used to estimate the ABA for geochemical samples. Based on Schafer (2012a), waste rock with an NNP of -15 kg/t or less is considered to be PAG. Waste rock with an NNP between -15 kg/t and 0 kg/t is less likely to generate acid but also is considered to be PAG. Waste rock with an NNP greater than 0 kg/t is treated as non-acid generating. For the purposes of this EIS, waste rock with an NNP of <0 kg/t is analyzed as PAG rock.

Waste rock that may be PAG is required by the NDEP and the BLM (BLM 2013f) to be tested using the kinetic HCT (American Society for Testing and Materials 2007a, 1996) and meteoric water mobility procedure (MWMP) (American Society for Testing and Materials 2007b) to assess the acid generating potential and metal leaching potential. The HCT simulates natural weathering of waste rock by subjecting the waste rock to alternating wetting and drying conditions. The waste rock is ground to a finer average grain size than would be used in the RDA to accelerate the reactions due to the increased surface area of the finer particles. During the HCT, leachate is sampled at periodic intervals to determine the acidity (pH) and metals content of the leachate generated. For the MWMP, the waste rock ground to a fine size is subjected to simulated rainwater in a short duration test to determine the metals content and acidity of the first “flush” of leachate due to rainwater dissolving easily soluble minerals in the waste rock.

These three tests, the static ABA, HCT, and MWMP, are used together to determine if potential waste rock or rocks exposed in open pit are PAG (static ABA), will generate acid and elevated metals under simulated weathering conditions (HCT), or will generate a leachate elevated in metals if subjected to rainfall or infiltration of water into an RDA (MWMP). Because the HCT and MWMP use material that is finer-grained than will be found in an RDA or in a pit wall, these tests are overly conservative and used as guides to what may happen. In order to assess how an RDA will react over time under the natural climate of the mine area, RDAs that have been exposed to natural conditions for an extended length of time (“legacy RDAs”) can be evaluated with borings. Barrick has completed such studies for selected legacy RDAs within the study area, the results of which are presented in a later section.

The classification of waste rock into PAG and non PAG waste is described in the Adaptive Waste Rock Management Plan (Schafer 2012a,b). The PAG classifications were based on the results of 87 HCTs that included 14 quarterly composite samples from the North Area (8 Saga, 5 Bida, and 1 Top Pit), 22 original and 11 supplemental Top Pit samples, 26 from Redbird Pit and 14 from other dominant rock units across the District (6 Galaxy, 3 Gator, 3 Vantage, and 2 Yankee). Of these 87 samples, 5 developed low pH conditions (<4) during testing with NNP values ranging from -13.2 to -80 kg/t (Schafer 2012a). The 14 historic humidity cell tests did not become acidic despite relatively low NNP values (all but one sample had NNP between -60.2 and +1.7 kg/t based on non-sulfate sulfur). Based on these results, PAG material was divided into two types: waste rock with an NNP of -15 kg/t or less was determined as likely to become acidic under field conditions (also called “red” waste); whereas, waste rock with NNP from 0 to -15 kg/t NNP was unlikely to become acidic (also called “yellow” waste), although its potential to form acid is higher than rock with NNP greater than zero.

Geochemistry of Lithologic Units

Mineralization within the study area is limited to specific lithologic units. **Figure 3.2-2** illustrates the distribution of mineralization within the stratigraphic column within the study area. In the BMM area, mineralization associated with deposits found in the Top/Sage Pit area, Redbird Pit, and Sage Flat Pit area is found in the Pogonip Group; the Chainman Shale, Windfall, and Dunderberg Shale formations;

and especially in the Jurassic intrusives. Carlin-style mineralization found in Mooney Basin and in the SOA is found mainly in the Pilot Shale, Chainman Shale, and Guilmette formations (Schafer 2012a).

Figure 3.3-11 illustrates the waste rock tonnages by lithology within the study area under the Proposed Action. The Pogonip, Pilot Shale, Laketown Dolomite, and Chainman Shale formations are the major lithologic units found in the RDAs. The Jurassic intrusives comprise a significant proportion of waste rock within the NOA. The Guilmette Formation is associated with the RDAs of Mooney Basin and the Carlin-style deposits.

The number of static ABA tests and total metals tests for the major lithologic types within the study area are summarized in waste rock characterization report (Schafer 2012b). The number of tests completed for each lithologic unit reflects the expected role of that unit in comprising waste rock found in the existing and proposed RDAs. The Pogonip, Pilot Shale, Laketown Dolomite, and Chainman Shale formations, and the Jurassic intrusives have received the majority of the static ABA tests and they are the dominant waste rock materials. Two methods were used for the static ABA evaluations: the standard Sobek method (Sobek et al. 1978) and a newer NCV method (Bucknam 1997). The results of the evaluation indicate that the standard Sobek method and the NCV method provide comparable results for ANP and AGP (Schafer 2012a,b).

The results of the static ABA tests for the major waste rock lithologies within the study area are summarized in **Table 3.3-6**. The Pogonip Formation consists of an estimated 1.0 percent (red plus yellow waste in **Table 3.3-6**) PAG waste rock. The sulfide sulfur is quite low, averaging 0.02 percent for the unit. The Pilot Shale Formation has an average of 0.26 percent sulfide sulfur and consists of 7.5 percent PAG material. The Chainman Shale has an average of 0.91 percent sulfide sulfur and consist of an estimated 52.7 percent PAG material. The Jurassic intrusives has an average of 0.1 percent sulfide sulfur and consist of an estimated 24.9 percent PAG material. As shown by the NNP values, only the Chainman Shale has the potential for acid generation based on an NNP of less than 0 kg/t (NNP = -4 kg/t). Other rock units may contain some PAG material, but the overall percentage of PAG waste rock to neutralizing, non-PAG waste rock is such that when mixed with other material, the NNP is >0 (Schafer 2012a,b).

Total metals tests of waste rock provide an estimate of those metals that are elevated above the crustal average and thus may leach during weathering of the waste rock. **Table 3.3-7** summarizes the total metals tests for the major waste rock types within the study area. Values in red are above the crustal average, and values in green are below the crustal average. For the major lithologic types found as waste rock in the existing and proposed RDAs, arsenic, bismuth, mercury, molybdenum, and antimony are consistently elevated above the crustal average and are potential candidates for leaching during weathering of the waste rock.

Kinetic Testing

Humidity cell tests provide an estimate of what may happen during weathering of waste rock. A total of 87 HCTs have been completed within the study area (Schafer 2012a). Most of the samples came from the Redbird and Top Pit areas, but the rock types tested include the major lithologic types that constitute waste rock that would be present in the proposed RDAs. **Table C-5, Appendix C** summarizes the results of the HCTs. Most lithologic types with an NNP greater than -20 kg/t have a pH greater than 6.1 Standard Units (SUs) and cumulative sulfate below 2,500 milligrams per kilograms (mg/kg) and generally below 1,000 mg/L. Exceptions are the Pilot Shale in the Galaxy Pit area with a pH in the range of 7.8 to 9.1 SUs and cumulative sulfate between 3,000 and 7,500 mg/L. Also, the Guilmette Formation at the Vantage Pit had a pH in the range of 7.8 to 7.9, but cumulative sulfate between 4,900 and 5,200 mg/L.

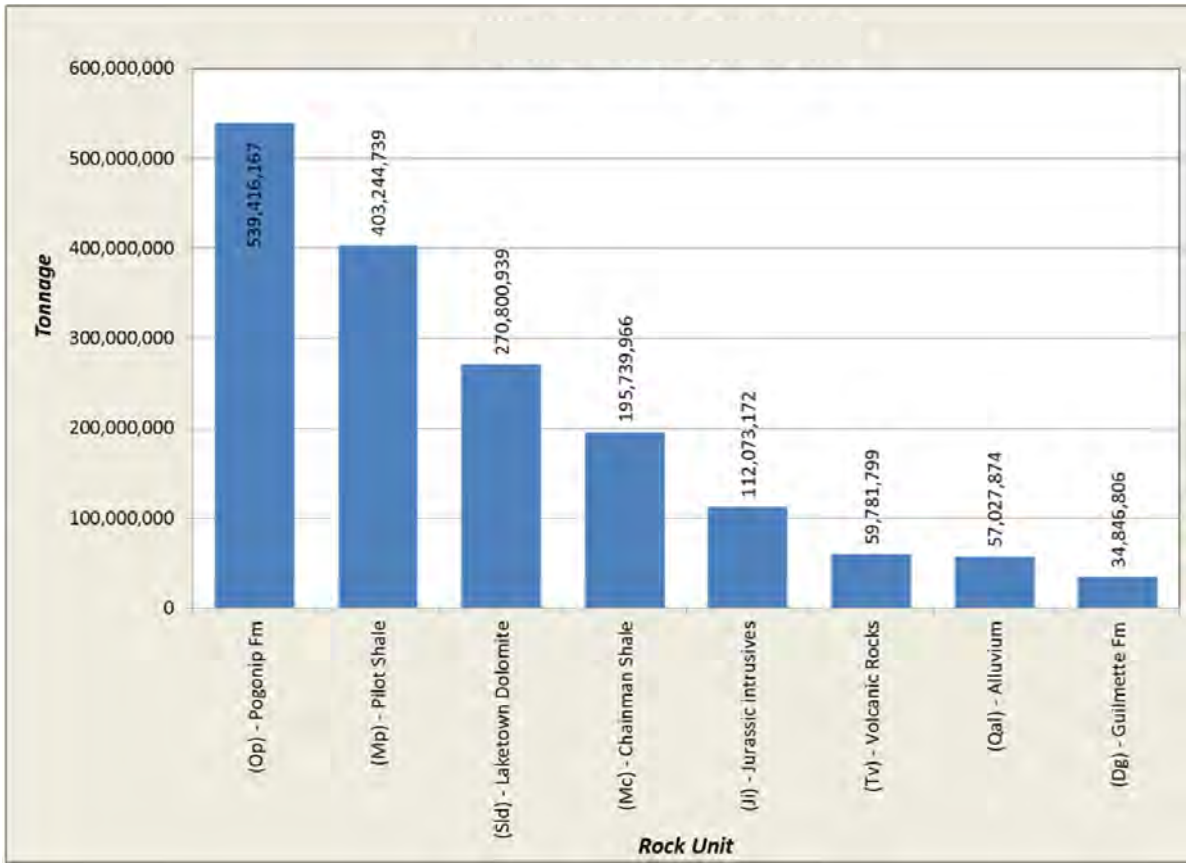

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Figure 3.3-11

Waste Rock Tonnages by Lithology

Source: Barrick 2012a,b.

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Table 3.3-6 Summary of Median Carbon, Sulfur, and Net Neutralizing Potential in Dominant Rock Units within the Study Area

Parameter	Formation							
	(Op) Pogonip Fm	(Mp) Pilot Shale	(Sld) Laketown Dolomite	(Mc) Chainman Shale	(Ji) All Jurassic Intrusives	(Qal) Alluvium	(Tv) Volcanics	(Dg) Guilmette Fm
Total C (%)	7.59	2.44	12.35	2.25	0.30	5.67	0.68	10.28
Organic C (%)	0.04	0.11	0.04	0.77	0.04	0.05	0.08	0.04
Inorganic C (%)	7.55	2.08	12.35	0.29	0.49	5.62	0.60	10.23
Total S (%)	0.02	0.36	0.02	0.98	0.09	0.03	0.04	0.08
Sulfate S (%)	0.01	0.08	0.01	0.08	0.02	0.01	0.04	0.04
Sulfide S (%)	0.02	0.26	0.01	0.91	0.10	0.03	0.04	0.04
ANP (kg/t)	629	173	1,000	24	41	468	50	852
AGP (kg/t)	0.3	9	0.3	28	2	0.6	0.3	1.3
NNP (kg/t)	629	164	1,000	-4	39	468	50	851
Red Waste (%) (NNP<-15)	0.3	4.6	0	27.3	11.4	0.3	1.3	0.4
Yellow Waste (%) (NNP 0 to -15)	0.7	2.9	0	25.4	13.5	0.8	0	0.2

Source: Barrick 2012a,b.

Table 3.3-7 Summary of Median Major Ions and Total Metals in Dominant Rock Units within the Study Area[1]

Constituent	Average Crustal Abundance	Formation							
		(Op) Pogonip Fm N=2538	(Mp) Pilot Shale N=822	(Sld) Laketown Dolomite N=895	(Mc) Chainman Shale N=1877	(Ji) All Jurassic Intrusives N=5275	(Tv) Volcanics N=299	(Qal) Alluvium N=255	(Dg) Guilmette Fm N=565
Major Ions (percent)									
Calcium	5	**16.1**	6.185	**19.85**	**0.21**	**0.91**	**26.45**	1.87	**26.50**
Magnesium	2.9	**0.54**	1.7	**11.8**	**0.17**	**0.15**	**0.355**	**0.63**	**0.35**
Sodium	2.3	**0.01**	**0.05**	**0.01**	**0.04**	**0.02**	**0.02**	0.87	**0.02**
Potassium	1.5	**0.08**	1.58	**0.02**	0.84	**0.28**	**0.3**	1.61	**0.30**
Aluminum	8.2	**1.99**	4.34	**0.24**	5.09	4.81	**0.885**	6.25	**0.89**
Iron	6.3	**1.33**	2.18	**0.27**	2.59	2.24	**0.51**	**2.04**	**0.51**
Sulfur	0.042	0.02	**0.27**	0.02	**0.65**	0.08	0.09	0.03	0.09
Titanium	0.66	**0.09**	**0.216**	**0.014**	0.284	**0.195**	**0.043**	**0.205**	**0.04**
Trace Metals (mg/kg)									
Silver	0.08	**0.52**	0.13	0.06	**0.25**	**0.46**	0.06	0.13	0.06
Arsenic	2.1	**276**	**181**	**25**	**267.5**	**512.5**	**72**	**17.45**	**72.5**
Barium	340	150	615	**70**	530	280	970	910	970
Beryllium	1.9	**0.53**	1.305	**0.16**	1.34	1.18	**0.34**	2.44	**0.34**
Bismuth	0.025	**2.8**	**0.14**	**0.22**	**0.41**	**4.44**	0.03	**0.28**	0.03
Cadmium	0.15	0.36	**0.56**	0.14	0.29	0.39	0.15	0.16	0.15
Cobalt	30	**4.2**	**9.6**	**1.5**	**5.3**	**6.4**	**2.7**	**5.2**	**2.7**
Chromium	140	**18**	**43**	**3**	103	**29**	**10**	**21**	**10**
Copper	68	91	22.8	**8.1**	38.1	67.2	**5.5**	**13.6**	**5.5**

Table 3.3-7 Summary of Median Major Ions and Total Metals in Dominant Rock Units within the Study Area[1]

Constituent	Average Crustal Abundance	Formation							
		(Op) Pogonip Fm N=2538	(Mp) Pilot Shale N=822	(Sld) Laketown Dolomite N=895	(Mc) Chainman Shale N=1877	(Ji) All Jurassic Intrusives N=5275	(Tv) Volcanics N=299	(Qal) Alluvium N=255	(Dg) Guilmette Fm N=565
Mercury	0.067	**0.66**	**0.51**	**0.305**	**0.26**	**0.94**	**0.53**	0.04	**0.54**
Manganese	1100	**363**	**223**	**200**	**37**	**190**	**188.5**	**359**	**189**
Molybdenum	1.1	**6.28**	**13.125**	1.4	**8.38**	**8.83**	1.445	1.91	1.45
Nickel	90	**9.9**	41.55	**3.2**	41.6	**15.6**	**9.2**	**10.8**	**9.2**
Phosphorus	1000	**14.5**	440	**11.3**	**15.8**	**19**	**30**	**22.6**	**30**
Lead	10	**350**	14.5	30	**695**	**560**	8.05	**350**	8.3
Rubidium	60	**4.5**	77.9	**1**	48.6	**17.4**	**14.7**	88.3	**14.7**
Antimony	0.2	**37.1**	**10.8**	**9.51**	**11.9**	**48**	**15.9**	**1.69**	**16.0**
Scandium	26	**3.2**	**7.4**	**0.9**	9.1	**5.1**	**2.65**	**6.6**	**2.7**
Selenium	0.05	**2**	**2**	**2**	**6**	**2**	**2**	**2**	**2**
Strontium	360	**85.3**	157.25	**58.3**	143.5	**83.8**	124.75	225	125
Thallium	0.53	0.58	**2.53**	0.195	0.85	0.99	1.25	0.95	1.25
Vanadium	190	**17**	80	**5**	176	**40**	**16**	**51**	**16**
Tungsten	190	**18.6**	**5.45**	**2**	**8.5**	**21.3**	**2.1**	**2.3**	**2.1**
Zinc	79	58	74	**18**	58	62	**23.5**	68	24
Zirconium	130	44.6	88.6	**5.1**	90.1	72.6	**16.6**	87.1	**16.6**

[1] Constituents enriched above three times average crustal background are shown in red; constituents depleted to less than one-third times average crustal background are shown in green.

Source: Schafer 2012b.

Samples with a pH less than 3.0 SUs had the highest cumulative sulfate in the HCT tests. The Diamond Peak Formation at the Gator Pit had a pH of 2.72, an NNP of –51.4 kg/t, and cumulative sulfate of 10,664 mg/L. The Pilot Shale at the Vantage Pit had a pH of 2.59 SUs, an NNP of -33.4 kg/t, and cumulative sulfate of 28,020 mg/L. Two samples of the Chainman Shale from the Redbird Pit area had pH values of 2.6 and 2.46 SUs, NNP values of -80.5 and -59 kg/t, and cumulative sulfate values of 16,957 and 18, 841 mg/L. Samples with NNP values below -15 kg/t appear to present the greatest potential for acid generation within the study area (Schafer 2012a).Of the three HCTs performed from material from the Gator Pit, sample 726-8 (NNP of -51.4) became acidic while, sample 726-7 (NNP of -11.8) did not become acidic, and sample 726-9 (NNP of 191) was an alkaline pH waste (**Table C-5, Appendix C**). The Gator Pit has an ANP of 44.0 kg/t and an AGP of 17.9 kg/t resulting in a neutralization potential (NP) ratio of 44/17.9 or 2.4 (Schafer 2012b).

Metals leached during the HCT are summarized in the Ficklin Plot (Ficklin et al. 1992) illustrated in **Figure 3.3-12**. The metals plotted along the Y-axis are the sum of cadmium, copper, nickel, lead, and zinc in the HCT leachate. Generally, metals are low in the HCT leachate for pH value greater than 5.0 SUs. For samples with a pH of less than 3.0 SUs, metals are elevated in the leachate. In addition, for acidic samples, total iron is in the range of 100 to 297 mg/L and TDS is greater than 1,000 mg/L and can be as high as 13,000 mg/L (Schafer 2012b). **Figure 3.3-13** illustrates the mobility of arsenic during the HCT tests. Arsenic is more mobile at pH values greater than 6.0 SUs than the base metals and can range up to 1.0 mg/L for most samples with a pH greater than 6.0 SUs. For acidic samples with a pH less than 3.0 SUs, arsenic can exceed 1.0 mg/L and range up to 100 mg/L.

Overall, lithologic types within the study area with NNP values greater than -15 kg/t in the static ABA tests can be expected to be non-acid generating and have limited base metals mobility during weathering of waste rock (Schafer 2012a,b). The mobility of metalloids, such as arsenic, may be somewhat enhanced at alkaline pH values for lithologic types containing both sulfides and carbonate minerals. Lithologic types with an NNP less than -15 kg/t may be acid generating and would need to be mixed with non-acid generating waste rock to minimize the potential for acid rock drainage from RDAs.

Geochemical Evaluation of Legacy Rock Disposal Areas

To determine the effect of weathering on historic (“legacy”) RDAs, Barrick completed nine sonic bore holes in RDAs representing 5 to 25 years of weathering in both the NOA and SOA. The RDAs that were sampled and year they were active are summarized below (Schafer 2012a,b):

- SWC-1 (1997/recent)
- RBM North-2 (1990)
- White Pine-3 (early 1990s)
- Vantage-5 (mid 1980s)
- Yankee-6 (early 1990s)
- 1/5 RDA-7 (1994)
- Galaxy-8 (2000)
- Rat-9 (1994)
- RBM New-10 (1990-2007)

The sonic bore holes encountered gravelly sand as the predominate texture with most zones showing 50 to 70 percent gravel (Schafer 2012a). The water content of the samples averaged 6 percent with 90 percent of the samples falling in the 2 to 12 percent range. No wetting front was noted in any of the RDAs and only 30 percent of the RDAs had moist zones. None of the RDAs had water content near field saturation.

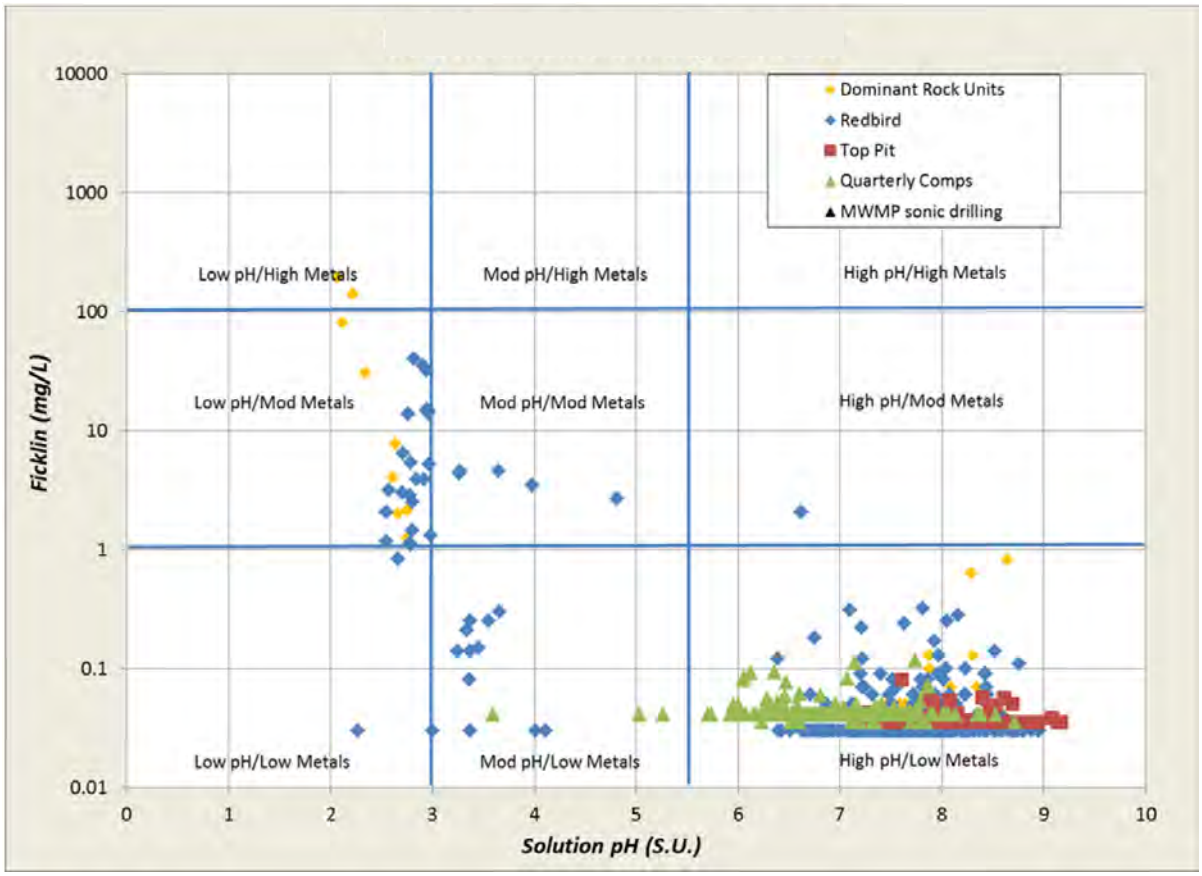

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Figure 3.3-12

Ficklin Plot of Humidity Cell pH against Base Metal Concentrations

Source: Barrick 2012a,b.

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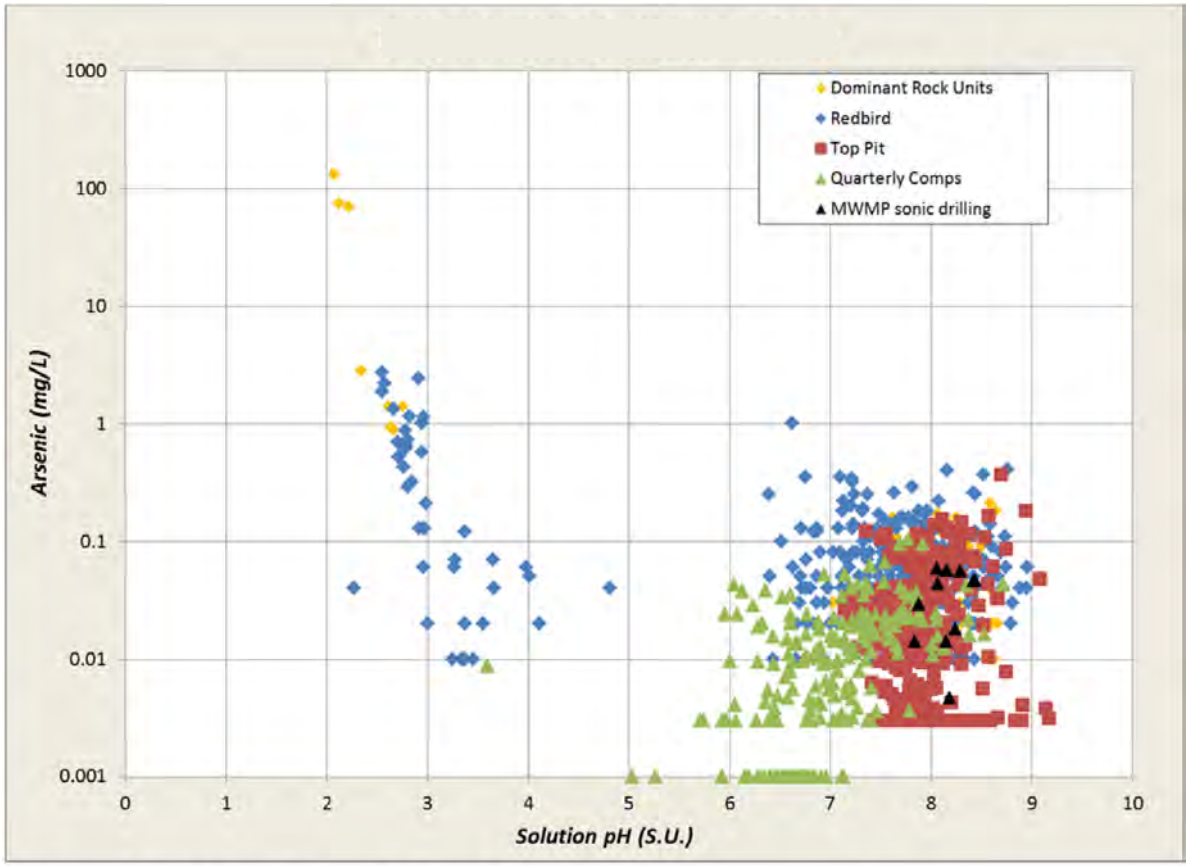

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Figure 3.3-13

Humidity Cell pH and
Dissolved Arsenic Concentrations

Source: Barrick 2012a,b.

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The NNP of samples taken in the sonic borings ranged from slightly below an NNP of zero to an NNP of 800 kg/t. The RBM, Galaxy, and Middle Water Canyon RDAs had the lowest NNP. The paste pH of the samples ranged from 7.0 to 8.5 SUs. The Vantage RDA had the most pyrite, with 0.2 percent pyrite.

Metals leaching in the drilled RDAs were generally quite low as determined from the results of the meteoric water mobility procedure tests. The Vantage RDA, because of its high pyrite content, showed sulfate as high as 2,200 mg/L. This sulfate decreased rapidly near the base of the Vantage RDA and was below 300 mg/L in the soil beneath the RDA due to chemical reactions with calcium and carbonate in the soil. Arsenic and antimony showed the most mobility in the soil beneath the RDAs. Arsenic in RDAs South Water Canyon-1, Numbers-7, and White Pine-3 increased in the upper 10 feet of soil beneath the RDA before decreasing to values comparable to those found near the base of the RDA. Similarly, antimony in RBB New-10, South Water Canyon-1, and White Pine-3 increased in the upper 10 feet of soil beneath the RDA. Arsenic and antimony concentrations for the RDA Numbers-7 sample would be expected to decline with increasing soil depth if a deeper core sample was taken and follow a similar pattern as SWC-1 or White Pine-3.

In summary, the legacy RDAs evaluated with sonic drilling showed no indication of acid rock drainage and generally had paste pH values above a pH of 7.0 SUs. No wetting fronts were observed and no indication of fluid movement through the RDAs was noted. RDAs with high pyrite, such as the Vantage RDA, can generate elevated sulfate that can enter the upper few feet of soil beneath the RDA. Similarly, arsenic and antimony can increase in the upper few feet of soil beneath some RDAs. Weathering of legacy RDAs over the past 5 to 25 years has not resulted in acid rock drainage or substantial mobilization of metals from the RDAs.

3.3.2 Environmental Consequences

The primary issues related to water resources include: 1) reduction in surface water and groundwater quantity for current users and water-dependent resources from groundwater withdrawal from water supply and pit dewatering wells; 2) impacts to groundwater and surface water quality from the construction, operation, and closure of the waste rock storage facilities, heap leach facilities, and other mining and processing facilities; 3) impacts from flooding, erosion, and sedimentation associated with mine construction, operation, or closure activities; and 4) impacts to groundwater quality related to the partial backfill of pits to preclude pit lake development.

Evaluation Methodology

This section provides a summary of the methods used to evaluate the potential changes in groundwater elevations (drawdown).

Groundwater Pumping

The following discussion summarizes the estimated future groundwater pumping required for the project relevant to evaluating the impacts to water resources associated with the No Action, Proposed Action, Reconfiguration and WRM alternatives. Existing and proposed new water supply wells that would be used for groundwater production under each alternative are listed in **Table 3.3-8**. The location of these water supply wells are shown on **Figure 3.3-14**.

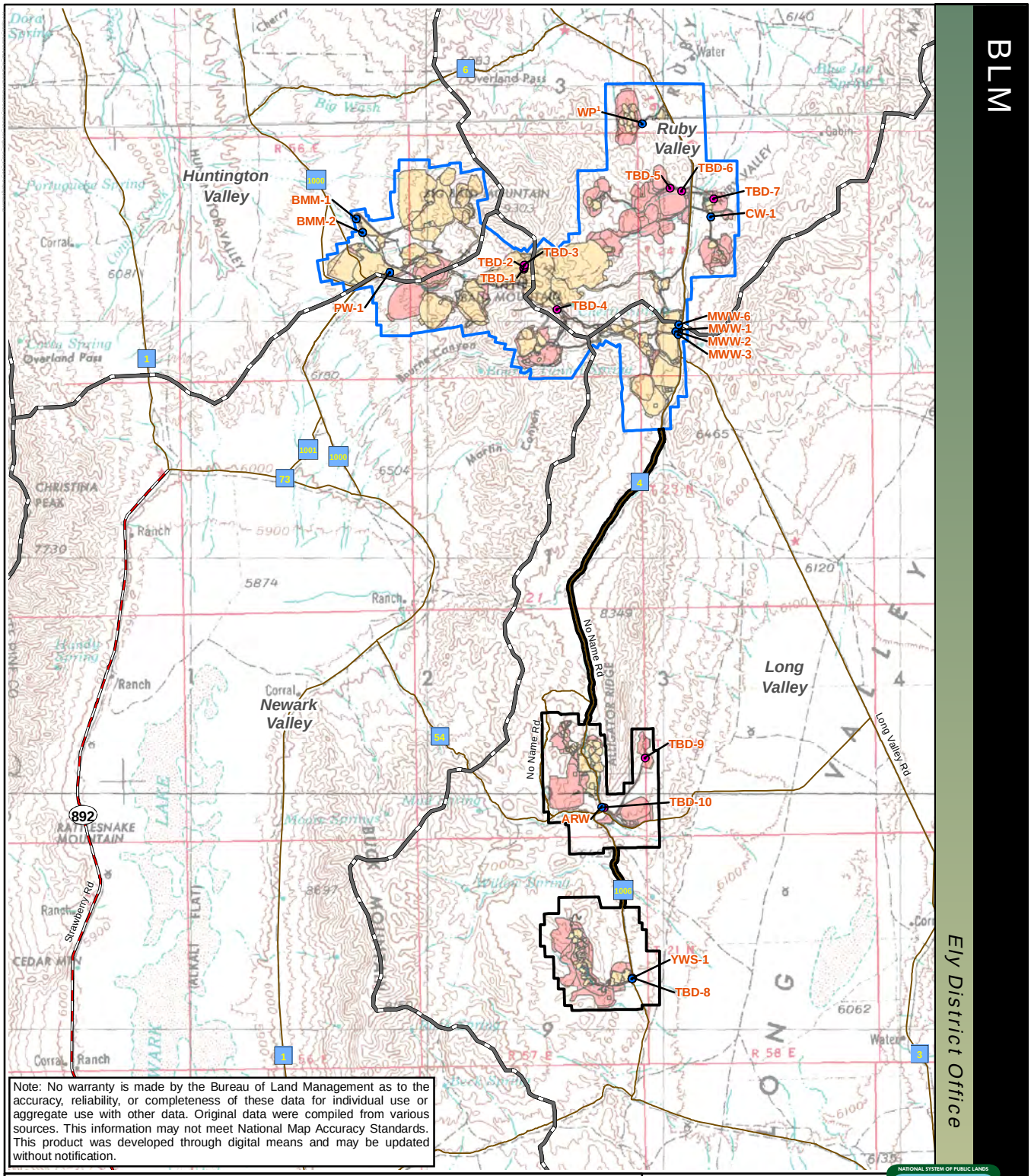
Projected future groundwater pumping requirements under each alternative are summarized in **Table 3.3-9** and illustrated in **Figure 3.3-15**. Under the No Action Alternative, groundwater pumping is projected to continue under currently permitted activities through 2027 at an average annual pumping rate ranging from 110 to 578 gpm.

Table 3.3-8 Existing and Proposed Groundwater Production Wells

Mine Area	Well ID	No Action	Proposed Action	Reconfiguation Alternative	WRM Alternative
Bald Mountain (Numbers, Redbird, Rat)	BMM-1	X	X	X	X
	BMM-2	X	X	X	X
	PW-1	X	X	X	X
Top Pit	TBD(1)[1]		X	X	X
	TBD(2)[1]		X	X	X
	TBD(3)[1]		X	X	X
	TBD(4)[1]		X	X	X
Poker Flats	TBD(5)[1]		X	X	X
	TBD(6)[1]		X	X	X
Royale	WP		X		
Winrock	CW-1		X	X	X
	TBD(7)[1]		X	X	X
Mooney Basin	MWW-1	X	X	X	X
	MWW-2	X	X	X	X
	MWW-3	X	X	X	X
	MWW-6	X	X	X	X
Yankee	YWS-1		X	X	X
	TBD(8)[1]		X	X	X
Gator	TBD(9)[1]		X	X	X
Vantage	ARW		X	X	X
	TBD(10)[1]		X	X	X
Total Production Wells		8	21	20	20

[1] TBD (To be determined) Proposed water supply well. (Approximate location shown on **Figure 3.3-14**.)

Source: Barrick 2015b.



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Legend

- Proposed NOA Plan Boundary
- Proposed SOA Plan Boundary
- Existing and Authorized Disturbance
- Proposed New or Modified Disturbance
- Hydrographic Basin Boundary
- Water Supply Well (Existing)
- Water Supply Well (Proposed)*

***TBD (To be determined)**

[1] The White Pine well is not owned by KG Mining.

Source: SRK 2015; Barrick 2012a,b.

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Figure 3.3-14

Existing and Proposed Groundwater Pumping Wells

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Table 3.3-9 Estimated Future Groundwater Pumping Requirements

Project Year	Calendar Year[1]	Total Estimated Future Pumping Requirements				Incremental Increase in Pumping[2]		
		No Action Alternative (gpm)	Proposed Action (gpm)	Reconfig. Alternative (gpm)	WRM Alternative (gpm)	Proposed Action (gpm)	Reconfig. Alternative (gpm)	WRM Alternative (gpm)
1	2015	578	615	614	614	37	36	36
2	2016	494	528	528	528	34	34	34
3	2017	253	895	473	473	642	220	220
4	2018	429	885	1,037	1,003	456	608	574
5	2019	429	863	1,014	981	434	585	552
6	2020	429	885	1,037	1,004	456	608	575
7	2021	429	1,006	1,134	1,035	577	705	606
8	2022	402	1,195	1,343	1,244	793	941	842
9	2023	204	1,117	1,242	1,151	913	1,038	947
10	2024	204	1,061	1,114	1,023	857	910	819
11	2025	204	1,222	823	797	1,018	619	593
12	2026	110	1,481	**823**	797	1,371	713	687
13	2027	110	1,527	823	797	1,417	713	687
14	2028		1,658	233	233	1,658	233	233
15	2029		1,538	233	233	1,538	233	233
16	2030		1,538	133	133	1,538	133	133
17	2031		1,538	133	133	1,538	133	133
18	2032		1,443	133	133	1,443	133	133
19	2033		1,443	31	31	1,443	31	31
20	2034		1,422	31	31	1,422	31	31
21	2035		1,422	31	31	1,422	31	31
22	2036		234	31	31	234	31	31
23	2037		234	31	31	234	31	31
24	2038		234	31	31	234	31	31
25	2039		234	31	31	234	31	31
26	2041		234			234		
27	2042		234			234		

[1] Calendar years used for numerical groundwater flow model simulations; actual startup dates for the Proposed Action or Reconfiguration and WRM alternatives would depend on BLM and NDEP authorizations.

[2] Incremental increase over the pumping required under the No Action Alternative.

Source: Barrick 2015b.

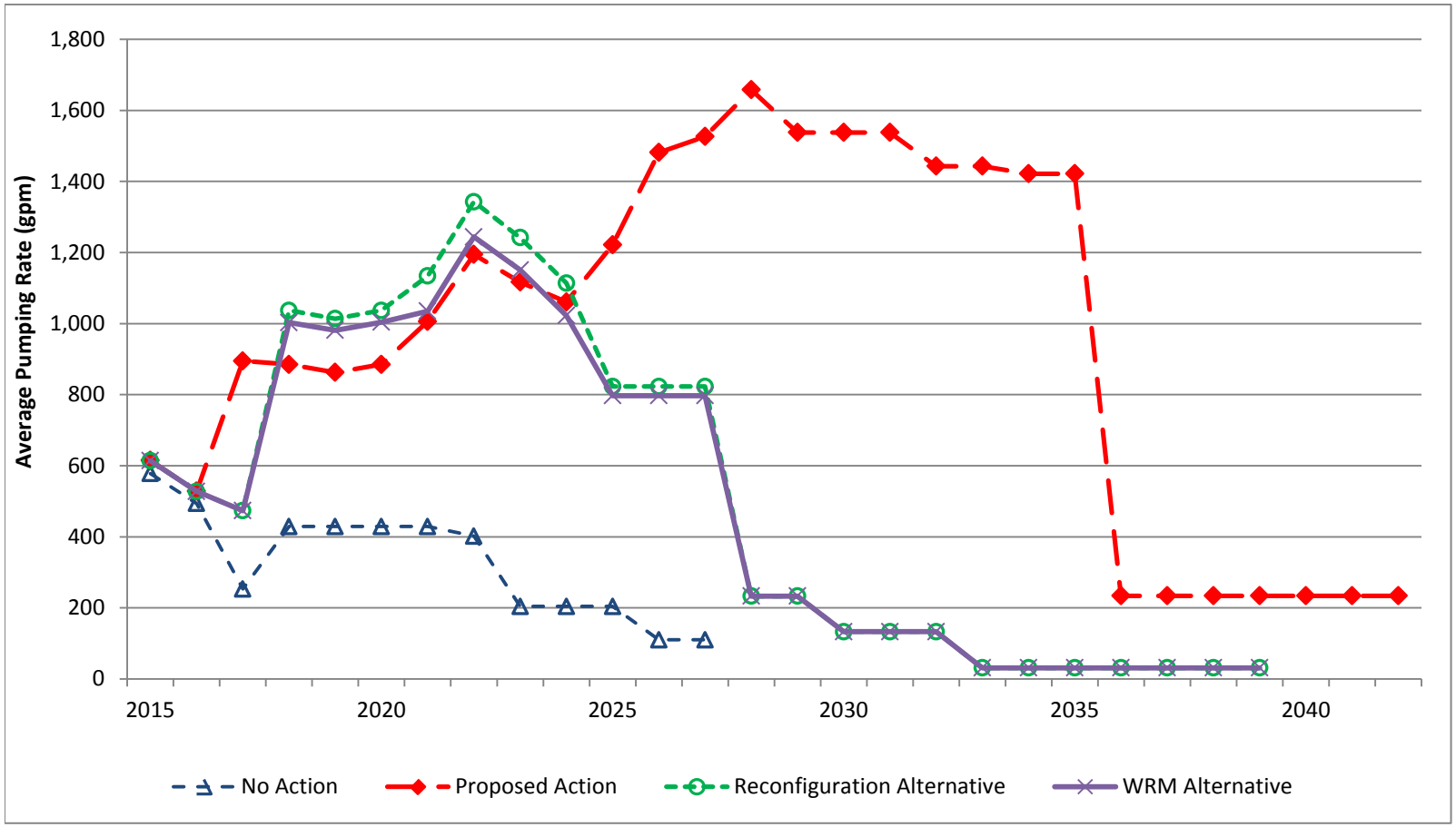


Figure 3.3-15. Estimated Groundwater Pumping Requirements

Under the Proposed Action, the groundwater pumping would be extended 14 years (depending on the actual start up date) longer than required for the currently authorized activities included in the No Action alternative. The average annual pumping rate would reach a maximum of 1,658 gpm in year 14. The incremental increase in pumping attributable to the Proposed Action (compared to currently permitted operations included in the No Action Alternative) ranges from 37 to 1,658 gpm on an average annual basis with the highest rates occurring between years 12 and 21 of the project (**Table 3.3-9**).

For the Reconfiguration Alternative and WRM Alternative, the groundwater pumping would be extended 12 years (depending on the actual start up date) longer than required for the currently authorized activities included in the No Action alternative. The average annual pumping rate would reach a maximum of 1,343 gpm for the Reconfiguration alternative, and 1,244 gpm for the WRM Alternative in year 8. The incremental increase in pumping attributable to these alternatives (compared to currently permitted operations included in the No Action Alternative) ranges from 31 to 1,038 gpm, and 31 to 947 gpm on an average annual basis for the Reconfiguration and WRM alternatives, respectively.

Groundwater Modeling

A calibrated three-dimensional numerical groundwater flow model was developed to estimate effects to groundwater and surface water resources from the No Action, Proposed Action, Reconfiguration and WRM alternatives. Specifically, the numerical model was used to evaluate or estimate: 1) mine dewatering rates required throughout the mine life; 2) drawdown and recovery of groundwater levels resulting from the total estimated groundwater pumping; and 3) groundwater recovery in backfilled pits.

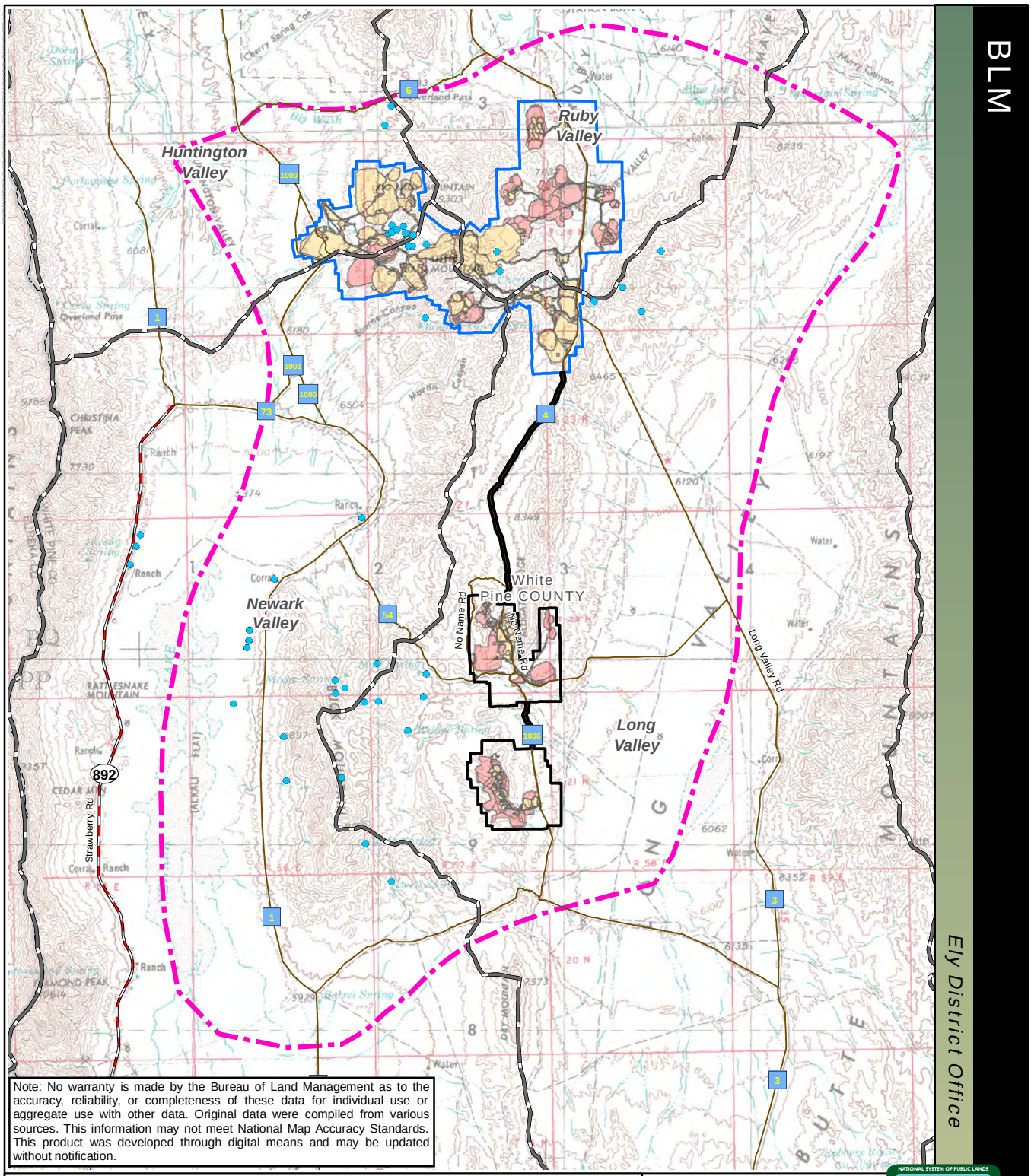
Geomega (2015a) conducted the numerical groundwater modeling using modeling code MODFLOW-USG (Panday et al. 2013) to simulate the groundwater system response to estimated groundwater pumping requirements under the three alternatives. The groundwater model domain encompasses the entire project area as shown in **Figure 3.3-16**.

The groundwater modeling included the development of a conceptual model of the groundwater flow systems. The conceptual model of the study consists of 22 hydrogeologic units based on the groupings of geologic and stratigraphic units with similar hydraulic characteristics. Recharge to the groundwater system was estimated using a modified Maxey-Eakin approach (Geomega 2015a). Under predevelopment conditions, groundwater discharges from the study area through evapotranspiration, underflow in the basin fill sediments, and to the deep, regional, carbonate system.

The numerical model domain was discretized into 124 rows, 94 columns, and 18 layers resulting in 209,808 cells – 124,778 of which are active. In order to provide more detailed flow information in the project area, the grid cell dimensions vary horizontally from 200 X 200 X 200 feet at the pit nodes to 2,500 X 2,500 X 3,200 feet at the outer margins of the model. The more detailed grid cells in the mining area allow the model to more accurately match observed hydrogeologic and groundwater conditions in the project vicinity. Model calibration incorporated a water level data set from 61 wells and used both manual methods and automated calibration software. A detailed explanation of the conceptual hydrogeologic model, modeling approach and setup, steady-state and transient calibration, sensitivity analysis, water budget and model predictions are presented in the groundwater model technical report (Geomega 2015a).

Evaluation of Impacts to Groundwater Levels

Impacts to groundwater levels were evaluated using the results of the numerical modeling for the different mine groundwater pumping scenarios discussed above. For the Proposed Action, Reconfiguration, and No Action alternatives groundwater pumping scenarios the projected changes in groundwater levels represent the difference between the model-simulated groundwater elevations and simulated baseline groundwater elevations that existed mid year 2014 (provided in **Figure 3.3-7**).



Legend

- Proposed NOA Plan Boundary
- Proposed SOA Plan Boundary
- Existing and Authorized Disturbance
- Proposed New or Modified Disturbance
- Groundwater Model Domain
- Seep or Spring
- Hydrographic Basin Boundary

Source: Geomega 2015b;
Barrick 2012a,b; JBR 2012, 2011a.

Bald Mountain Mine North and South Operations Area Projects EIS

Figure 3.3-16

Groundwater Model Domain

0 1 2 4 Miles

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Evaluation of Impacts to Water Resources.

For this impact analysis, the area that is predicted to experience a reduction (drawdown) in groundwater elevation of 10 feet or more as a result of mine groundwater pumping activities was selected as the area of potential concern regarding potential impacts to water resources. Changes in groundwater levels of less than 10 feet are typically difficult to distinguish from natural seasonal and annual fluctuations in groundwater levels. Springs located outside but within close proximity (<1 mile) to the perimeter of the 10-foot drawdown area also were evaluated to identify surface water resources that may be at risk of impacts from drawdown by examination of the model predicted drawdown at those specific points. Potential impacts to perennial streams and springs were evaluated by: 1) identifying perennial surface waters within or near the predicted drawdown area and 2) evaluating the likely source of the water to identify waters that could be susceptible to mine-induced drawdown impacts. In addition, it was assumed that any spring observed to be flowing in most years between August and November was perennial and dependent upon groundwater discharge.

3.3.2.1 Proposed Action

Water Quantity Impacts

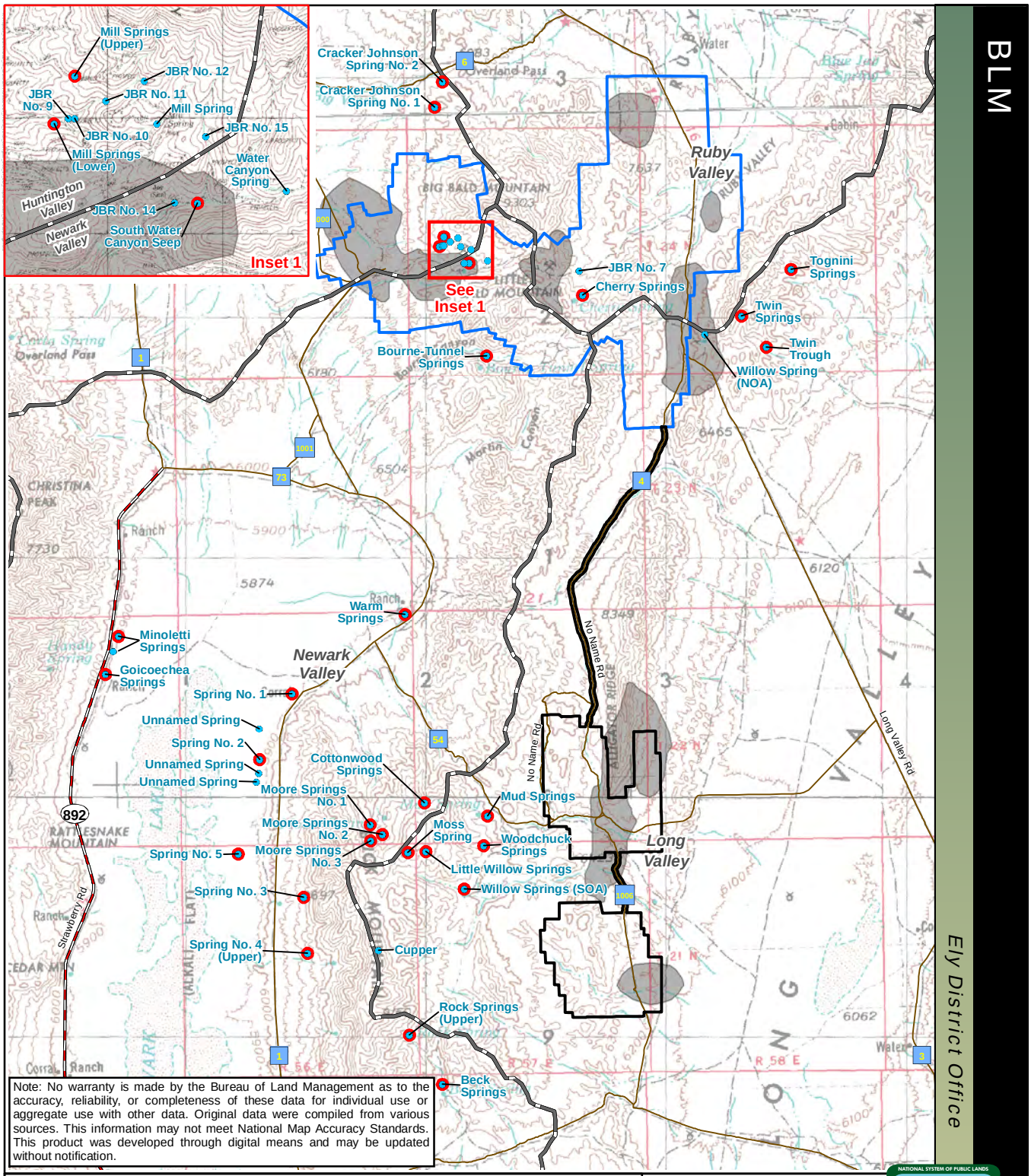
Impacts to Water Levels

The groundwater model simulations for the Proposed Action were based on the total groundwater pumping for water supply and pit dewatering activities that would occur in the future for the existing and proposed operations as described in **Table 3.3-9**. As such, the modeling scenario incorporated the estimated average annual groundwater pumping rates shown in **Figure 3.3-15** ranging from 234 to 1,658 gpm over the anticipated 27-year project life.

The areas predicted to experience a reduction of groundwater levels (or drawdown) of 10 feet or more attributable to the total anticipated mine pumping requirements under Proposed Action are provided in **Figure 3.3-17**. This figure illustrates the areas where the water levels are predicted to decrease over time in comparison to the baseline groundwater elevations in 2014.

Impacts to Springs and Seeps

The locations of springs and seeps within the drawdown areas are presented in **Figure 3.3-17**. Three springs occur within the drawdown area: South Water Canyon Seep, JBR No. 14 (spring) and Willow Springs (NOA) (**Table 3.3-10**). The maximum predicted drawdown at these spring locations is approximately 41 feet at South Water Canon Seep, 61 feet at JBR No. 14 spring, and 15 feet at Willow Spring (NOA). South Water Canyon Seep and the JBR No. 14 spring and their associated wetlands areas were described in Section 3.3.1.2, Surface Water Resources. In September 2011, the wetlands areas associated with these springs were estimated at 19.20 acres for South Water Canyon Seep and 13.68 acres for JBR Spring No. 14 (**Figures 3.3-4** and **3.3-5**) (JBR 2011a). In addition to the wetlands, the fact that South Water Canyon Seep was reported to be flowing in most years in October, and JBR No. 14 was noted by JBR to be flowing in September 2011 (the only observation available for this spring), suggest these springs and their associated wetlands are perennial and likely sustained by groundwater discharge.



Legend

- Proposed NOA Plan Boundary
- Proposed SOA Plan Boundary
- 10' Drawdown Area (Proposed Action)
- Seep or Spring
- Baseline Monitoring Site[1]
- Hydrographic Basin Boundary

[1]Monitoring sites reported in seep, spring and well monitoring update annual report (Tetra Tech 2012).
Sources (spring locations): Tetra Tech 2012, JBR 2011a, Geomega 2015a, b, and 2011a.

Bald Mountain Mine North and South Operations Area Projects EIS

Figure 3.3-17

Proposed Action 10' Drawdown Area and Springs and Seeps

0 1 2 4 Miles

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Table 3.3-10 Inventoried Springs Located Within the Predicted Drawdown Areas for Each Alternative

Basin Number	Hydrographic Basin	Spring Name	Monitor Site[1]	Acres Wetland[2]	Fall Condition (Typical)	No Action	Proposed Action	Reconfig. Alternative	WRM Alternative
154	Newark Valley	JBR No. 14	No	13.68	Perennial flow		X	X	
154	Newark Valley	South Water Canyon Seep	Yes	19.20	Perennial flow		X	X	
175	Long Valley	Willow Springs (NOA)	No	NA	Unknown	X	X	X	X

[1] Monitor Site - site included in the water monitoring plan (Tetra Tech 2011).

[2] JBR 2011.

Geomega (2015b) evaluated the potential effects to flow at the South Water Canyon Seep and JBR No. 14 spring resulting from the predicted drawdown. Their evaluation concluded that since the model simulated baseline (i.e., pre-project pumping) depth to groundwater at these springs is greater than 60 feet beneath the ground surface at these spring sites, these springs are not connected to the regional groundwater system and are fed by local perched groundwater. However, there is uncertainty regarding the depth to the groundwater system that would be affected by mine-induced drawdown at these spring sites. Specifically, there is uncertainty regarding the accuracy of the model simulated groundwater elevations at these spring sites; and uncertainty regarding the interconnection between the spring source and the groundwater system that would be affected by drawdown. There are 16 monitoring wells situated at 10 groundwater-monitoring sites located within an approximate 2-mile radius of the South Water Canyon Seep (Geomega 2015c). Several of these groundwater-monitoring sites include multiple wells completed at different elevations. The nearest monitoring well to the South Water Canyon Seep is 4,295 feet. The model calibration statistics for these 16 wells indicate that the absolute difference between the monitored groundwater elevation and the model simulated groundwater elevation is highly variable from well to well in this area and ranges from approximately 9 feet to 257 feet (Geomega 2015c) with an average absolute difference of 109 feet.

Considering the uncertainty between the actual groundwater elevations and model simulated groundwater elevations in this area, and the absence of any groundwater monitoring wells located in close proximity to these springs to clearly define if these springs are perched or connected to the groundwater aquifer system that would be impacted by pumping, this EIS analysis conservatively assumed that there is a potential risk that drawdown associated with groundwater pumping for the mine could impact (i.e., reduce) the baseflow and associated wetlands at South Water Canyon Seep and JBR No. 14. The effects to these springs would depend on the actual drawdown that occurs in these areas and the site-specific hydraulic connection between the groundwater systems impacted by pumping and the perennial water source. Perennial water sources that are hydraulically connected to the groundwater system impacted by pumping and within the drawdown area likely would experience a reduction in baseflow. Depending on the severity of these reductions in flow, this could result in drying up of springs and reducing the size of their associated wetland area.

The time periods for the model simulations included a recovery period that extended 100 years from the end of mining (i.e., groundwater pumping). Hydrographs of the predicted groundwater elevations at the South Water Canyon and JBR No. 14 locations indicate that the model predicts that drawdown would

persist at these locations over the 100-year postmining period (Geomega 2015b). Therefore, any reduction in flow at these spring sites resulting from mine-induced drawdown would likely persist for the foreseeable future.

Willow Spring (NOA) located in the Mooney Basin area also occurs within the predicted drawdown area (**Figure 3.3-17**). Flow information from this spring site is not available. However, regardless of the spring flow characteristics, the predicted depth to groundwater at the spring location is approximately 375 feet below the ground surface; and the spring occurs in the Diamond Peak Formation that is inferred to have a low horizontal and vertical hydraulic conductivity (Geomega 2015b). The large depth to groundwater and low hydraulic conductivity of the formation suggest that this spring is controlled by shallow perched conditions that are not hydraulically interconnected with the groundwater system that would be affected by mine induced drawdown. Therefore, impacts to the flow Willow Spring are not anticipated.

The predicted water level declines also were reviewed for Mill Spring, Water Canyon Spring and Twin Springs located outside but within 1 mile of the predicted 10-foot drawdown contour. The model results indicate that the current groundwater elevations at Mill Spring, Water Canyon Spring, and Twin Springs are not predicted to decline as a result of the groundwater pumping for the project under the Proposed Action (Geomega 2015b). Therefore, based on the model predictions, impacts to flow at these springs are not anticipated.

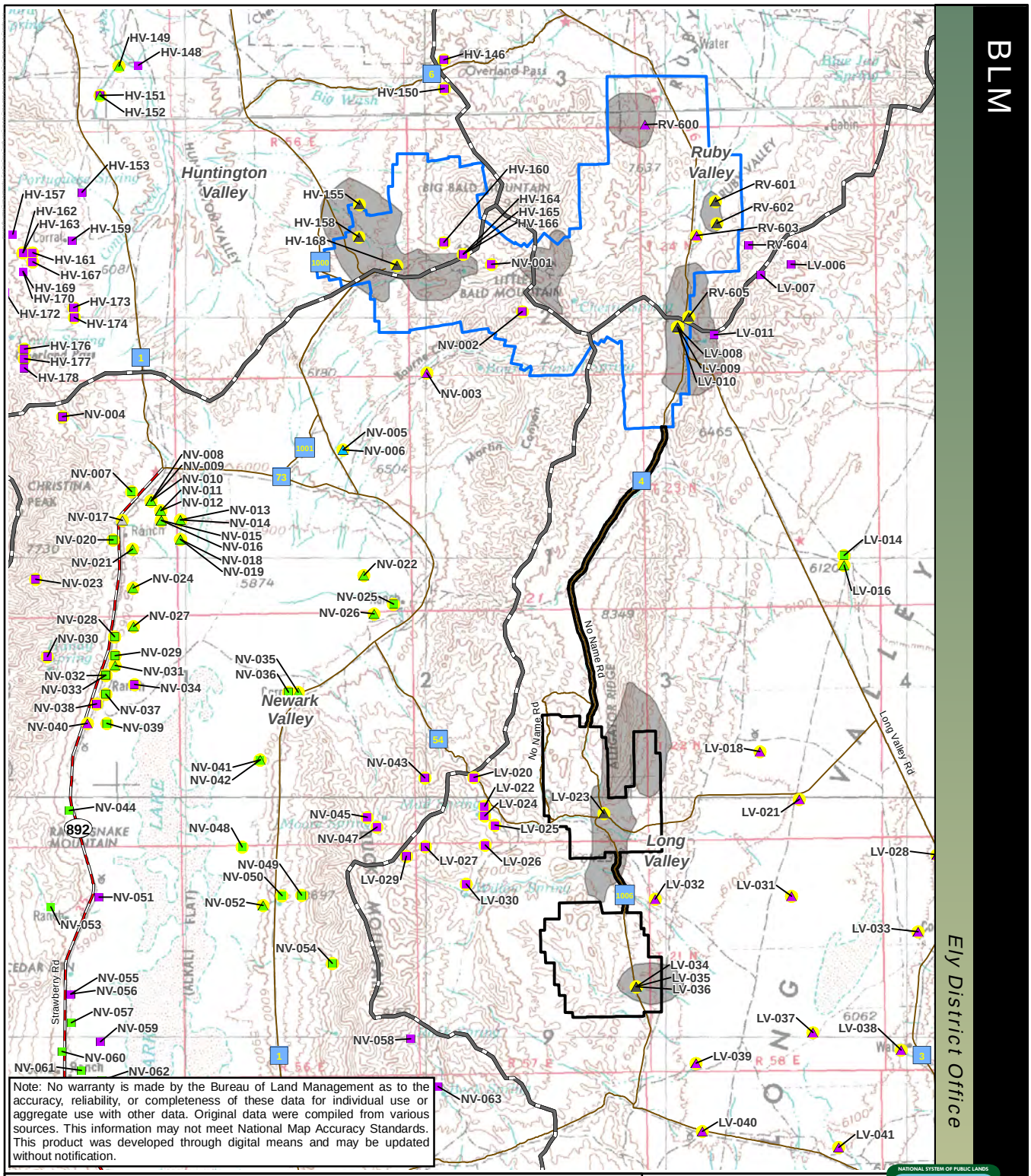
Impacts to Water Rights

Water rights located within the predicted drawdown areas are shown in **Figure 3.3-18.** For the purpose of this evaluation, all water rights owned by Barrick Gold U.S. Inc. or BMM were excluded. As shown in **Table 3.3-11**, there are 3 non-Barrick owned or controlled water rights (Map IDs HV-164, HV-165, and LV-011) located within the predicted mine-induced drawdown area (i.e., areas where the groundwater levels are predicted to be lowered by 10 feet or more resulting from the mine groundwater pumping activities under the Proposed Action). All three water rights are surface water rights established at a spring source and used for stock watering. HV-164 is a “Reserved” water right with a priority date of 4/17/1926 owned by the BLM and used for stock watering. HV-165 is a private owned “Vested” surface water right listed as a spring source used for stock watering. “Vested” water rights for surface water are those rights for which the work to establish beneficial use was initiated prior to March 1, 1905, the date of adoption of Nevada’s Water Law.

Table 3.3-11 Water Rights Located Within the Predicted Drawdown Areas for Each Alternative

Basin #	Basin	Map ID	Application	Status	Source	Use	Owner	No Action	Proposed Action	Reconfig. Alternative	WRM Alternative
47	Huntington Valley	HV-164	R09310	Reserved	Spring	Stock	BLM		X	X	
47	Huntington Valley	HV-165	V01560	Vested	Spring	Stock	Private		X	X	
175	Long Valley	LV-011	3030	Certificate	Spring	Stock	Private	X	X	X	X

Source: NDWR 2014.



Legend

- Proposed NOA Plan Boundary
- Proposed SOA Plan Boundary
- Hydrographic Basin Boundary
- 10' Drawdown Area (Proposed Action)
- Barrick Gold Water Right

Water Right Water Source

- Surface Water
- Groundwater

Water Right Use Type

- Irrigation
- Mining/Milling
- Quasi-Municipal
- Stock Watering
- Wildlife

Source: Geomega 2015c, NDWR 2014.

Bald Mountain Mine North and South Operations Area Projects EIS

Figure 3.3-18

Proposed Action 10' Drawdown Area and Water Rights

0 1 2 4 Miles

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Water right HV-164, HV-165 and HV-166 (owned by Barrick) all have the same point of diversion location (**Table C-2**, **Appendix C**) indicating that they all divert water from the same spring source. These water rights are recorded as being located within the Huntington Valley HA although their location occurs essentially on the boundary between the Huntington Valley HA and the Newark Valley HA (see **Figure 3.3-18**). The closest spring source to this location is the South Water Canyon Seep (listed as being in the Newark Valley HA) suggesting that this spring is the source of water for all three water rights. The discrepancy between the hydrographic basin designations for the water rights vs. the spring source is presumably attributable to the fact that the boundary between the HA's is drawn through this location.

The water right with Map ID LV-011 occurs in Mooney Basin (**Figure 3.3-18**) in the Long Valley HA (near the boundary between the Ruby Valley HA and Long Valley HA). The closest known spring to this water right point of diversion location is Willow Spring (NOA) located in the Long Valley HA (**Figure 3.3-17**). Based on these observations, Willow Spring (NOA) is the inferred the likely source of water for LV-011 water right.

The actual impacts to individual surface water rights would depend on the site-specific hydrologic conditions that control surface water discharge. Only those waters sustained by discharge from the regional groundwater system would be likely to be impacted. For surface water rights that are dependent on groundwater discharge, a potential reduction in groundwater levels could reduce or eliminate the flow available at the point of diversion for the surface water right. The previously provided discussion of potential impacts to springs and seeps indicated that drawdown could potentially reduce flows at the South Water Canyon Seep (the likely source for HV-165 and HV-166) but is unlikely to impact flows at Willow Spring (NOA) (the likely source for LV-011).

Watershed Disturbance

Under the Proposed Action, impacts to surface water resources would involve removal of approximately 24 miles of unnamed ephemeral drainages and associated contributing watershed areas. With the exception of pits, in most cases the proposed project components would be located along ridge-tops or alongside road ditches that would drain small upgradient areas. Direct precipitation on process features would be retained. Under a scenario wherein all disturbance would not contribute to the watershed, the potential spatial impact to the contributing areas to hydrographic basins (see **Table 3.3-1**) would be quite small: in Huntington Valley, approximately 0.05 percent; in Newark Valley, approximately 0.21 percent; in Long Valley, approximately 0.60 percent; and in Ruby Valley, approximately 0.46 percent of the land area would be removed from the contributing watershed. Even these estimates are high, since runoff from non-process features (e.g., waste rock dumps, buildings, roads) would not be retained on-site. In addition, the phasing of project disturbance and reclamation would further reduce the overall watershed disturbance at any given time. The surface water effect on the hydrographic basins would be minor to negligible.

In the proposed NOA, these effects would occur in the Water Canyon vicinity (in the southwest portion of the proposed NOA), as a result of the excavation of the proposed Redbird Pit. Additional effects would occur to the northeast in the Mahoney Canyon and lower Cherry Canyon vicinities, from development of open pits, HLFs, and intervening areas associated with the Casino, North and South Poker Flats, Duke and South Duke, and Winrock areas.

The proposed Royale Pit would remove small, poorly defined headwater ephemerals and swales in the foothills above the floor of Ruby Valley. None of these drainages have defined channels, even in their downgradient paths (JBR 2011a). The proposed Royale Pit, Royale North RDA, and Royale South RDA would be located approximately 2 miles upgradient of the open water/wetland complex at the south end of Ruby Valley. Proposed waste rock handling and segregation, in addition to required recontouring, growth media restoration, and successful revegetation of the RDAs, would avoid drainage impacts from these components in Ruby Valley.

Similar drainage conditions occur elsewhere in the proposed NOA where the Poker Flats, Casino, and Winrock components would be developed. In addition to open pits and RDAs, process components are proposed in the east-central part of the proposed NOA. Required containment and monitoring of process fluids under the WPCP would consist of designed liner systems under ponds and HLFs, leak detection systems and reporting programs, lined channels and pipelines, and event pond capacities sufficient to retain runoff and draindown from storm events and 24-hour power outages. These component features are further described in Section 2.4.1.14, Process Solution Ponds, Carbon Columns, and Support Facilities. Containment and monitoring at the North Poker Flats and South Poker Flats process areas would comply with provisions of the WPCP and storm water permits. In combination with monitored reclamation and closure as planned and required by state and federal programs, these measures would substantially reduce the potential for adverse surface water impacts from these process components.

Drainage areas in the proposed NOA would be affected by project components, such that open pits and process components would be removed from areas that contribute to runoff. These potential spatial impacts to watershed areas would be quite small (as previously described), and would occur in ephemeral drainages where most runoff is lost to seepage or evaporation. It is anticipated that during the proposed life of the project, the limited runoff that presently occurs would be somewhat reduced in the small ephemeral drainges. However, successful reclamation and closure in accordance with NDEP/BLM reclamation requirements would essentially restored the contributing drainage areas and ephemeral drainages.

In the proposed NOA, some of the major drainage courses (e.g., Mill Canyon, Cherry Canyon, and unnamed drainages near the proposed Royale Pit) would be avoided by proposed project components. Note that many of these drainages that would be disturbed typically do not exhibit bed, bank, or Ordinary High Water Mark, except for the southward-trending ephemeral in Mooney Basin located at the southeast end of the proposed NOA (JBR 2011a). The proposed Mooney South and Mooney Deep South processing components would lie alongside an ephemeral channel that drains towards Long Valley. Process component design and fluid containment would avoid impacts to the ephemeral drainageway. Elsewhere, RDAs could interrupt other small, undefined ephemeral drainage pathways. Runoff from these proposed components could re-create similar drainage routes. Concurrent reclamation and BMPs established as part of the storm water program would control drainage, erosion, and sedimentation at such locations.

In the proposed SOA, all ephemerals drain to the floor of Long Valley (**Figure 3.3-2**). The only defined channels in the Alligator Ridge Area enter the proposed SOA from upstream, and dissipate through the property. Further south, small unnamed ephemerals coalesce to a defined ephemeral before leaving the study area and draining onto the Long Valley floor.

Identified springs, seeps located in the vicinity of the proposed NOA and SOA components are shown in **Figure 3.3-3**. No springs or seeps would be covered by proposed components, and drainages below springs would generally remain open to flow. Therefore, impacts to springs and seeps associated with surface disturbance from the proposed project are not anticipated.

<u>Water Quality Impacts</u>

Waste Rock Disposal Facilities (RDAs)

The geochemical testing data for waste rock material is summarized in Section 3.3.1.6, Rock Geochemistry. Exploration drilling data and geochemical testing results were entered into a geologic block model to estimate the waste materials and mass of PAG waste rock generated during mining in each mine area (Schafer 2012a,b). **Table 3.3-12** summarizes the estimated percentage of waste rock generated by material types (PAG and Non-PAG). **Table 3.3-12** also identifies the RDA's that would be used for disposal of waste rock generated from each mine area; and their capacity, acreage, and estimated rainfall. The percentage of waste rock estimated to be non-PAG ranges from a low of 61.7 percent at the Gator Pit to 100 percent at the Numbers and Rat Pits.

Table 3.3-12 Description of Mine Areas and Associated Pits and RDAs at the Bald Mountain Mine

Project Area	PAG NNP <-15[2] (%)	PAG NNP 0 to -15[2] (%)	Non-PAG NNP >0[2] (%)	Pits	RDAs	Estimated Capacity (million tons)[1]	Area (acres)	Annual Rainfall (inches)
North Area								
Bida	8.2%	11.7%	80.1%	Bida Pit	Belmont RDA	5.2	36.0	17
					Belmont South RDA	6.6	49.2	17
Casino	4.8%	3.1%	92.1%	Casino Pit	Casino North RDA	11.1	55.3	16
					Casino South RDA	9.8	69.4	16
Duke	4.9%	3.2%	91.9%	Duke Pit	Duke RDA	2.2	41.9	14.5
				South Duke Pit	South Duke 1 RDA	18.5	84.6	14.5
					South Duke 2 RDA	16.8	72.9	14.5
Galaxy	0.0%	0.0%	0.0%	Galaxy Pit	Galaxy RDA	reclaimed	29.9	15.5
Horseshoe	0.0%	0.0%	0.0%	Horseshoe Pit	Horseshoe RDA	reclaimed	24.9	18
LBM	0.5%	0.9%	98.6%	LBM Pit	LBM #1 RDA	6.7	74.5	19
					LBM #2 RDA	23.0	120.4	19
Ll Ridge	0.0%	0.0%	0.0%	LJ Ridge 1 Pit	North 4 RDA		60.5	16
				LJ Ridge 2 Pit	North3 RDA	23.2	97.4	16
				Banghart Pit				
Numbers	0.0%	0.0%	100.0%	Numbers Pit Complex	North 1 RDA	277.8	676.9	15
					North 2 RDA	18.3	90.4	15
					North 5 RDA	29.8	141.1	16
Poker	5.0%	3.4%	91.6%	Poker Flats Pit	Poker Flats RDA	78.0	178.7	17
Rat	0.0%	0.0%	100.0%	Rat Pit	Rat East RDA		164.4	17
					Rat West RDA	56.8	220.6	16.5

Table 3.3-12 Description of Mine Areas and Associated Pits and RDAs at the Bald Mountain Mine

Project Area	PAG NNP <-15[2] (%)	PAG NNP 0 to -15[2] (%)	Non-PAG NNP >0[2] (%)	Pits	RDAs	Estimated Capacity (million tons)[1]	Area (acres)	Annual Rainfall (inches)
Redbird	14.8%	15.6%	69.6%	Redbird Pit	RBM North RDA	reclaimed	133.0	15
					RBM South RDA	reclaimed	20.3	15
					Redbird RDA	378.2	547.0	15
Royale	4.8%	3.1%	92.1%	Royale Pit	Royale North RDA	45.9	162.3	15
					Royale South RDA	14.3	84.9	15
Saga	3.2%	1.8%	95.1%	Saga Pit	Saga RDA	61.7	185.0	15.5
Top	0.5%	0.7%	98.7%	Top Pit Complex	South Water Canyon RDA	95.0	461.7	17
					East Sage RDA	833.2	910.1	18.5
					Sage Flat RDA	38.7	213.8	19
					Sage Flats backfill	117.5		19
Winrock	18.9%	17.4%	63.7%	Winrock Main	Winrock West RDA	40.5	140.2	15
				Winrock South	Winrock East RDA	13.1	69.1	15
				Winrock North	Winrock North RDA	1.6	22.6	15
South Area								
Gator	14.8%	23.5%	61.7%	Gator Pit	Gator North RDA	3.0	28.9	14
					Gator South RDA	6.1	46.6	14
Luxe	3.6%	2.3%	94.0%	Luxe Pit	Luxe RDA	19.0	83.7	14
Vantage	3.5%	2.1%	94.4%	Vantage Pit	Vantage RDA	222.5	504.2	13.5
Yankee	4.9%	3.1%	92.0%	Yankee Pit	Yankee North RDA	58.2	241.4	12

Table 3.3-12 Description of Mine Areas and Associated Pits and RDAs at the Bald Mountain Mine

Project Area	PAG NNP <-15[2] (%)	PAG NNP 0 to -15[2] (%)	Non-PAG NNP >0[2] (%)	Pits	RDAs	Estimated Capacity (million tons)[1]	Area (acres)	Annual Rainfall (inches)
					Yankee West RDA	15.1	116.4	12
					Yankee South RDA	70.3	246.1	12

[1] Life-of-Mine disturbance based on Plan of Operations submitted in June 2012. Area reported here accounts for proposed expansions, proposed reductions (from mining activities), and changes to reconcile shapes and permit authorizations. Where proposed RDAs cover existing, reclaimed RDAs or other features, the reported capacity is for the "new" RDA and does not include material volume for the reclaimed feature.

[2] kg/t

Source: Schafer 2012a.

The estimated tonnages and proportion of waste rock by material type for each mine area are shown in **Figure 3.3-19**. The PAG material in **Figure 3.3-19** is subdivided into Red waste rock (NNP <-15 kg/t) and Yellow waste rock (NNP 0 to -15 kg/t), whereas, the non-PAG material is represented by the Green waste rock (NNP > 0 kg/t). The subdivision of the PAG rock into Red and Yellow waste is based on humidity cell test results that indicate that waste rock materials with NNP values of less than -15 kg/t (Red waste) have the potential to generate acidic leachate. The humidity cell test data also suggest that waste rock materials with NNP values of 0 to -15 kg/t (yellow waste) are unlikely to generate acidic leachate (Schafer 2012a). Of the 87 humidity cell test, 5 samples (with NNP values ranging from -13.2 to -80.5 kg/t) generated acidic leachate (pH <4) (Schafer 2012a).

Waste rock characterization results indicate that the average ANP is generally much greater than the average AGP for waste rock generated in each mine area (**Figure 3.3-20**). This substantiates the conclusion that most waste rock that would be disposed in the RDAs are strongly alkaline with a large neutralization capacity (Schafer 2012a).

Table 3.3-13 provides a summary comparison of the estimated percentage of PAG material from each pit under the specific mining operations that would occur under the Proposed Action, Reconfiguration Alternative and WRM Alternative. This summary indicates that under the Proposed Action approximately 16 percent of the waste rock generated in the NOA, and 6.2 percent of the waste rock generated in the SOA would be classified as PAG. RDAs associated with pits that have a higher estimated proportion of PAG material under the Proposed Action include the Redbird Pit (29.1 percent PAG), Winrock (35.6 percent PAG), and Gator Pit (39.8 percent PAG). These same three mine areas also are estimated to generate more that 10 percent waste rock that has NNP <-15 kg/t (Schafer 2012a).

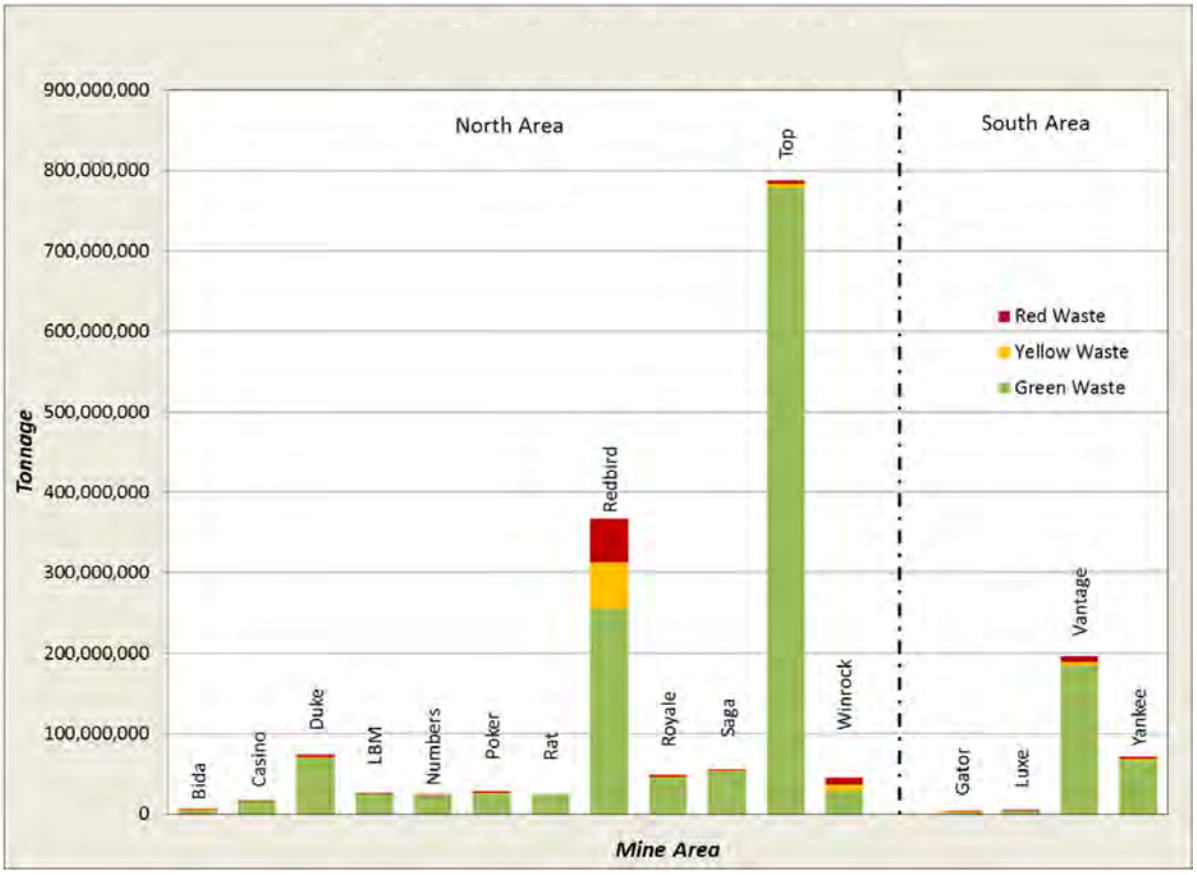

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Figure 3.3-19

Waste Tonnage and Average Proportion of Potentially Acid Generating Rock by Mine Area

Source: Barrick 2012a,b.

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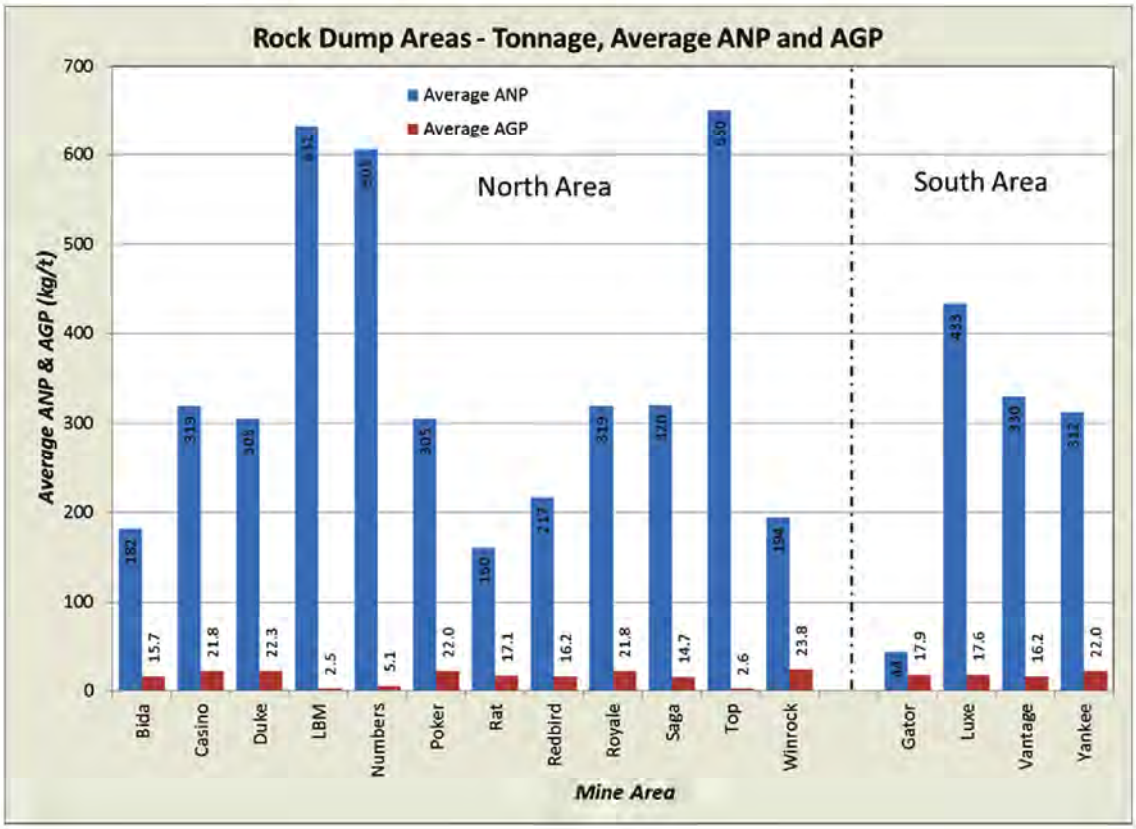

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Bald Mountain Mine North and South Operations Area Projects EIS

Figure 3.3-20

Average ANP and AGP by Mine Area

Source: Schafer 2012a.

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Table 3.3-13 Estimated Waste Rock Volume and Percentage of PAG Material Generated for the Proposed Action, and Reconfiguration and WRM Alternatives

Facility/Area	Proposed Action		Reconfiguration Alternative		WRM Alternative	
	Waste Rock Material (MT)	PAG Waste Rock (%)	Waste Rock Material (MT)	PAG Waste Rock (%)	Waste Rock Material (MT)	PAG Waste Rock (%)
North Operations Area (NOA)						
Redbird Pit	367	29.1	367	29.1	33	43.2
Top Pit	303	1.9	303	1.9	303	1.9
Casino Pit	17	7.2	0	0.0	0	0.0
Royale Pit	48	7.2	0	0.0	0	0.0
Poker Flats Pit	28	7.6	28	7.6	28	7.6
Duke and South Duke Pits[1]	74	7.4	-	-	-	-
Duke Pit[1]	-	-	15	7.3	15	7.3
South Duke Pit[1]	-	-	0	0.0	0	0.0
Winrock Pits	45	35.6	45	35.6	45	35.6
Bida Pit	5	17.3	5	17.3	5	17.3
LBM Pit[3]	0	0.0	0	0.0	0	0.0
LJR 1 Pit[3,4]	0	0.0	0	0.0	0	0.0
LJR 2 Pit[3,4]	0	0.0	0	0.0	0	0.0
Rat Pit	0	0.0	0	0.0	0	0.0
Total (NOA)	**887**	**16.0**	**763**	**17.4**	**429**	**9.4**
South Operations Area (SOA)						
Vantage and Luxe[2]	200	5.1	200	5.1	200	5.1
Gator	4	39.8	4	39.8	4	39.8
Yankee	72	7.3	72	7.3	72	7.3
Total (SOA)	**276**	**6.2**	**276**	**6.2**	**276**	**6.2**
Total	**1162**	**13.7**	**1039**	**14.4**	**705**	**8.1**

[1] Volumes for Duke and South Duke Pits were grouped together for Proposed Action; South Duke Pit will not be developed under the Reconfiguration and WRM alternatives.

[2] Vantage and Luxe material volumes were grouped together by operation area versus individual pit.

[3] Pits are existing authorized and will not be expanded per the alternatives.

[4] Pits are existing authrorized mine features known as the North 3 and North 4, respectively.

Values rounded to nearest MT.

For the purposes of this evaluation, any waste rock material with an NNP less than 0 kg/t is classified as PAG.

Source: Barrick 2015e.

The proposed RDA design, slope parameters, reclamation and best management practices are outlined in Section 2.4.1.12, Rock Disposal Area Overview. An Adaptive Waste Rock Management Plan was developed to describe how waste rock generated during mining under the proposed NOA project would be managed and monitored to minimize erosion and prevent environmental impacts to waters of the State. The Adaptive Waste Rock Management Plan provides a conceptual model of an RDA; characterizes waste rock geochemistry; provides anticipated waste rock tonnages by project area and

rock unit; summarizes results of environmental monitoring in existing RDAs (e.g., water quality and waste rock geochemical monitoring); discusses the strategy for classification, in-pit identification, mine planning, and overburden placement; describes water and rock monitoring programs; and provides an overview of proposed closure of the facility including design and placement of covers (Schafer 2012a).

The Adaptive Waste Rock Management Plan indicates that PAG waste rock would be combined with non-PAG waste rock such that all RDAs would have an overall positive NNP. RDAs would be covered with 6 inches of soil material (Schafer 2012a). Historically, the Bald Mountain Mine has successfully used a 6-inch soil cover to reclaim waste rock dumps. Cover modeling and experience on site described in the Adaptive Waste Rock Management Plan indicates that the 6-inch cover will support vegetation reestablishment and minimize infiltration (Schafer 2012a,b).

Geochemical studies completed for development of the Adaptive Waste Rock Management Plan conclude that the potential for acid drainage and metals mobilization is low under the Proposed Action due to pervasive alkaline conditions, abundance of iron that increases the tendency for arsenic and antimony to sorb, and low rainfall. The risk of acid drainage and metals mobilization would generally increase for RDAs with higher proportions of PAG material, particularly PAG material with NNP values of <-15 kg/t (as $CaCO_3$). Specifically, the Adaptive Waste Rock Management Plan does not require PAG materials to be placed in the interior of the facilities except for the case where it may be implemented as a contingency measure if the amount of PAG material with values of <-15 kg/t (as $CaCO_3$) exceeds 20 percent (Schafer 2014b). The plan also does not require that the PAG material to be thoroughly blended with alkaline or carbonate rich waste rock. Therefore, there is the potential for pods of PAG material to be placed along the base or margin of the facility that are not encapsulated or thoroughly mixed with neutralizing materials. Under this scenario, pockets of acidic water could develop in the PAG material placed along the base or margin of the facility that eventually could migrate out of the facility. This could occur because the acidic water generated in the PAG material would not flow through masses of carbonate-rich waste rock where neutralization could occur as it would if the material were placed in the interior of the facility.

Drilling and testing of legacy RDAs summarized in Section 3.3.1.6 (Rock Geochemistry) in the project area showed no indication of acid rock drainage and no indication of fluid movement through nine investigated RDAs. RDAs with high pyrite, such as the Vantage RDA, can generate elevated sulfate that can enter the upper few feet of soil beneath the RDA. Similarly, arsenic and antimony can increase in the upper few feet of soil beneath some RDAs. However, weathering of the legacy RDAs over the past 5 to 25 years has not resulted in acid rock drainage or substantial mobilization of metals from the RDAs. These results suggest that acidic water and metals mobilized under the scenario described previously would likely be neutralized (and arsenic and antimony sorbed) as the leachate moves through the upper few feet of soil beneath the RDA. However, considering the likely variation in the substrate materials, depth to groundwater, surface runoff, and rainfall at 14 expanded and 15 new RDA's distributed across the project area, there is some inferred risk that acid and metals released from PAG materials placed along the base or margin of one or more RDA(s) could eventually impact local groundwater quality.

Partial Pit Backfill – Top Pit Complex and Redbird Pit

As described in Section 2.4, BMM proposes to partially backfill the Top Pit Complex and Redbird Pit as necessary to preclude the development of any anticipated pit lakes in the post-mining period. The previously described groundwater flow model developed for the project (Geomega 2015a) was used to estimate the groundwater elevations in the partially backfilled pits after 100 years of recovery. The model predicts that 100 years after mine dewatering ceases, the water levels in the backfill of the Top Pit Complex would be approximately 6,369 feet amsl (269 feet above the pit bottom); and water levels in the backfill in the Redbird Pit would be at approximately 6,142 feet amsl (122 feet above the pit bottom).

Backfill to be placed in the Top Pit Complex and Redbird Pit to preclude pit lake development would consist of oxidized sedimentary-carbonate rocks. This would entail using waste rock generated from the Pogonip Formation and Laketown Dolomite in the Top Pit Complex ; and the Pogonip Formation in the

Redbird Pit. No PAG material has been found in the Laketown Dolomite whereas the Pognip contains 1 percent PAG. The average NNP of the Pogonip and Laketown are +533 and +952, respectively (Schafer 2014b). Based on the geochemical characterization of the proposed backfill material to be used in the Top Pit Complex and Redbird Pits, impacts to downgradient water quality are not anticipated.

Heap Leach and Other Process Facilities

The proposed HLF design would be consistent with that outlined in Section 2.4.1.13, Ore Processing Overview. As discussed, HLFs would be designed as zero-discharge facilities including liners and leak detection systems to prevent leakage during operations. At closure, each HLF would undergo heap recirculation and active evaporation at a flow rate necessary to remove excess fluids from the process pond(s) and prevent overtopping. During this initial stage, the solution flow will be reduced through a combination of evaporation from the top of the HLFs, forced-air evaporators in the ponds, and passive evaporation from the open-water pond surface(s). The draindown will diminish over time to a point where recirculation back to the HLF is no longer necessary and construction of the HLF closure cover and final reclamation can be completed. At that time, fluids will be managed by active and passive evaporation within the pond(s) until the draindown diminishes to the point where active evaporation is no longer necessary.

The estimated time for draindown of an individual HLF to reach the flow rate where active evaporation is no longer necessary and the drainage can be managed through passive evaporation would vary depending on the facility but is estimated to range from 0.8 to 3.5 years (SRK and Schafer 2015). As the target draindown rates are reached, the respective process pond(s) for each HLF will be converted to an evaporation cell (E-cell) or evapotranspiration cell (ET-cell) to allow for the passive management of drainage from the closed and reclaimed heap into the post-closure period. E-cells rely solely on evaporation while ET-cells use both evaporation and transpiration from plants to eliminate the discharge solution.

The Heap Leach Draindown Estimator (HLDE) model was used to estimate draindown flow rates (i.e., draindown curves) for each proposed HLF. The HLDE model is a tool that is commonly used by the NDEP and BLM to calculate the volumes of process solution to be managed during closure for reclamation planning and cost estimating purposes. The methodology and input parameter values assumed for the analysis and results are presented in the Closure/Post-Closure Draindown Management, Rates and Chemistry report (SRK and Schafer 2015). The estimated flow rates at 10 , 20, and 30 years after closure for each of HLFs under the Proposed Action are summarized in **Table 3.3-14**. The results of the analysis estimate average flow rates after 30 years of draindown ranging from 1.9 to 5.7 gpm for the proposed HLFs. These rates are based on an assumed infiltration rate of 6 percent of the average annual precipitation for covered (reclaimed) facilities.

SRK and Schafer (2015) reviewed available draindown data for three existing closed HLFs within the project area that included the Alligator Ridge, Yankee, and Little Bald Mountain (LBM) HLFs. Because the cover (i.e., growth media thickness and properties) for the existing closed facilities is expected to be similar to the proposed HLFs, the measured draindown for these facilities can be used to estimate the draindown rates for the proposed HLFs. SRK and Schafer (2015) concluded, after review of the draindown curves for the three existing heap leach facilities, that the long-term infiltration rate is anticipated to be about 1 percent of annual precipitation at the proposed HLFs. Their conclusions suggest that the long term flow rates from the HLDE model calculated using the 6 percent of annual precipitation infiltration rates likely overestimate the long term steady state flow rates for the proposed facilities. The flow rates from the closed HLFs on site indicate that the long term flow rates estimates from the HLDE model provides a conservative estimates of the solution to be managed in the ET-Cells in the postclosure period.

Table 3.3-14 Estimated Flow Rates[1,2] for Reclaimed HLFs at 10, 20 and 30 Years Post-Closure (Proposed Action)

Heap Leach Facility	10 Years (gpm)	20 Years (gpm)	30 Years (gpm)
BMM 2/3	7.8	6.0	5.7
LBM	3.7	3.0	2.8
Mooney North	2.6	2.0	1.9
Mooney South	5.5	4.1	3.8
Mooney Deep South	5.7	4.2	3.9
North Poker Flats	2.1	1.9	1.9
South Poker Flats	7.4	5.9	5.7
Winrock	6.8	5.8	5.6
Gator	7.2	5.8	5.7
Vantage	6.7	5.7	5.6
Yankee	6.4	5.7	5.6

[1] Estimated flow rates rounded to one decimal place.

[2] Estimated based on HLDE model.

Source: SRK and Schafer 2015.

Draindown solution from several closed HLFs provides an analog for the leachate chemistry that would need to be managed at closure in the proposed HLFs. The complete data sets for closed HLF's on the project site are provided in Appendix 3, in SRK and Schafer (2015). This data includes analytical results for periodic sampling of solution chemistry 1 to 13 years after leaching operations. The expected solution chemistry in draindown from the proposed HLFs to be managed at closure was summarized in SRK and Schafer (2015) as follows:

> *"Draindown solutions from the LBM HLF for 2000 to 2003 and from the Yankee HLF for 2009 to 2011 provide the most representative estimates of long-term draindown chemistry at a time in closure when excess solution has been evaporated and long-term flows would be managed by passive evaporation. The primary constituents of concern in the HLF draindown would likely include nitrate (100 to >250 mg/L), arsenic (0.7 to 2.3 mg/L), and TDS (1,500 to 5,000 mg/L)."*

In addition, the average solution chemistry for the closed LBM HLF for 2000 to 2003 and the Yankee HLFs for 2009 to 2011 also indicate that leachate generated from one or both of these facilities contained concentrations of sulfate, cyanide, antimony, mercury, selenium, and thallium that exceed the Nevada primary or secondary drinking water MCLs.

The long-term drainage from the HLFs would be managed in E-cells or ET-cells in accordance with NDEP and Nevada BLM Reclamation/Closure requirements such that closure of the facilities would not present the potential to degrade waters of the State. The proposed design of the lined E-cells and or ET-cells and procedures for passive management of leachate generated from the heap leach facilities in the closure and postclosure period is anticipated to prevent the solution from infiltrating to the groundwater system or impacting surface water resources. Accordingly, there would be little to no risk to groundwater or surface water from operation and closure of the proposed HLFs. Details associated with facility closure and reclamation including final grading and cover specifications are discussed in Section 2.4.4, Reclamation, and within the Reclamation Plan (Barrick 2012a,b) and in SRK and Schafer (2015).

3.3.2.2 Reconfiguration Alternative

Water Quantity Impacts

Impacts to Water Levels

The groundwater model simulations for the Reconfiguration Alternative were based on the total groundwater pumping for water supply and pit dewatering activities that would occur in the future for the existing and proposed operations as described in Section 3.2.2.1. The modeling scenario incorporated the estimated average annual groundwater pumping rates ranging from 31 gpm to 1,343 gpm over the anticipated 25-year pumping period (**Table 3.3-9**). As shown on **Figure 3.3-15**, the pumping required for the Reconfiguration Alternative would be less than required under the Proposed Action from year 11 (2025) through the end of the project.

The areas predicted to experience a reduction of groundwater levels (or drawdown) of 10 feet or more attributable to the total anticipated mine pumping requirements under the Reconfiguration Alternative are provided in **Figure 3.3-21**. This figure illustrates the areas where the water levels are predicted to decrease over time in comparison to the baseline groundwater elevations in 2014. Comparison between **Figure 3.3-17** (Proposed Action) and **Figure 3.3-21** (Reconfiguration Alternative) indicates that the areas affected by 10 feet or more of drawdown would be reduced under the Reconfiguration Alternative in the northwest and northern portion of the NOA; and slightly reduced in the SOA.

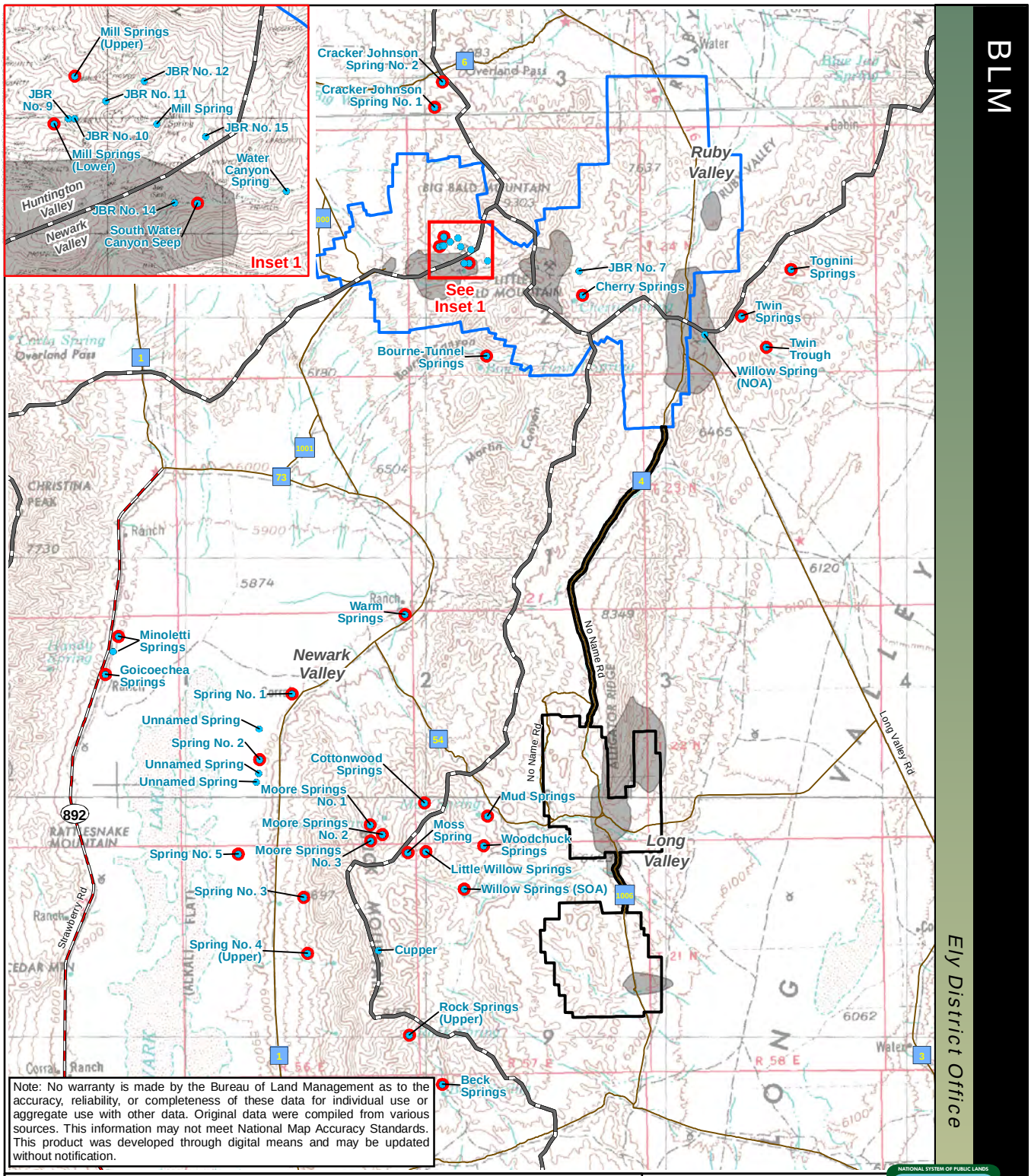
Impacts to Springs

The locations of springs and seeps within the drawdown areas are presented in **Figure 3.3-21**. Three springs occur within the drawdown area: South Water Canyon Seep, JBR No. 14 (spring) and Willow Springs (NOA) (**Table 3.3-10**). Impacts to springs would be essentially the same as those described for the Proposed Action (Section 3.3.2.1). Based on the site conditions, and model predictions, and model uncertainty, there is potential risk that drawdown associated with groundwater pumping for the mine could impact (i.e., reduce) the baseflow and associated wetlands at South Water Canyon Seep and JBR No. 14. The effects to these springs would depend on the actual drawdown that occurs in these areas and the site-specific hydraulic connection between the groundwater systems impacted by pumping and the perennial water source. If these springs are interconnected with the groundwater system that is impacted by pumping, the level of impacts experienced at these springs are expected to be the same as those that would occur under the Proposed Action. Perennial water sources that are hydraulically connected to the groundwater system impacted by pumping and within the drawdown area likely would experience a reduction in baseflow. Depending on the severity of these reductions in flow, this could result in drying up of springs and reducing the size of their associated wetland area. Potential impacts to vegetation, wildlife, and aquatic resources resulting from these potential drawdown effects to the South Water Canyon Seep and JBR No. 14 are addressed in in Section 3.5, Vegetation Resources; Section 3.7, Wildlife and Fisheries; Section 3.8, Special Status Species; Section 3.9, Livestock Grazing; Section 3.10, Wild Horses; and Section 3.13, Native American Traditional Values.

As with the Proposed Action, impacts to other springs including Willow Spring (NOA) located in the Mooney Basin, and Mill Spring, Water Canyon Spring and Twin Springs located outside but within 1 mile of the predicted 10-foot drawdown contour are not anticipated (see Section 3.3.2.1, Proposed Action, for additional discussion).

Impacts to Water Rights

Water rights located within the predicted drawdown areas under the Reconfiguration alternative are shown in **Figure 3.3-22**. Potential impacts to water rights would be essentially the same as those described for the Proposed Action since the anticipated drawdown is predicted to be the same at these locations for both alternatives. As shown in **Table 3.2-11**, there are 3 non-Barrick owned or controlled water rights (Map IDs HV-164, HV-165, and LV-011) located within the predicted mine-induced



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Legend

- Action Alternative NOA Plan Boundary
- Action Alternative SOA Plan Boundary
- 10' Drawdown Area (Reconfiguration Alternative)
- Seep or Spring
- Baseline Monitoring Site[1]
- Hydrographic Basin Boundary

Bald Mountain Mine North and South Operations Area Projects EIS

Figure 3.3-21

Reconfiguration Alternative 10' Drawdown Area and Springs and Seeps

0 1 2 4 Miles

N

[1]Monitoring sites reported in seep, spring and well monitoring update annual report (Tetra Tech 2012).
Sources (spring locations): Tetra Tech 2012, JBR 2011a, Geomega 2015a, b, and 2011a.

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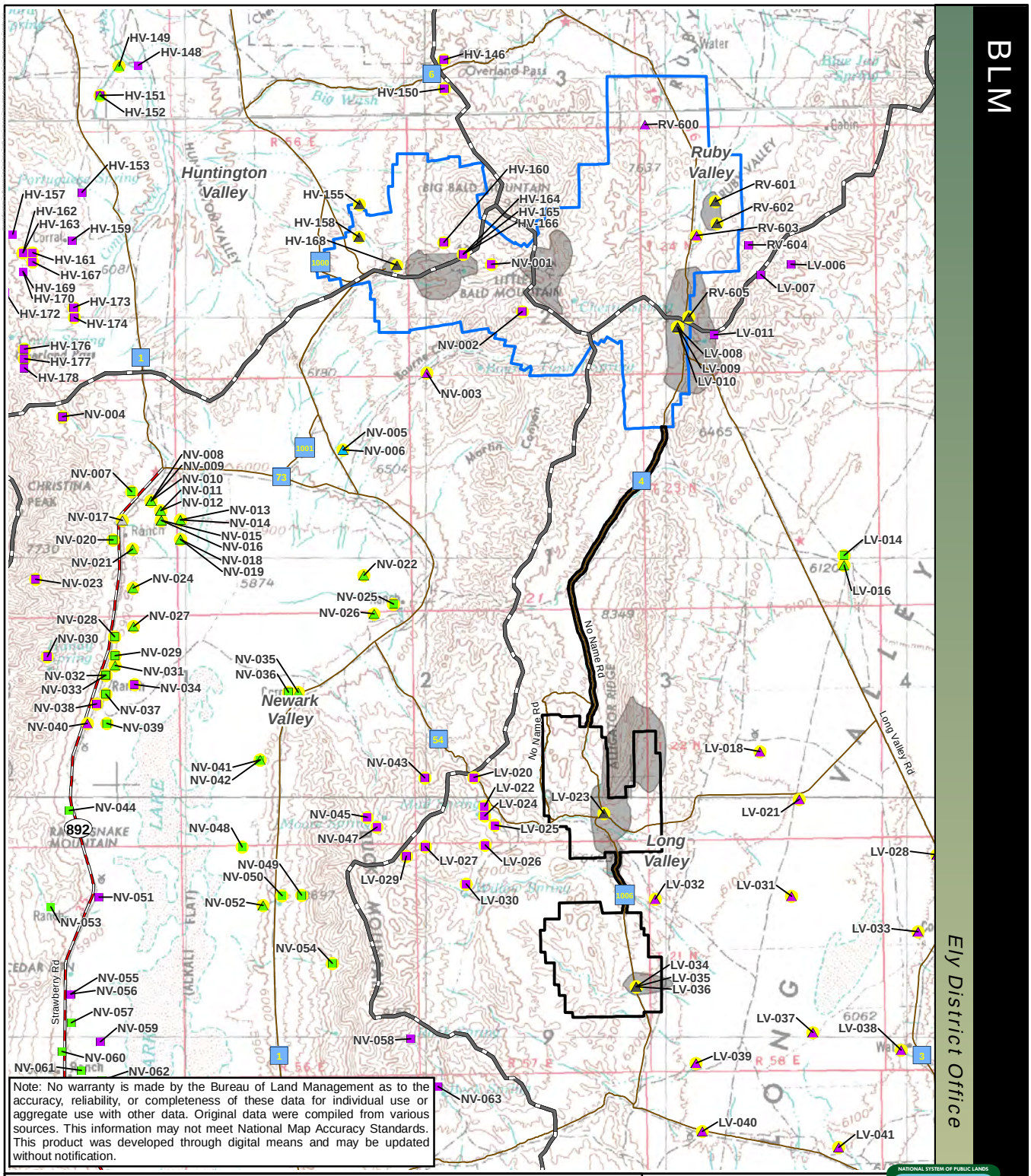

Legend

- Action Alternative NOA Plan Boundary
- Action Alternative SOA Plan Boundary
- Hydrographic Basin Boundary
- 10' Drawdown Area (Reconfiguration Alternative)
- Barrick Gold Water Right

Water Right Water Source

- Surface Water
- Groundwater

Water Right Use Type

- Irrigation
- Mining/Milling
- Quasi-Municipal
- Stock Watering
- Wildlife

Source: Geomega 2015c, NDWR 2014.

Bald Mountain Mine North and South Operations Area Projects EIS

Figure 3.3-22

Reconfiguration Alternative 10' Drawdown Area and Water Rights

0 1 2 4 Miles

N

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2/10/2016

drawdown area (i.e., areas where the groundwater levels are predicted to be lowered by 10 feet or more resulting from the mine groundwater pumping activities under the Reconfiguration Alternative groundwater pumping scenario.) All three water rights are surface water rights established at a spring source and used for stock watering.

In summary, the actual impacts to individual surface water rights would depend on the site-specific hydrologic conditions that control surface water discharge. Only those waters sustained by discharge from the regional groundwater system would be likely to be impacted. For surface water rights that are dependent on groundwater discharge, a potential reduction in groundwater levels could reduce or eliminate the flow available at the point of diversion for the surface water right. As discussed for the Proposed Action, there is potential for drawdown to reduce flows at the South Water Canyon Seep (the likely source for HV-165 and HV-166); but drawdown is unlikely to impact flows at Willow Spring (NOA) (the likely source for LV-011).

Watershed Disturbance

Under the Reconfiguration Alternative, potential impacts to surface water resources would be similar to those described for the Proposed Action. In some local areas, such as the Mill Canyon vicinity near the proposed North 1 RDA and North 5 RDA, smaller disturbance footprints or modified component configurations under this alternative would reduce impacts to existing watershed characteristics in ephemeral headwater drainages.

Similar to the assessment of the Proposed Action, in most cases the project components would be located along ridge-tops or alongside road ditches that would drain small upgradient areas. Direct precipitation on process features would be retained. Under a scenario wherein all disturbance under this alternative would not contribute to the watershed, the potential spatial impact to the contributing areas in the NDWR hydrographic basins would be quite small: in Huntington Valley, approximately 0.05 percent; in Newark Valley, approximately 0.20 percent; in Long Valley, approximately 0.52 percent; and in Ruby Valley, approximately 0.55 percent of the land area would be removed from the contributing watershed.

In addition, the phasing of project disturbance and reclamation would further reduce the overall watershed disturbance at any given time. The surface water effect on the hydrographic basins would be minor to negligible, but slightly greater than that of the Proposed Action. This would be due primarily to the somewhat greater disturbance area in Long Valley and Ruby Valley. Concurrent reclamation, process water controls, storm water management, and final reclamation and closure activities would be conducted in compliance with state and federal programs, as stated above for the Proposed Action.

Water Quality Impacts

The strategy for handling waste rock material is presented in the Adaptive Waste Rock Management Plan (Schafter 2014b, 2012a). Since the geochemical characterization of the waste rock material, environmental protection measures incorporated into the design of the RDAs, and closure and reclamation practices would be the same as the Proposed Action, the potential impacts to surface water and groundwater would be similar to those previously described under the Proposed Action.

Table 3.3-13 provides a summary comparison of the estimated percentage of PAG material from each pit under the specific mining operations that would occur under the Proposed Action, Reconfiguration Alternative and WRM Alternative. This summary indicates that under the Reconfiguration Alternative approximately 17.4 percent of the waste rock generated in the NOA, and 6.2 percent of the waste rock generated in the SOA would be classified as PAG. Compared with the Proposed Action, the percentage of waste rock classified as PAG is slightly higher (i.e., 17.4 percent vs. 16.0 percent for the Proposed Action) for the NOA, and the same in the SOA.

RDAs associated with pits with relatively high estimated proportion of PAG material under the Reconfiguration Alternative include the Redbird Pit (29.1 percent PAG), Winrock (35.6 percent PAG),

and Gator Pit (39.8 percent PAG). However, as shown on **Table 3.3-13**, the volume of waste rock and percentage of waste rock classified as PAG from the Redbird, Winrock and Gator pits are the same under both the Reconfiguration Alternative and Proposed Action.

Potential impacts associated with Heap Leach Facilities and partial backfill to preclude pit lake development in the Top Pit Complex and Redbird Pit would be the same as previously described for the Proposed Action.

3.3.2.3 Western Redbird Modification Alternative

Water Quantity Impacts

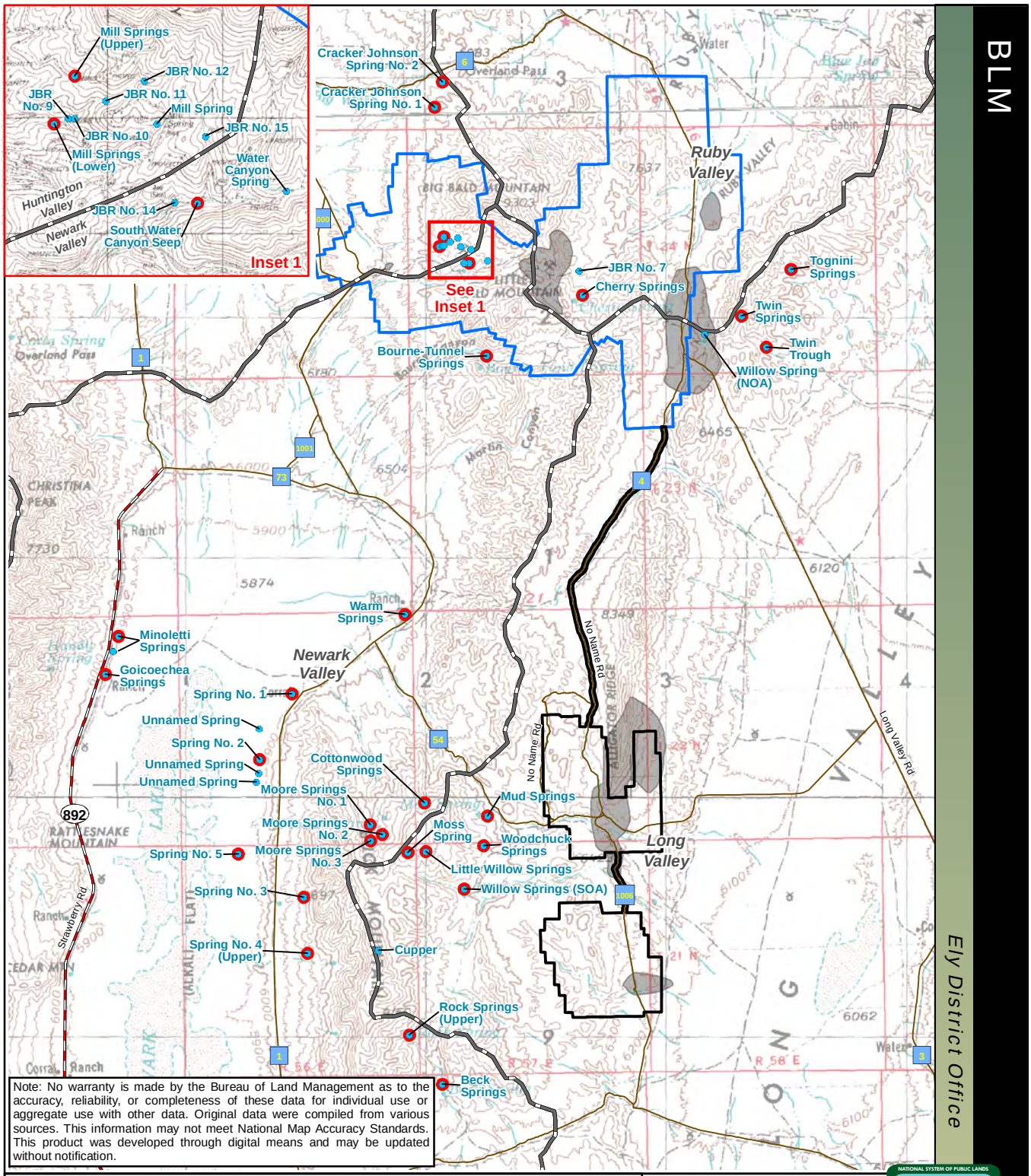
Impacts to Water Levels

The groundwater model simulations for the WRM Alternative were based on the total groundwater pumping for water supply and pit dewatering activities that would occur in the future for the existing and proposed operations as described in Section 3.2.2.1. The modeling scenario incorporated the estimated average annual groundwater pumping rates ranging from 31 gpm to 1,244 gpm over the anticipated 25-year pumping period (**Table 3.3-9**). As shown on **Figure 3.3-15**, the pumping required for the WRM Alternative would be similar to the pumping required under the Reconfiguration Alternative. The primary difference between these two alternatives is that the pumping for dewatering of the Redbird Pit under the Reconfiguration Alternative would not occur under the WRM Alternative. Specifically, under the WRM Alternative, mining would extend to an elevation of 6,620 feet (amsl) in the Redbird Pit. The pit floor elevation for the Redbird Pit would be 600 feet higher that the proposed pit floor elevation (6,020 feet amsl) under the Reconfiguration Alternative. The shallower depth of mining at the Redbird Pit under the WRM Alternative would not intercept the pre-mining water table and partial pit backfill to prevent formation of a pit lake would not be required.

The areas predicted to experience a reduction of groundwater levels (or drawdown) of 10 feet or more attributable to the total anticipated mine pumping requirements under the WRM Alternative are provided in **Figure 3.3-23**. This figure illustrates the areas where the water levels are predicted to decrease over time in comparison to the baseline groundwater elevations in 2014. Comparison between **Figure 3.3-21** (Reconfiguration Alternative) and **Figure 3.3-23** (WRM Alternative) indicates that the predicted areas affected by 10 feet or more of drawdown would be the same under both alternatives except that the drawdown area that occurs in the northwest portion of the NOA under the Reconfiguration Alternative does not occur under the WRM Alternative.

Impacts to Springs

The locations of springs and seeps within the drawdown areas are presented in **Figure 3.3-23**. One spring occurs within the drawdown area: Willow Springs (NOA) (**Table 3.3-10**). The predicted depth to groundwater at Willow Spring (NOA) is approximately 375 feet below the ground surface; and the spring occurs in the Diamond Peak Formation that is inferred to have a low horizontal and vertical hydraulic conductivity (Geomega 2015b). The large depth to groundwater and low hydraulic conductivity of the formation suggest that this spring is controlled by shallow perched conditions that are not hydraulically interconnected with the groundwater system that would be affected by mine induced drawdown. Therefore, as with the Proposed Action and Reconfiguration Alternative impacts to the flow at Willow Spring are not anticipated. Impacts to other springs located in the project area are not anticipated. In comparison to the Reconfiguration Alternative, the potential impacts to springs, seeps and their associated wetlands would be reduced under the WRM Alternative. Specifically, potential drawdown impacts to South Water Canyon Seep and the JBR No. 14 spring (identified under the Reconfiguration Alternative) are not anticipated under the WRM Alternative.



BLM

Ely District Office

Legend

- Action Alternative NOA Plan Boundary
- Action Alternative SOA Plan Boundary
- 10' Drawdown Area (Western Redbird Alternative)
- Seep or Spring
- Baseline Monitoring Site[1]
- Hydrographic Basin Boundary

Bald Mountain Mine North and South Operations Area Projects EIS

Figure 3.3-23

Western Redbird Alternative 10' Drawdown Area and Springs and Seeps

0 1 2 4 Miles

N

[1]Monitoring sites reported in seep, spring and well monitoring update annual report (Tetra Tech 2012).
Sources (spring locations): Tetra Tech 2012, JBR 2011a, Geomega 2015a, b, and 2011a.

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Impacts to Water Rights

Water rights located within the predicted drawdown areas under the WRM Alternative are shown in **Figure 3.3-24**. As shown in **Table 3.2-11**, there is one non-Barrick owned or controlled water rights (Map IDs LV-011) located within the predicted mine-induced drawdown area (i.e., areas where the groundwater levels are predicted to be lowered by 10 feet or more resulting from the mine groundwater pumping activities under the WRM Alternative groundwater pumping scenario.) LV-001 is a surface water right established at a spring source used for stock watering. The map location is near the location of Willow Spring (NOA) and is therefore the likely source of water for the water right. As discussed above, Willow Spring is likely fed by a perched groundwater and therefore, impacts to flow resulting from mine induced drawdown of the regional aquifer are not expected to impact the source of flow for the water right. Impacts to other non-Barrick owned or controlled water rights are not anticipated. Compared to the Reconfiguration Alternative, the potential impacts to water rights identified as HV-165 and HV-166 that are likely sourced from flows at the South Water Canyon Seep, would not occur under the WRM Alternative.

Watershed Disturbance

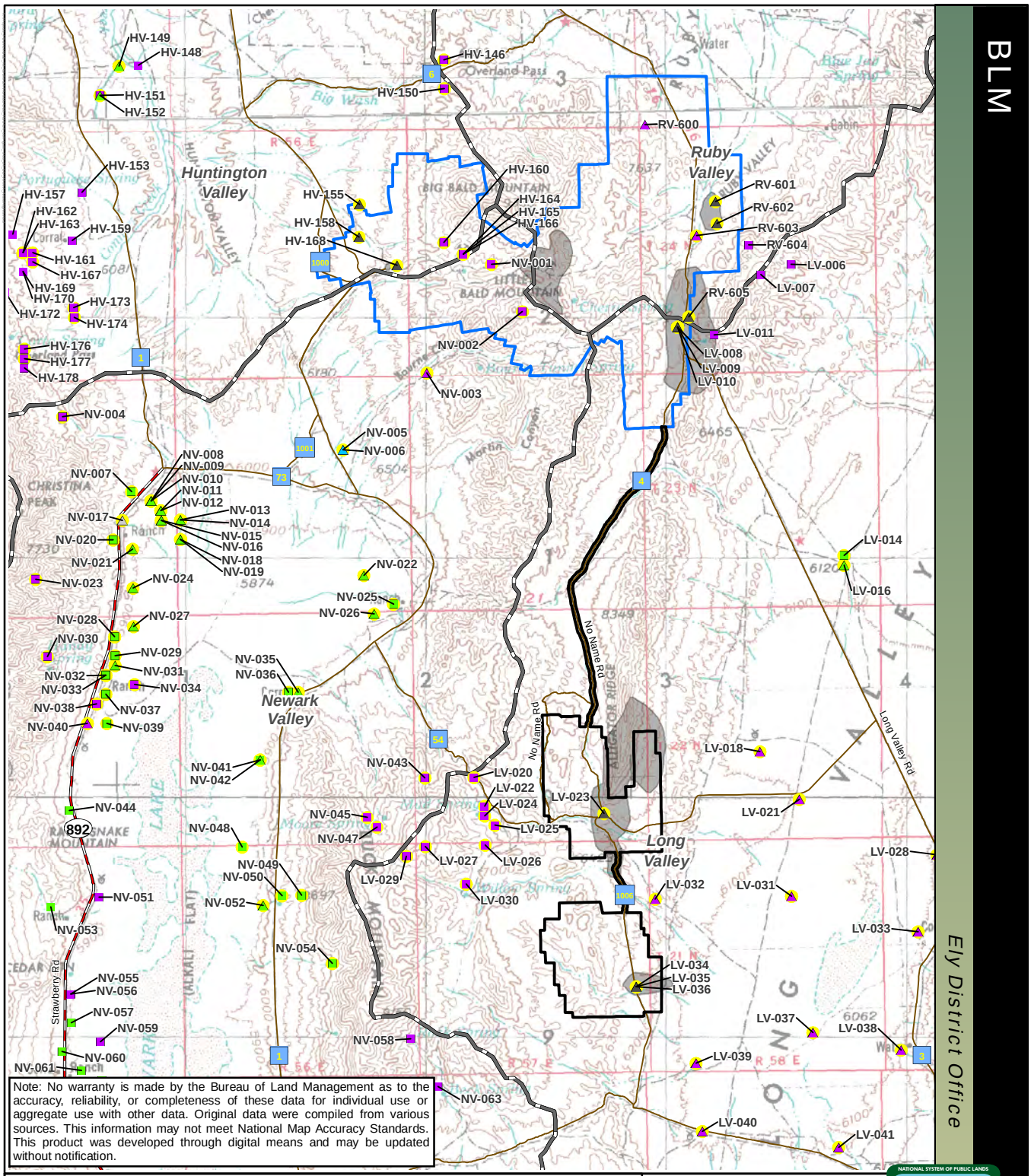
Under the WRM Alternative, potential impacts to surface water resources would be similar to those but reduced from those described for the Reconfiguration Alternative. Specifically, the smaller disturbance footprints or modified component configurations in the western portion of the NOA that would occur under this alternative would proportionally reduce impacts to existing watershed characteristics in ephemeral headwater drainages in this area. The impacts to contributing watershed areas in the other portions of the NOA and SOA would be the same as previously described for the Reconfiguration Alternative.

Water Quality Impacts

The volume of rock material generated under the WRM Alternative represents a 60 percent reduction in the leach ore production, and 70 percent reduction in the waste rock generated from the NOA, and no change in ore and waste rock generated from the SOA compared with the Reconfiguration Alternative. The reduction in leach ore material and waste rock under the WRM (as compared with the Reconfiguration Alternative) would generally tend to reduce the potential risk associated with the management of leachate generated during runoff or infiltrating from the base of the facilities over the long term.

Table 3.3-13 provides a summary comparison of the estimated percentage of PAG material from each pit under the specific mining operations that would occur under the Proposed Action, Reconfiguration Alternative and WRM Alternative. This summary indicates that under the WRM Alternative approximately 9.4 percent of the waste rock generated in the NOA, and 6.2 percent of the waste rock generated in the SOA would be classified as PAG. Mining under the WRM Alternative in the NOA would generate a lower percentage of material classified as PAG (9.4 percent PAG) compared to the Proposed Action (16.0 percent PAG), and Reconfiguration Alternative (17.4 percent PAG). However, the waste rock volume and percentage of PAG material generated in the SOA under the WRM Alternative is the same as under both the Proposed Action and Reconfiguration Alternative.

RDAs associated with pits with relatively high estimated proportion of PAG material under the Western Redbird Modification Alternative include the Redbird Pit (43.2 percent PAG), Winrock (35.6 percent PAG), and Gator Pit (39.8 percent PAG). However, as shown on **Table 3.3-13**, the volume of waste rock and percentage of waste rock classified as PAG from the Winrock and Gator pits are the same as under both the Reconfiguration Alternative and Proposed Action.



Legend

- Action Alternative NOA Plan Boundary
- Action Alternative SOA Plan Boundary
- Hydrographic Basin Boundary
- 10' Drawdown Area (Western Redbird Alternative)
- Barrick Gold Water Right

Water Right Water Source

- Surface Water
- Groundwater

Water Right Use Type

- Irrigation
- Mining/Milling
- Quasi-Municipal
- Stock Watering
- Wildlife

Source: Geomega 2015c, NDWR 2014.

Bald Mountain Mine North and South Operations Area Projects EIS

Figure 3.3-24

Western Redbird Alternative 10' Drawdown Area and Water Rights

0 1 2 4 Miles

N

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2/10/2016

The strategy for handling waste rock material under the WRM Alternative is presented in the Revised Waste Rock Management Plan (Tetra Tech 2016). The Revised Waste Rock Management Plan specifies: 1) the sampling procedures and analyses to be used for ongoing geochemical characterization as mining proceeds; 2) the geochemical thresholds that would be used to trigger the implementation of one or more mitigation measures to minimize potential adverse effects to downgradient surface and/ or groundwater water quality; and 3) the specific mitigation measures that may be applied as necessary if the geochemical thresholds are exceeded. The sampling procedures would consists of collecting a representative quarterly composite samples from each active pit. The composite samples would be analysed for paste pH to determine if the weathered mine waste has become acidic; static test to quantify the acid generation and acid neutralization potential; and Meteoric Water Mobility Procedure tests to evaluate leachable metal concentrations. If the annual weighted averages computed from the quarterly monitoring results indicate that any RDA (including RDAs located in open pits above the water table) had received waste rock with either: (a) greater than 20 percent PAG material; or (b) between 10 percent and 20 percent PAG material with an NNP value of less than 200 kg/t, then any one or combination of the following measures would be applied in an effort to to minimize potential risk to downgradient water quality:

1. Change routing of future waste rock to reduce the percentage of PAG material in the facility.
2. Place PAG in interior of facility (e.g., minimum of 20 feet within the perimeter of the RDA or backfilled area). The minimum 20 feet thick perimeter shell would consist of oxidized (non-PAG) material.
3. Co-mingle PAG with non-PAG with an NNP value greater than 200 kg/t.
4. Enhance cover design, subject to approval by the BLM and NDEP, to reduce net infiltration.
5. Re-design RDA, subject to approval by the BLM and NDEP, to redirect surface runoff, manage seepage, reslope facility or locally enhance cover.

Implementation of the Revised Waste Rock Management Plan is anticipated to effectively minimize the potential for acid or metals released from the RDAs. Therefore, impact to surface water and groundwater quality associated with construction, operation, and closure of the RDAs is not anticipated.

In contrast to the Proposed Action and Reconfiguration Alternative, the shallower depth of mining at the Redbird Pit (6,620 feet amsl) under the WRM Alternative would not intercept the estimated pre-mining water table (6,142 amsl) and partial pit backfill to prevent formation of a pit lake would not be required. Therefore, potential impacts associated with partial pit backfill to preclude pit lake development (i.e., placement of waste rock below the final recoved groundwater elevation) would not occur at the Redbird Pit.

Under the WRM Alternative, the open pit mining at the Top Pit would be the same as the Proposed Action and Reconfiguration Alternative. Therefore, the pit floor elevation (6,100 feet amsl), and predicted recovered groundwater elevation (6,369 feet amsl) are the same as for the Proposed Action. BMM proposes to partially backfill the Top Pit Complex as necessary to preclude the development of any anticipated pit lake in the post-mining period. The Revised Waste Rock Management Plan (Tetra Tech 2016) developed for the WRM Alternative specifies that waste rock material placed below the predicted recovered groundwater elevation in the pit would be selectively handled to minimize any potential for degradation of groundwater downgradient from the pit. The select rock units to be used would have Net Neutralization Potential greater than 0 kg/t (as $CaCO_3$) in the majority (>95 percent) of samples from historic geochemical test data, have an average NNP of greater than +100 kg/t (as $CaCO_3$), and would have total sulfur levels of less than 0.3 percent in the majority (>95 percent) of samples from historic geochemical test data. The specifications for selective handling of waste rock for use as partial backfill below the predicted recovered groundwater elevation is expected to prevent adverse impacts to downgradient water quality. Therefore, impacts to downgradient groundwater

quality resulting from the partial pit backfill at the Top Pit are not anticipated under the WRM Alternative.

3.3.2.4 No Action

Water Quantity Impacts

Impacts to Water Levels

The groundwater model simulations for the No Action were based on the total groundwater pumping for water supply and pit dewatering activities that would occur in the future for the existing and proposed operations as described in Section 3.2.2.1. As such, the modeling scenario incorporated the estimated average annual groundwater pumping rates shown in **Figure 3.2-15** ranging from 110 gpm to 578 gpm over the remaining 13-year project life.

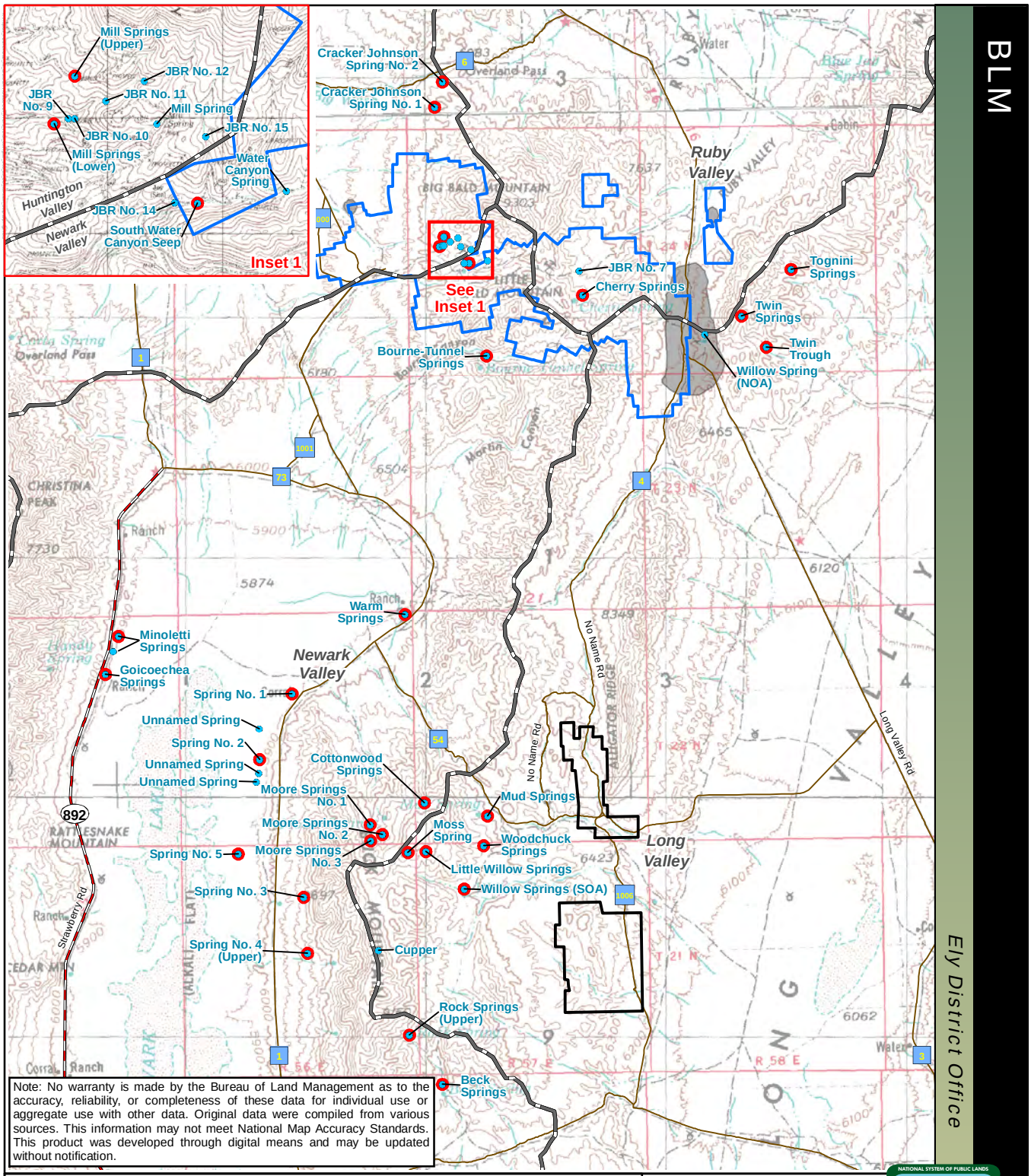
The areas predicted to experience a reduction of groundwater levels (or drawdown) of 10 feet or more attributable to the total anticipated mine pumping requirements under the Proposed Action are provided in **Figures 3.3-25**. This figure illustrates the areas where the water levels are predicted to decrease over time in comparison to the baseline groundwater elevations in 2014. The area predicted to experience a reduction of groundwater levels (or drawdown) of 10 feet or more attributable to the total anticipated mine pumping requirements under the No Action pumping scenario is located in the Mooney Basin area along the eastern margin of the NOA. Drawdown (10 feet or more) is not predicted to occur in the other project areas.

Impacts to Springs

The locations of springs and seeps within the drawdown areas are presented in **Figure 3.3-25**. The potential impacts to springs is essentially the same as those described under the WRM Alternative. in summary, one spring, Willow Spring (NOA) (**Table 3.3-10**) occurs in the drawdown area. As with the Proposed Action, impacts to Willow Spring (NOA) located in the Mooney Basin, and other springs located outside but within 1 mile of the predicted 10-foot drawdown contour are not anticipated (see Section 3.3.2.1, Proposed Action, for additional discussion. The effects to springs would depend on the actual drawdown that occurs in these areas and the site-specific hydraulic connection between the groundwater systems impacted by pumping and the perennial water source. Perennial water sources that are hydraulically connected to the groundwater system impacted by pumping and within the drawdown area likely would experience a reduction in baseflow.

Impacts to Water Rights

Water rights located within the predicted drawdown areas under the No Action groundwater pumping scenario are shown in **Figure 3.3-26**. Potential impacts to water rights would be the same as described under the WRM Alternative. As shown in **Table 3.2-11**, there is one non-Barrick owned or controlled water rights (Map IDs LV-011) located within the predicted mine-induced drawdown area (i.e., areas where the groundwater levels are predicted to be lowered by 10 feet or more resulting from the mine groundwater pumping activities under the WRM Alternative groundwater pumping scenario.) LV-001 is a surface water right established at a spring source used for stock watering. The map location is near the location of Willow Spring (NOA) and is therefore the likely source of water for the water right. As discussed above, Willow Spring is likely fed by a perched groundwater and therefore, impacts to flow resulting from mine induced drawdown of the regional aquifer are not expected to impact the source of flow for the water right. Impacts to other non-Barrick owned or controlled water rights are not anticipated.



Legend

- Authorized NOA Plan Boundary
- Authorized SOA Plan Boundary
- 10' Drawdown Area (No Action)
- Seep or Spring
- Baseline Monitoring Site[1]
- Hydrographic Basin Boundary

Bald Mountain Mine North and South Operations Area Projects EIS

Figure 3.3-25

No Action 10' Drawdown Area and Springs and Seeps

0 1 2 4 Miles

N

[1]Monitoring sites reported in seep, spring and well monitoring update annual report (Tetra Tech 2012).
Sources (spring locations): Tetra Tech 2012, JBR 2011a, Geomega 2015a, b, and 2011a.

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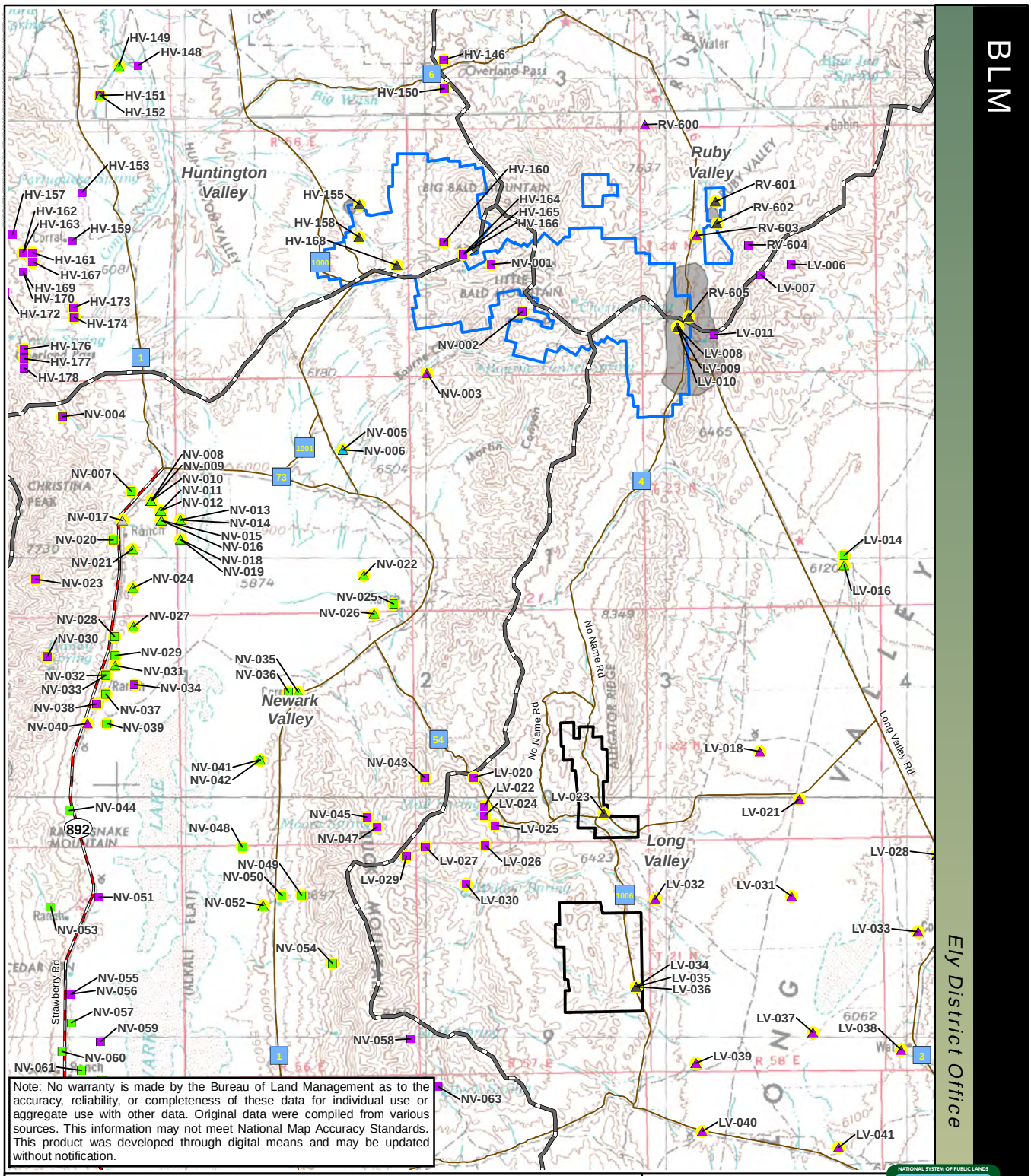

Note: No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual use or aggregate use with other data. Original data were compiled from various sources. This information may not meet National Map Accuracy Standards. This product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

Legend

- Authorized NOA Plan Boundary
- Authorized SOA Plan Boundary
- Hydrographic Basin Boundary
- 10' Drawdown Area (No Action)
- Barrick Gold Water Right

Water Right Water Source

- Surface Water
- Groundwater

Water Right Use Type

- Irrigation
- Mining/Milling
- Quasi-Municipal
- Stock Watering
- Wildlife

Source: Geomega 2015c, NDWR 2014.

Bald Mountain Mine North and South Operations Area Projects EIS

Figure 3.3-26

No Action 10' Drawdown Area and Water Rights

0 1 2 4 Miles

N

BLM

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2/10/2016

Watershed Disturbance

Under the No Action Alternative, Barrick would continue its operations, closure, and reclamation activities within the NOA and SOA under the terms and current permits and approvals as authorized by the BLM and State of Nevada. This would include reclamation of all previously authorized facilities. The proposed NOA and SOA projects would not be developed and additional disturbance to the headwater ephemeral drainages and associated watersheds in the study area would not occur. No direct or indirect impacts to surface water resources associated with ground disturbance activities would occur. Concurrent reclamation, process water controls, storm water management, and reclamation and closure activities would all be conducted in accordance to Barrick's ongoing practices in compliance with state and federal programs.

Water Quality Impacts

Impacts to water quality associated with the currently authorized facilities included under No Action in the NOA were provided in the Bald Mountain Mine Operations Area Project Final EIS (BLM 2009a).

3.3.3 Cumulative Impacts

The CESA for water quality and quantity consists of the Huntington Valley, Newark Valley, Long Valley, and Ruby Valley hydrographic basins (**Figure 3.3-1**). The four basins cover an area of approximately 2,075,520 acres (**Table 3.3-1**). Three of the four hydrographic basins in the CESA are closed basins (without external drainage). Surface water in Huntington Valley drains outward to Huntington Creek (a perennial stream), which is tributary to the South Fork of the Humboldt River. Ruby Valley, Long Valley, and Newark Valley lack external surface drainage.

Past and present actions and RFFAs are discussed in Section 2.7, (Past, Present, and Reasonably Foreseeable Future Actions); their locations are illustrated in **Figure 2.7-1**. Past and present actions have resulted, or would result, in approximately 29,757 acres of total surface disturbance within the water quality and quantity CESA. The total quantifiable surface disturbances are related to mining, oil and gas development, wind energy development, exploration, land, road, and utility corridor development, agriculture, livestock grazing, residential developments, and other county and government actions. RFFAs proposed within the water quality and quantity CESA include, but are not limited to, the following: mineral-related actions (totaling 3,204 acres), oil and gas exploration within Huntington Valley and near Maverick Springs (320 acres), development of oil and gas leases within the Long, Ruby, and Huntington valleys (acreage of exploration and development unknown), vegetation treatments (totaling 56,572 acres), exploration within Long Valley (acreage unknown), oil and gas lease sales within the Long, Ruby, and Huntington valleys (acreage unknown), and vegetation treatments (totaling 56,500 acres).

Unless specified otherwise, the following discussion of cumulative impacts pertains to the Proposed Action, Reconfiguration Alternative and WRM Alternative.

Climate Change Effects to Water Resources

The potential effects to water resources associated with climate change are the same as summarized in the Clark, Lincoln, and White Pine Counties Groundwater Development Project Final EIS prepared by the BLM Nevada State Office (BLM 2012p):

"Global climate change models predict potential alterations in the distribution and seasonality of precipitation (Houghton et al. 1996; Mahlman 1997; Giorgi et al. 1998). The effects of this climate change already are being observed in the western U.S., including the reduction and earlier melting of mountain snowpacks, earlier timing of spring runoff, and associated declines in river flows (Barnett et al. 2011; Dettinger et al. 2004; Stewart et al. 2004). Climate change simulations also clearly indicate a general, large-scale warming over the western U.S. (Barnett et al. 2004), which likely will lead to more widespread drought. Paradoxically, a warmer atmosphere and an intensified water cycle are likely to

mean not only a greater likelihood of drought for the Southwest, but also an increased risk of flooding (USGCRP 2009). Patterns of precipitation currently are changing, with more rain falling in heavy downpours that also can lead to such flooding events (Allan and Soden 2008; IPCC 2007c). Moreover, increased flood risk in the Southwest is likely to result from a combination of decreased snow cover on the lower slopes of high mountains and an increased fraction of winter precipitation falling as rain and therefore running off more rapidly (Knowles et al. 2006). This increase in rain-on-snow events also could result in rapid runoff and flooding (Bales et al. 2006). Winter precipitation in Arizona is becoming increasingly variable, with a trend toward both extremely dry and extremely wet winters (Goodrich and Ellis 2008). Greater variability in patterns of precipitation can be anticipated in the future. Rapid landscape transformation due to vegetation die-off and wildfire as well as loss of wetlands along rivers also is likely to reduce flood-buffering capacity.

The effect of climate change on streamflow and groundwater recharge will vary regionally and locally, likely following projected changes in precipitation. The impact of climate change on water resources depends not only on changes in the volume, timing, and quality of streamflow and recharge but also on system characteristics, changing pressures on the system, how the management of the system evolves, and what adaptations to climate change are implemented (Arnell et al. 2001). Recent studies from the Sierra Nevada of California indicate that climate change will lead to increasing winter streamflow and decreasing late spring and summer flow (Miller et al. 2003; Maurer 2007). The amount and timing of runoff are dependent on the characteristics of each basin, especially elevation. Increased temperatures lead to a higher freezing line, and therefore, less snow accumulation and increased melting below the freezing height (Miller et al. 2003). These studies suggest that a decrease in late winter snow accumulation is a confident projection, as is the earlier arrival of the annual flow volume.

Climate change could affect water resources in the project area by impacting:

- Surface hydrology (volume and timing of surface flows, rainfall-runoff response, flood events, water quality, sediment and contaminant transport);
- Vadose zone hydrology (runoff, ET, infiltration, groundwater recharge); and
- Hydrogeology (groundwater flow)."

Watershed Disturbance

Under the Proposed Action, impacts to surface water resources would involve removal or disturbance of approximately 24 miles of unnamed ephemeral drainages and associated contributing watershed areas. The watershed disturbance expressed as an approximate percentage of the hydrographic basin watershed area where it would occur represents 0.05 percent in Huntington Valley, 0.21 percent in Newark Valley, 0.60 percent in Long Valley, and 0.46 percent Ruby Valley. For the Reconfiguration Alternative, the watershed disturbance expressed as an approximate percentage of the hydrographic basin watershed area represents 0.05 percent in Huntington Valley, 0.20 percent in Newark Valley, 0.52 percent in Long Valley, and 0.55 percent Ruby Valley. The phasing of project disturbance and reclamation would reduce the overall watershed disturbance at any given time. Therefore, overall, the project would have a minor to negligible effect to watershed disturbance in the cumulative area.

Groundwater Levels

The groundwater model simulations for the Proposed Action, Reconfiguration, and WRM alternatives predict the area that would experience drawdown resulting from groundwater pumping over the project life (**Figure 3.3-17**, **Figure 3.3-21**, and **Figure 3.3-23**, respectively). The groundwater model also was used to simulate past and present drawdown for the mine area using pumping rates for the historic mining period (1983 to 2014). The model simulation and review of historic water level data indicates that there is essentially no additional drawdown in the project area attributable to the historic mining period. No other major groundwater pumping is known to have occurred in the past, or is currently planned for the future that would contribute to the cumulative drawdown in the project area. Therefore, the predicted

drawdown area for the Proposed Action and the Reconfiguration Alternative represents the cumulative drawdown area under each respective pumping scenario.

Perennial Springs, Seeps and Streams

Based on the site conditions, the predicted drawdown associated with groundwater pumping for the Proposed Action and Reconfiguration Alternative could impact (i.e., reduce) the baseflow and associated wetlands at South Water Canyon Seep and JBR No. 14. (Note that potential drawdown impacts to South Water Canyon Seep and the JBR No. 14 spring are not anticipated under the WRM Alternative.) Depending on the severity of these reductions in flow, this could result in drying up of springs and reducing the size of their associated wetland area. These potential impacts would result in an incremental increase in impacts to perennial water sources in the CESA. Impacts to perennial springs, seeps and streams can occur due to livestock grazing, surface disturbance, and groundwater pumping for other projects (including agricultural pumping, other mine development that intercept groundwater, and other water supply development projects). Information is not available to quantify existing and projected future effects to other perennial springs and seeps in the CESA.

Groundwater Availability

Water rights appropriated for groundwater use in the Huntington, Newark, Ruby and Long valleys are summarized in **Table 3.3-4**. (Note, the water rights included in **Table 3.3-4** include water rights for Barrick Gold's existing and proposed groundwater pumping proposed for the project.) The proportion of groundwater appropriated by use for the study area includes irrigation (85 percent), mining and milling (13 percent), and stockwater (2 percent) and all other uses (including commercial, wildlife, domestic, industrial, quasi-municipal, and other) (<1 percent). The total appropriated groundwater for the four-basin study area is approximately 60,053 AFY (NDWR 2014). The average annual pumping rate for the Proposed Action would reach a maximum of 1,516 gpm (2,441 AFY) in year 14 of the project (**Table 3.3-9**), which represents approximately 4 percent of the total groundwater appropriated for the study area.

The estimated perennial groundwater yield for the cumulative study area is 92,000 AFY (**Table 3.3-1**). The perennial yield of a groundwater reservoir may be defined as the maximum amount of ground water that can be salvaged each year over the long term without depleting the ground-water reservoir. The maximum annual groundwater pumping rate for the project represents <3 percent of the total available groundwater in the cumulative study area. As a result, this level of groundwater pumping would have a small effect on the total groundwater resource available in the study area.

Ruby Lake NWR

Ruby Lake is the major body of surface water closest to the study area and contains the largest area of perennial wetlands in northeastern Nevada and is the site of the Ruby Lake NWR. The source of water for the lake and associated wetlands, spring inventory, and estimated inflow required to sustain the lake and associated wetlands are discussed in Section 3.3.1.2. The results of the groundwater modeling indicate that the drawdown areas (as defined by the area that would experience 10-foot or more of drawdown) for each action alternative (as shown on **Figures 3.3-17, 3.3-21,** and **3.3-23**, for the Proposed Action, Reconfiguration, and WRM alternatives, respectively) would not extend north of the proposed project boundary under any of the alternative pumping scenarios. The maximum northern extent of the predicted drawdown area would be located approximately 2.3 miles south of the boundary of the Ruby Lake NWR under the Proposed Action, and approximately 5.3 miles south of the boundary of the Ruby Lake NWR under the Reconfiguration and WRM alternatives. The distance between the drawdown area and the boundary of the NWR indicates that drawdown associated with the groundwater pumping is not likely to extend to, or capture flow in springs that sustain the lake and associated wetland areas within the NWR. Therefore, local impacts to groundwater in the project area are not expected to contribute to cumulative effects to the source of water that sustains the Ruby Lake and associated wetlands at the NWR.

Groundwater pumping for the project would reduce the total quantity of groundwater available within the Ruby Valley Hydrographic Basin (HB). The estimated perennial groundwater yield for the Ruby Valley HB is 53,000 acre-feet/year. The proposed project would increase the maximum rate of pumping in the Ruby Valley HA from approximately 425 acre-feet/year under the No Action to approximately 679 to 757 acre-feet/year that varies depending on the alternative (Barrick 2015b). Using the maximum pumping rate of 757 acre-feet/year, the maximum annual pumping rate for the project represents approximately 1.4 percent of the total estimated perennial yield for the basin. This groundwater withdrawal would only occur during the mine life, and therefore, is not expected to affect the water balance in the basin after mine closure.

The proposed designed, and closure of the mine facilities and potential impacts to water quality under the various alternatives are discussed in Section 3.3.2, and mitigation measures are discussed in Section 3.3.4. No impacts to surface water or groundwater water quality are anticipated upon the successful completion of reclamation and closure activities and implementation of proposed mitigation measures. Therefore, the proposed mine expansion alternatives is not expected to contribute to cumulative impacts to surface water or groundwater quality in the Ruby Valley or the Ruby Lake NWR.

Water Rights

Water rights are administered and protected by the State Engineer. The potential surface water and groundwater rights are discussed in the following paragraphs.

Groundwater pumping could reduce flows at the South Water Canyon Seep, the likely source for surface water rights at Map IDs HV-165 (Federal Reserve Water Right) and Map ID HV-166 (a privately owned vested water right) both used for stock watering. Although these potential impacts would contribute to cumulative impacts to surface water rights, there is insufficient data to predict the level of potential cumulative effects to surface water rights for the CESA.

Drawdown associated with groundwater pumping also could impact groundwater rights. Impacts to groundwater rights associated with wells may occur where water levels decline such that water yield is reduced or a pump must be lowered to keep it in water. No groundwater rights (other than those owned by Barrick) occur within the drawdown area under the Proposed Action. Therefore, groundwater pumping under the Proposed Action would not contribute to cumulative impacts to groundwater rights in the study area.

Water Quality

Erosion of mine-related land disturbances can result in increased sedimentation to surface water bodies in the Study Area. All mine projects have storm water permits that incorporate best management practices (BMPs) to control erosion and capture runoff from disturbed areas. NDEP conducts regular inspections of sediment control systems to ensure compliance with storm water permits. Reclamation of disturbed areas during and after mining will manage potential long-term erosion and sedimentation from mine sites.

Impacts to water quality within the cumulative study area can occur as a result of agricultural use. Grazing along stream corridors can result in a loss of bank stability, and associated erosion and sedimentation. Impacts to water quality include increasing suspended solids and turbidity, increasing temperature, decreasing riparian vegetation, and a variety of other effects. Diversion of water for irrigation also potentially impacts water quality by increasing water temperature, as well as introducing a number of agricultural contaminants via return flow.

Evidence of acid mine drainage or trace metal release has not been observed in water quality monitoring stations for the project. Geochemical studies completed for development of the Adaptive Waste Rock Management Plan conclude that the potential for acid drainage and metals mobilization is low under the Proposed Action due to pervasive alkaline conditions, abundance of iron that increases the tendency for

arsenic and antimony to sorb, and low rainfall (Schafer 2012a). Drilling and testing of legacy RDAs summarized in Section 3.3.1.6 (Rock Geochemistry) in the project area showed no indication of acid rock drainage and no indication of fluid movement through nine investigated RDAs. No pit lakes exist on the project site; and two pits will be partially backfilled to prevent pit lake development. An evaluation of the geochemical characterization of the proposed backfill material to be used for the partial pit backfill indicated that impacts to downgradient water quality are not anticipated. Therefore, the Proposed Action is not expected to contribute to cumulative impacts to surface water or groundwater quality in the CESA.

3.3.4 Monitoring and Mitigation Measures

Issue: Groundwater pumping under the Proposed Action and Reconfiguration Alternative could impact (i.e., reduce) the baseflow and associated wetlands at South Water Canyon Seep and spring JBR No. 14.

WR-1: Spring and Seeps. Barrick would expand the Water Management and Monitoring Plan to include biannual (May and October) monitoring of flow and water quality at all springs, seeps and annual mapping of associated wetland areas located within the maximum predicted drawdown area, and within 1 mile of the maximum predicted drawdown areas, as identified in **Figure 3.3-17** (Proposed Action), **Figure 3.3-21** (Reconfiguration Alternative), and **Figure 3.3-23** (WRM Alternative) as appropriate. Barrick would develop a mitigation plan to offset potential impacts to baseflow and associated wetlands at South Water Canyon Seep and spring JBR No. 14 for the Proposed Action and Reconfiguration Alternative. The plan would define offsite mitigation to restore or reclaim natural spring and wetland areas on BLM land in the district. The plan would be subject to BLM approval prior to initiation of the project. Although impacts to spring baseflows in the study area are not anticipated under the WRM Alternative based on groundwater modeling results, if monitoring data show impacts as the result of mining operations, then Barrick would develop and implement a mitigation plan to offset potential impacts to baseflow and associated wetlands.

Effectiveness: Expansion of the spring, seep and wetland monitoring would identify impacts to baseflow and associated wetland areas within or near the drawdown areas. It would not be practical to mitigate impacts to the perennial springs and associated wetlands at South Water Canyon Seep or spring JBR No. 14. However, successful implementation of a BLM approved plan to restore or reclaim natural spring and wetland areas on BLM land in the district would effectively offset potential onsite impacts.

Issue: Goundwater pumping under the Proposed Action and Reconfiguration Alternative could reduce flows at the South Water Canyon Seep, the likely source for water rights at Map IDs HV-165 (Federal Reserve Water Right) and Map ID HV-166 (a privately owned vested water right) both used for stock watering.

WR-2: Surface Water Rights. Impacts to existing water rights would be mitigated, as required by the Nevada State Engineer (NSE). The NSE is required by law to take action to resolve groundwater withdrawal conflicts with existing water right. Mitigation for impacts to existing water rights would depend on the site-specific conditions and impacts and could include a variety of measures. Methods to avoid or minimize impacts to existing water rights may include such measures as alterations to the groundwater pumping activities (e.g., modifying the pumping regime, changing the location of pumping). The NSE could require the implementation of other proven and cost-effective mitigation measures at the water source locations. For surface water rights, these measures may include but would not be limited to providing a replacement water supply of equivalent yield and water quality for duration of the impact.

Effectiveness: Mitigation for impacts to existing water rights would be mitigated on a case-by-case basis as determined by the NDWR using proven cost-effective strategies. Implementation of appropriate monitoring, management, and mitigation measures required by the NSE is anticipated to effectively protect existing water rights in accordance with applicable state laws.

Issue: The release of chemical loads associated with acid generation and/or metals release from waste rock material could pose a risk to surface water and groundwater resources under the Proposed Action or Reconfiguration Alternatives. The Adaptive Waste Rock Management Plan (Schafer 2012a) and supplemental memorandum (Schafer 2014b) may not propose adequate measures to manage all PAG waste rock materials to be placed in the proposed RDAs to protect waters of the State. For example, the Adaptive Waste Rock Management Plan does not require PAG materials to be placed in the interior of the facilities except for the case where it may be implemented as a contingency measure. Therefore, there is some risk under the waste rock management plan that pods of PAG material could be placed along the base or margin of the facility that could generate acidic leachate that eventually migrates out of the facility. (Note that the provisions outlined in WR-3 have been incorporated into the Revised Waste Rock Management Plan [Tetra Tech 2016] that is specific to the WRM Alternative).

WR-3: **Waste Rock Management**. If either the Proposed Action or Reconfiguration Alternative is authorized in the Record of Decision for this EIS, the Waste Rock Management Plan would be revised as necessary to include the following provisions.

1. Any waste rock material with an NNP less than 0 kg/t would be classified as PAG, and any waste rock material with an NNP greater than or equal to 0 kg/t would be classified as Non-PAG for the purpose of waste rock management.
2. If annual monitoring indicates that either: (a) there is greater than 20 percent PAG; or (b) there is between 10 percent and 20 percent PAG and the NNP value is less than 200 kg/t, in any RDA, then contingency measures would be implemented to enhance protection to water resources. Specific contingency measures applied to each RDA may include one or more of the following measures:
    a. Change routing of future waste rock to reduce the percentage of PAG material in the facility.
    b. Place PAG in interior of facility (e.g., minimum of 20 feet within the perimeter of the RDA). The minimum 20 feet thick perimeter shell would consist of oxidized (non-PAG) material.
    c. Co-mingle PAG with non-PAG with an NNP value greater than 200 kg/t.
    d. Enhance cover design, subject to approval by the BLM and NDEP, to reduce net infiltration.
    e. Re-design RDA, subject to approval by the BLM and NDEP, to redirect surface runoff, manage seepage, reslope facility or locally enhance cover.

Effectiveness: Implementation of the revised Waste Rock Management Plan and contingency measures outlined in **WR-3** is anticipated to effectively minimize the potential for acid or metals released from the RDAs to adversely impact surface water and groundwater quality.

Issue: The Top Pit Complex (Proposed Action, and Reconfiguration, and WRM alternatives) and Redbird Pit (Proposed Action and Reconfiguration alternatives) would be partially backfilled to preclude pit lake development. A portion of the backfill materials in each pit would eventually be submerged below the rebounding water table. Chemical constituents leached from the backfilled material could adversely affect downgradient groundwater quality. (Note that the provisions outlined in WR-4 have been incorporated into the Revised Waste Rock Management Plan [Tetra Tech 2016] that is specific to the WRM Alternative. Therefore, WR-4 only applies to the Proposed Action and Reconfiguration Alternative).

WR-4: **Pit Backfill Material**. The Waste Rock Management Plan developed prior to initiation of mining for either the Proposed Action or Reconguration Alternative would be modified to provide for selective handling of waste rock material used for partial backfill of the Top Pit Complex and Redbird Pit in accordance with the following criteria. Only waste rock that prevents degradation of groundwater

downgradient of the backfilled pits would be used to partially backfill the Top and Redbird pits. This would be accomplished by only using select rock units for placement as backfill. The select rock units to be used would have Net Neutralization Potential greater than 0 kg/t (as $CaCO_3$) in the majority (>95 percent) of samples from historic geochemical test data, have an average NNP of greater than +100 kg/t, and would have total sulfur levels of less than 0.3 percent in the majority (>95 percent) of samples from historic geochemical test data.

Effectiveness: Mitigation measure **WR-4** would effectively minimize the potential adverse impacts to downgradient groundwater quality associated with the partial backfill.

3.3.5 Residual Adverse Impacts

Water Quantity

Under the Proposed Action and Reconfiguration Alternative, residual impacts to surface water resources would consist of the removal of open pit areas from watersheds. Under the Proposed Action, approximately 1,210 acres (1.89 square miles) of open pit and areas would remain as non-contributing to ephemeral runoff conditions within over 2 million acres (approximately 3,243 square miles) in the four hydrographic basins (see **Table 3.3-1**). The Reconfiguration and WRM alternatives, would reduce the net increase in open pit areas to approximately 722 acres (1.13 square miles), and 556 acres (0.87 square mile), respectively, of open pit areas. The open pit areas would slightly reduce the amount of runoff originating from the headwater ephemeral drainages, and somewhat reduce the amount of water contributed to downslope groundwater recharge and storage in the valley fills.

Water Quality

No residual impacts to surface water or groundwater water quality are anticipated upon the successful completion of reclamation and closure activities and implementation of proposed mitigation measures.

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3.4 Soil Resources and Reclamation

The study area for soil resources is defined as the proposed NOA and SOA projects (**Figures 3-4.1** and **3-4.2**). The CESA for soil resources encompasses the entirety of four hydrographic basins (Huntington Valley and Central Region, Ruby Valley, Long Valley, and Newark Valley) (**Figure 3.3-1**). The rationale for the selected CESA boundary is that this area contains the mining development associated with the Carlin, Bida, and Yankee-Alligator Ridge-Mooney Basin trends that affect soil resources within watersheds that drain south to the Humboldt River.

A variety of data sources were used to identify the baseline soil characteristics within the study area. Information on Major Land Resource Areas (MLRAs) and Soil Types was obtained from NRCS literature or databases, including the Land Resource Regions and MLRAs of the United States, the Caribbean, and the Pacific Basin U.S. Department of Agriculture Handbook 296 (USDA NRCS 2006) and the Soil Survey Geographic (SSURGO) database. Soil baseline characterization for the Proposed Action and Reconfiguration Alternative is based on SSURGO database review and analyses. SSURGO is the most detailed level of soil mapping done by the USDA NRCS (2012a).

3.4.1 Affected Environment

3.4.1.1 Regional Overview

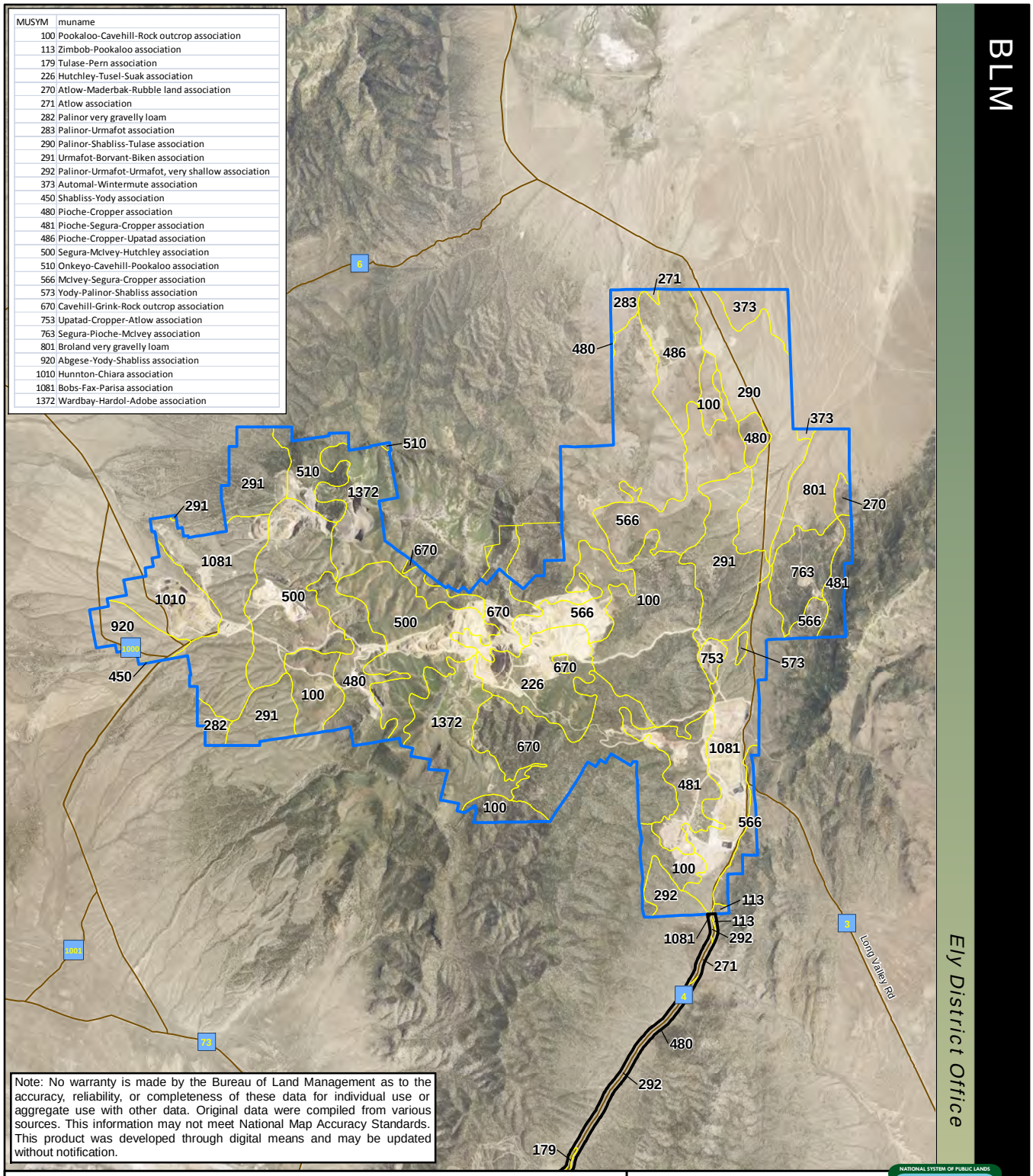
The study area lies within MLRA 28B, the Central Nevada Basin and Range (USDA NRCS 2006). The topography consists of nearly level, aggraded desert basins and valleys between a series of mountain ranges trending north to south. The basins are bordered by long, gently sloping to strongly sloping alluvial fans. The mountains are uplifted fault blocks with steep side slopes that are not well dissected due to low precipitation. Many of the valleys are closed basins containing sinks or playas.

Soils within the study area have generally developed on mountain slopes, hills, alluvial fans, and pediments. The valleys consist mostly of alluvial fill, but lake deposits are at the lowest elevations in the closed basins. The alluvial valleys consist of cobbles, gravel, and coarse sand near the mountains and grade to sands, silts, and clays on the distal ends of the fans.

The dominant soil orders within the study area include Aridisols, Entisols, and Mollisols. Aridisols are well developed soils that have a very low concentration of organic matter and form in an arid or semi-arid climate. In contrast, Mollisols are fertile soils with high organic matter and a nutrient-enriched, thick surface. Entisols are considered recent soils that lack soil development because erosion or deposition rates occur faster than the rate of soil development.

3.4.1.2 Soil Characteristics

Soils within the study area are highly varied and range in depth from shallow (i.e., less than 20 inches) to very deep (i.e., greater than 60 inches). Soils along ridge tops and mountain slopes tend to be shallow to moderately deep. These soils are typically gravelly or cobbly and are coarse textured. The alluvial fans along the valley bottom include deep, gravelly moderate to coarse textured soils. Floodplains include deep, fine textured soils that formed in alluvium from mixed bedrock types. Floodplains typically have poorly drained soils with high water tables and often are richer in organic matter.



MUSYM	muname
100	Pookaloo-Cavehill-Rock outcrop association
113	Zimbob-Pookaloo association
179	Tulase-Pern association
226	Hutchley-Tusel-Suak association
270	Atlow-Maderbak-Rubble land association
271	Atlow association
282	Palinor very gravelly loam
283	Palinor-Urmafot association
290	Palinor-Shabliss-Tulase association
291	Urmafot-Borvant-Biken association
292	Palinor-Urmafot-Urmafot, very shallow association
373	Automal-Wintermute association
450	Shabliss-Yody association
480	Pioche-Cropper association
481	Pioche-Segura-Cropper association
486	Pioche-Cropper-Upatad association
500	Segura-McIvey-Hutchley association
510	Onkeyo-Cavehill-Pookaloo association
566	McIvey-Segura-Cropper association
573	Yody-Palinor-Shabliss association
670	Cavehill-Grink-Rock outcrop association
753	Upatad-Cropper-Atlow association
763	Segura-Pioche-McIvey association
801	Broland very gravelly loam
920	Abgese-Yody-Shabliss association
1010	Hunnton-Chiara association
1081	Bobs-Fax-Parisa association
1372	Wardbay-Hardol-Adobe association

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

Legend

- Proposed NOA Plan Boundary
- Proposed SOA Plan Boundary
- Soil Map Unit

Bald Mountain Mine North and South Operations Area Projects EIS

Figure 3.4-1

Soil Map Units within the North Operations Area Project

0 0.5 1 2 Miles

N

Source: Barrick 2012a; USDA NRCS 2012a.

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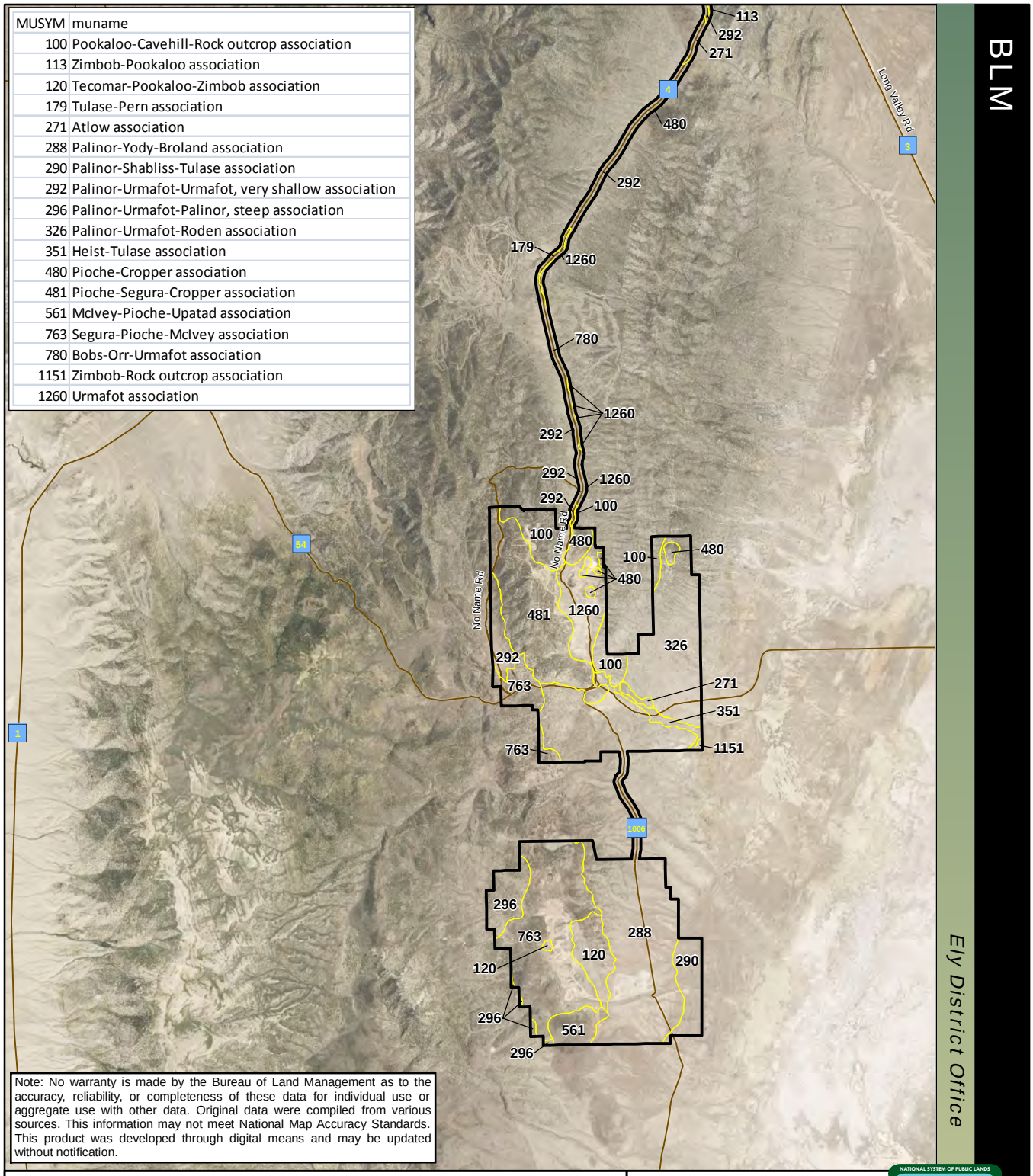

MUSYM	muname
100	Pookaloo-Cavehill-Rock outcrop association
113	Zimbob-Pookaloo association
120	Tecomar-Pookaloo-Zimbob association
179	Tulase-Pern association
271	Atlow association
288	Palinor-Yody-Broland association
290	Palinor-Shabliss-Tulase association
292	Palinor-Urmafot-Urmafot, very shallow association
296	Palinor-Urmafot-Palinor, steep association
326	Palinor-Urmafot-Roden association
351	Heist-Tulase association
480	Pioche-Cropper association
481	Pioche-Segura-Cropper association
561	McIvey-Pioche-Upatad association
763	Segura-Pioche-McIvey association
780	Bobs-Orr-Urmafot association
1151	Zimbob-Rock outcrop association
1260	Urmafot association

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

BLM

Ely District Office

Legend

Proposed NOA Plan Boundary

Proposed SOA Plan Boundary

Bald Mountain Mine North and South Operations Area Projects EIS

Figure 3.4-2

Soil Map Units within the South Operations Area Project

0 0.5 1 2 Miles

N

Source: Barrick 2012a; USDA NRCS 2012a.

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The study area is dominated by 36 soil map units. **Figures 3.4-1** and **3.4-2** illustrate the soil map units within the study area. **Appendix D** summarizes the physical and chemical characteristics and reclamation suitabilities of soil map units that occur within the study area. The soils data summarized in **Appendix D** include the following:

- Soil association name and map number;
- Average soil depth ranges for each soil association;
- Average salvageable growth medium depth ranges for each soil association;
- Soil texture in the surface layer;
- Erosion hazard;
- Hydrologic group;
- Factors that may limit reclamation potential (e.g., steep slopes, shallow depths to bedrock or duripan, droughty, high percentage of coarse fragments near the surface, clay texture, high alkalinity, high salts or sodium, high erosion hazard, low organic matter); and
- Topsoil suitability.

A summary of overall soil characteristics within the study area is provided in **Table 3.4-1**.

Table 3.4-1 Summary of Soil Characteristics within Study Area

Soil Limitation	Good		Fair		Poor	
	Acres	Percent	Acres	Percent	Acres	Percent
North Operations Area Project						
Wind Erosion	10,963	35	20,122	65	-	0
Water Erosion	9,985	32	-	0	21,100	68
Road Construction	2,621	8	7,234	23	21,229	68
Shallow Excavations	-	0	720	2	30,365	98
Potential for Revegetation	-	0	2,712	9	28,373	91
Topsoil Suitability	-	0	2	0	31,083	100
South Operations Area Project						
Wind Erosion	3,993	37	6,872	63	-	0
Water Erosion	6,288	58	-	0	4,577	42
Road Construction	4,638	43	1,650	15	4,576	42
Shallow Excavations	-	0	36	0	10,829	100
Potential for Revegetation	-	0	90	1	10,775	99
Topsoil Suitability	36	0	90	1	10,740	99

Note: Discrepancies in percentages may exist due to rounding.

Source: USDA NRCS 2012a.

The physical and chemical properties of soils were evaluated to identify factors that may limit successful reclamation (BLM 2009a). The following properties are considered unsuitable criteria when determining what soils are suitable growth medium:

- Greater than 60 percent clay;
- Less than 0.5 percent organic matter content;
- Greater than 35 percent coarse material by volume;
- Salinity values greater than 8 milliohms per centimeter;
- Sodium adsorption ratio greater than 15;
- pH values less than 4.5 and greater than 9.0;
- Calcium carbonate content greater than 40 percent; and
- Slope steepness greater than 40 percent (USDA NRCS 2012a).

Suitable growth medium is restricted to material lying above indurated or cemented layers, material above bedrock, and material that is not very gravelly, stony, or cobbly. Soil suitability evaluations are summarized in **Table 3.4-1** and indicate the average depth of salvageable suitable growth medium that may be encountered for each soil. Salvageable growth medium depths vary by site-specific locations but are generally the average maximum obtainable depths based upon limiting factors in each soil unit. The depth range corresponds to the variability of soil characteristics among the soil series designated for a specific soil association. Depth of salvageable growth medium for reclamation was determined for each soil series within a particular soil association and would need to be differentiated in the field.

The study area has been previously disturbed by historic and recent mining activities. Where previous mining disturbance has occurred, it is assumed that growth media has been previously salvaged and are no longer available and the previously mapped soil has been altered or removed.

The Pookaloo-Cavehill-Rock outcrop association comprises the largest percentage of the study area (15 percent) and occurs on mountains. The soils are very gravelly and moderately deep. The Bobs-Fax-Parisa association encompasses 8 percent of the study area and occurs on fan remnants. This map unit consists of gravelly to very cobbly soils with an indurated or cemented layer occurring between 14 to 47 inches. The Segura-McIvey-Hutchley association encompasses 8 percent of the study area and occurs on mountains. The Segura and Hutchley soils are shallow to bedrock and the McIvy soil is very deep. All of the soil components are very gravelly. The Palinor-Yody-Broland association makes up 7 percent of the study area and occurs on fan remnants and fan pediments. This map unit has soils that range from gravelly to very gravelly with a cemented layer occurring between 18 to 60 inches. The Segura-Pioche-McIvey association encompasses 6 percent of the study area and occurs on mountains. The soils are gravelly to extremely stony and shallow to very deep. The Cavehill-Grink-Rock outcrop association encompasses 6 percent of the study area and occurs on mountains. The soils are moderately deep and range from very gravelly to very stony. The remaining soils that occur within the study area are of lesser extents and are characterized in **Appendix D**.

Much of the study area contains soil associations characterized as extremely stony, very gravelly, very cobbly, or very stony material. Some soil associations can produce between 4 and 60 inches of salvageable growth medium; however, growth media may be limited due to rock fragment content. Sorting rock fragments from the soil materials may provide additional growth media and cover material, if needed, for reclamation purposes. With the exception of the gently sloping alluvial fans at the lower elevations, most soils within the study area have slopes of 15 percent or greater, which increase the potential for accelerated erosion.

3.4.2 Environmental Consequences

This section discusses project-related impacts to soil resources resulting from the Proposed Action, Reconfiguration Alternative, WRM Alternative, and No Action Alternative. Primary issues related to soil resources include the following: potential erosion impacts; availability of suitable soils and growth media for revegetation; potential for successfully restoring post-mining land uses; protection of public safety after mine reclamation and closure; and stabilization of site drainage.

During development of the proposed action, suitable soil resources and/or growth media would be salvaged as land disturbance proceeds. These materials would be directly redistributed or stockpiled and protected for later use in reclamation. Additional descriptions of Barrick's design features and ACEPMs are summarized in Section 2.4.3, Design Features and Applicant-committed Environmental Protection Measures for the Proposed North and South Operations Area projects. Reclamation and revegetation materials and practices including growth media handling are presented within the Reclamation Plan (Barrick 2012a,b) and in Section 2.4.4, Reclamation.

Impacts to soils resources would occur during and after mining. Impact assessments were based on understanding the range of physical and chemical soil characteristics, as well as the pre-mining topography and drainage in comparison to short-term and long-term reclaimed configurations.

3.4.2.1 Proposed Action

Surface Disturbance

Under the Proposed Action, implementation of surface disturbance activities as a result of proposed development and expansion would disturb approximately 4,357 acres within the proposed NOA. Soil mapping units within the proposed disturbance areas are illustrated in **Figure 3.4-1**. A summary of soil characteristics within the proposed NOA and SOA are provided in **Appendix D**. Much of the disturbance associated with the proposed NOA would occur where the Pookaloo-Cavehill-Rock outcrop soils occur. These soils are shallow to moderately deep to hard bedrock and range from strongly sloping to very steep slopes. There may be as much as 15 percent rock outcrop associated with this map unit. These soils are not recommended for use as growth media due to high gravel content. Much of the disturbance within the proposed Winrock Area would primarily occur on Segura-Pioche-McIvey soils and Broland very gravelly loam soils. The Segura soils are shallow to tuff and are not recommended for use as growth media due to rock fragment content. The Pioche soils are moderately deep to hard bedrock and are not recommended as growth media due to rock fragment content and clay content. The McIvey soils are very deep, and the soils from 0 to 5 inches are recommended as growth media. The subsoil is not recommended as growth media due to rock fragment and clay content. The soils occur on gently sloping to very steep slopes. Broland soils are shallow to a duripan (cemented layer). These soils are not recommended for use as growth media. The proposed Redbird Pit and Redbird RDA are primarily located on Bobs-Fax-Parisa and Segura-McIvey-Hutchley associations. The Bobs-Fax-Parisa soils range from shallow to very deep. The upper 4 inches would be salvaged for use as growth media from the Parisa soil. The Bobs and Fax soils are unsuitable for use as growth media due to rock fragments, high carbonates, and sodium content. The Segura-McIvey-Hutchley soils range from shallow to very deep. None of these soils are recommended for use as growth media due to rock fragment content. If rock fragments can be sorted from the soil profile, the soils may be suitable for use as growth media.

Under the Proposed Action, implementation of surface disturbance activities as a result of proposed development and expansion would disturb approximately 2,740 acres within the proposed SOA. Soil mapping units within the proposed disturbance areas are illustrated in **Figure 3.4-2**. The proposed Luxe Pit and Luxe RDA generally occur on the Pookaloo-Cavehill-Rock Outcrop (described above) and Pioche-Segura-Cropper associations. The Pioche-Segura-Cropper soils are shallow soils that occur on strongly sloping to steep slopes. None of these soils are recommended for use as growth media due to being shallow to bedrock and rock fragment content. The proposed Vantage RDA would primarily disturb Pioche-Segura-Cropper and Segura-Pioche-McIvey associations (both associations described above).

The proposed Gator HLF, Gator Pit, and Gator North and South RDAs primarily disturb the Palinor-Yody-Broland and Palinor-Urmafot-Roden associations. The Palinor-Yody-Broland soils are very deep soils that occur on gently sloping to strongly sloping fan remnants and fan pediments. The upper 10 inches of the Palinor soils and the upper 36 inches of the Yody soils are suitable for use as growth media. The Broland soils are not recommended for use as growth media due to rock fragment content. The Palinor-Urmafot-Roden associations occur on gently sloping to strongly sloping fan remnants and hills. The upper 9 inches of the Urmafot soils and the upper 10 inches of the Palinor soils are suitable for salvage as growth media. The Roden soil is not recommended for growth media due to rock fragment content and clay content. The proposed Yankee Pit, Yankee North, South, and West RDAs, and Yankee HLF are primarily located on the Tecomar-Pookaloo-Zimbob and Palinor-Yody-Broland (described above) associations. The Tecomar-Pookaloo-Zimbob soils are shallow to moderately deep and occur on moderately steep to very steep slopes. None of these soils are recommended for use as growth media due to rock fragment content. If rock fragments can be sorted from the soil profile, the soils may be suitable for use as growth media.

Replacement of growth media for vegetation is proposed for major disturbances associated with the Proposed Action. In areas of new disturbance, up to 60 inches of growth media would be salvaged, as appropriate. The available salvage depth for native soil material is provided in **Appendix D**. The factors limiting soil salvage within the proposed NOA and SOA are physical and chemical in nature—shallow soils, high amounts of rock fragments, salt content, carbonate content, sodium content, and to a lesser degree, slope gradient. As previously stated, rock fragments may be sorted out of the soil profile, thus making the remaining soil material suitable for reclamation purposes.

Barrick estimates that 3.5 to 6.7 million cubic yards of growth media are available within the proposed NOA; and 1.9 to 3.7 million cubic yards of growth media are available within the proposed SOA. However, the steep terrain and limited thickness of non-rock material could result in insufficient growth media available for salvage (Barrick 2012a,b). Additionally, rock fragment content of the soils could be a limiting factor in its use as suitable growth media. As shown in **Appendix D** if rock fragments are sorted out of the soils with high rock fragment content, additional soil components may be suitable for use as growth media.

Growth media volumes may be insufficient for reclamation; therefore, amendments may be added to existing growth media. Amended growth media would be sourced from materials mined as part of waste rock disposal facility or a readily available source such as the crusher reject material. The amendments would be acquired from onsite or offsite locations and may include: other soils, sewage sludge, manure, compost, man-made fertilizers or microbes, or other not-yet-identified amendment materials. The off-site amendments are commercially available at many locations and would be transported to the site using over-the-road trucks. The specifics associated with the amended materials including quantities available, location, and how the material would be acquired may change over the course of the mine life; thus an evaluation would be performed at the appropriate time via Bald Mountain Mine's personnel. Depending on the material used and the amendments selected, the volumes of each would vary; therefore an estimate of volumes for these various combinations is unavailable but would be determined by the Bald Mountain Mine personnel during the near-term reclamation planning. Decisions associated with growth media depths at various disturbed areas would vary, but would be sufficient to meet the revegetation standards provided in the Nevada Guidelines for Successful Revegetation. Reclamation activities for bond release require that desirable species have been established successfully and provide sufficient aerial cover to adequately protect the site from soil erosion. Furthermore, reclamation of disturbed areas would be completed in accordance with the BLM and NDEP regulations. RDAs would have a minimum of 6 inches of cover, while heap leach facilities would have an 18- to 24-inch cover. Per NDEP requirements, a reclamation plan must be developed and submitted for BLM and NDEP approval. The approved reclamation plan would require any land disturbed by the project is reclaimed to be stable and comparable to adjacent areas.

Barrick would locate GMSs such that mining operations would not disturb the stockpiles. To minimize wind and water erosion, the GMSs would be interim-seeded. Diversion channels and/or berms would be constructed around the stockpiles as needed to prevent erosion from overland runoff. BMPs, such as silt fences or staked straw bales, would be used as necessary to contain sediment liberated from direct precipitation. Alternately, the growth media would be transported to and redistributed on mine-related disturbance areas undergoing concurrent reclamation.

Overall site productivity is primarily a vegetation measure. Productivity varies with vegetation community, but more importantly, with land management objectives as they relate to which vegetation types are desirable or productive. In contrast, soil quality is an inherent soil resource characteristic involving aeration, permeability, texture, salinity and alkalinity, microbial populations, fertility, and other physical and chemical characteristics that are accepted as beneficial to overall plant growth and establishment. Based on this concept, there would be impacts to the existing quality of native soils from project-related disturbance. Growth media excavation, transport and storage, and redistribution would modify existing soil structure, which would affect aeration and permeability. It is likely that some mixing of textural zones would occur, as well as mixing of saline or alkaline materials with relatively salt-free materials. This may result in chemical impacts to soil quality for seedbeds. In addition, microbial populations which currently exist in the growth media would likely decrease during stockpiling and storage.

Due to these probable effects, the initial soil quality of reconstructed seedbeds and root zones would be less than that of the existing soil resources. A permanent irretrievable loss of soil productivity would occur on approximately 1,210 acres in association with development of the proposed open pits, which would not be reclaimed.

No data exists on soil crust coverage within the study area; however, biological soil crusts are considered an important component in dry arid ecosystems. In dry arid environments biological soil crusts are essential for soil stability due to less vegetative growth and soil cover. They provide soil stability, prevent erosion, fix nitrogen, increase infiltration rates, and may reduce noxious weed migration. Crusts are very sensitive to ground disturbances, but in moister sagebrush habitats, crusts should begin to recover within a couple decades and form reasonably well developed communities after a few more decades.

Soil compaction and rutting could result from the movement of heavy mining vehicles in areas of native soils. The risk of rutting and compaction of native soils is considered to be minimal as most areas within the mine operations areas would be cleared and grubbed prior to mining activities. The degree of compaction would depend on the moisture content and texture of the soil at the time of impact. Compaction would be most severe where heavy equipment operates on moist to wet soils with high clay contents. Detrimental compaction also can occur on soils of various textures and moisture contents if multiple passes are made by high ground-weight equipment (i.e., rubber-tired heavy equipment).

Soil contamination would result if petroleum products are spilled. Precipitation events or a high water table would have the potential to diffuse contaminates to larger areas. Barrick has developed a Petroleum Contaminated Soil (PCS) Management Plan as part of the NDEP permitting process (Barrick 2012a,b). In general, PCS would be transferred to a holding pad or to provisional, short-term placement at an on-site disposal location until screening to determine suitability for treatment, on-site disposal, or off-site disposal. On-site disposal of PCS would be managed to prevent or minimize the potential for erosion and sediment transport by conducting on-site inventories of PCS, maintaining appropriate volumes, and employing appropriate sediment and erosion control.

Erosion hazard of native soils across the study area are shown in **Table 3.4-1**. Sandy and silty textured, sparsely vegetated soils are subject to wind erosion. Although accelerated erosion due to mining-related soil disturbance could occur at any stage of the proposed project, the maximum potential for erosion within the study area would be expected while soils are loose, with no established cover. Erosion also

would be of concern after reclamation work has occurred but before a vegetative cover has been reestablished. If the ground surface is left smooth and barren during this period, winds could dislodge soil particles and rainfall intercepting barren surfaces could result in increased erosion.

Barrick performed RUSLE analyses to characterize cover material (Barrick 2012a,b). Inputs to any RUSLE analysis involve professional judgment. Since the equation multiplies the inputs for various factors, these inputs may dramatically influence the outcome. For this reason, the RUSLE is best used as a comparative tool to investigate erosion control practices, rather than as a quantitatively accurate means of predicting erosion losses. The results of the RUSLE analysis indicate that, in general, all of the soil types evaluated for the proposed NOA and SOA would require base management and/or additional BMPs and erosion control measures to prevent soil loss until vegetation is established on the reclaimed slopes. The use of active erosion control devices would be used during reclamation activities to reduce sediment migration from the reclaimed facilities until vegetation can be established. Barrick would maintain erosion control devices at the base of reclaimed facilities and, where applicable, diversions at the head of those reclaimed slopes having excessive erosion until vegetation has established. Head-relief benches (depressions) would be placed at regular intervals to further reduce soil migration.

Revegetation of disturbed areas would be conducted as soon as practical to reduce the potential for wind and water erosion, minimize impacts to soils and vegetation, help prevent the spread of invasive and non-native species in disturbance areas, and facilitate post-mining land uses. Concurrent reclamation would be conducted to the extent practical to accelerate revegetation of disturbance areas.

Revegetation monitoring and ongoing maintenance and inspection of BMPs during the required reclamation monitoring period would facilitate successful control of accelerated erosion. Such monitoring and any necessary corrective practices would be implemented as described in the Reclamation Plan (Barrick 2012a,b).

Over time, these impacts would be reduced by successful implementation of phased construction, concurrent reclamation of project facilities, and the successful restoration of productive post-mining land uses. These objectives would be attained through the use of BMPs, design features, ACEPMs, and the use of site-adapted plant species for reseeding. In addition, state and federal reclamation requirements require revegetation monitoring in comparison with established quantitative standards for the locale. A period of overall reclamation monitoring (and maintenance as necessary) also is required prior to agency approval of reclamation bond release. Based on these requirements, it is likely that short- to long-term (e.g., up to 25 years or more) decreases in soil quality would not limit the attainment of overall post-mining land use objectives. Over time, soil quality on reclaimed and revegetated sites would resemble pre-mining conditions. Substantial long-term effects on proposed post-mining land uses from soil quality impacts are not anticipated.

Reclamation

Reclamation of disturbed areas resulting from mining activities would be completed in accordance with the BLM and NDEP regulations.

Growth media would be salvaged and stockpiled prior to surface disturbing activities. Long-term stockpiles would be seeded with an interim seed mixture to stabilize the media and to minimize non-native species establishment. The placement of growth media would be prioritized during reclamation to ensure critical reclamation areas are provided sufficient growth media cover to meet closure requirements. The depth of growth media placed on disturbed areas would vary but would be sufficient to meet the revegetation standards provided in the Nevada Guidelines for Successful Revegetation (NDEP 1998).

Reclaimed surfaces would be revegetated to reduce runoff and erosion, provide forage for wildlife and livestock, control invasive weeds, and reduce visual impacts. Barrick would conduct revegetation

monitoring to evaluate and select successful, site-specific reclamation measures that will achieve the reclamation standards or to demonstrate the need to plant species mixes that will be adaptable to different geomorphic settings expected within the reclaimed area, including different aspects and growth media amendments. Various surface preparation techniques would be evaluated for success in promoting plant establishment and resistance to soil erosion. This program has been implemented in the NOA in coordination with the BLM and the NDEP, and results from this program would be used in determining proper revegetation methods for proposed disturbance.

Revegetation efforts would be determined to be successful and complete upon demonstrating compliance with Nevada Guidelines for Successful Reclamation (NDEP 1998) and upon approval by the BLM and the NDEP. The results of revegetation monitoring would be used in conjunction with these guidelines to determine applicable vegetation release criteria under the proposed activities (Barrick 2012a,b).

3.4.2.2 North and South Operations Area Facilities Reconfiguration Alternative

Under the Reconfiguration Alternative, implementation of surface disturbance activities as a result of proposed development and expansion would remove approximately 3,254 acres within the proposed NOA; and approximately 2,414 acres within the proposed SOA. With consideration of the 1,986 acres of existing authorized disturbance that would not be constructed under the Reconfiguration Alternative, implementation of this alternative would result in a reduction of 1,429 acres of surface disturbance in comparison to the Proposed Action. As with the Proposed Action, growth media salvage and redistribution, phased construction, and concurrent reclamation practices would minimize potential impacts to soil resources. A permanent irreversible loss of soil productivity would occur on approximately 885 acres in association with development of the proposed open pits, which would not be reclaimed.

3.4.2.3 Western Redbird Modification Alternative

Under the WRM Alternative, implementation of surface disturbance activities as a result of proposed development and expansion would remove approximately 2,852 acres within the proposed NOA; and approximately 2,414 acres within the proposed SOA. With consideration of the 2,220 acres of existing authorized disturbance that would not be constructed under the WRM Alternative, implementation of this alternative would result in a reduction of 402 acres of surface disturbance in comparison to the Reconfiguration Alternative. The types of potential impacts to soil resources under the WRM Alternative will be the same as those discussed under the Reconfiguration Alternative. As with the Reconfiguration Alternative, growth media salvage and redistribution, phased construction, and concurrent reclamation practices would minimize potential impacts to soil resources. Under the WRM Alternative, a permanent irreversible loss of soil productivity would occur on approximately 780 acres in association with development of the proposed open pits, which would not be reclaimed.

3.4.2.4 No Action Alternative

Under the No Action Alternative, the proposed NOA and SOA projects would not be developed and associated impacts to soil resources would not occur. Barrick would continue its operations, closure, and reclamation activities within the NOA and SOA boundaries under the terms and current permits and approvals as authorized by the BLM and State of Nevada. Under the No Action Alternative, construction of all previously authorized expansion and associated facilities would be implemented and reclaimed as authorized.

3.4.2.5 Cumulative Impacts

The 2,070,999-acre CESA for soil resources is shown in **Figure 3.3-1** and consists of the Huntington Valley and Central Region, Newark Valley, Long Valley, and Ruby Valley hydrographic basins. Past and present actions and RFFAs are discussed in Section 2.7, Past, Present, and Reasonably Foreseeable Future Actions; their locations are illustrated in **Figure 2.7-1**.

Past and present actions have resulted, or would result, in approximately 30,732 acres of total soil disturbance within the soil resources CESA. The total quantifiable surface disturbances are related to mining, oil and gas development, wind energy development, exploration, land, road, and utility corridor development, agriculture, livestock grazing; residential developments, and other county and government actions. RFFAs proposed within the soil resources CESA include, but are not limited to, the following: mining-related actions (totaling 2,549 acres), exploration within Huntington Valley and Maverick Springs area (320 acres), oil and gas lease sales within the Long, Ruby, and Huntington valleys (acreage unknown), vegetation treatments (totaling 56,572 acres), and implementation of the USFWS Ruby Mountain NWR CCP.

The Proposed Action incrementally would increase disturbance to soils by an additional 7,097 acres resulting in a total cumulative disturbance of approximately 96,939 acres (5 percent of the total soil resources CESA). The Reconfiguration Alternative incrementally would remove 1,934 acres of authorized disturbance from the 30,732 acres of past and present actions and increase disturbance to soil resources by an additional 5,668 acres resulting in a total cumulative disturbance of approximately 93,578 acres (5 percent of the total soil resources CESA). The WRM Alternative incrementally would remove 2,169 acres of authorized disturbance from the 30,732 acres of past and present actions and increase disturbance to soil resources by an additional 5,266 acres resulting in a total cumulative disturbance of approximately 92,950 acres (4 percent of the total soil resources CESA). Under the No Action Alternative, cumulative impacts to soils would be the same as those described in the *Final Environmental Impact Statement for the Bald Mountain Mine North Operations Area Project* (BLM 2009a) and *Environmental Assessment for the Mooney Heap and Little Bald Mountain Expansion Project* (BLM 2011a).

Past and present actions and RFFAs would cumulatively and incrementally reduce soils until such time that reclamation is deemed successful. It is assumed that portions of past disturbances have been reclaimed, and ongoing reclamation at existing operations would continue to reduce cumulative impacts within the soil resources CESA. Pending completion of successful reclamation on all project components with the exception of open pits, it is anticipated that the Proposed Action, Reconfiguration Alternative, and WRM Alternative would contribute less than 1 percent to the overall cumulative disturbance within the soil resources CESA.

3.4.2.6 Monitoring and Mitigation Measures

No additional monitoring and mitigation measures are recommended.

3.4.2.7 Residual Impacts

Assuming successful reclamation of all project components, residual impacts to soil resources would include the permanent irretrievable loss of soil quality and vegetation productivity of approximately 1,210 acres and 885 acres for the Proposed Action and Reconfiguration Alternative, respectively. Under the WRM Alternative, residual impacts to soil resources would include the permanent irretrievable loss of soil quality and vegetation productivity of approximately 780 acres. Residual impacts under all alternatives would be associated with open pits, which would not be reclaimed.

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3.5 Vegetation Resources

The study area for vegetation resources is defined as the proposed NOA and SOA plan boundaries. The CESA for vegetation resources encompasses the entirety of four hydrographic basins (Huntington Valley and Central Region, Long Valley, Newark Valley, and Ruby Valley). **Figure 3.3-1** illustrates the study area and CESA for vegetation resources.

3.5.1 Affected Environment

The study area is located within the Central Basin and Range USEPA Level 3 ecoregion. This ecoregion is characterized by fault block ranges and intervening drier basins (Bryce et al. 2003). Pinyon-juniper dominates the northern portion of the study area in higher elevations, while sagebrush is more common in the southern portion and at lower elevations. Vegetation types, acreage calculations, and community characterizations were compiled based on the results of site-specific vegetation studies and seep and springs surveys within the study area (JBR 2012a, 2011a; SRK 2008).

Disturbances within the study area include wildfires, vegetation treatments, and grazing. Between the years of 2000 and 2004, three wildfires have occurred within the NOA and surrounding area including the Chrome, Water Canyon, and Jacob wildfires. Wildland fire management is administered under the Ely District Resource Management Plan (BLM 2007b). The burned areas were reclaimed with a variety of seeding methods, with some portions being left to naturally revegetate. Current and historical vegetation treatments within the proposed NOA and proposed TUC include emergency stabilization and noxious weed treatments within the Chrome, Water Canyon, and Jacob wildfire areas, and rangeland improvements including chaining and seeding treatments. Additional vegetation treatments within the proposed NOA include the Overland Pass Habitat Improvement Project and the Newark and Huntington Watersheds Implementation and Restoration Plan (BLM 2013a). **Figure 3.5-1** illustrates the historical wildfires and historical, existing, and proposed vegetation treatments within the study area.

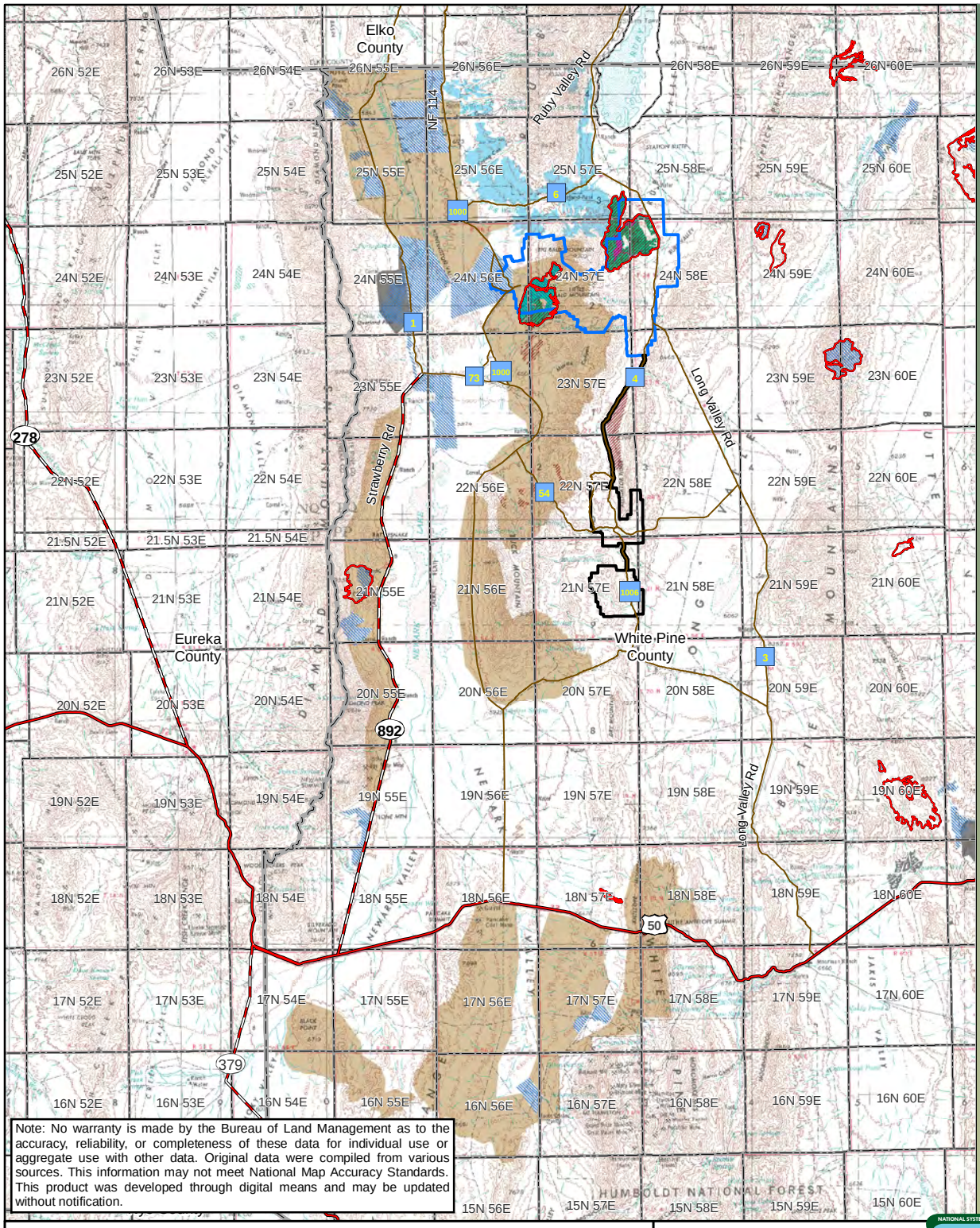
Six vegetation types occur within the study area. The vegetation types include big sagebrush, pinyon-juniper, mountain brush, low sagebrush, shadscale, and wetland. Distribution of vegetation types in these areas are strongly influenced by variations in landscape position, soil type, moisture, elevation, and aspect. Descriptions of the vegetation types based on the Bald Mountain Project Area Biological Baseline Report (SRK 2008) are provided in the following text. Species nomenclature is consistent with the USDA NRCS Plants Database (USDA NRCS 2012b). **Figure 3.5-2** illustrates the vegetation types present within the study area. **Table 3.5-1** summarizes acreages for each vegetation type within the study area.

Table 3.5-1 Vegetation Cover Types within the Study Area

Vegetation Cover Type	North Operations Area		South Operations Area		Total	
	Acreage	Percentage	Acreage	Percentage	Acreage	Percentage
Pinyon – Juniper	15,479	50	5,220	48	20,713	49
Big Sagebrush	13,590	44	5,645	52	19,249	46
Mountain Brush	1,504	5	-	-	1,506	4
Low Sagebrush	275	1	-	-	275	1
Shadscale	196	1	-	-	196	<1
Wetland/Riparian	41	<1	-	-	41	<1
Total[1]	**31,085**	**100**	**10,865**	**100**	**41,950**	**100**

[1] Totals may vary due to rounding.

Source: JBR 2011a; SRK 2008.



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

Legend

- Proposed NOA Plan Boundary
- Proposed SOA Plan Boundary
- Wildfires

Vegetation Treatments

- Newark and Huntington Watershed Treatments
- Overland Pass Vegetation Treatments
- Wildfire Emergency Stabilization
- Wildfire Weed Program Treatment
- Chain and Seed
- Seeded Only
- Other

Source: BLM 2013, 2000.

Bald Mountain Mine North and South Operations Area Projects EIS

Figure 3.5-1

Wildfires and Vegetation Treatments

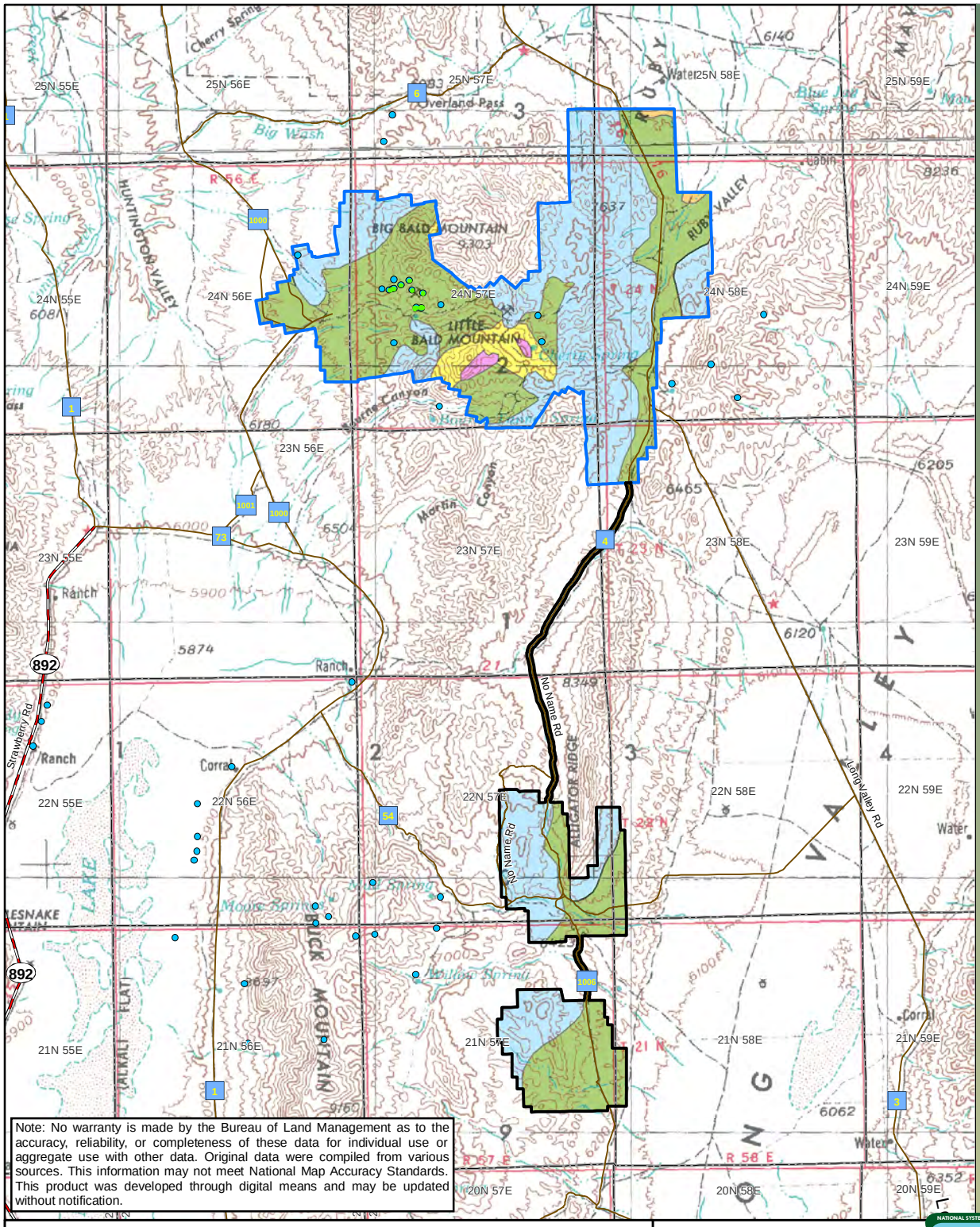
0 1 2 3 4 5 10 Miles

N

BLM

Ely District Office

12/21/2015



Legend

- Proposed NOA Plan Boundary
- Proposed SOA Plan Boundary
- Big Sagebrush
- Low Sagebrush
- Mountain Brush
- Pinyon - Juniper
- Shadscale
- Wetland
- Seeps and Springs

Source: JBR 2011a; SRK 2008.

Bald Mountain Mine North and South Operations Area Projects EIS

Figure 3.5-2

Vegetation Cover Types within the Study Area

0 1 2 4 Miles

N

BLM

Ely District Office

12/21/2015

Pinyon-Juniper Woodland

The pinyon-juniper woodland is the dominant vegetation type in the study area, occurring on steep hillsides and mountains between 6,200 to 8,600 feet elevation. This vegetation type has increased in distribution into sagebrush habitat in both higher and lower elevations due to decreases in fire frequency in the area. Rangeland improvements or wildlife habitat enhancements projects in the area seek to decrease pinyon-juniper occurrence in historically sagebrush dominated areas. This vegetation type occurs along north-south trending mountains in between the low sagebrush and big sagebrush vegetation types. Substrate is typically shallow, loamy soils with high percentage of coarse fragments. Dominant overstory species include single leaf pinyon (*Pinus monophylla*) and one-seed juniper (*Juniperus osteosperma*). Shrub species observed in this vegetation type include mountain big sagebrush (*Artemisia tridentata* spp. *vaseyana*), antelope bitterbrush (*Purshia tridentata*), common snowberry (*Symphoricarpos albus*), and yellow rabbitbrush (*Chrysothamnus viscidiflorus*). The understory is typically sparse and composed of grasses such as Sandberg bluegrass (*Poa secunda*), squirreltail (*Elymus elymoides*), Indian ricegrass (*Achnatherum hymenoides*), basin wildrye (*Leymus cinereus*), and bluebunch wheatgrass (*Pseudoroegneria spicatum* ssp. *spicatum*). Within this vegetation type are rock outcrops on summits and side slopes of hills and mountains dominated by curl-leaf mountain mahogany (*Cercocarpus ledifolius*) (SRK 2008).

Big Sagebrush

The big sagebrush vegetation type is the second dominant vegetation type in the study area, occurring on alluvial fans, valley bottoms, and hillsides throughout the study area. The vegetation community is found at elevations between 5,700 to 8,600 feet elevation, on a variety of soil types, slopes, and aspects. Rangeland improvements or wildlife habitat enhancement projects seek to enhance and increase big sagebrush vegetation communities in the area. Dominant shrub species include big sagebrush (*Artemisia tridentata*), Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*), or mountain big sagebrush. Other shrubs found in this vegetation type include black sagebrush (*Artemisia nova*), and little sagebrush (*Artemisia arbuscula*). Understory species include Sandberg bluegrass, squirreltail, Indian ricegrass, cheatgrass (*Bromus tectorum*), lupine (*Lupinus* sp), phlox (*Phlox* sp.), and pale bastard toadflax (*Comandra umbellata* ssp. *pallida*). Other common species associated with this vegetation type include yellow rabbitbrush, bluebunch wheatgrass, crested wheatgrass (*Agropyron cristatum*), and antelope bitterbrush (SRK 2008).

Mountain Brush

The mountain brush vegetation type occurs on approximately 4 percent of the study area and is found on moderately steep to steep sideslopes and backslopes of hills and mountains at all aspects at elevations ranging from 6,900 to 9,300 feet elevation. Substrates are typically shallow to moderately deep, loamy soils that are typically moist. Dominant species include mountain big sagebrush, common snowberry, antelope bitterbrush, and yellow rabbitbrush. Understory species include grasses such as bluebunch wheatgrass, mountain brome (*Bromus marginatus*), Sandberg bluegrass, basin wildrye, and forbs such sedges (*Cyperaceae* ssp.), balsamroot (*Balsamorhiza* ssp.), lupine, pale bastard toadflax, ragwort (*Senecio* ssp.), and buckwheat (*Eriogonum* spp.) (SRK 2008).

Low Sagebrush

The low sagebrush vegetation comprises approximately 1 percent of the study area. This vegetation community type has low species diversity, and occurs on the shallow, rocky soils along mountain ridges on gentle to very steep slopes. It is often interspersed within the mountain brush and pinyon-juniper communities at higher elevations, 7,500 to 9,300 feet, with low growing vegetation. The dominant species include little sagebrush, with associated shrubs including yellow rabbitbrush and winterfat (*Krascheninnikovia lanata*). Common herbaceous species found in this vegetation type include Sandberg bluegrass, squirreltail, and buckwheat (SRK 2008).

Shadscale

The shadscale vegetation type comprised less than one percent of the study area and is found on shallow, slightly saline soils subject to periods of drought at a variety of topographic positions. Its elevation range is 5,900 to 6,400 feet. The dominant shrub is shadscale saltbush (*Atriplex conferifolia*), which can occur as a monoculture or with a mixture of shrubs. Associated shrubs include winterfat, bud sagebrush (*Picrothamnus desertorum*), black sagebrush, and greasewood (*Sarobatus vermiculatus*). Other shrubs found in this vegetation type include fourwing saltbush (*Atriplex canescens*) and low rabbitbrush. Common herbaceous species include Nevada jointfir (*Ephedra nevadensis*), Indian ricegrass, squirreltail, Sandberg bluegrass, needle-and-thread (*Hesperostipa comata* ssp. *comata*), buckwheat, phlox, and globemallow (*Sphaeralcea* ssp.) (SRK 2008).

Wetlands and Riparian Areas

Riparian areas are generally defined as the vegetated transitional zones that lie between aquatic and terrestrial (or upland) environments. Riparian areas usually occur as belts along streams, rivers, lakes, marshes, bogs, and other waterbodies. As a transitional zone between aquatic and upland environments, riparian systems often exhibit characteristics of both; but are not as dry as upland environments nor as wet as aquatic or wetland systems. Generally, only perennial and intermittent streams can support riparian areas that serve the entire suite of riparian ecological functions. Ephemeral streams rarely possess the hydrologic conditions that allow true riparian vegetation to grow.

The term “wetland” is defined in 33 CFR 328, 7(b) as “those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs and similar areas.” The frequency and duration of saturation may vary by geographical region, and is largely dependent upon local climatic conditions.

According to the USACE’s 1987 Wetland Delineation Manual, a “three-parameter” approach is required for delineating USACE-defined wetlands (USACE 1987). Based on this approach, areas are identified as wetlands if they exhibit the following characteristics:

1. The prevalence of vegetation consisting of hydrophytic species or plants that have the ability to grow in water or on a substrate that is at least periodically deficient in oxygen as a result of excessive water content and depleted soil oxygen levels.
2. The presence of soils that are classified as hydric or possessing characteristics that are associated with reducing soil conditions. Hydric soils are poorly drained and have a seasonal high water table within 6 inches of the surface.
3. An area that is inundated either permanently or periodically at mean water depths less than or equal to 6.6 feet or the soil is saturated to the surface at some time during the growing season of the prevalent vegetation.

The USACE (1987) requires that, under normal circumstances, all three of these conditions be met for an area to be considered a wetland.

Within the study area, the terrain is moderate to steep, with no named drainages. Surveys were conducted to evaluate the jurisdictional status of ephemeral channels and delineate wetlands within the study area. The study area is located in the Huntington Valley and Central Region, Ruby Valley, Newark Valley, and Long Valley hydrographic basins. Riparian and wetland areas were delineated within the study area based on a review of USGS topographic maps, aerial imagery, and subsequent field surveys of blue-line drainages and springs (JBR 2011a).

Within the study area, two of the four hydrographic basins, Newark Valley and Long Valley, are closed basins that do not connect to interstate waters. The Huntington Valley hydrographic basin contributes to the Humboldt River Basin. The Ruby Valley hydrographic basin contributes to the Ruby Valley NWR; however, there are no drainages in Ruby Valley within the study area (USACE 2013). The desktop analysis identified 178 ephemeral drainages and drainage-like features. The drainages are shown in **Figure 3.3-1**. Defined drainages are drainages that were observed during field surveys to have ordinary high water mark (OHWM) indicators for some portion of the channel. The remaining drainages on the figure were not observed to have OHWM indicators.

Of the 178 ephemeral drainages, the majority of the surveyed channels were not observed to have a defined bed and bank during field surveys. Eight channels did have sufficient flow to develop OHWM indicators (i.e., defined bed and bank); however, none of the eight channels have a continuous OHWM that connect to a jurisdictional drainage (JBR 2011a). The drainages in the study area are isolated, and do not have an interstate or foreign commerce connection (JBR 2011a).

USGS topographic maps identified seven mapped springs, and National Agriculture Imagery Program aerial imagery identified eight potential springs within the study area. All mapped springs were surveyed; springs that were found to exhibit wetland hydrology, hydric soils, and vegetation communities typical of wetlands are summarized in **Table 3.5-2**. **Figure 3.5-2** illustrates wetland areas within in the study area.

Table 3.5-2 Wetlands and Springs within the Survey Area

Spring Number	Mapped Spring Name	Description	Vegetation	Acres
Spring 4	South Water Canyon Seep	Hillside seep adjacent to the drainage. Flowing water present at time of survey.	Nebraska sedge, fringed willowherb, seep monkeyflower, American speedwell, and curly dock.	19
Spring 6	New Lower Mill Spring	Spring adjacent to the drainage. Flowing water present at time of survey.	Creeping bentgrass, and American speedwell.	2
Spring 9	Unnamed	In-channel seep. Flowing water present at time of survey.	Creeping bentgrass, Baltic rush, Nebraska sedge, American speedwell, common yarrow, seep monkeyflower, and fringed willowherb.	1
Spring 10	Unnamed	In-channel seep. Flowing water present at time of survey.	Creeping bentgrass, American speedwell, Woods' rose, chokecherry, Kentucky bluegrass, white sagewort, seep monkeyflower, stinging nettle, fringed willowherb, and musk thistle.	1
Spring 11	Unnamed	In-channel seep. Flowing water present at time of survey.	Creeping bentgrass, Baltic rush, seep monkeyflower, American speedwell, fringed willowherb, Woods' rose, and bull thistle.	1
Spring 12	Unnamed	In-channel seep. The spring had a high water table, but flowing water was not present at time of survey.	Cheatgrass, tall tumble mustard, white sagewort, yellow rabbitbrush, Wyoming big sagebrush, and Baltic rush.	<1

Table 3.5-2 Wetlands and Springs within the Survey Area

Spring Number	Mapped Spring Name	Description	Vegetation	Acres
Spring 14	Unnamed	In-channel seep located upstream from man-made stock pond. Flowing water present at time of survey.	Nebraska sedge, Woods' rose, creeping bentgrass.	14
Spring 15	Unnamed	Hillside seep. Flowing water was present at the time of survey.	Nebraska sedge, creeping bentgrass, seep monkey flower, American speedwell, western wheatgrass, and Kentucky bluegrass.	1

Source: JBR 2011a.

A jurisdictional determination was received by Barrick on August 17, 2012, for the Long and Newark Valley hydrographic basins; on August 23, 2012, for the Ruby Valley hydrographic basin; and on November 8, 2012, for the Huntington Valley hydrographic basin from the Sacramento District Office of the USACE for the proposed NOA and SOA projects. A final jurisdictional determination was received on January 14, 2013, summarizing the jurisdictional determinations for the four hydrographic basins. The January 14, 2013, jurisdictional letter also clarified that two drainages were not located within the Ruby Valley hydrographic basin, but were instead in the Long Valley hydrographic basin. There are no drainages in the Ruby Valley hydrographic basin associated with the proposed NOA project. For all four hydrographic basins, the USACE determined that all of the identified ephemeral drainages are considered intrastate isolated waters with no apparent interstate or foreign commerce connection and, thus, are not currently regulated by the USACE under Section 404 of the Federal CWA (USACE 2013, 2012a-c). Therefore, the proposed NOA and SOA projects would not be required to obtain an USACE permit to proceed with project implementation.

3.5.2 Environmental Consequences

This section discusses project related impacts to vegetation, including wetland and riparian areas, resulting from the Proposed Action, Reconfiguration Alternative, WRM Alternative, and No Action Alternative. Primary issues related to vegetation resources include direct and indirect impacts associated with the loss or degradation of native vegetation communities, preferred grazing areas, and suitable wildlife habitat.

3.5.2.1 Proposed Action

Under the Proposed Action, implementation of surface disturbance activities as a result of proposed development and expansion would disturb approximately 4,357 acres of vegetation within the proposed NOA; and approximately 2,740 acres of vegetation within the proposed SOA. With the exception of open pits, all project components would be reclaimed, representing a permanent loss of 863 acres of vegetation within the proposed NOA; and a permanent loss of 347 acres of vegetation within the proposed SOA. **Table 3.5-3** summarizes the vegetation cover types and associated acreage and percentage of the study area that would be disturbed as a result of implementation of the Proposed Action. In addition, vegetation along existing access roads would be affected (e.g., reduction in growth rate) as a result of additional dust deposition.

Table 3.5-3 Proposed Action – Direct Impacts to Vegetation Cover Types

Vegetation Cover	North Operations Area (acres)	Percent of Study Area	South Operations Area (acres)	Percent of Study Area
Temporary Disturbance				
Big Sagebrush	1,616	4	1,090	2
Pinyon-Juniper	1,865	5	1,304	3
Mountain Brush	7	<1	--	<1
Low Sagebrush	6	<1	--	<1
Shadscale	--	--	--	--
Wetland	--	--	--	--
Total[1]	**3,494**	**8**	**2,393**	**5**
Permanent Disturbance				
Big Sagebrush	212	<1	133	<1
Pinyon-Juniper	645	2	214	<1
Mountain Brush	7	<1	--	--
Low Sagebrush	--	--	--	--
Shadscale	--	--	--	--
Wetland	--	--	--	--
Total[1]	**863**	**2**	**347**	**<1**

[1] Totals may vary due to rounding.

Source: JBR 2011a; SRK 2008.

The majority of project-related surface disturbance would occur within woody-dominated vegetation types. This represents a potential long-term impact as reseeding of recontoured facilities and re-establishment of mature shrub species is anticipated to require 15 to 50 years depending upon site specific conditions. Over the long term, shrubs would become re-established and increase in abundance within the majority of disturbed areas as a result of reclamation and natural re-colonization. Communities of big sagebrush, the second most extensive plant community in the project area, have proven difficult to re-establish on reclaimed lands when the soil characteristics do not contain the specific chemicals required by sagebrush to establish and grow (BLM 2010e).

Water Management Activities

It is anticipated that groundwater drawdown from the Proposed Action would not result in impacts to upland vegetation within the maximum extent of the 10-foot drawdown contour. Most shrub roots do not extend below 20 to 25 feet (Branson et al. 1976; Comstock and Ehleringer 1992; Donovan et al. 1996; Foxx and Tierney 1987; Robertson 1983; Shantz and Piemeisel 1940) and most grass roots do not extend below 7 feet (Elmore et al. 2006). The water table in the upland areas within the study area is greater than 50 feet below the soil surface, and therefore, these upland plants would not be affected by lowering of the water table.

Design features and ACEMPs are summarized in Section 2.4.3, Design Features and Applicant-committed Environmental Protection Measures for the Proposed NOA and SOA projects. Design

features and ACEMPs specific to vegetation focus on noxious weed prevention and control, reclamation, and minimization of surface disturbance. Erosion control methods also would be implemented for soils and surface water resources. To minimize impacts to woody vegetation communities, curl-leaf mountain mahogany, single leaf pinyon pine, and one-seed juniper would be removed only as necessary in proposed disturbance areas as described in the ACEMPs. To minimize impacts to vegetation, reclamation would be conducted as soon as practical, with concurrent reclamation implemented to the maximum extent possible. Successful reclamation standards would include the recontouring of all disturbed area to blend with the natural topography, stabilization of erosion, and the establishment of an acceptable vegetative cover in accordance with Nevada Guidelines for Successful revegetation prepared by NDEP, BLM, and the USFS. GMSs that remain in place throughout the growing season would be seeded with an interim seed mixture as summarized in **Table 2.4-57**.

Reclamation goals and criteria, concurrent and proposed reclamation timelines, and post-reclamation monitoring standards are described in Section 2.4.4, Reclamation. Upon completion of operations, final closure and reclamation of proposed facilities would be completed pursuant to the final closure plan and schedule that would be submitted to the BLM and NDEP for approval. The detailed closure plan for each facility would be prepared at least 2 years prior to the anticipated closure date and would conform with the WPCP regulations at the time of closure. Barrick would conform to the NDEP mine closure process requirements as outlined in Section 2.4.4, Reclamation. Reclamation activities would include ripping or scarifying recontoured facilities, preparing the seed bed, seeding between the BLM recommended dates of October 1 and March 15 of each year, and applying two BLM-approved reclamation seed mixtures. These seed mixes are designed for reclamation in low annual precipitation areas, and have been tailored to the site-specific elevation, soil type, and aspect parameters within the proposed NOA and SOA projects. The recommended seed mixes are listed in **Table 2.4-60** (above 7,000 feet in elevation) and **Table 2.4-61** (under 7,000 feet in elevation). Using seedlings for sagebrush re-establishment would be considered in consultation with NDOW to increase recovery times.

Satisfactory revegetation of mine-related disturbance areas (i.e., assuming the primary goal of soil stabilization through presence of adequate plant cover) is anticipated to occur approximately 3 to 15 years following reclamation. After 25 years, the reclaimed plant communities likely would consist of adequate herbaceous plant cover with sufficient diversity to substantially reduce the potential for soil erosion and provide suitable forage for livestock and wildlife. Establishment of woody vegetation communities would take from 15 to 50 years after initial reclamation activities.

Wetlands and Riparian Areas

Under the Proposed Action, no direct impacts from construction activities are anticipated to springs or wetland areas within the proposed NOA and SOA projects. Several ephemeral channels with no jurisdictional features are located in areas of proposed surface disturbance. For a discussion of the impacts to these features, see Section 3.3, Water Quality and Quantity. One ephemeral channel that has defined OHWM for portions of its length would be potentially impacted by the Mooney South and Mooney Deep South processing components which would lie along the channel (**Figure 3.3-1**). Process component design and fluid containment would avoid impacts to the ephemeral drainageway. While this feature has a defined OHWM, it is an isolated waterway, and not considered jurisdictional (USACE 2012c).

Water Management Activities

As discussed in Section 3.3, Water Quality and Quantity, and based on the site conditions and model predictions, drawdown associated with groundwater pumping for the mine under the Proposed Action could indirectly impact (i.e., reduce) the baseflow and associated wetlands at South Water Canyon Seep and JBR No. 14 Spring (**Figure 3.3-17**). Reduced flows may result in the partial loss of herbaceous riparian and wetland vegetation; cessation of flows would result in the long-term loss of woody and herbaceous riparian and wetland vegetation in these areas. The groundwater pumping would be extended 14 years (depending on the actual start-up date) longer than required for the currently

authorized activities included in the No Action alternative. After this time, impacts to wetland vegetation is expected to decrease as groundwater recharges and seeps and spread return to pre-project condition. During the life of the project, up to 33 acres of wetland vegetation associated with these two springs may be impacted from groundwater drawdown.

3.5.2.2 North and South Operations Area Facilities Reconfiguration Alternative

Under the Reconfiguration Alternative, implementation of surface disturbance activities as a result of proposed development and expansion would disturb approximately 3,254 acres of vegetation within the proposed NOA; and approximately 2,414 acres of vegetation within the proposed SOA. With the exception of open pits, all project components would be reclaimed, representing a permanent loss of 564 acres of vegetation within the proposed NOA; and a permanent loss of 321 acres of vegetation within the proposed SOA. With consideration of the 1,934 acres of existing authorized disturbance that would not be constructed under the Reconfiguration Alternative, implementation of this alternative would result in a decrease in 3,352 acres of vegetation disturbance in comparison to the Proposed Action. **Table 3.5-4** summarizes the vegetation cover types and associated acreage and percentage of the study area that would be disturbed as a result of implementation of the Reconfiguration Alternative.

Table 3.5-4 Reconfiguration Alternative – Direct Impacts to Vegetation Cover Types

Vegetation Cover	North Operations Area (acres)	Percent of Study Area	South Operations Area (acres)	Percent of Study Area
Temporary Disturbance				
Big Sagebrush	1,273	2	777	2
Pinyon–Juniper	1,403	3	1,317	4
Mountain Brush	6	<1	--	--
Low Sagebrush	8	<1	--	--
Shadscale	--	--	--	--
Wetland	--	--	--	--
Total[1]	**2,690**	**6**	**2,094**	**5**
Permanent Disturbance				
Big Sagebrush	212	<1	106	<1
Pinyon-Juniper	346	<1	214	<1
Mountain Brush	7	<1	--	--
Low Sagebrush	--	--	--	--
Shadscale	--	--	--	--
Wetland	--	--	--	--
Total[1]	**564**	**1**	**321**	**<1**

[1] Totals may vary due to rounding.

Source: JBR 2011a; SRK 2008.

It is anticipated that groundwater drawdown under the Reconfiguration Alternative would not result in direct impacts to upland vegetation within the maximum extent of the 10-foot drawdown contour. Most shrub roots do not extend below 20 to 25 feet (Branson et al. 1976; Comstock and Ehleringer 1992;

Donovan et al. 1996; Foxx and Tierney 1987; Robertson 1983; Shantz and Piemeisel 1940) and most grass roots do not extend below 7 feet (Elmore et al. 2006). The water table in the upland areas within the study area is greater than 50 feet below the soil surface, and therefore, these upland plants would not be affected by lowering of the water table.

Direct and indirect impact to vegetation resources would be the same as described for the Proposed Action. In general, the Reconfiguration Alternative would result in reduced impacts to vegetation resources (a reduction of approximately 3,037 acres) due to the modification of project facilities within the proposed NOA project that would reduce or eliminate surface disturbance.

Water Management Activities

As discussed in Section 3.3, Water Quality and Quantity, and based on the site conditions and model predictions, drawdown associated with groundwater pumping for the mine under the Reconfiguration Alternative could have an indirect impact (i.e., reduce) the baseflow and associated wetlands at South Water Canyon Seep and JBR No. 14 (**Figure 3.3-21**). Reduced flows at these two springs may indirectly result in the partial loss of herbaceous riparian and wetland vegetation; cessation of flows would result in the long-term loss of woody and herbaceous riparian and wetland vegetation in these areas. Potential impacts to the two springs and associated wetlands are anticipated to be similar to the Proposed Action. However, groundwater pumping is anticipated to be extended for 12 years (rather than 14 years under the Proposed Action) longer than required for the currently authorized activities included in the No Action Alternative. Up to 33 acres of wetland associated with these two springs may be impacted from groundwater drawdown.

3.5.2.3 Western Redbird Modification Alternative

Under the WRM Alternative, implementation of surface disturbance activities as a result of proposed development and expansion would disturb approximately 2,852 acres of vegetation disturbance within the proposed NOA; and approximately 2,414 acres of vegetation disturbance within the proposed SOA. With the exception of open pits, all project components would be reclaimed, representing a permanent loss of 460 acres of vegetation within the proposed NOA; and a permanent loss of 321 acres of vegetation within the proposed SOA. With consideration of the 2,169 acres of existing authorized disturbance that would not be constructed under the WRM Alternative, implementation of this alternative would result in a decrease in 3,989 acres and 636 acres of vegetation disturbance in comparison to the Proposed Action and Reconfiguration Alternative, respectively. **Table 3.5-5** summarizes the vegetation cover types and associated acreage and percentage of the study area that would be disturbed as a result of implementation of the WRM Alternative.

Table 3.5-5 Western Redbird Modification Alternative – Direct Impacts to Vegetation Cover Types

Vegetation Cover	North Operations Area (acres)	Percent of Study Area	South Operations Area (acres)	Percent of Study Area
Temporary Disturbance				
Big Sagebrush	977	1	777	1
Pinyon–Juniper	1,402	3	1,317	3
Mountain Brush	6	<1	--	--
Low Sagebrush	8	<1	--	--
Shadscale	--	--	--	--
Wetland	--	--	--	--
Total[1]	**2,393**	**5**	**2,094**	**5**

Table 3.5-5 Western Redbird Modification Alternative – Direct Impacts to Vegetation Cover Types

Vegetation Cover	North Operations Area (acres)	Percent of Study Area	South Operations Area (acres)	Percent of Study Area
Permanent Disturbance				
Big Sagebrush	107	<1	106	<1
Pinyon-Juniper	346	1	214	1
Mountain Brush	7	<1	--	--
Low Sagebrush	--	--	--	--
Shadscale	--	--	--	--
Wetland	--	--	--	--
Total[1]	**460**	**1**	**321**	**1**

[1] Totals may vary due to rounding.

Source: JBR 2011a; SRK 2008.

It is anticipated that groundwater drawdown under the WRM Alternative would not result in direct impacts to upland vegetation within the maximum extent of the 10-foot drawdown contour. Most shrub roots do not extend below 20 to 25 feet (Branson et al. 1976; Comstock and Ehlerigner 1992; Donovan et al. 1996; Foxx and Tierney 1987; Robertson 1983; Shantz and Piemeisel 1940) and most grass roots do not extend below 7 feet (Elmore et al. 2006). The water table in the upland areas within the study area is greater than 50 feet below the soil surface, and therefore, these upland plants would not be affected by lowering of the water table.

The types of direct and indirect impact to vegetation resources would be the same as described for the Proposed Action. In general, the WRM Alternative would result in reduced impacts to vegetation resources due to the modification of project facilities within the proposed NOA project that would reduce or eliminate surface disturbance.

Water Management Activities

As discussed in Section 3.3, Water Quality and Quantity, and based on the site conditions and model predictions, drawdown associated with groundwater pumping for the mine under the WRM Alternative is not anticipated to impact the baseflow of springs and wetlands in the project area. This represents a reduction of potential impacts to vegetation resources in comparison to the Proposed Action.

3.5.2.4 No Action Alternative

Under the No Action Alternative, the proposed NOA and SOA projects would not be developed and associated impacts to vegetation resources would not occur. Barrick would continue its operations, closure, and reclamation activities within the NOA and SOA boundaries under the terms and current permits and approvals as authorized by the BLM and State of Nevada. Under the No Action Alternative, construction of all previously authorized expansion and associated facilities would be implemented and reclaimed as authorized.

Water Management Activities

As discussed in Section 3.3, Water Quality and Quantity, and based on the site conditions and model predictions, drawdown associated with groundwater pumping for the mine under the No Action Alternative is not anticipated to impact the baseflow of springs and wetlands in the project area.

3.5.2.5 Cumulative Impacts

The 2,070,999-acre CESA for vegetation resources consists of the Huntington Valley and Central Region, Newark Valley, Long Valley, and Ruby Valley hydrographic basins (**Figure 3.3-1**). Past and present actions and RFFAs are discussed in Section 2.7, Past, Present, and Reasonably Foreseeable Future Actions; their locations are illustrated in **Figure 2.7-1**.

Surface Disturbance

Past and present actions have resulted, or would result, in approximately 30,732 acres of total surface disturbance within the vegetation resources CESA. The total quantifiable surface disturbances are related to mining, oil and gas development, wind energy development, exploration, land, road, and utility corridor development, agriculture, livestock grazing; residential developments, and other county and government actions. RFFAs proposed within the vegetation resources CESA include, but are not limited to, the following: mining-related actions (totaling 2,235 acres), oil and gas exploration within Huntington Valley (314 acres), development of oil and gas leases within the Long, Ruby, and Huntington valleys (acreage of exploration and development unknown), vegetation treatments (totaling 56,572 acres), and implementation of the USFWS Ruby Mountain NWR CCP.

The proposed vegetation treatments would affect 3 percent of the total vegetation resources CESA. Within rangeland vegetation, the vegetation treatments to address the invasion and/or expansion of pinyon pine and juniper species and diminishing herbaceous cover in sagebrush vegetation would move the watersheds toward the desired range of conditions for rangeland vegetation. Within Forest and Woodland vegetation, treatments used to reduce pinyon and juniper species and/ or tree density in targeted stands would result in short-term disturbance that do not necessarily mimic natural disturbance but would, in the long term, result in a return to desired succession classes (BLM 2013a). Because these activities would have countervailing effects to vegetation resources, they are not considered in the surface disturbance calculations provided below.

The Proposed Action incrementally would increase vegetation disturbance by an additional 7,097acres and remove 11 acres of existing authorized disturbance from the 30,732 acres of past and present disturbance. As stated above, RFFAs would result in an additional 2,549 acres of disturbance, resulting in total cumulative disturbance of approximately 40,367 acres (2 percent of the vegetation resources CESA). Open pits would not be reclaimed resulting in a permanent loss of 863 acres of vegetation within the proposed NOA and a permanent loss of 347 acres of vegetation within the proposed SOA. This permanent loss of vegetation would represent less than 1 percent of the total vegetation resources CESA.

The Reconfiguration Alternative would remove 1,934 acres of authorized disturbance and would increase proposed vegetation disturbance by 5,668 acres resulting in a total cumulative disturbance of approximately 37,015 acres (2 percent of the total cultural resource CESA). The Reconfiguration Alternative would result in the permanent loss of 564 acres of vegetation within the proposed NOA; and a permanent loss of 321 acres of vegetation within the proposed SOA. This would result in 325 fewer total acres of permanent vegetation loss compared to the Proposed Action, and less than 1 percent of the total vegetation resources CESA.

As compared to the Reconfiguration Alternative, the WRM Alternative would remove an additional 235 acres of authorized disturbance from the 28,563 acres of past and present disturbance and would decrease proposed vegetation disturbance by an additional 402 acres for a total cumulative disturbance of approximately 36,378 acres (2 percent of the total cultural resource CESA). The WRM Alternative

would result in the permanent loss of 460 acres of vegetation within the proposed NOA; and a permanent loss of 321 acres of vegetation within the proposed SOA. This would result in 104 fewer total acres of permanent vegetation loss compared to the Reconfiguration Alternative, and less than 1 percent of the total vegetation resources CESA. Under the No Action Alternative, cumulative impacts to vegetation resources would be the same as those described in the *Final Environmental Impact Statement for the Bald Mountain Mine North Operations Area Project* (BLM 2009a) and *Environmental Assessment for the Mooney Heap and Little Bald Mountain Expansion Project* (BLM 2011a).

Other surface disturbing activities within the vegetation resources CESA that contribute to cumulative effects of vegetation resources include the establishment and spread of noxious weeds and invasive plant species, livestock grazing, and wildfires. Cumulative losses for vegetation resources potentially would include the reduction of native ecosystem functions such as soil stability, erosion control, livestock and wildlife forage, and wildlife habitat. The removal of woody species from these areas would result in a long-term change in vegetation structure since it may take up to 15 to 50 years for woody vegetation of similar stature to become re-established in these areas. Indirect impacts to vegetation resources associated with surface disturbance activities would include fugitive dust accumulation and the introduction or spread of noxious weeds and invasive plant species. These impacts would be reduced through the implementation of applicant committed design features listed in **Table 2.4-54**. Fugitive dust from development activities can adversely impact native vegetation communities and alter vegetative composition (USFWS 2008a). The cumulative effects of noxious weeds and invasive plant species are discussed in Section 3.6, Noxious Weeds and Invasive Species.

Water Use

Groundwater drawdown associated with the Proposed Action may result in the loss of up to 33 acres of wetland vegetation from the potential loss or decrease in water flow from seeps and springs. The impacts from the proposed project would add to the existing and future riparian and wetland impacts within the CESA. Groundwater drawdown associated with the Reconfiguration Alternative may also result in the loss of areas of wetland vegetation similar to the effects described under the Proposed Action. This impact is not anticipated under the WRM Alternative, as discussed in Section 3.5.2.3 Western Redbird Modification Alternative. In combination with direct drawdown impacts that are anticipated to occur as a result of the proposed groundwater pumping, regional groundwater levels would undergo additive declines. This would create cumulative impacts in the form of reduced flows from springs, seeps, and groundwater contributions to stream flows and would directly affect riparian and wetland areas.

Past and present actions and RFFAs would cumulatively and incrementally reduce vegetation resources until such time that reclamation is deemed successful and native plants are re-established. It is assumed that portions of past disturbances have been reclaimed, and ongoing reclamation at existing operations would continue to reduce cumulative impacts within the vegetation resources CESA. Although the cumulative surface disturbance would be greater than the Proposed Action, Reconfiguration Alternative, or WRM Alternative surface disturbance, it would represent a small portion of the vast acreage of public lands in the area, and would have minimal effect on land uses displaced by past and present actions and RFFAs within the vegetation resources CESA. Additionally, the loss of mature shrubs would be minimal relative to the total acreage of woody species communities that occur within the vegetation resources CESA. Pending completion of successful reclamation on all project components with the exception of open pits, it is anticipated that the Proposed Action, Reconfiguration Alternative, and WRM Alternative would contribute less than one percent to the overall cumulative disturbance within the vegetation resources CESA.

Climate Change

Potential changes to the project area resulting from the effects of climate change forecasted by the Central Basin and Range Rapid EcoRegional Assessment (REA) could include higher than normal growing season temperatures, contraction or expansion of some existing vegetation communities, the

expansion of existing noxious weed populations, and the introduction of noxious weed species previously undocumented in the ecoregion and project area (Comer et al. 2013). Regarding temperature increases specifically, the Central Basin and Range REA forecasts an average increase in average summer maximum daytime temperatures of approximately 5°F within the BMM project area by 2060 (Comer et al. 2013). These increases in average growing season temperatures are anticipated to result in low elevation basins throughout the Central Basin and Range ecoregion potentially transitioning from the existing cool semi-desert vegetation communities into very warm and sparsely-vegetated desert landscapes more typical of the Mojave Basin and Range.

A number of studies have documented a decrease in biomass and productivity resulting from climate change in the Southwest. Anderson-Teixeira et al. (2011) found that the amount of above-ground plant biomass decreased as temperature increased and precipitation decreased in a central New Mexico study. On the Colorado Plateau, drought was associated with a substantial decrease in photosynthetic production of organic compounds, with summer rains rarely resulting in net increase in biomass (Bowling et al. 2010). The impact of climate change on vegetation communities within the CESA may be magnified compared to other ecosystems due to the aridity and lower resiliency of lands in the Great Basin. These lands are always “on the edge” due to extreme variation in the timing and quantity of precipitation, invasive species, altered fire regimes and increasing development (Pellant 2007). With increasing atmospheric CO2 levels, cheatgrass and other introduced annual grasses are expected to proliferate and continue to outcompete native species which can be expected to increase the frequency and size of wildfires in the area (Smith et al. 2000). Ultimately, biodiversity in the CESA could be significantly reduced, which in turn might alter ecosystem processes such as primary production, nutrient dynamics and landscape water balance.

3.5.2.6 Monitoring and Mitigation Measures

The following mitigation measures are recommended to minimize and mitigate potential impacts to vegetation resources:

Issue: Sagebrush is an important habitat throughout the study area, and the loss of sagebrush communities would have impacts on wildlife. Sagebrush communities can take several decades to reestablish and often be unsuccessful without additional reclamation measures.

Mitigation Measure V-1: Additional reclamation measures would be implemented to assist in the reclamation of sagebrush communities within the study area where determined appropriate by the BLM. Additional reclamation measures to be considered for implementation by the BLM include:

- Application of mulch;
- Inoculation with arbusucular mychorrizea;
- Reduced seeding rate of grasses and forbs in the reclamation seed mixes to reduce competition;
- Reclamation with native seeds that are representative of the indigenous species present in the adjacent habitat except for the seeding of non-native species to produce a temporary cover crop to out-compete invasive weeds;
- Growth media would be direct-placed, when possible; and
- Planting of sagebrush in small patches carried out in accordance with the project Reclamation Plan.

Mitigation Measure V-2: Basin big sagebrush (*A. tridentata* ssp. *tridentata*), and mountain big sagebrush (*A. tridentata* ssp. *vaseyana*) would be required in the final seed mixture to be used during reclamation (**Tables 2.4-60** and **2.4-61**).

Effectiveness: The implementation of the additional sagebrush measures would assist in the establishment of successful sagebrush communities by favoring the establishment of big sagebrush within disturbed areas. Basin big sagebrush and mountain big sagebrush would be favored by decreasing competition with herbaceous species and noxious weeds, adding sagebrush seeds to the reclamation seed mixes, and the amelioration of site conditions through the addition of mulch and inoculation with arbusucular mychorrizea.

3.5.2.7 Residual Impacts

Assuming successful reclamation of all project components, residual impacts to vegetation would include the permanent loss of approximately 1,210 acres, 885 acres, and 780 acres for the Proposed Action, Reconfiguration Alternative, and WRM Alternative, respectively. These residual impacts would be associated with open pits, which would not be reclaimed. Fragmentation and the loss of shrub-dominated communities would represent a long-term change in vegetation composition (i.e., shrub-dominated communities to grass/forb-dominated communities).

Reclamation and vegetation recovery to pre-disturbance conditions is expected to occur at varying rates based on factors such as noxious weed invasion, fire regimes, and climatic and other environmental variations. It is anticipated that the reestablishment of an early-seral vegetation community comprised of annual and perennial grasses and forbs will take between 2 to 5 years. Successful reestablishment of early seral native vegetation may take a longer time than anticipated as a result of potential noxious and invasive weed occurrences. It is estimated that overall, herbaceous-dominated plant communities would require a minimum of 3 to 5 years to establish adequate ground cover to prevent erosion and provide forage for wildlife species and grazing operations. Woody-dominated plant communities, such as sagebrush shrublands, would require between 2 to 10 years to establish and at least 10 to 25 years to successfully recolonize the area.

3.6 Noxious Weeds and Invasive Species

The study area for noxious weeds and invasive species is defined as the proposed NOA and SOA plan boundaries. The CESA for noxious weeds and invasive species encompasses the entirety of four hydrographic basins (Huntington Valley and Central Region, Long Valley, Newark Valley, and Ruby Valley). **Figure 3.3-1** illustrates the study area and CESA for noxious weeds and invasive species.

3.6.1 Affected Environment

Under the Federal Plant Protection Act of 2000 (formerly the Noxious Weed Act of 1974 [7 United States Code {USC} SS 2801-2814]), a noxious weed is defined as “any plant or plant product that can directly or indirectly injure or cause damage to crops, livestock, poultry, or other interests of agriculture, irrigation, navigation, the natural resources of the U.S., the public health, or the environment.” Each state is federally mandated to uphold the rules and regulations set forth by this act and manage their lands accordingly. The State of Nevada also regulates noxious weeds. Under the NRS, a noxious weed is defined as “any species of plant which is, or is likely to be, detrimental or destructive and difficult to control or eradicate” (NRS 555.005 – Control of insects, pests, and noxious weeds). Noxious weeds have become a growing concern in Nevada due to their ability to increase in cover relative to surrounding vegetation and out-compete native plants from an area. Noxious weeds are classified into three categories based on statewide importance, distribution, and the ability of eradication or control measures to be successful. Category A weeds are not currently found or have limited distribution throughout the state and eradication and control are required by the state in all infestations; Category B weeds are found in scattered populations in some counties of the state; and control is required by the state in areas where populations are not well established or previously unknown to occur; and Category C weeds are currently established and generally widespread in many counties of the state and control is at the discretion of the state quarantine officer (NRS 555.010). A list of the noxious weed species designated by the State of Nevada is provided in **Table 3.6-1**.

In addition, the federal Noxious Weed Act of 1974, as amended (7 USC 2801 et seq.) requires cooperation with state, local, and other federal agencies in the application and enforcement of all laws and regulations relating to the management and control of noxious weeds. Recognizing these regulations, the BLM requires that NEPA documents consider and analyze the potential for the spread of noxious weed species and provide preventative rehabilitation measures for each management action involving surface disturbance. The BLM considers plants invasive if they have been introduced into an environment where they did not evolve. As a result, they usually have no natural enemies to limit their reproduction and spread (Westbrooks 1998).

Surveys for noxious weeds have been conducted in 2006, 2007, 2008, and 2009 (SRK 2008). Surveys conducted in 2006, 2007, and 2008 identified Canada thistle, musk thistle, Scotch thistle, spotted knapweed, Russian knapweed, whitetop, and black henbane as present within the study area. Surveys in 2009, identified the presence of eight noxious weed species within the study area (BLM 2012j). Of these, two are classified as Class A species (control required), three are classified as Class B species (control required where populations are not well established or previously unknown), and three are classified as Class C species (management required to control population size). Additionally, non-native invasive species identified within the study area included cheatgrass, bull thistle (*Cirsium vulgare*), and Russian thistle (*Salsola kali*). Noxious weeds and invasive species in the study area are predominately found along travel routes (e.g., roads, utility corridors), and water sources.

Table 3.6-1 State of Nevada Noxious Weed List and Presence within the Study Area

Common Name	Scientific Name	Category[1]	NOA	SOA
Russian knapweed	*Acroptilon repens*	B	X	-
Camelthorn	*Alhagi camelorum*	A	-	-
Mayweed chamomile	*Anthemis cotula*	A	-	-
Giant reed	*Arundo donax*	A	-	-
Sahara mustard	*Brassica tournefortii*	B	-	-
Whitetop / hoary cress	*Cardaria draba*	C	X	X
Musk thistle	*Carduus nutans*	B	X	X
Purple star thistle	*Centaurea calcitrapa*	A	-	-
Diffuse knapweed	*Centaurea diffusa*	B	-	-
Iberian starthistle	*Centaurea iberica*	A	-	-
Spotted knapweed	*Centaurea masculosa*	A	X	X
Malta star thistle	*Centaurea melitensis*	A	-	-
Yellow starthistle	*Centaurea solstiltialis*	A	-	-
Squarrose knapweed	*Centaurea virgata*	A	-	-
Rush skeletonweed	*Chondrilla juncea*	A	-	-
Water hemlock	*Cicuta maculata*	C	-	-
Canada thistle	*Cirsium arvense*	C	X	-
Poison hemlock	*Conium maculatum*	C	-	-
Common crupina	*Crupina vulgaris*	A	-	-
Houndstongue	*Cynoglossum officinale*	A	-	-
Leafy spurge	*Euphorbia esula*	B	-	-
Goats rue	*Galega officinalis*	A	-	-
Hydrilla	*Hydrilla verticillata*	A	-	-
Black henbane	*Hyoscyamus niger*	A	X	X
Klamath weed	*Hypericum perforatum*	A	-	-
Dyer's woad	*Isatis tinctoria*	A	-	-
Perennial pepperweed	*Lepidium latifolium*	C	-	-
Dalmation toadflax	*Linaria dalmatica*	A	-	-
Yellow toadflax	*Linaria vulgaris*	A	-	-
Purple loosestrife	*Lythrum salicaria, L. virgatum* and their cultivars	A	-	-
Eurasian water-milfoil	*Myriophyllum spicatum*	A	-	-
Scotch thistle	*Onopordum acanthium*	B	X	X

Table 3.6-1 State of Nevada Noxious Weed List and Presence within the Study Area

Common Name	Scientific Name	Category[1]	NOA	SOA
African rue	*Peganum harmala*	A	-	-
Green fountain grass	*Pennisetum setaceum*	A	-	-
Sulfur cinquefoil	*Potentilla recta*	A	-	-
Austrian fieldcress	*Rorippa austriaca*	A	-	-
Mediterranean sage	*Salvia aethiopis*	A	-	-
Giant salvinia	*Salvinia molesta*	A	-	-
Carolina horse-nettle	*Solanum carolinense*	B	-	-
White Horse-nettle	*Solanum elaeagnifolium*	B	-	-
Sow thistle	*Sonchus arvensis*	A	-	-
Johnson grass	*Sorghum halepense*	C	-	-
Austrian peaweed	*Sphaerophysa salsula / Swainsona salsula*	A	-	-
Medusahead	*Taeniatherum caput-medusae*	B	-	-
Salt cedar (tamarisk)	*Tamarix* spp.	C	X	-
Puncture vine	*Tribulus terrestris*	C	-	-
Syrian bean caper	*Zygophyllum fabago*	A	-	-

[1] Category A weeds are not currently found or have limited distribution throughout the state and eradication and control are required by the state in all infestations; Category B weeds are found in scattered populations in some counties of the state and control is required by the state in areas where populations are not well established or previously unknown to occur; and Category C weeds are currently established and generally widespread in many counties of the state and control is at the discretion of the state quarantine officer.

Source: Nevada Department of Agriculture 2012.

3.6.2 Environmental Consequences

This section discusses project-related impacts to noxious weeds resulting from the Proposed Action, Reconfiguration Alternative, WRM Alternative, and No Action Alternative. Primary issues related to noxious weeds and invasive species include direct and indirect impacts associated with the introduction or spread of noxious weeds and invasive species resulting in the loss or degradation of native vegetation communities, or preferred grazing areas.

3.6.2.1 Proposed Action

Under the Proposed Action, implementation of surface disturbance activities as a result of proposed development and expansion would disturb approximately 4,357 acres within the proposed NOA; and approximately 2,740 acres within the proposed SOA. With the exception of open pits, all project components would be reclaimed, representing a permanent loss of 863 acres of vegetation within the proposed NOA; and a permanent loss of 347 acres of vegetation within the proposed SOA.

All areas with surface disturbance are at risk for the spread of noxious weeds and invasive species. These species readily colonize disturbed areas and areas adjacent to disturbance areas including linear

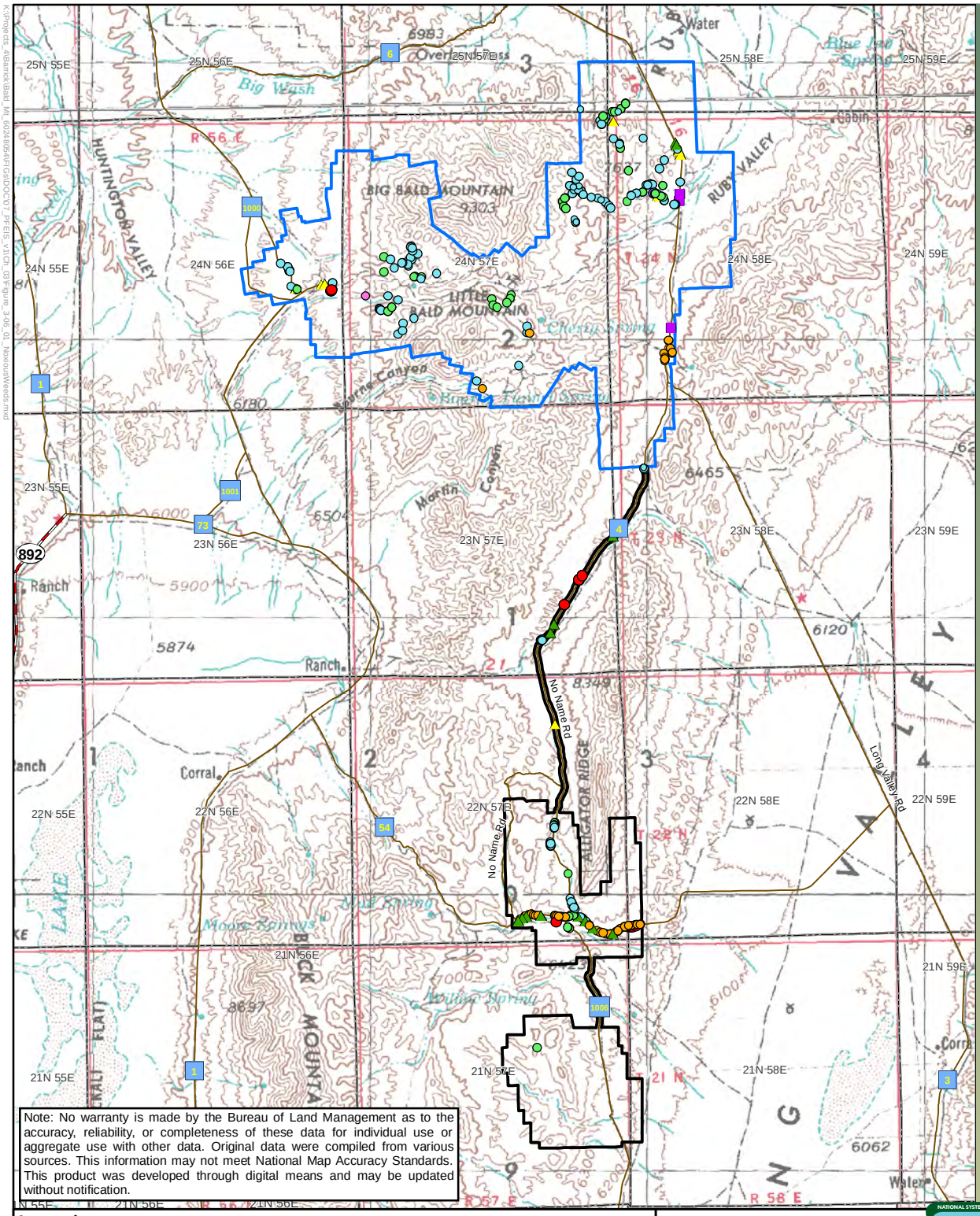
disturbances such as roads, and utility corridors. Noxious weeds and invasive species can easily spread into areas that typically lack or have minimal vegetation cover. It is anticipated that populations of weedy annual species (e.g., cheatgrass or Russian thistle) are the most likely to become established in localized areas where disturbance occurs for extended periods of time. However, disturbance in or near any of the areas where known populations of noxious weeds and invasive species occur (**Figure 3.6-1**) create a risk for the spread for these species. Increased vehicle travel along existing and new access and haul roads also are vectors that readily spread noxious weeds and invasive species.

Changes in hydrological regimes also have the potential to favor floral species replacement (Stromberg et al. 2007), and groundwater drawdown may promote the spread of invasive and noxious weeds, especially around seeps and springs where native plants are adapted to mesic conditions (Elmore et al. 2003). Reduced groundwater levels can alter local ecology facilitating species with a different suite of life-history traits (Tickner et al. 2001) resulting in the proliferation of deeper-rooted or more stress-tolerant invasive species which may replace native species over time. Springs and seeps in the project area are described in Section 3.3.1.2 Surface Water Resources and locations are shown in **Figure 3.3-3**. The areas predicted to experience a reduction of groundwater levels (or drawdown) of 10 feet or more attributable to the total anticipated mine pumping requirements under the Proposed Action are provided in **Figure 3.3-17**. Three springs or seeps occur within the predicted 10-foot drawdown contour: South Water Canyon Seep, JBR No. 14 (spring), and Willow Springs. Under the Proposed Action, the groundwater pumping would be extended 14 years (depending on the actual start-up date) longer than required for the currently authorized activities included in the No Action Alternative.

As is described in Section 3.3.1.2, this EIS analysis conservatively assumed that there is a potential risk that drawdown associated with groundwater pumping for the mine could impact (i.e., reduce) the baseflow and associated wetlands at South Water Canyon Seep and JBR No. 14. Perennial water sources that are hydraulically connected to the groundwater system impacted by pumping and within the drawdown area likely would experience a reduction in baseflow. Depending on the severity of reductions in flow, this could result in drying up of springs and reducing the size of their associated wetland area resulting in the partial loss of native herbaceous wetland vegetation. Up to 32.88 acres of wetland vegetation associated with these two springs may be impacted from groundwater drawdown. These areas would be at-risk for increased proliferation of noxious and invasive weeds.

Noxious weeds and invasive species can degrade and modify native communities, reduce resources for native species, monopolize limited sources of moisture, and adversely affect native pollinators. In addition, noxious weeds and invasive species can reduce wildlife habitat, alter fire regimes, and degrade wetland and riparian areas.

Design features and ACEPMs are summarized in Section 2.4.3, Design Features and Applicant-committed Environmental Protection Measures for the Proposed NOA and SOA projects. Implementation of these measures and design features, in conjunction with the Noxious Weed Control Plan (Barrick 2012a,b) would reduce the potential for noxious weeds and invasive species establishment within the proposed NOA and SOA. Design features and ACEPMs specific to noxious weeds and invasive species focus on noxious weed prevention and control, reclamation, and minimization of surface disturbance. Following construction, reclamation would be conducted as soon as practical, with concurrent reclamation implemented to the maximum extent possible. Additionally following construction, GMSs stockpiled over the growing season would be seeded with an interim seed mixture to minimize erosion. The Noxious Weed Control Plan includes management strategies and control techniques to prevent or minimize the establishment or spread of weed populations. Noxious weed management would continue during the post-mining reclamation period and the post-closure monitoring period.



Legend

- Proposed NOA Plan Boundary
- Proposed SOA Plan Boundary
- Black Henbane
- Bull Thistle
- Canada Thistle
- Musk Thistle
- Russian Knapweed
- Salt Cedar
- Scotch Thistle
- Spotted Knapweed
- Whitetop/Hoary Cross

Source: BLM 2012.

Bald Mountain Mine North and South Operations Area Projects EIS

Figure 3.6-1

Noxious Weeds and Invasive Species within the Study Area

0 1 2 4 Miles

N

BLM

Ely District Office

12/21/2015

The BLM's BMPs (Barrick 2012a,b) focusing on noxious weed and invasive species prevention and control measures would be implemented. BMPs specific to noxious weeds and invasive species include use of certified weed-free hay and straw, and reclamation with a BLM-approved seed mixture. Seeding GMSs with an interim seed mix would stabilize the growth media, reduce soil erosion, and minimize the potential for establishment of noxious weeds and invasive species. Successful reclamation of mine-related disturbance areas would result in the establishment of a permanent vegetative cover, which would minimize the potential establishment of noxious weeds and invasive species over the long term. Open pits would not be reclaimed; however, due to the absence of topsoil, the potential for establishment of noxious weeds and invasive species would be less likely.

3.6.2.2 North and South Operations Area Facilities Reconfiguration Alternative

Under the Reconfiguration Alternative, implementation of surface disturbance activities as a result of proposed development and expansion would disturb approximately 3,254 acres within the proposed NOA; and approximately 2,414 acres within the proposed SOA. With the exception of open pits, all project components would be recontoured and reseeded, representing a permanent loss of 564 acres of vegetation within the proposed NOA; and a permanent loss of 321 acres of vegetation within the proposed SOA. With consideration of the 1,934 acres of existing authorized disturbance that would not be constructed under the Reconfiguration Alternative, implementation of this alternative would result in a reduction of 3,352 acres of surface disturbance in comparison to the Proposed Action.

Under the Reconfiguration Alternative, groundwater drawdown impacts to seeps and springs would be essentially the same as those described for the Proposed Action (Section 3.6.2.1); however, groundwater pumping would be extended 2 fewer years than under the Proposed Action. The potential for the proliferation of noxious and invasive weeds resulting from drying of seeps and springs (South Water Canyon Seep and JBR No. 14.) would be the same as described under the Proposed Action.

Based on the amount of disturbance under the Reconfiguration Alternative, direct and indirect impacts to noxious weed and invasive species would be less than those described for the Proposed Action.

3.6.2.3 Western Redbird Modification Alternative

Under the WRM Alternative, implementation of surface disturbance activities as a result of proposed development and expansion would disturb approximately 2,852 acres within the proposed NOA; and approximately 2,414 acres within the proposed SOA. With the exception of open pits, all project components would be recontoured and reseeded, representing a permanent loss of 460 acres of vegetation within the proposed NOA; and a permanent loss of 321 acres of vegetation within the proposed SOA. With consideration of the 2,169 acres of existing authorized disturbance that would not be constructed under the WRM Alternative, implementation of this alternative would result in a reduction of 636 acres of surface disturbance in comparison to the Reconfiguration Alternative.

As discussed in Section 3.3, Water Quality and Quantity, drawdown associated with groundwater pumping for the mine under the WRM Alternative is not anticipated to impact the baseflow of springs and wetlands in the project area. This represents a reduction of potential impacts resulting from the proliferation of noxious and invasive weeds in comparison to the Proposed Action.

Based on the amount of disturbance under the WRM Alternative, direct and indirect impacts to noxious weed and invasive species would be less than those described for the Proposed Action or Reconfiguration Alternative.

3.6.2.4 No Action Alternative

Under the No Action Alternative, the proposed NOA and SOA projects would not be developed and associated impacts to noxious weed and invasive species would not occur. Barrick would continue its operations, reclamation, and closure activities within the NOA and SOA boundaries under the terms and

current permits and approvals as authorized by the BLM and State of Nevada. Under the No Action Alternative, construction of all previously authorized expansion and associated facilities would be implemented and reclaimed as authorized.

3.6.2.5 Cumulative Impacts

The 2,070,999-acre CESA for noxious weeds and invasive species is shown in **Figure 3.3-1** and consists of the Huntington Valley and Central Region, Newark Valley, Long Valley, and Ruby Valley hydrographic basins. Past and present actions and RFFAs are discussed in Section 2.7, Past, Present, and Reasonably Foreseeable Future Actions; their locations are illustrated in **Figure 2.7-1**.

Impacts from Past, Present, and Reasonably Foreseeable Future Surface Disturbance

Past and present actions have resulted, or would result, in approximately 30,732 acres of total past and present disturbance within the noxious weeds and invasive species CESA. The total quantifiable surface disturbances are related to mining, oil and gas development, wind energy development, exploration, land, road, and utility corridor development, agriculture, livestock grazing; residential developments, and other county and government actions. RFFAs proposed within the noxious weeds and invasive species CESA include, but are not limited to, the following: mining-related actions (totaling 2,235 acres), oil and gas exploration within Huntington Valley 314 acres), oil and gas lease sales within the Long, Ruby, and Huntington valleys (acreage unknown), fuels reduction and vegetation treatments (totaling 56,572 acres), and implementation of the USFWS Ruby Lake NWR CCP.

All areas with surface disturbance from past and present actions and RFFAs would be at risk for the spread of noxious weeds and invasive species, and increased vehicle travel along existing and new roads also may spread noxious weeds and invasive species. Noxious weeds and invasive species populations currently exist within the noxious weed and invasive species CESA. Surface disturbance activities from the Proposed Action, Reconfiguration Alternative, WRM Alternative, and RFFAs could further spread noxious weeds and invasive species into previously undisturbed areas, and may increase the acreage and population numbers of already established noxious weeds and invasive species populations. Other surface disturbing activities within the noxious weed and invasive species CESA that contribute to cumulative effects noxious weeds and invasive species include livestock grazing, wildfire, all-terrain vehicles, and recreation use. Vegetation treatments also spread noxious and invasive weeds; however, the use of cheatgrass suppression options and reseeding areas with desired plant species would be used to prevent weeds from becoming a dense cover (BLM 2013a).

The Proposed Action incrementally would increase surface disturbance by an additional 7,097 and remove 11 acres of existing disturbance from the 30,732 acres of past and present disturbance resulting in a total cumulative disturbance of approximately 96,939 acres (5 percent of the total noxious weeds and invasive species CESA with consideration of vegetation treatments RFFAs and approximately 2 percent of the CESA without consideration of these RFFAs). The Reconfiguration Alternative would remove 1,934 acres of authorized disturbance and would incrementally increase proposed surface disturbance by 5,668 acres, resulting in a total cumulative disturbance of approximately 93,587 acres (5 percent of the total noxious weeds and invasive species CESA). Relative to the Reconfiguration Alternative, the WRM alternative would remove an additional 235 acres of authorized disturbance from the 28,798 acres of past and present disturbance that would occur under the Reconfiguration Alternative and would decrease proposed surface disturbance by an additional 402 acres for a total cumulative disturbance of approximately 92,850 acres (4 percent of the total noxious weeds and invasive species resource CESA). Under the No Action Alternative, cumulative impacts to vegetation resources would be the same as those described in the *Final Environmental Impact Statement for the Bald Mountain Mine North Operations Area Project* (BLM 2009a) and *Environmental Assessment for the Mooney Heap and Little Bald Mountain Expansion Project* (BLM 2011a).

It is anticipated that the cumulative impacts to noxious weeds and invasive species within the noxious weed and invasive species CESA from past and present actions and RFFAs would result in the potential for the increased spread of noxious weeds and non-native invasive plant species into disturbed area created from surface disturbances associated with grazing, wildfires, and the development of mining projects and utility corridors. Linear surface disturbances such as utility corridors, roads, and trails provide corridors for further introduction and spread of noxious weeds and non-native invasive plant species (Gelbard and Belnap 2003; Watkins et al. 2003). These networks of corridors can then serve as a source of propagules (D'Antonio et al. 2001) for noxious weeds and invasive species to spread into adjacent undisturbed areas. It is assumed that the majority of the surface disturbance-related impacts within the noxious weed and invasive species CESA would be reclaimed, minimizing the introduction and spread of noxious weeds and invasive species. Implementation of Barrick's Reclamation Plan and Noxious Weed Control Plan would minimize the introduction and spread of noxious weeds and invasive species within the proposed NOA and SOA projects, thereby minimizing the project's contribution to cumulative effects.

Impacts from Climate Change

Potential changes to the project area resulting from the effects of climate change forecasted by the Central Basin and Range REA could include higher than normal growing season temperatures, contraction or expansion of some existing vegetation communities, the expansion of existing noxious weed populations, and the introduction of noxious weed species previously undocumented in the ecoregion and project area (Comer et al. 2013). Regarding temperature increases specifically, the Central Basin and Range REA forecasts an average increase in average summer maximum daytime temperatures of approximately 5°F within the BMM project area by 2060 (Comer et al. 2013). These increases in average growing season temperatures are anticipated to result in low elevation basins throughout the Central Basin and Range ecoregion potentially transitioning from the existing cool semi-desert vegetation communities into very warm and sparsely-vegetated desert landscapes more typical of the Mojave Basin and Range.

Increasing temperature and longer growing season could further result in expansion of invasive annual grass and forb species into elevations where they are currently limited or the replacement of one existing exotic annual grass with another. These shifts in species compositions have potential to introduce novel effects on local fire regimes in vegetation communities such as montane sagebrush steppe and higher-elevation woodland and forest (Abatzoglou and Kolden 2011; Rivera et al. 2011).

3.6.2.6 Monitoring and Mitigation Measures

No additional monitoring and mitigation measures are recommended.

3.6.2.7 Residual Impacts

Under the Proposed Action, Reconfiguration Alternative, and WRM Alternative, noxious weeds and invasive species may persist over the long term regardless of the implementation of weed control programs. The extent of that persistence is unknown as it could be highly variable based on annual climatic fluctuations such as precipitation, etc. As stated above, Barrick's Reclamation Plan and Noxious Weed Control Plan would be implemented to minimize these residual impacts.

3.7 Wildlife and Fisheries Resources

The study area for wildlife and fisheries resources is defined as the proposed NOA and SOA plan boundaries. The CESA for wildlife resources includes the NDOW Big Game Management Area 10, which generally extends from the western end of the Ruby Mountains northwest of the study area, south to U.S. Highway 50, east to the Cherry Creek Mountains and northeast to the Nevada/Utah border. The northern boundary of the CESA generally follows the Interstate 80 (I-80) corridor. The wildlife resources CESA was determined based on wildlife use within the project region and important seasonal habitats for species such as mule deer, pronghorn, and elk (**Figure 3.7-1**).

3.7.1 Affected Environment

3.7.1.1 Wildlife Resources

As discussed in Section 3.5, Vegetation Resources, six vegetation cover types occur within the study area. The vegetation types include big sagebrush, pinyon-juniper, mountain brush, low sagebrush, shadscale, and wetland. **Table 3.5-1** summarizes acreages for each vegetation type within the study area.

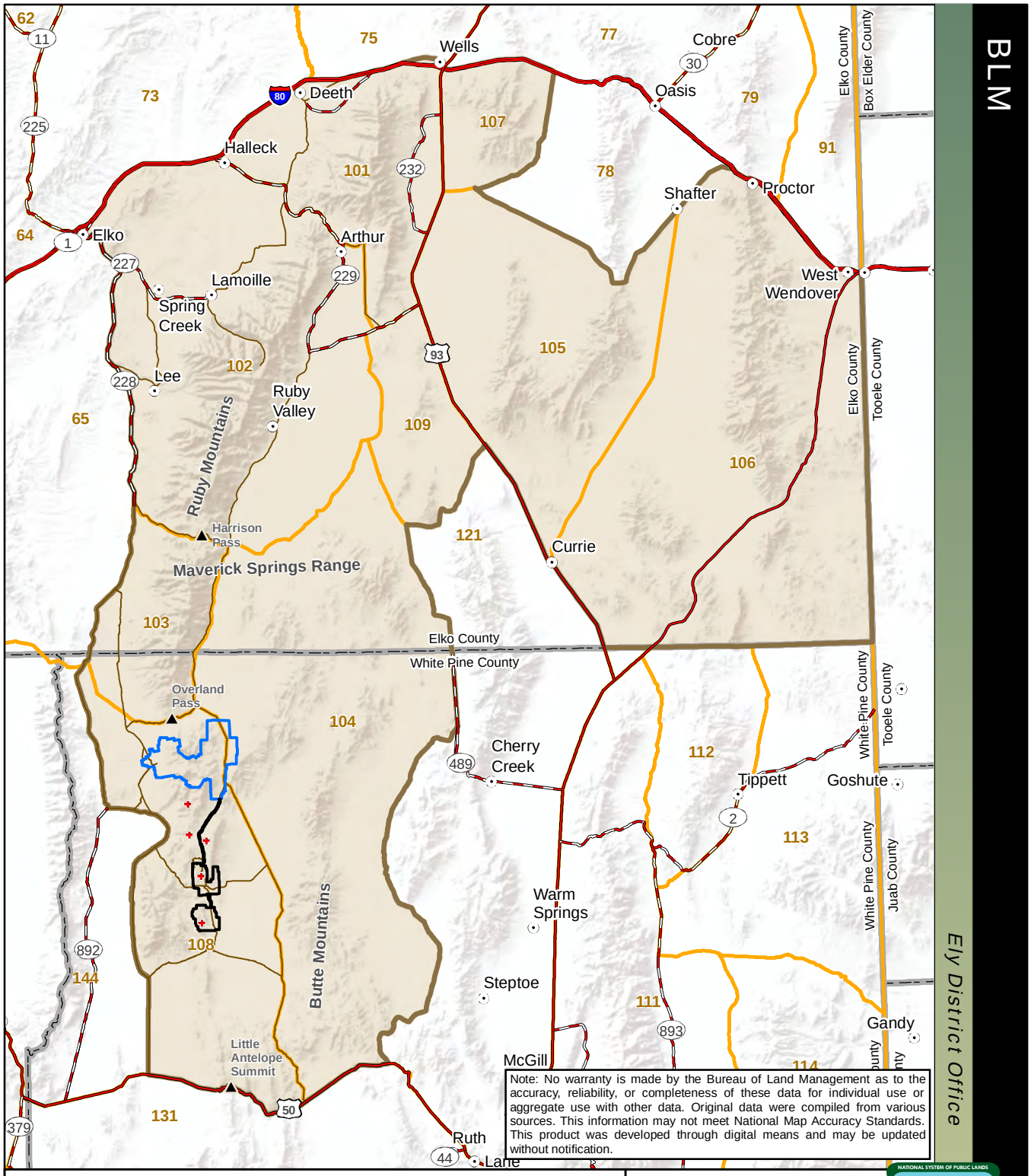
Wildlife species and habitats found within the study area are typical of the Great Basin region (BLM 2009a). Available water for wildlife consumption is limited to ephemeral drainages, springs, and seeps, and two artificial wildlife guzzlers within the study area. Water sources, particularly those that maintain open water and riparian vegetation, support a greater diversity and population density of wildlife species than any other habitat types occurring in the study area. Ephemeral drainages, springs, and seeps within and adjacent to the study area are illustrated in **Figures 3.3-2** and **3.3-3**; wildlife guzzlers within the study area are illustrated in **Figure 3.7-1**. Natural water features are typically located in the uppermost headwater reaches of canyons, or along channels and banks above approximately 6,200 feet. Springs that occur in or adjacent to the northern part of the study area include upper and lower Mill Spring, South Water Canyon Spring (also known as South Water Canyon Seep), Cherry Spring, Bourne Tunnel Spring, and Willow Spring. The South Water Canyon Spring typically flows until late summer or early fall, as do the Cracker Johnson #1 and #2 springs north of the study area. Refer to Section 3.3, Water Quality and Quantity, for a detailed discussion on surface water resources.

Information regarding wildlife species and habitat within the study area and CESA was obtained from a review of existing published sources; site-specific surveys; BLM, NDOW, and USFWS file information; and Nevada Natural Heritage Program (NNHP) database information.

3.7.1.2 Big Game Species

Mule deer (*Odocoileus hemionus*), pronghorn (*Antilocapra americana*), and elk (*Cervus canadensis nelsoni*) are the primary big game species occurring within the project region (NDOW 2011a). The study area occurs entirely within NDOW Management Area 10, specifically Hunt Units 104 and 108 (**Figure 3.7-1**).

Population numbers for mule deer, pronghorn, and elk fluctuate slightly from year-to-year based on habitat conditions. Important limiting factors to big game populations within the study area are habitat fragmentation, impediments to migration between seasonally important habitats, and hunting. Other factors affecting big game species use of the study area include water availability, forage quality, cover, and weather patterns.



Bald Mountain Mine North and South Operations Area Projects EIS

Figure 3.7-1

Wildlife Resources Cumulative Effects Study Area

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Mule Deer

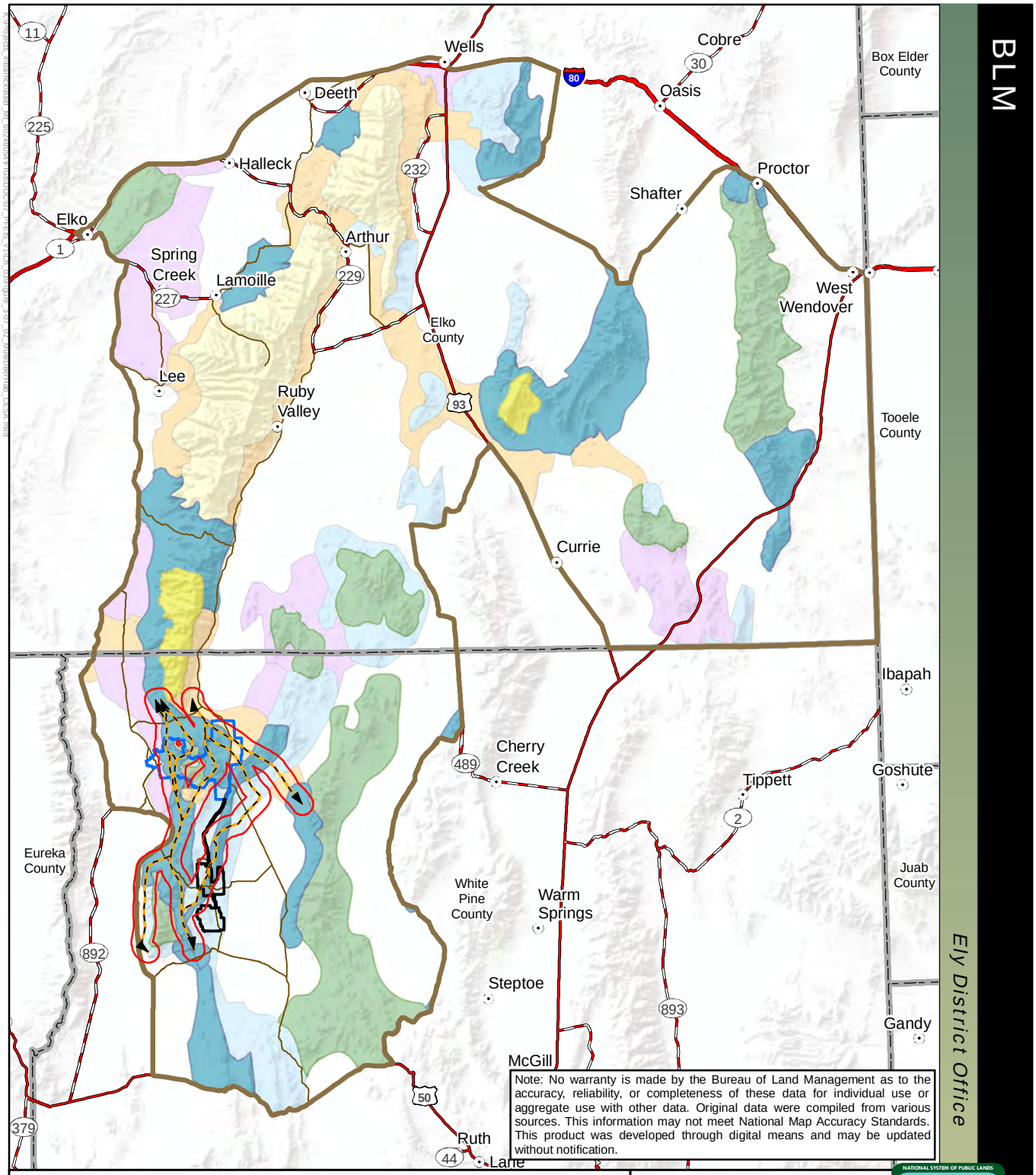
Population numbers for mule deer in Management Area 10 have shown a 22 percent increase over the last 15 years due to favorable habitat conditions and the lack of large-scale wildfires that have occurred in other portions of northern Nevada. According to the NDOW the Management Area 10 mule deer herd is estimated at 24,500 (McAdoo 2012). This represents approximately 23 percent of Nevada's mule deer and the largest deer herd in the state. During spring 2013 helicopter surveys, NDOW classified approximately 8,526 mule deer in Management Area 10 (NDOW 2015a).

Mule deer are the primary game species currently hunted in Nevada (Wasley 2004). Mule deer hunting provides recreational opportunities as well as generating substantial revenue for management agencies and local economies through the sale of hunting tags and other hunting related material (Heffelfinger and Messmer 2003). The relative recreational and economic importance of the Management Area 10 mule deer herd is demonstrated by the annual allocation of hunting permits which varies from year-to-year but has averaged approximately 5,000 tags from 2009 to 2015 (NDOW 2015b). Although Management Area 10 is comprised of approximately 10 percent of the surface area of the entire State of Nevada, according to NDOW, approximately 27 percent of all Nevada mule deer hunting permits in 2013 were allocated to Management Area 10 (NDOW 2014b). Management Area 10 is comprised of big game hunt units 101,102,103,104,105,106,107, 108, and 109 (**Figure 3.7-1**).

Mule deer use of the study area is seasonally variable but typically peaks during the winter months and during migration in the fall and spring months. The majority of the mule deer in Management Area 10 typically spend the summer months in the Ruby Mountains and East Humboldt Mountains, north of the study area, and winter along the southern end of the Ruby Mountains and western edge of the Butte Mountains (east of the study area) (NDOW 2012b). Although the study area supports resident mule deer herds, the majority of mule deer utilize the study area as connectivity habitat between areas of winter and summer ranges. The Bald Mountain area is considered an important migratory route for mule deer moving from summer range in NDOW Hunt Units 101, 102, and 103 to winter range in Hunt Units 104, 108, and 131.

Approximately 5,011 acres of undisturbed (e.g., undeveloped, unburned) year-round habitat, 10,462 acres of undisturbed winter habitat, and 18,211 acres of undisturbed crucial winter range occurs within the study area. The nearest designated mule deer summer range is located approximately 5 miles due north of the NOA. The study area also has been designated as an important mule deer migration corridor by the NDOW for the Area 10 Mule deer herd due to the geographic location, topographic features, and the vegetative cover of the study area between mule deer summer and winter range (**Figures 3.7-2** and **3.7-3**). This migration corridor is primarily used by mule deer; however, elk also use the study area, including the migration corridor as suitable seasonal habitat, depending on weather patterns and snow conditions. Details on the big game migration corridor are presented below.

By definition, a wildlife movement corridor is a linear habitat with a primary function of connecting two or more important habitat areas (Harris and Gallagher 1989). Migration is an adaptive behavioral strategy that allows ungulates to avoid resource shortages (Baker 1978). Across the Intermountain West, it is common for ungulates to seasonally migrate from low-elevation winter ranges to high-elevation summer ranges, allowing them access to high-quality forage necessary for successful breeding and recruitment of young (Albon et al. 1987; Cook et al. 2004; Singer et al. 1997). The Ruby Deer Herd occupies the Ruby and East Humboldt mountain ranges during the summer months and migrates south once snowfall begins to accumulate at depths that limit available forage. Although the extent of the southward migration is variable and dependent upon snow depth conditions on summer and transition ranges and the duration of snow coverage, some level of migratory use of the study area by mule deer occurs every year. Obligate migrators will utilize the study area every year regardless of conditions, while facultative migrators use of the study area can vary year-to-year. During mild winters, mule deer may not migrate as far south as the study area, but during severe winters, as many as 16,000 mule deer may move through



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Legend

- Proposed NOA Plan Boundary
- Proposed SOA Plan Boundary
- Cumulative Effects Study Area
- Mule Deer General Migration Routes
- Mule Deer General Migration Corridor

Habitat Type

- Limited Use
- Summer Crucial Range
- Summer Range
- Transition Range
- Crucial Winter
- Winter Range
- Year-round

Source: NDOW 2014, Sawyer and Brittell 2014, SRK 2012.

Bald Mountain Mine North and South Operations Area Projects EIS

Figure 3.7-2

Mule Deer Habitat within the Cumulative Effects Study Area

0 5 10 20 Miles

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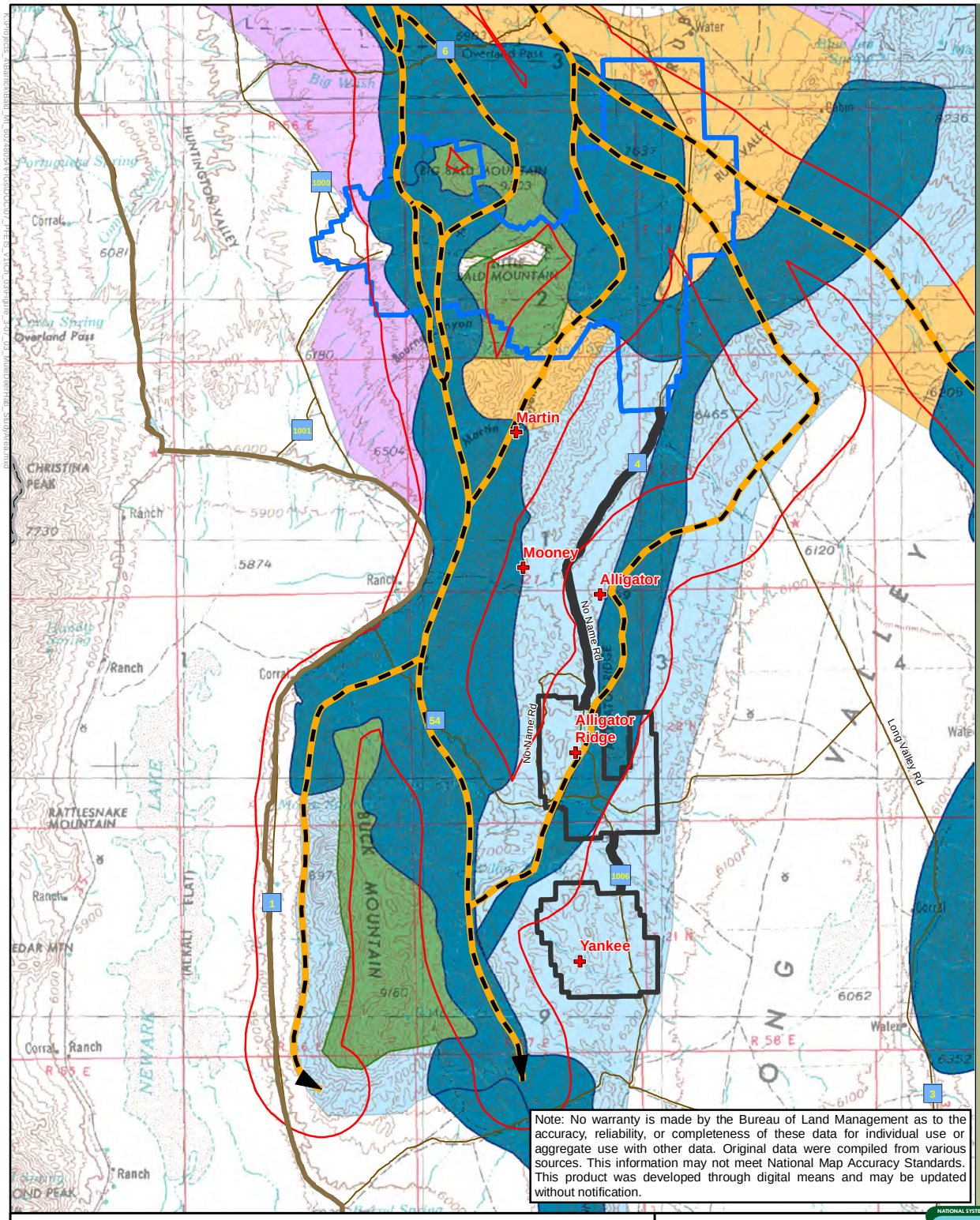

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Ely District Office

Legend

- Proposed NOA Plan Boundary
- Proposed SOA Plan Boundary
- Cumulative Effects Study Area
- Wildlife Guzzler
- Mule Deer General Migration Routes
- Mule Deer General Migration Corridor

Habitat Type

- Limited Use Range
- Transition Range
- Crucial Winter Range
- Winter Range
- Year-round Range

Source: NDOW 2014, Sawyer and Brittell 2014, SRK 2012.

Bald Mountain Mine North and South Operations Area Projects EIS

Figure 3.7-3

Mule Deer Habitat within the Study Area

0 1 2 4 Miles

N

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the study area and continue south to crucial winter range habitat located near the Little Antelope Summit and U.S. Highway 50 (BLM 2009a). The number of mule deer migrating through the study area and the total length of those migrations varies from year to year. In some years, limited numbers of migrating mule deer have been observed through telemetry monitoring to move as far south as Hunt Unit 131. Mule deer are highly philopatric and unlikely to modify or alter migration routes at a large scale to avoid impediments, which add additional hardships and risks to migratory individuals (Wasley 2004). Recent radio collar telemetry data collected indicate that the migration corridor splits in the proposed NOA and most mule deer migrate south along the western edge of the southern Ruby Mountains, while smaller numbers of mule deer move southeast toward the Maverick Springs Range and Butte Mountains (NDOW 2012a). More specifically, 2012 radio collar telemetry data collected by the NDOW for the project area indicated that, within the proposed NOA, mule deer utilized the corridor traversing the areas of the proposed Redbird Pit, Redbird RDA, Rat West RDA, Rat Pit, Numbers Pit Complex, North 1 RDA, North 2 RDA, RBM North RDA, and the associated interpit areas adjacent to the proposed Redbird and Rat pits (NDOW 2012a). Telemetry data also have shown that some migrating mule deer are able to navigate through the NOA at the present time, avoiding areas of mining disturbance including open pits and vertical slopes of road cuts. The increased energetic cost to migrating mule deer likely has adverse consequences on body condition of individual mule deer and to the overall fitness of the Area 10 herd (McAdoo 2012). Wintering mule deer migrate back north through the study area once snowmelt occurs and grasses and shrubs green-up in the spring. During the 2012 spring migration, the majority of the deer collared during the 2012 migratory study (McAdoo 2012), migrated through the proposed NOA during the month of April. It is important to note that unseasonably mild conditions were observed during the 2011/2012 winter within the study area, affecting seasonal use areas for mule deer and potentially resulting in migratory movements not representative of most years (McAdoo 2012). However, the data collected during the 2012 study was largely consistent with historic records from NDOW biologists and mine personnel; and additional aerial surveys during the post-season and spring deer composition surveys of the area (McAdoo 2012). As discussed above, a portion of the local mule deer herd will utilize the study area as a migratory corridor on a seasonal basis regardless of conditions. These obligate migrators may utilize alternate routes through the study area as heavy snow accumulations may cause certain migratory pathways to become impassable but are unlikely to avoid non-natural impediments resulting from human developments (Wasley 2004).

NDOW, the University of Nevada Reno, and Barrick initiated the Bald Mountain Mule Deer Collaring Project in 2012 to collect baseline global positioning system (GPS) data to assess migratory patterns of deer that utilize the Bald Mountain Mine area. Collars were deployed on 12 deer in 2012 and 28 collars were installed on deer in 2013. Sawyer and Brittell (2014) conducted an analysis of the GPS data collected from the collared mule deer on behalf of the NDOW. Estimates of individual and population-level mule deer migration routes from GPS data were determined through the use of the Brownian bridge movement model. The analysis focused on determining mule deer high-use migration routes, stop over sites, and movement rates in the vicinity of the existing Bald Mountain Mine as well as a larger area extending from the Ruby Mountains to south of U.S. Highway 50. The analysis identified one distinct high use route that most deer used to move from winter ranges near U.S. Highway 50 north into the Ruby Mountains. The reportedly high-use route extended approximately 85 miles and ranged between 0.25 and 1.25 miles in width. The route splits for approximately 2 miles near the south end of the Bald Mountain Mine and again for approximately 6 miles north of the mine, from Overland Pass to Sherman Mountain. The high-use route ends just north of Harrison Pass Road where deer split off to continue migrations along both the east and west side of the Ruby Mountains. In the vicinity of the Bald Mountain Mine, the high-use route appeared to split in the vicinity of the proposed Redbird Pit and then pass through the western portions of the North 1 RDA. A prominent mule deer stopover site (Mill Spring) was identified just north of the proposed Redbird Pit. The Sawyer and Brittell (2014) analysis of mule deer migration data provides further evidence that although mule deer migrate through the existing mine site at the current levels of disturbance, the level of additional energy expenditures required for mule deer to negotiate the study area and the resulting effects on overall herd health and productivity are not well defined.

Pronghorn

Pronghorn numbers have been stable to slightly increasing in Management Area 10 over the past 5 years due to favorable habitat conditions and the lack of large-scale wildfires that have occurred in other portions of northern Nevada (NDOW 2014d). Recent NDOW surveys in herd management units 104 and 108 have resulted in NDOW estimates of approximately 950 pronghorn (NDOW 2015c). NDOW estimates approximately 100 pronghorn in the Buck Mountain and Bald Mountain areas (BLM 2009a; SRK 2008). Use of the study area by pronghorn is highly dependent on water and availability of quality forage as well as snow depth during the winter months. The majority of the pronghorn in this area of Nevada typically use the lower elevation habitats of Huntington, Ruby, Butte, and Long valleys (NDOW 2012b), and can be consistently found within the study area. Pronghorn have been observed to consistently use areas of suitable habitat within the SOA formerly referred to as the Yankee and Alligator Ridge units (NDOW 2015c). Recently, pronghorn antelope have been observed to be expanding their seasonal range into wooded areas not typically associated with pronghorn use (NDOW 2015b,c). Portions of the study area are designated as year-round habitat and winter range. Approximately 16,424 acres of undisturbed (e.g., undeveloped, unburned) year-round habitat and 163 acres of undisturbed winter range occurs within the study area. **Figures 3.7-4** and **3.7-5** illustrate pronghorn habitat ranges within the CESA and study area, respectively.

Elk

Elk numbers have steadily increased over the last several years in Management Area 10 due to an increase in herbaceous forage from above-average late summer precipitation received in 2012 and 2013. NDOW aerial surveys classified 449 elk during January 2014 surveys and a majority of the study area is designated as year-round habitat (NDOW 2014d). Approximately 39,407 acres of undisturbed (e.g., undeveloped, unburned) year-round habitat occurs within the study area. **Figures 3.7-6** and **3.7-7** illustrate elk habitat ranges within the CESA and study area, respectively.

Mountain Lion

In Nevada, mountain lions (*Puma concolor*) also are classified as a big game species. Mountain lions are fairly common in central Nevada and typically occupy higher elevations habitats. They often travel between mountain ranges and valleys depending on prey availability. Based on NDOW harvest data, mountain lion populations in eastern Nevada have been stable to increasing over the past 5 years (NDOW 2011a). **Table 3.7–1** provides details regarding harvested mountain lions in Game Management Units (GMUs) within the study area (GMUs 104 and 108) and other adjacent GMUs that also are utilized by local mountain lion populations. Although harvest results are not an accurate indicator of population densities they provide an indicator of hunter effort per NDOW GMU. Approximately 24,135 acres of undisturbed mountain lion suitable habitat occurs within the study area.

Table 3.7-1 Summary of Mountain Lion Harvest in GMU 102, 103, 104, and 108

Season	Number of Mountain Lions Harvested			
	GMU 102	**GMU 103**	**GMU 104**	**GMU 108**
2012	10	11	1	1
2011	10	1	1	1
2010	12	7	0	0
2009	10	4	0	1
2008	4	3	0	0
2007	5	0	2	0
2006	8	2	0	0
2005	4	2	0	0
2004	6	4	1	1
2003	7	4	0	0
10-yr Average	**7.6**	**3.8**	**0.5**	**0.4**

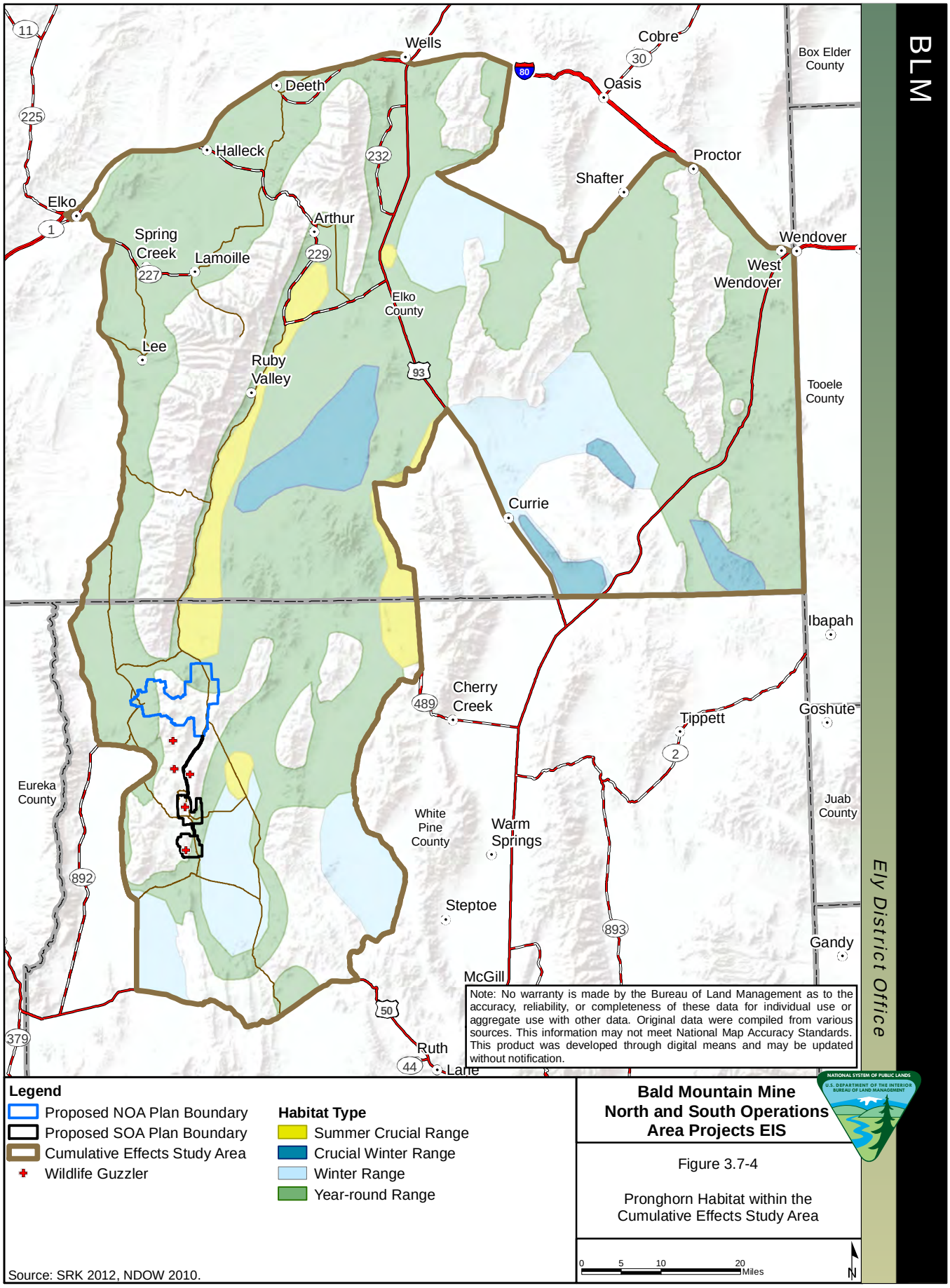

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Figure 3.7-4

Pronghorn Habitat within the Cumulative Effects Study Area

Source: SRK 2012, NDOW 2010.

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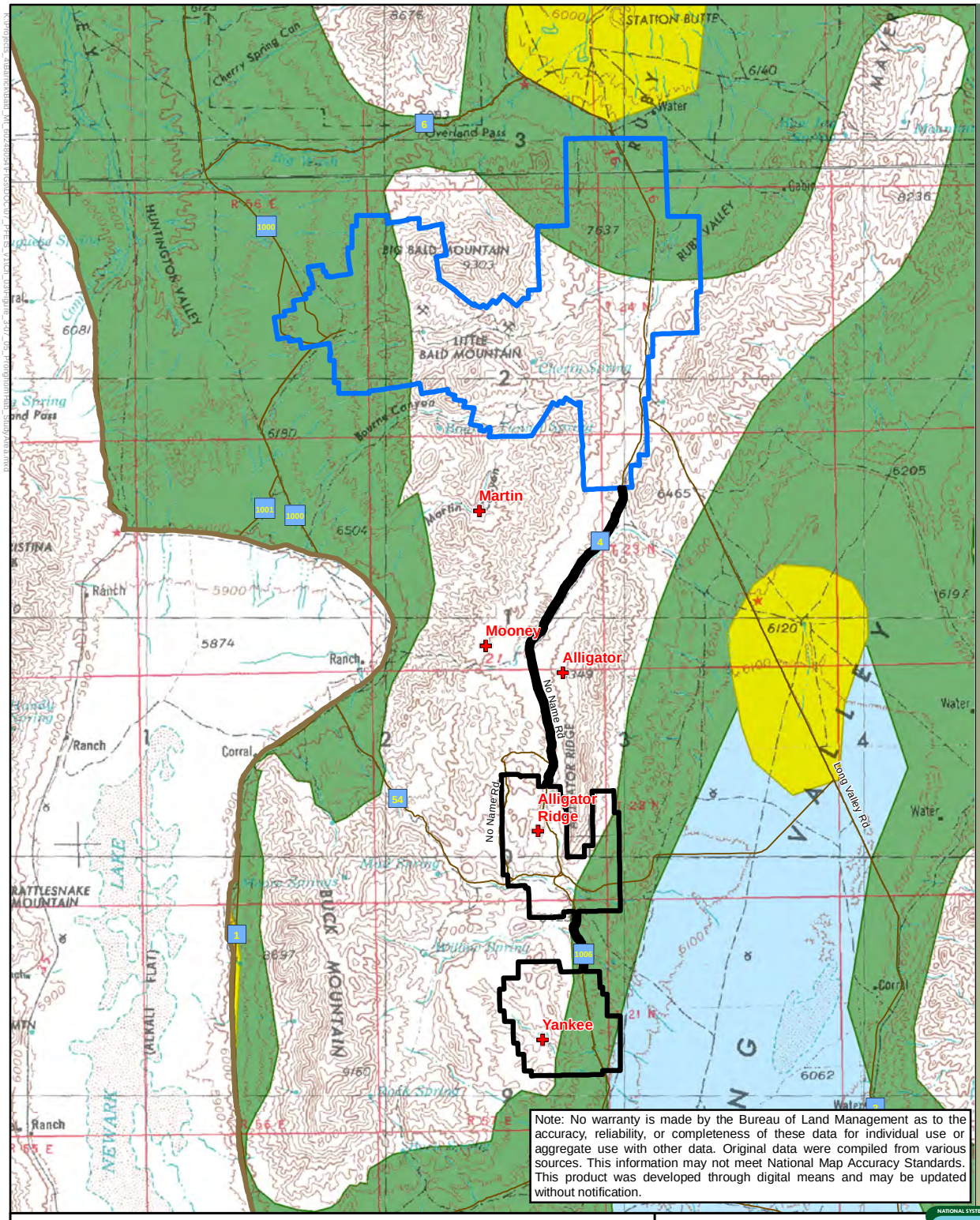

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Legend

- Proposed NOA Plan Boundary
- Proposed SOA Plan Boundary
- Cumulative Effects Study Area
- Wildlife Guzzler

Habitat Type

- Summer Crucial Range
- Winter Range
- Year-round Range

Source: SRK 2012, NDOW 2010.

Bald Mountain Mine North and South Operations Area Projects EIS

Figure 3.7-5

Pronghorn Habitat within the Study Area

0 1 2 4 Miles

N

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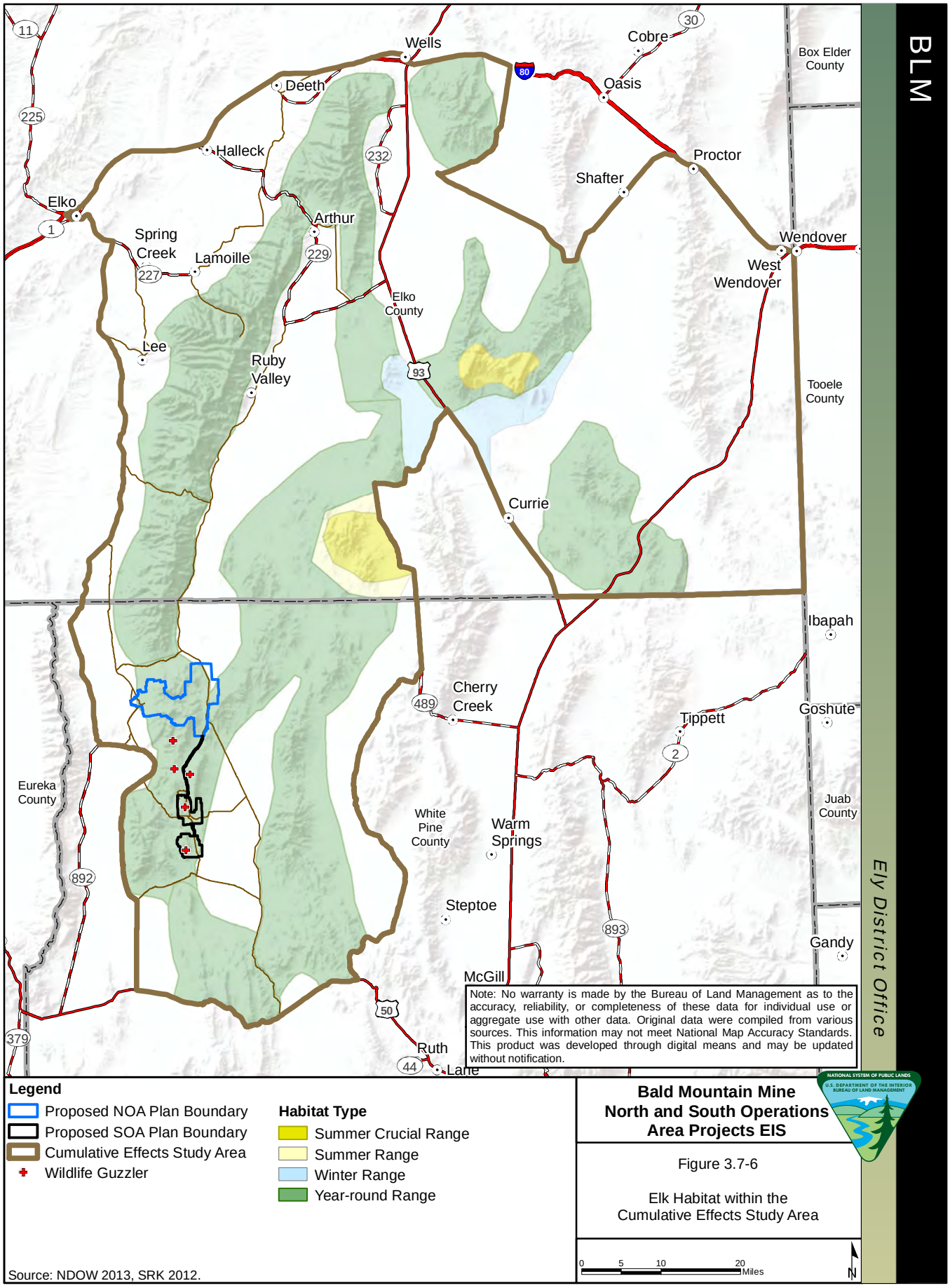

Bald Mountain Mine North and South Operations Area Projects EIS

Figure 3.7-6

Elk Habitat within the Cumulative Effects Study Area

Source: NDOW 2013, SRK 2012.

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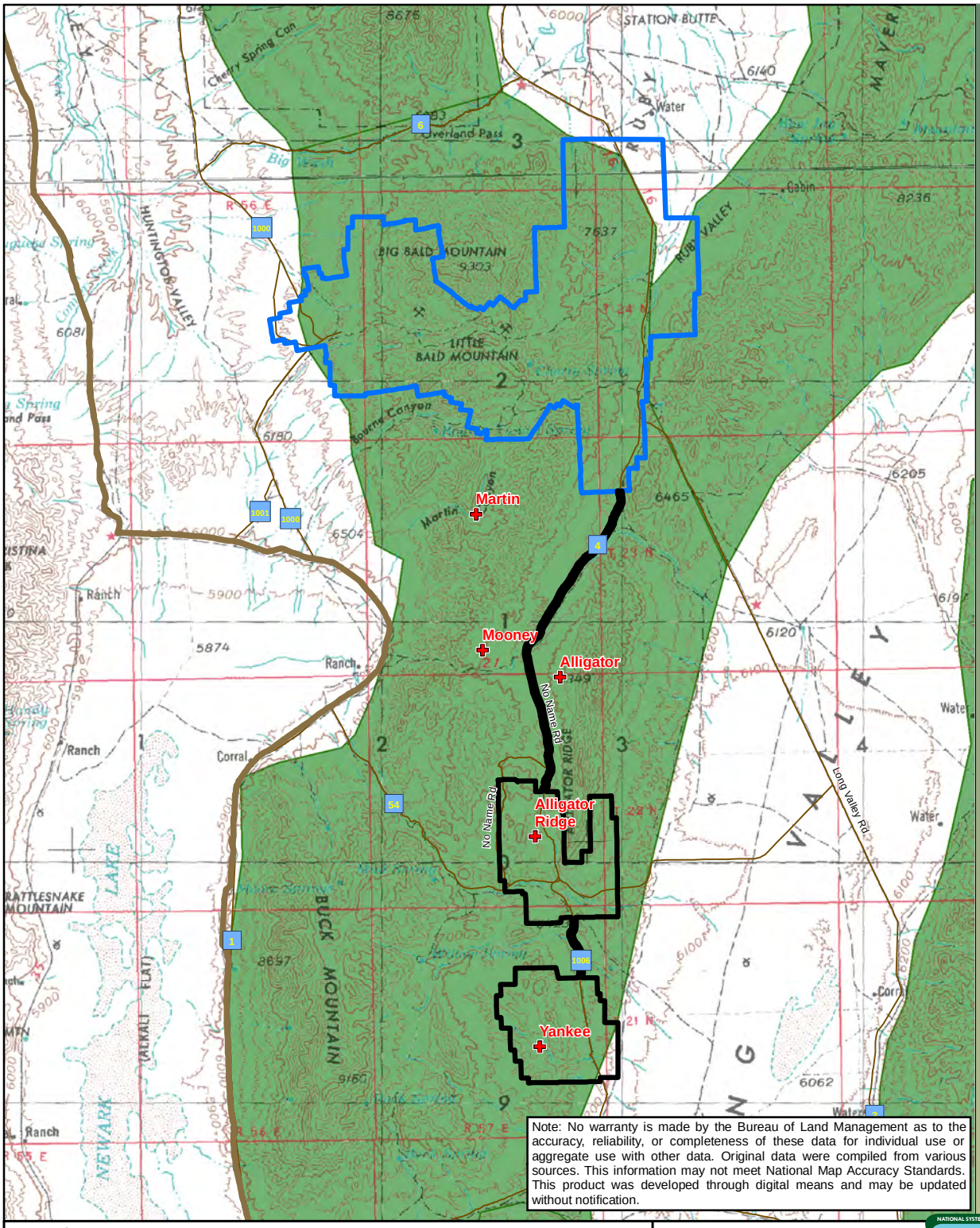

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Legend

- Proposed NOA Plan Boundary
- Proposed SOA Plan Boundary
- Cumulative Effects Study Area
- Wildlife Guzzler

Habitat Type

- Year-round Range

Source: NDOW 2013, SRK 2012.

Bald Mountain Mine North and South Operations Area Projects EIS

Figure 3.7-7

Elk Habitat within the Study Area

0 1 2 4 Miles

N

BLM

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3.7.1.3 Small Game Species

Several upland game bird species are found within the study area that includes approximately 24,135 acres of suitable small game habitat. Species that occur within the study area include greater sage-grouse (*Centrocercus urophasianus*), dusky grouse, chukar, gray partridge, and mourning dove (BLM 2009a; JBR 2012a; NDOW 2011c; SRK 2011a). Dusky grouse have been documented within the study area and are typically found within or near forested habitats (BLM 2009a). Chukar occur within the study area, especially on rocky ridges and hillsides with cheatgrass near a water source (BLM 2009a). Gray partridge are found at lower elevations within the study area near riparian drainages and agricultural areas (BLM 2009a). Although mourning doves are a migratory bird species, they can be found in a wide range of habitats in close proximity to water and are most likely to occur within the study area during spring, summer, and early fall (Floyd et al. 2007; Wildlife Action Plan Team 2006). Mountain quail have been reintroduced to the study area through two separate releases on the west side of Buck Mountain adjacent to the SOA. Approximately 200 mountain quail were released during the winters of 2012 and 2013 and have established a resident population (NDOW 2014c). The greater sage-grouse is a federal candidate and a BLM sensitive species and is discussed in detail in Section 3.8, Special Status Species.

Several rabbit species are known to occur within the study area, including mountain cottontail and pygmy rabbit. Pygmy rabbits have been documented in the project vicinity and habitat has been mapped within the study area (BLM 2009a; NNHP 2012a; SRK 2011b). Although the pygmy rabbit is considered a game species in Nevada (NDOW 2011b), it also is a BLM sensitive species and is discussed in Section 3.8, Special Status Species.

Furbearing species classified under NAC Section 503.025 potentially occurring within the study area include gray fox, kit fox, and bobcat (Wildlife Action Plan Team 2012). Although furbearing species occur in multiple habitat types within the study area, a higher diversity of furbearers is likely present along the intermittent drainages and seeps and springs within the study area due to the increased structural diversity of habitat and availability of food sources. Other mammal species that may occur within the study area include coyote, badger, short-tailed weasel, long-tailed weasel, spotted skunk, red fox, and black-tailed and white-tailed jackrabbits (BLM 2009a).

Due to the lack of suitable open water habitat, no waterfowl concentrations are found within the study area. Ruby Lake NWR, located approximately 4 miles north of the study area, is one of the most important wetland habitat complexes found in northeast Nevada. The Ruby Lake NWR provides habitat for many species of waterfowl and other wildlife species.

3.7.1.4 Nongame Species

A diversity of nongame species (e.g., small mammals, passerines, raptors, reptiles, and amphibians) occupies the study area that includes approximately 24,135 acres of suitable non-game wildlife habitat. Habitats found within the study area (e.g., big sagebrush, pinyon-juniper woodland) support a variety of resident and seasonal nongame species. Acreages of these existing habitats are presented in **Table 3.5-1**. Nongame mammals include the deer mouse, western harvest mouse, vagrant shrew, Merriam's shrew, Ord's kangaroo rat, sagebrush vole, golden-mantled ground squirrel, least chipmunk, and desert woodrat (BLM 2009a; Wildlife Action Plan Team 2012). Rodent populations provide a large prey base for the area's predators.

<u>Bats</u>

A number of bat species are known to inhabit the project region and potential bat roosting habitat has been documented within the study area (JBR 2011b). The presence of pit highwalls, forested habitat (e.g., pinyon-juniper woodland), and wetland habitat (e.g., spring/seeps) indicates that the study area contains suitable roosting and foraging habitat for several bat species including the pallid bat, western small-footed myotis, long-eared myotis, Townsend's big-eared bat, big brown bat, spotted bat, silver-haired bat, hoary bat, fringed myotis, little brown myotis, California myotis, long-legged myotis, Yuma

myotis, Brazilian free-tailed bat, and western pipistrelle bat (BLM 2009a; Bradley et al. 2006). The majority of the bats identified for the proposed NOA and SOA projects are currently BLM sensitive species and/or Nevada protected species (Bradley et al. 2006; NNHP 2012b). These species are presented in detail in Section 3.8, Special Status Species.

Detection surveys for bat species were conducted within the study area in 2006 and 2012 (JBR 2012a, 2006). The surveys detected a diversity of both roosting and foraging bat species within the vicinity of the project area, with tree-roosting species most commonly documented (JBR 2012a). During the 2006 survey, historic mine underground workings or caves within the study area were surveyed visually; a total of 10 bats were identified (9 western small-footed myotis and one long-eared myotis) (JBR 2006). **Table 3.7-2** summarizes the species and number of calls recorded at each of the AnaBat survey sites within the study area in 2012 (JBR 2012a). The Water Canyon site represents potential foraging habitat, while the other sites surveyed were mine workings representing potential roost sites. The majority of the bats recorded during the 2012 surveys were myotis bats. Long-eared, little brown, long-legged and dark-nosed small-footed myotis calls were the most frequently recorded, with some variation between sites (JBR 2012a).

Table 3.7-2 Number of Bat Calls Recorded at AnaBat Recording Sites in May and August 2012

Species	Water Canyon GPS-14 Overflow near Source	Eastern Little Bald Mountain GPS-10 Adit with Ore Card Tracks	SW of Upper Bourne Canyon			
			GPS-78 Partially Juniper Log-covered Working	GPS-76 Shaft near Tank	GPS-77 Shaft into Seam in Limestone Outcrop	GPS-107 Eastern Working on South Slope
Pallid bat (*Antrozous pallidus*)	3	-	-	2	-	-
Townsend's big-eared bat (*Corynorhinus townsendii*)	1	-	-	-	-	-
Big brown bat (*Eptesicus fuscus*)	7	-	-	4	-	1
Hoary bat (*Lasiurus cinereus*)	4	-	-	-	-	-
Silver-haired bat (*Lasionycteris noctivagans*)	4	-	-	1	-	-
California myotis (*Myotis californicus*)	24	-	-	-	-	1
Long-eared myotis (*Myotis evotis*)	43	3	19	20	21	9
Little brown bat (*Myotis lucifugus*)	13	20	-	22	28	-
Dark-nosed small-footed myotis (*Myotis melanorhinus*)	116	-	-	13	3	12

Table 3.7-2 Number of Bat Calls Recorded at AnaBat Recording Sites in May and August 2012

Species	Water Canyon GPS-14 Overflow near Source	Eastern Little Bald Mountain GPS-10 Adit with Ore Card Tracks	SW of Upper Bourne Canyon			
			GPS-78 Partially Juniper Log-covered Working	GPS-76 Shaft near Tank	GPS-77 Shaft into Seam in Limestone Outcrop	GPS-107 Eastern Working on South Slope
Long-legged myotis (*Myotis volans*)	228	2	6	16	21	13
Yuma myotis (*Myotis yumanensis*)	-	-	-	1	1	3
Brazilian free-tailed bat (*Tadarida braziliensis*)	-	-	-	-	5	-

No calls recorded.

Source: JBR 2012a.

Migratory Birds

Nongame birds encompass a variety of passerine and raptor species including migratory bird species that are protected under the MBTA (16 USC 703-711) and EO 13186 (66 FR 3853). Suitable habitat for migratory bird species totaling 24,135 acres occurs across all undisturbed areas of the study area. Pursuant to EO 13186, a Memorandum of Understanding (MOU) between the BLM and USFWS outlines a collaborative approach to promote the conservation of migratory bird populations. The purpose of the MOU is to strengthen migratory bird conservation by identifying and implementing strategies that promote conservation and avoid or minimize adverse impacts on migratory birds in coordination with state, tribal, and local governments. This MOU identifies specific activities where cooperation between the BLM and USFWS would contribute to the conservation of migratory birds and their habitat. In addition, the BLM Nevada State Office prepared Migratory Bird BMPs for the Sagebrush Biome in order to assist BLM field offices in the consideration of migratory birds in land management activities (BLM 2003). In Nevada, all birds protected under the MBTA also are state protected (NAC 503.050). Many of the sensitive migratory bird species found in Nevada also are identified in the Nevada Partners in Flight (PIF) Bird Conservation Plan (Neel 1999). This plan, along with the Birds of Conservation Concern (BCC) Plan (USFWS 2008b), prioritizes migratory bird species for management actions according to habitat types.

Partners in Flight Priority Bird Species

The national PIF program began in 1989 as a coordinated effort to document and reverse apparent declines in the populations of neotropical migratory birds that breed north of Mexico and then migrate to Mexico, Central, South America and the Caribbean in the winter months (Neel 1999). Several PIF priority bird species have been documented within the study area (**Appendix E**).

USFWS Birds of Conservation Concern

A list of BCC was developed as a result of a 1988 amendment to the Fish and Wildlife Conservation Act. This Act mandated that the USFWS “identify species, subspecies, and populations of all migratory

nongame birds that, without additional conservation actions, are likely to become candidates for listing under the Endangered Species Act of 1973." The goal of the BCC list is to prevent or remove the need for additional Endangered Species Act (ESA) bird listings by implementing proactive management and conservation actions, and that these species would be consulted on in accordance with EO 13186, Responsibilities of Federal Agencies to Protect Migratory Birds (USFWS 2008b). The study area is located within Bird Conservation Region (BCR) 9 (Great Basin). This BCR region contains a wide variety of habitats from high elevation coniferous forests and alpine tundra to low elevation desert and sagebrush shrublands. Due to the habitat diversity, a large number of migratory birds are found year-round or during migration within this region, which also serves as a major migration corridor for bird species migrating to and from western Canada through the U.S. to Mexico and Central and South America (USFWS 2008b). BCC species that are known to occur within the study area include Brewer's sparrow, golden eagle, greater sage-grouse, green-tailed towhee, pinyon jay, sagebrush sparrow, and sage thrasher (**Appendix E**).

Several baseline biological surveys have been conducted within the study area since 2008 (BLM 2009a; JBR 2011b; SRK 2014, 2011a, 2008). In total, 66 avian species have been documented as occurring within the study area as summarized in **Appendix E**.

Many of these species are associated with a variety of habitat types and some occur within the project vicinity year-round (e.g., red-tailed hawk, golden eagle, chukar, black-billed magpie, common raven). However, due to the higher level of plant diversity and structure, more abundant potential nest sites, and greater food base and water sources, the habitats near spring/seeps support the highest diversity of bird species within the study area.

Raptor species that potentially occur as residents or migrants within the study area include eagles (bald and golden eagles), hawks (e.g., red-tailed hawk, Swainson's hawk, ferruginous hawk), falcons (e.g., prairie falcon, American kestrel), accipiters (e.g., northern goshawk, Cooper's hawk), owls (e.g., short-eared owl and burrowing owl), northern harrier, and turkey vulture (Floyd et al. 2007; Herron et al. 1985; NDOW 2012b). Bald and golden eagles are protected under the Bald & Golden Eagle Protection Act (16 USC 668 et seq.) and are discussed in detail in Section 3.8, Special Status Species. Raptor surveys were conducted from 2010 to 2014. The survey area for raptors in 2010 and 2011 encompassed the Exploration area of the Plan of Operations. In 2012, the raptor survey area was increased to include areas within a 5-mile radius of the NOA and SOA project areas. In 2013 and 2014, the raptor survey area was increased to include a 10-mile radius around the NOA and SOA project areas based on USFWS recommendations. Sixty-eight raptor nests have been documented within the vicinity of the study area, including 22 golden eagle nests, 16 ferruginous hawk nests, 10 red-tailed hawk nests, 1 Swainson's hawk nest, 6 Cooper's hawk nests, 1 northern harrier nest, 4 prairie falcon nests, 1 turkey vulture nest, 2 burrowing owl nest, 3 great horned owl nests, and 4 unknown nests (JBR 2012b, 2011b, Stantec 2015). Some nests have been observed to have been used by multiple species between 2010 and 2014. Of the 68 nests identified, 21 were considered active in 2012, including 8 golden eagle nests, 6 red-tailed hawk nests, 3 prairie falcon nests, 1 burrowing owl nest, 2 great-horned owl nests, 1 Cooper's hawk nest, and 1 raven nest that was previously occupied by ferruginous hawks. **Table 3.7-3** presents the 68 raptor nests found within the study area and the status and nest results from 2010 to 2014. Species associations of nests that were observed to be inactive during the 2010 through 2014 survey periods are based upon observations of nest size, location, substrate, and habitat made by field biologists at the time of survey.

Additional information on BLM and state-sensitive migratory bird and raptor species such as golden eagle, ferruginous hawk, sage thrasher, and loggerhead shrike are discussed further in Section 3.8, Special Status Species.

Table 3.7-3 Raptor Nests Identified within the Vicinity of the Study Area

Nest Name and Number	Distance from Existing Disturbance (miles)	Year, Status, Nest Results			
		2011	2012	2013	2014
Golden Eagle Nests					
Water Canyon Golden Eagle Nest (WC-1)	Within existing disturbance areas.	Inactive, birds regularly observed in area.	Active early in season. Adult observed on the nest during April survey, but not on subsequent ground surveys in 2012.	Active early in season. Adult observed on the nest during April survey, but not on subsequent ground surveys in 2013.	Inactive
Tognini Mountains Probable Golden Eagle Nest (TM-1)	1.00	Inactive	Inactive	Inactive	Inactive
Tognini Cliffs Golden Eagle Nest (TM-2)	0.30	-	Active, one young on nest.	Inactive	Inactive
Tognini Cliffs Golden Eagle Nest (TM-4)[1]	0.28	-	-	-	Inactive
Martin Canyon Probable Golden Eagle Nest (MC-1)	2.14	Inactive	Inactive	Inactive	Inactive
West Mooney Summit Probable Golden Eagle Nest (WMS-1)	4.30	Inactive	Inactive	Inactive	Inactive
Buck Station Golden Eagle Nest (BS-1)	5.15	-	-	Active/Occupied; single young believed fledged	Active/Occupied; two young believed fledged
Mud Springs Golden Eagle Nest (MS-1)	2.75	-	-	Inactive	Inactive
Buck Pass Golden Eagle Nest (BP-1)	3.53	Inactive	Active early in season. Adult observed on the nest during March survey, but not on subsequent surveys in 2012.	Active/Occupied; single young believed fledged	Active/Occupied; one young believed fledged

Table 3.7-3 Raptor Nests Identified within the Vicinity of the Study Area

Nest Name and Number	Distance from Existing Disturbance (miles)	Year, Status, Nest Results			
		2011	2012	2013	2014
Southwest Buck Mountain Outcrops Golden Eagle Nest (SBM-1)	4.55	-	-	Active/Occupied; one young fledged	Inactive
Southwest Buck Mountain Golden Eagle Nest (SBM-2)	4.75	-	-	Active/Occupied; one young fledged	Active/Occupied; two young fledged
Alligator Ridge Golden Eagle Nest (AR-1)	Within existing disturbance areas.	Inactive, appears to be old golden eagle nest.	Active early in season. Adult observed on the nest during March survey, but not on subsequent surveys in 2012.	Inactive	Active/Occupied; one young fledged
Alligator Ridge Golden Eagle Nest (AR-2)	0.45	-	-	Inactive	Inactive
Warm Springs South Golden Eagle Nest (WS-1)	7.30	-	Active, one young on nest.	Inactive	Inactive
Warm Springs South Golden Eagle Nest (WS-2)	7.25	-	-	Active/Occupied; single young believed fledged	Inactive
North Tognini Mountains Golden Eagle Nest (TM-3)	4.80	-	Inactive	Inactive	Active early in the season, success unconfirmed
Yankee Pit Stick Nest (YP-1)	Within existing disturbance areas.	Inactive, possible red-tailed hawk nest.	Inactive	Inactive	Active/Occupied; at least one young fledged
Cherry Canyon Golden Eagle Nest (CCN-1)	4.60	-	Inactive	Inactive	Inactive
Fort Ruby Golden Eagle Nest (FR-1)	5.15	-	Inactive	Inactive	Inactive

Table 3.7-3 Raptor Nests Identified within the Vicinity of the Study Area

Nest Name and Number	Distance from Existing Disturbance (miles)	Year, Status, Nest Results			
		2011	2012	2013	2014
Headwaters Golden Eagle Nest (HW-1)	6.10	-	Inactive	Active early, then abandoned	Inactive
Nick's Well Golden Eagle Nest (NW-1)	7.20	-	Inactive	Inactive	Active early, believed to have failed
Roost Canyon Golden Eagle Nest (RC-1)	6.70	-	Inactive	Inactive	Active/Occupied; two eggs observed, number of young successfully fledged is unconfirmed
Ferruginous Hawk Nests					
Northwest Mine Probable Ferruginous Hawk Nest North (NWM-1)	1.21	Inactive	Inactive	Inactive	Inactive
Northwest Mine Probable Ferruginous Hawk Nest North (NWM-4)	1.01	Inactive	Inactive	Inactive	Inactive
Northwest Mine Ferruginous Hawk Nests, Middle Group (NWM-6)	1.12	Active, bird on nest on April 20; Inactive on May 24, June 9, and June 24.	Active raven nest, eggs in nest on April 25.	Inactive	Occupied by common ravens
Probable Ferruginous Hawk (NWM-7)	1.18	Inactive	Inactive	Inactive	Inactive
Northwest Mine Probable Ferruginous Hawk Nests, South Draw (NWM-8)	0.80	-	Inactive	Inactive	Inactive

Table 3.7-3 Raptor Nests Identified within the Vicinity of the Study Area

Nest Name and Number	Distance from Existing Disturbance (miles)	Year, Status, Nest Results			
		2011	2012	2013	2014
Northwest Mine Probable Ferruginous Hawk Nests South (NWM-3)	0.50	Inactive	Inactive	Inactive	Inactive
Probable Ferruginous Hawk (NWM-2)	0.67	Inactive	Inactive	Inactive	Inactive
Beck Pass Ferruginous Hawk Nest (BEP-1)	Outside of Exploration Area	-	-	Active, two young fledged	Inactive
Bourne Canyon Road Ferruginous Hawk Nest (BC-1)	3.86	Active, two young fledged.	Inactive	Inactive	Inactive
Bourne Canyon Road Probable Ferruginous Hawk Nest (BC-2)	4.00	-	Inactive	Active, two young fledged	Inactive
Bourne Canyon Road Probable Ferruginous Hawk Nest (BC-3)	4.00	-	Inactive	Inactive	Inactive
Long Valley Range Front Probable Ferruginous Hawk Nest North (LV-2)	5.00	Inactive	Inactive	Inactive	Inactive
Long Valley Range Front Probable Ferruginous Hawk Nest South (LV-3)	2.34	Inactive	Inactive	Inactive	Inactive

Table 3.7-3 Raptor Nests Identified within the Vicinity of the Study Area

Nest Name and Number	Distance from Existing Disturbance (miles)	Year, Status, Nest Results			
		2011	2012	2013	2014
South Area Ferruginous Hawk Nest (LV-1)	0.70	Active, one young fledged.	Inactive	Inactive	Inactive
Southeast Area Alternate Ferruginous Hawk Nest (LV-4)	2.00	-	Active, nearly fledged young in nest.	Inactive	Inactive
South Area Ferruginous Hawk Nest (LV-5)[1]	1.95	-	-	-	Inactive
Red-tailed Hawk Nests					
Horseshoe Pit Red-tailed Hawk Nest (HSP-1)	Within existing disturbance areas.	Active, outcome uncertain.	Active, two fledglings in nest.	Active, two fledglings in nest	Active/Occupied; at least one young fledged
Little Bald Mountain Mine Red-tailed Hawk Nest (LBM-1)	Within existing disturbance areas.	-	Active, two young fledged.	Inactive	Active/Occupied; two young believed fledged
Casino Red-tailed Hawk Nest (CP-1 formerly PF-1)	Within existing disturbance areas.	-	Active, two nearly fledged young in nest.	Inactive	Inactive
Casino Red-tailed Hawk nest (CP-2)[1]	Within existing disturbance areas.	-	-	-	Active/Occupied; two young believed fledged
Orchard Canyon Red-tailed Hawk Nest (OC-1)	5.10	-	Active, young in nest.	Uncertain	Occupied by Great-horned owl
North Cherry Creek Stick Nest (CC-1)	Within existing disturbance areas.	Inactive, possible red-tailed hawk nest.	Inactive	Inactive	Inactive

Table 3.7-3 Raptor Nests Identified within the Vicinity of the Study Area

Nest Name and Number	Distance from Existing Disturbance (miles)	Year, Status, Nest Results			
		2011	2012	2013	2014
Galaxy Pit Red-tailed Hawk Nest (GP-1)	Within existing disturbance areas.	-	-	Uncertain	Active early, nest success unconfirmed
RBM Pit Nest (RB-1)[1]	Within existing disturbance areas.	-	-	-	Inactive
Saga Pit Red-tailed Hawk Nest (SAGA-1)[1]	Within existing disturbance areas.	-	-	-	Active/Occupied, believed to have fledged 2 young
Northeast Red-tailed Hawk Nest (NE-1)[1]	1.05	-	-	-	Active/Occupied, believed to have fledged 2 young
Swainson's Hawk Nests					
Northwest Mine Swainson's Hawk Nest (NWM-5)	1.02	Occupied by ferruginous hawks.	Inactive	Uncertain	Occupied early by ferruginous hawk; inactive after first visit
Cooper's Hawk Nests					
Water Canyon Cooper's Hawk Nest (WC-2)	Within existing disturbance areas.	Inactive	Inactive	Inactive	Inactive
Cottonwood Springs Cooper's Hawk Nest (CW-1)	3.73	Inactive	Inactive	Inactive	No data
Cottonwood Springs Cooper's Hawk Alternate Nest (CW-4)	3.90	-	Inactive	Inactive	No data
Buck Pass Cooper's Hawk Nest (BP-2)	3.13	Inactive	Active, two young fledged.	Inactive	Inactive

Table 3.7-3 Raptor Nests Identified within the Vicinity of the Study Area

Nest Name and Number	Distance from Existing Disturbance (miles)	Year, Status, Nest Results			
		2011	2012	2013	2014
Middle Cottonwood Springs Cooper's Hawk Nest (CW-5)	4.5	-	-	Active, outcome uncertain	No data
Water Canyon Cooper's Hawk Nest (WC-3)[1]	Within existing disturbance areas.	-	-	-	Active/Occupied: number of fledglings unconfirmed
Northern Harrier Nest					
Cottonwood Springs Canyon Northern Harrier Nest (CW-2)	3.41	Inactive	Inactive	Inactive	Inactive
Prairie Falcon Nests					
Mooney Basin Prairie Falcon Nest (MB-2)	0.21	Active, outcome uncertain.	Active, three young on nest.	Active	Active, outcome uncertain.
Bourne Canyon Prairie Falcon Nest (BC-4)	0.10	-	Active, four young fledged.	Inactive	Inactive
Nick's Well Prairie Falcon Nest (NW-2)[1]	7.05	-	-	-	Active/Occupied; 5 downy young observed, number of successful fledglings unconfirmed
Yankee Pit North Prairie Falcon Nest (YPN-1)[1]	Within existing disturbance areas.	-	-	-	Active/Occupied, outcome uncertain
Turkey Vulture Nest					
Mooney Basin Turkey Vulture Nest (MB-1)	0.06	Occupied by common ravens.	Inactive	Inactive	Inactive

Table 3.7-3 Raptor Nests Identified within the Vicinity of the Study Area

Nest Name and Number	Distance from Existing Disturbance (miles)	Year, Status, Nest Results			
		2011	2012	2013	2014
Burrowing Owl Nests					
Warm Springs Road Burrowing Owl Nest (WSR-1)	5.50	-	Active, young bird perched near culvert.	Inactive	Inactive
Warm Springs Road Burrowing Owl Nest (WSR-1)	5.25	-	-	Inactive	Active, outcome uncertain.
Great-horned Owl Nests					
Galaxy Pit Great-horned Owl Nest (GP-2)	Within existing disturbance areas.	-	-	Active, two young observed	Inactive
RBM Pit Great-horned Owl Nest (RB-2)[1]	Within existing disturbance areas.	-	-	-	Active early in season, productivity unconfirmed
Unknown Nests					
Big Wash Stick Nest – Species Unknown (BW-1)	2.50	-	Inactive	No data	No data
Cottonwood Springs Stick Nest - Species Unknown (CW-3)	3.63	Inactive	Inactive	Inactive	Inactive
Rat Pit Nest (RAT-1)[1]	Within existing disturbance areas.	-	-	-	Inactive
Stick Nest North of Cherry Canyon (CC-1)	0.5	-	-	Inactive	Inactive

[1] New nests located by Stantec in 2014.

Sources: JBR 2012b, 2011b, Stantec 2015.

Reptiles and Amphibians

Several species of reptiles are known to occur within the study area including the Great Basin whiptail, gopher snake, western rattlesnake, sagebrush lizard, desert horned lizard, western skink, and western

fence lizard (BLM 2009a). These species occupy a wide variety of habitats and are most active during the summer and early fall months. Amphibians potentially occurring within the study area include Pacific chorus frog and Great Basin spadefoot toad (BLM 2009a).

Fisheries

Due to a lack of perennial water sources providing aquatic habitat within the study area (e.g., creeks, streams, lakes, etc.), no fisheries resources are found within the study area (SRK 2008).

3.7.2 Environmental Consequences

This section discusses project related impacts to wildlife resources resulting from the Proposed Action, Reconfiguration Alternative, WRM Alternative, and No Action Alternative. Primary issues related to wildlife resources include loss or alteration of native habitats, increased habitat fragmentation, animal displacement, direct loss of wildlife, and impacts associated with water management.

Potential impacts on wildlife may include the temporary (short-term and long-term) and permanent reduction or loss of habitat. Short-term impacts arise from habitat removal and disturbance from activities associated with mine operation. Short-term impacts would cease upon completion of successful initial reclamation and closure efforts. Long-term impacts consist of changes to habitats and the wildlife populations that depend on those habitats, irrespective of reclamation success over the life of the mine. Permanent impacts are typically associated with the development and expansion of open pits, which permanently alter the vegetation, soil, and topography of the landscape.

Direct impacts to wildlife populations may include direct mortalities from mine development, habitat loss or alteration, incremental habitat fragmentation, and animal displacement. Indirect impacts could include increased noise, additional human presence, and the potential for increased vehicle-related mortalities due to the increase of acreages disturbed and the extension of the life of mining activity. The degree of the impacts on terrestrial wildlife species and their upland habitats would depend on factors such as the sensitivity of the species, seasonal use patterns, type and timing of project activity, and physical parameters (e.g., topography, cover, forage, and climate).

3.7.2.1 Proposed Action

Surface Disturbance

Under the Proposed Action, implementation of surface disturbance activities as a result of proposed development and expansion would result in the long-term reduction of approximately 7,097acres of wildlife habitat, including approximately 3,051 acres of big sagebrush, 4,028 acres of pinyon-juniper woodland, 14 acres of mountain brush, and 6 acres of low sagebrush. With the exception of open pits, all project components would be reclaimed, representing a permanent loss of 863 acres of wildlife habitat within the proposed NOA; and a permanent loss of 347 acres of wildlife habitat within the proposed SOA. Woody species such as sagebrush and pinyon-juniper would require up to 25 years and 100 years, respectively, to reach maturity. The disturbance associated with the proposed project would be reclaimed following completion of mining activities. **Table 3.5-3** summarizes the vegetation cover types and associated acreage and percentage of the study area that would be disturbed as a result of implementation of the Proposed Action.

Impacts to wildlife from mine and exploration surface disturbance activities would include the temporary reduction or loss of habitat. Habitat loss or alteration would result in direct losses of smaller, less mobile species of wildlife, such as small mammals and reptiles, and the displacement of more mobile species into adjacent habitats. In areas where habitats are at, or near, carrying capacity, animal displacement could result in some unquantifiable reductions in local wildlife populations. Mine and exploration surface disturbance also would result in an incremental increase in habitat fragmentation in the study area until reclamation has been completed and vegetation has been re-established. Noise and visual disturbance resulting from mining and exploration related activities may deter wildlife from using available sources of

water within and near the project. This impact would result in increases of energy expenditure and reduced overall fitness for wildlife forced to travel farther between undisturbed water sources.

Impacts to wildlife species within the Ruby Lake NWR could potentially occur from the increase of vehicle traffic from construction and mine personnel commuting to the project area over the life of mining operations. These impacts would be more pronounced during the construction phase of the project and could include increased mortality from collisions with vehicles, increased vehicle noise, and reductions of habitat suitability as a result of increased fugitive dust and reduced water quality of waterbodies located adjacent to county roads. Detailed discussion of potential increases of traffic volume is presented in Section 3.15, Land Use and Access.

Approximately 16 miles (15 percent) of ephemeral streams within the proposed NOA project, and approximately 9 miles (16 percent) of ephemeral streams within the proposed SOA project would be directly impacted as a result of the Proposed Action. Additionally, the Proposed Action would remove two existing wildlife guzzlers. The loss of ephemeral drainages and artificial water sources would represent a reduction in available water for wildlife. However, this reduction is anticipated to be minimal as ephemeral streams provide access to water only during runoff events and do not serve as consistent water sources. Perennial springs, seeps, and springs provide a consistent water source for wildlife, and although these features would not be removed by construction of the Proposed Action, the potential for impacts to baseflow levels at two locations is anticipated under the Proposed Action as discussed below under Water Management Activities. A reduction in water quality is not anticipated due to implementation of Barrick's Plan of Operations and associated ACEPMs (Barrick 2012a,b). For more information regarding impacts to water sources see Section 3.3, Water Quality and Quantity and Section 3.20, Hazardous Materials and Solid Waste.

Water Management Activities

As discussed in Section 3.3, Water Quality and Quantity and Section 3.5. 2.1, Wetlands and Riparian Areas, groundwater drawdown under the Proposed Action has the potential to impact two springs (South Water Canyon Seep and JBR No. 14) and up to 32.88 acres of associated wetland habitat and riparian habitat within the maximum extent of the 10-foot groundwater drawdown contour (**Figure 3.3-17**). Given the total of 41 acres of wetland habitat within the project area, the Proposed Action may impact up to approximately 80 percent of the wetland habitat within the NOA and SOA areas. Therefore, impacts to wildlife that utilize any groundwater drawdown impacted wetland and riparian habitats would increase as a result of increased groundwater pumping, but would decrease once pumping ceases and groundwater levels rebound. As noted in Section 3.3.2.1, hydrographs predict that drawdown would persist at these locations over the 100-year post-mining period (Geomega 2015b). Therefore, potential impacts would include a potential decrease in riparian and wetland vegetation. These areas also would be at-risk for increased proliferation of noxious and invasive weeds.

Willow Spring (LV-011) also is located within the anticipated maximum extent of the 10-foot groundwater drawdown contour (**Figure 3.3-17**). Multiple wildlife species including mule deer have been observed using this spring when flowing water is present (NDOW 2015d). As discussed in Section 3.3.2.1, impacts to this spring are not anticipated due to the fact that there is a large depth to groundwater and low hydraulic conductivity of the formation. This suggests that Willow Spring is controlled by shallow perched conditions that are not hydraulically interconnected with the groundwater system that would be affected by mine induced drawdown. Therefore, impacts to the flow at Willow Spring are not anticipated under the Proposed Action.

A reduction in groundwater level from pumping operations would potentially reduce the water availability at each affected spring as well as to associated groundwater dependent vegetation communities adjacent to spring areas. The potential loss or reduction in available water as a result of water level change could result in long-term changes in these wildlife habitats where the water sources are hydraulically connected to pumped areas. Reduction or loss of habitats associated with water sources would impact local terrestrial wildlife dependent on these sources, resulting in a possible reduction or

loss of cover, breeding sites, foraging areas, and changes in both plant and animal community structure. Naturally occurring seeps and springs provide important wildlife habitat in the project study area. These habitats and their associated plant communities contribute to greater wildlife species diversity, as compared to the adjacent upland areas. Since surface water and associated habitats are limiting factors for wildlife in the study area, loss of these habitat features would alter the available habitat for species that depend on these areas, resulting in: 1) a reduction of available water for consumption; 2) a reduction in amount or quality of groundwater dependent vegetation types for breeding, foraging, and cover; 3) a reduction in the local wildlife habitat carrying capacity; 4) displacement and loss of animals; 5) a reduction in the overall biological diversity; 6) a potential long-term impact to the population numbers of some species; and 7) and a reduction in prey availability.

Species groups likely affected by reduction in groundwater dependent habitats would include: big game, small mammals, upland game birds, waterfowl, nongame birds (e.g., raptors and passerines), bats, reptiles, and invertebrates. Due to the fact that riparian and wetland habitat types are limited within the study area and the surrounding areas, it is assumed that species dependent on these habitat types are currently at carrying capacity. As a result, individuals displaced as a result of reduction in amount or quality of these habitats could be lost, concentrating the remaining animals within smaller habitat areas. The adverse impacts of groundwater pumping under the Proposed Action would be expected to change the distribution and movements of big game. As pumping would alter the availability of water and associated foraging habitat within the project area, big game would make use of these high value habitats where they are found. The potential reduced availability of spring and wetland habitats due to groundwater pumping under the Proposed Action, could result in reductions or even loss of local populations of less mobile species in the NOA and displacement of mobile species. For migratory birds, pumping impacts could decrease the amount of stopover habitat available in the NOA.

The degree of impacts to wildlife resources would depend on a number of variables, such as the existing habitat values and level of use, species' sensitivity (i.e., level of dependency on groundwater dependent habitats), the extent of the anticipated water and habitat reductions/shifts, and capacity for wildlife to accommodate additional effects.

Human Presence and Noise

The most common wildlife responses to noise and human presence are avoidance or accommodation. Avoidance would result in displacement of animals from an area larger than the actual disturbance area. The total extent of habitat loss as a result of the wildlife avoidance response is impossible to predict since the degree of this response varies from species to species and can even vary between individuals of the same species. Also, after initial avoidance of human activity and noise-producing areas, certain wildlife species may acclimate to the activity and begin to reoccupy areas formerly avoided. For example, during the initial development phases, it is likely that big game (i.e., deer, pronghorn, and elk) would be displaced from a larger area than the actual disturbance sites due to the avoidance response. However, these big game species have demonstrated the ability to acclimate to a variety of activities as long as human harassment levels do not increase substantially (Ward 1976). Therefore, it is possible that the extent of displacement would approximate the actual disturbance area after the first few years of mine operation (Ward 1976). In addition to avoidance response, increased human presence intensifies the potential for wildlife/human interactions ranging from harassment of wildlife to illegal harvest (i.e., poaching).

Several factors would combine to minimize the potential increase of impacts related to increased human presence in the study area. First, the proposed NOA and SOA projects are in the immediate vicinity of existing mine sites where human activity associated with mining operations continues to date. Second, to minimize wildlife/vehicle-related collision impacts during project operations, Barrick would require speed limits enforced under previous authorizations to be maintained.

Game Species

Mule Deer

Direct impacts to mule deer would include the incremental long-term reduction of potential forage and the incremental increase in habitat fragmentation from vegetation removal associated with mine development activities. Displacement of big game, as a result of direct habitat loss and indirect reduction in habitat quality, has been widely documented (Irwin and Peek 1983; Lyon 1983, 1979; Rost and Bailey 1979; Ward 1976). Big game species tend to move away from areas of human activity and roads, reducing habitat utilization near the disturbance areas and also have shown increased avoidance of areas with higher traffic rates (Cole et al. 1997; Sawyer et al. 2006). Displacement distances are strongly influenced by the level and timing of human activity, topography, and the presence of vegetation (Cole et al. 1997; Lyon 1979), presumably due to noise attenuation and visual cover. Displacement of big game is greatest for heavily traveled secondary and dirt roads. Most research has focused on displacement distances for elk and deer.

Displacement distances indicate the distance from the road's centerline where animal densities are less than in surrounding areas (i.e., under-utilized habitat). Mule deer displacement distances ranged from 330 feet to 0.6 mile, depending on the presence of vegetative cover (Ward 1976). For evaluation purposes, 660 feet was the most common displacement distance used for deer, especially in areas with minimal vegetative cover. Deer and pronghorn have been observed to habituate to vehicles. Displacement distances decreased when traffic was predictable, moving at constant speeds, and was not associated with out-of-vehicle activities (Ward 1976). In addition, big game may experience increased mortality rates due to increased vehicle traffic on the haul road that runs between the proposed NOA and SOA projects. Vehicular traffic may injure or kill individuals, and local populations may experience higher levels of mortality due to increased use of roads in the immediate project vicinity.

Human related disturbances have been shown to divert time and energy away from foraging, resting, and other activities that improve fitness, which would be important to wintering ungulates whose nutritional condition is closely linked to survival (Frid and Dill 2002; Gill et al. 1996). These human-related disturbances on wildlife energetics, demography, and habitat selection are particularly important among temperate ungulates whose survival depends on minimizing energy expenditures during winter (Hobbs 1989; Parker et al. 1984). Furthermore, animals displaced from disturbed sites may experience greater intraspecific competition or density dependent effects when congregating into smaller areas of undisturbed or suboptimal habitat (Gill and Sutherland 2000).

Potential direct impacts to mule deer would include the incremental long-term reduction of potential forage and the incremental increase of habitat fragmentation from vegetation removal associated with mine development activities. Under the Proposed Action, the proposed NOA and SOA projects would result in the long-term direct removal of approximately 386 acres of the 5,011 acres (8 percent) of undisturbed mule deer year-round habitat within the study area; approximately 2,180 acres of the 10,462 acres (20 percent) of undisturbed mule deer winter range within the study area; and approximately 2,415 acres of the 18,211 acres (13 percent) of undisturbed mule deer crucial winter range within the study area. These habitats consist primarily of big sagebrush and pinyon-juniper dominated vegetation communities. Additional loss of habitat, especially habitat within the mule deer migration corridors, would result in an incremental reduction in the amount of available mule deer habitat in the study area.

Potential impacts to South Water Canyon and JBR No. 14 springs resulting from groundwater pumping within the NOA would reduce available wetland habitat utilized by migrating mule deer. As discussed above, approximately 32.88 acres of potentially impacted wetland habitat associated with South Water Canyon and JBR No. 14 springs is located within the designated mule deer migration corridor between the Redbird and Top Pits. Naturally occurring springs and wetlands provide important mule deer migratory stopover habitat in the project study area by providing available water and high quality herbaceous forage in comparison to other areas of migratory corridors. The potential reduction or loss of

habitats associated with these water sources would impact migrating mule deer, resulting in a possible reduction or loss of migration stopover sites and foraging areas. Although migrating mule deer have been observed to spend a majority of seasonal migration time at stopover locations along a specific migration route, the ecological attributes of stopover locations and spacing of stopover sites required by mule deer along a seasonal migration route remains unclear (Sawyer and Kaufmann 2011). Furthermore, research has indicated that although stopover sites are important to completion of seasonal migrations, mule deer are not severely constrained by stopover spacing and are able to navigate both shorter and longer distances between stopovers (Sawyer and Kaufmann 2011).

Under the Proposed Action, mine development would leave no continuous undisturbed areas for mule deer moving north and south through the east and west side of the proposed NOA project. This would remove the remaining “undisturbed continuous corridors” for mule deer annual migration. For the purposes of this EIS, any reference to “undisturbed corridors” in relation to the three designated mule deer migration corridors means no large scale disturbance. Haul roads and exploration activities occur within “undisturbed corridors.” Currently, these “undisturbed continuous corridors” are located between the Rat facilities and the Administrative facilities on the west side of the NOA and in the general location of the Poker Flats facilities on the east side of the NOA. Though these corridors, which would be eliminated as a result of the Proposed Action, are considered continuous and undisturbed, there are currently existing haul roads and exploration activities located within them that result in noise and human presence within the corridor. The resulting behavioral shift by mule deer to negotiate disturbed terrain and avoid mining activities increases the animal’s physiological energy expenditures due to elevated stress levels. This disturbed terrain would include pits, RDAs, bermed haul roads, equipment parking and storage areas, lighted work areas, temporary facilities (trailers, etc.). As disclosed in the migratory study conducted by the NDOW for the study area (McAdoo 2012), based on the efficiency (time per mile) of travel within the mining disturbance areas, as compared to other movements observed by the same animal in undisturbed areas, mule deer activity collected from the collared deer is indicative of an increased metabolic energy demand on deer navigating mining-related disturbance. Even given only the current mining disturbance, increased negative energetic costs are being imposed on migrating mule deer through the mine site area (McAdoo 2012). The removal of undisturbed migration corridors under the Proposed Action is anticipated to result in adverse impacts upon the ability of mule deer in Management Area 10 to successfully migrate through the NOA in the event of severe seasonal events such as extremely cold winters with heavy snowfall. Given that ungulate migrations have been observed to generally occur along traditional routes that are learned and passed on from mother to young (McCullough 1985; Sweanor and Sandegren 1988), the complete removal of suitable migration corridors through the NOA would likely result in long-term population level impacts to the Management Area 10 mule deer herd.

Historically, the Management Area 10 mule deer herd has experienced increased mortality during severe winter events. From the period of 1982 to 1984 in eastern Nevada, the impacts of a series of severe winters characterized by below average temperatures and above normal snowfall accumulations experienced approximately every 25 years combined with wildfires in important mule deer winter range habitat to result in a decline of approximately 50 percent of the estimated Management Area 10 mule deer herd (National Climate Data Center 2014; NDOW 1981 through 1984). As a result of this decline in the overall Management Area 10 mule deer herd, hunt tag allocations in Management Area 10 were reduced by approximately 61 percent over the same time period. Following these reductions, the Management Area 10 mule deer herd experienced a strong growth trend as range conditions improved due to increased seasonal precipitation, a lack of wildfires, and multiple years of mild winter conditions characterized by below average snowfall. Correspondingly, the number of mule deer hunting tags allocated within Management Area 10 increased to historically high levels by 1988 (NDOW 1988). This pattern of population declines resulting from severe winters followed by population increase was again experienced in Management Area 10 in the late 1990s. Management Area 10 hunting tags allocated by NDOW followed this same trend of declines and growth as a lagging indicator of population estimates. Although hunting tag allocations generally follow general population estimates by management area, several other population dynamics and habitat condition factors are considered by NDOW biologists

when determining appropriate hunter harvest levels (NDOW 2014a). These factors can include population dynamics of buck to doe ratios, fawn recruitment, and age-class structure. Habitat factors considered can include the present condition of important seasonal ranges resulting from annual precipitation levels, impacts of wildfire, and impacts of range conditions in areas of livestock and wild horse grazing. This complexity of biotic and abiotic factors results in the inability to accurately quantify the level of mortality that would be experienced by the Management Area 10 mule deer herd under the Proposed Action.

It should be noted that some of the risk to mule deer under the Proposed Action would be alleviated by the mule deer design features described in Section 2.4.3.1. These include providing matched berm cuts along haul roads in identified mule deer corridors, designing haul road cuts at a slope to facilitate mule deer migration, maximizing the use of natural topography where possible instead of building haul road berms. Additionally, these design features would require that RDAs be recontoured to 3H:1V or shallower slopes to facilitate deer movement. RDA edges would be reclaimed concurrently to RDA construction to maximize the vegetated portion of the RDA to provide for wildlife movement as soon as possible. These design features also would include limitations on exploration activities in identified corridors during active migration periods (November 30 to January 5 and March 15 to April 30). Based on the time of year, mule deer collar movement data, and/or the type of activity, exploration activities may be authorized within designated mule deer migration corridors only when determined appropriate by the authorized officer. All interpit areas would be reclaimed as soon as activity in them is complete and reclamation would include the planting of shrub seedlings and use of pinyon-juniper skeletons to provide for security cover in identified migration routes within the NOA. Successful implementation of these design features under the Proposed Action may facilitate deer migration through disturbed areas and would provide assistance to deer in traversing haul roads. This would provide some benefit for migrating mule deer but would not entirely remove the risks described above as it would not provide for open undisturbed mule deer migration corridors with mature vegetation for cover.

To ensure the design features are effectively implemented to the maximum benefit for migrating mule deer, a Mule Deer Monitoring Plan was developed in consultation with the NDOW and BLM (**Appendix F**). This Mule Deer Monitoring Plan would guide the on-going data gathering on migrating mule deer which would be used to adaptively manage mitigation measures to facilitate deer migration.

To offset the permanent loss of mule deer crucial winter range within the study area, Barrick has voluntarily committed to restore and enhance important summer and winter mule deer range located on public land managed by the BLM or State of Nevada within the vicinity of the Bald Mountain Mine at a ratio of 1:1, as presented in **Table 2.4-54**. Barrick commits to coordinating with NDOW and other appropriate land management agencies to identify appropriate areas for restoration or to provide monetary compensation sufficient to offset the loss of crucial wintering range within the NOA and SOA. Compensatory mitigation in the form of monetary compensation of up to $600 per acre of permanent disturbance would be applied to aid in funding current and future authorized habitat enhancement activities such as the Overland Pass Habitat Enhancement Decision and the Huntington and Newark Watershed Restoration Projects. Under the Proposed Action, approximately 781 acres of mule deer crucial winter range would be permanently removed or disturbed. Restoration activities that would be used to restore important seasonal mule deer range that do not interfere with mining activities include, but would not be limited to any of the following:

- Seeding Treatments – Possible seeding treatments include broadcast and drag, drill, broadcast/aerial, harrow, disking, and hand.
- Mechanical Treatment – To provide for an adequate seedbed, mechanical treatments would include disking (plowing), harrowing and mowing of existing grasses.
- Livestock Grazing and Protective Fencing – Provides rest from livestock grazing.

- Herbicide Treatment – A combination of herbicide treatments would be used to suppress non-native annuals and crested wheatgrass in order to introduce shrubs, forbs and grasses into the treatment areas.
- Prescribed Burn Treatments – Controlled burns would be used to reduce fuels, control competing vegetation, and improve wildlife and mule deer habitat.
- Restoration activities would occur within a 10-year period and would commence prior to surface disturbance located within mule deer crucial wintering range within the project area.

Pronghorn

The types of impacts to pronghorn would be similar to those previously discussed for mule deer with the exception of potential impacts to migratory habitat. Pronghorn within the project area do not rely upon migratory corridors to the same extent as mule deer, therefore potential impacts under the Proposed Action would be reduced in comparison to mule deer. Potential direct impacts would include the incremental long-term reduction of approximately 2,865 acres of the 16,008 acres (18 percent) of undisturbed pronghorn year-round habitat within the study area; and approximately 35 acres of the 163 acres (20 percent) of undisturbed pronghorn winter range within the study area. Similar to mule deer, additional loss of habitat, especially undisturbed big sagebrush, would result in an incremental reduction in the amount of available pronghorn habitat in the study area.

Elk

Potential direct impacts to elk would include the incremental long-term reduction of approximately 5,287 acres of the 24,135 acres (22 percent) of undisturbed year-round habitat within the study area. However, unlike mule deer and pronghorn, elk prefer grasses to sagebrush and are therefore less susceptible to the effects of large scale fires or habitat conversion from mining operations. In fact, the conversion of large tracts of sagebrush and pinyon-juniper habitat to grassland habitat or reclaimed areas may favor elk and lead to population increases and expansion into previously unoccupied habitat.

Mountain Lion

Direct impacts to mountain lions are expected to be low, as this species occurs at low densities in and around the study area. Indirect impacts to mountain lions would be similar to those discussed for mule deer, as mountain lion movements tend to follow those of their prey (Sidensticker et al. 1973). Reductions in the preferred mountain lion prey base potentially resulting under the Proposed Action would adversely impact mountain lions within the study area. This impact would likely result in a reduction of local mountain lion populations and may lead to an increase in intra-specific completion for prey.

Small Game Species

Direct impacts to small game species (e.g., mountain cottontail rabbit, pygmy rabbit, chukar, gray partridge, and mourning dove) would include the permanent removal of approximately 1,210 acres of potentially suitable habitat. This acreage of permanent loss represents approximately 2.8 percent of available habitat within the study area. Impacts also would include displacement from the disturbance areas and increased habitat fragmentation, until reclamation has been completed and vegetation is re-established. In most instances, suitable habitat adjacent to disturbance areas would be available for use by these species. However, displacement would increase competition and could include some temporary local reductions in wildlife populations if adjacent habitats are at carrying capacity. Potential impacts resulting from the displacement of individuals also could include nest and burrow abandonment or loss of eggs or young. However, potential impacts to small game populations from mine development are expected to be low.

Nongame Species

Impacts to nongame species would be similar to those discussed above for small game species. Direct impacts to nongame species (e.g., small mammals, passerines, raptors, and reptiles) would include the permanent removal of approximately 1,210 acres of potentially suitable habitat. Specific habitat requirements differ amongst non-game species, therefore the actual acreage of direct impacts to each species is expected to be less than 1,210 acres. This acreage of permanent loss represents a summation of all habitat types considered suitable to non-game species and is approximately 2.8 percent of all available wildlife habitat within the study area. Impacts also would include displacement from the disturbance areas and increased habitat fragmentation, until vegetation is re-established. In most instances, suitable habitat adjacent to disturbance areas would be available for use by these species. However, displacement would increase competition and could result in some local reductions in wildlife populations if adjacent habitats are at carrying capacity. Other potential impacts also could include nest and burrow abandonment or loss of young. However, potential impacts to nongame populations from mine development are expected to be low. These temporary losses would reduce productivity for that breeding season.

Raptors

A variety of resident and migratory raptor species (e.g., eagles, hawks, falcons, owls) have been observed to occur and nest within the study area (**Table 3.7-3**). Bald and golden eagles are protected under the Bald & Golden Eagle Protection Act (16 USC 668 et seq.) and are discussed in detail in Section 3.8, Special Status Species. Potential direct impacts to raptor species would include the permanent loss of approximately 1,210 acres of potentially suitable breeding, roosting, and foraging habitat. This acreage of permanent loss represents approximately 2.8 percent of available habitat within the study area. A *Bird and Bat Conservation Strategy* (BBCS) has been developed (Barrick 2012a,b) and would be updated as necessary in consultation with NDOW and the USFWS to ensure avoidance of unnecessary and undue degradation of avian resources and habitat within the project area.

Raptor nest clearance surveys would be required to be conducted within 2 weeks prior to any ground disturbance during the breeding season (March 15 to July 31) to determine the presence or absence of raptors as well as other migratory bird species protected under the MBTA. If nesting or brooding raptors are determined to be present, Barrick would avoid the area using a buffer zone developed in coordination with the BLM and USFWS. Additionally, ground disturbance would be minimized where possible to retain foraging habitat and to maintain production by not interfering with normal breeding, feeding, or sheltering. Growth media would be salvaged and stockpiled for future reclamation to restore the disturbed areas to the pre-mining land uses. At the end of operations, the proposed NOA and SOA projects would be closed and reclaimed according to a plan approved by the BLM and the NDEP. The closure and reclamation plans would be designed to return areas to the pre-mining land uses and to stabilize the process components to protect water resources. Where possible, reclamation would be performed concurrently to reduce the duration of disturbance and to accelerate the return to pre-mining land uses, including wildlife use.

In addition to coordinating with the USFWS regarding nests within proposed development areas of the NOA and SOA, Barrick would utilize the following measures to prevent the illegal take or disturbance of bald eagles, golden eagles, and other raptor species:

- Where possible, protect and preserve potential roost and nest sites by retaining mature trees, particularly within 0.5 mile from water;
- Where eagles are likely to nest in human-made structures, such as radio towers, and such use may impede the operation and maintenance of the structures or jeopardize the safety of the birds, the structures would be equipped with either devices engineered to discourage eagles from nest-building or would be constructed with nesting platforms that would safely accommodate eagle nests without interfering with structure performance;

- Employ industry-accepted BMPs to prevent eagles from colliding with or being electrocuted by utility lines, towers, and poles (APLIC 2012, 2006);
- Process areas would be designed to prevent contact between eagles and process solution by using BLM approved avian deterrents that could include installing bird balls on process ponds and placing overliner or other material over conveyance ditches;
- Speed limits would be maintained to reduce vehicle/bird collisions; and
- During annual training, Barrick would remind employees of their individual and company-defined responsibilities toward protecting eagles and other raptors.

With implementation of these measures, impacts to nesting raptor species within the study area would be limited primarily to temporary and permanent habitat loss.

Passerines

A variety of resident and migratory bird species (i.e., passerines) have been identified as potentially occurring within the study area. Potential direct impacts to these bird species would include the permanent loss of approximately 1,210 acres of potentially suitable breeding, roosting, and foraging habitat. This acreage of permanent loss represents approximately 2.8 percent of available habitat within the study area. This loss is expected to have little effect on local bird populations based on the amount of suitable breeding and foraging habitat in the surrounding area. In addition, an *Bird and Bat Conservation Strategy* (Barrick 2012a,b) has been developed and would be updated as necessary in consultation with the USFWS to reduce or eliminate potential adverse impacts to avian and bat species during the construction, operation, and reclamation of mine facilities.

Land clearing and surface disturbance would be planned and coordinated to prevent destruction of active bird nests or mortality of juvenile birds during the migratory bird breeding season (March 15 to July 31) to comply with the MBTA. If surface disturbing activities are unavoidable during the migratory bird breeding season, Barrick would have a qualified wildlife biologist survey areas proposed for disturbance for the presence of active nests within 1 week prior to disturbance. If active nests are located, or if other compelling evidence of nesting is observed (e.g., mating pairs, territorial defense, carrying nesting material, transporting of food), the area would be avoided and buffer zones would be established in consultation with BLM to prevent destruction or disturbance of nests until the birds are no longer present. Migratory bird nest surveys are proposed to be conducted only during the migratory bird breeding season and within 1 week prior to Barrick conducting activities that result in disturbance. After such surveys are performed and the related disturbance created (e.g., road construction and drill pad development), Barrick would not conduct any additional disturbance during the migratory bird breeding season without first conducting another nest survey. After July 31, no further migratory bird nest surveys would be required until the following year. With implementation of these measures, impacts to nesting migratory bird species within the study area would be limited primarily to temporary and permanent habitat loss. This loss is anticipated to have little impact given the extent of suitable habitats in the surrounding region.

As described in Chapter 2.0 (Proposed Ancillary and Support Facilities), Barrick would construct new electrical transmission lines to accommodate project facilities. Transmission lines pose an electrocution hazard for raptor species attempting to perch on the structures, as well as incrementally increasing the collision potential for migrating and foraging bird species. However, collision potential typically is dependent on variables such as the location in relation to high-use habitat areas (e.g., nesting, foraging, and roosting), line orientation to flight patterns and movement corridors, species composition, visibility, and line design (APLIC 2006). As discussed in Section 2.4.3, Design Features and Applicant-committed Environmental Protection Measures, Barrick has committed to use current science, guidelines, and methodologies for new and existing transmission lines to minimize raptor and other bird electrocution and collision potential.

Passerine species migrating through the vicinity of the project area at night could be adversely impacted by artificial lighting used during nighttime mining operations. Studies involving lighting on communication towers and other tall structures have shown that steady-burning white or red lights can disorient migrating birds at night (Manville 2007, 2009; Gehring et al. 2009, 2011). These potential impacts also have been shown to be increased during periods of inclement weather. In order to reduce the impact of light pollution resulting from nighttime mining operations Barrick has committed to installing anti-glare fixtures authorized by the BLM Egan Field Office, as discussed in **Table 2.4-54**.

Water Management Activities

Under the Proposed Action, new process ponds would be constructed adjacent to the proposed LBM, South Poker Flats, and Winrock HLFs; and within the proposed process areas associated with the proposed BMM 2/3 Expansion and North Poker Flats HLFs.

To minimize impacts to wildlife from exposure to potentially toxic process solutions, new solution ponds would be double-lined and would incorporate continuous LCRS between the liners. Pipeline ditches provide secondary containment and would be single-lined. At a minimum, the solution ponds would be sized and operated to withstand and fully contain process fluids from a 24-hour power outage as well as projected accumulations from a 25-year, 24-hour storm event. Solution that could be toxic to wildlife and domestic animals would be fenced and covered to prevent access to both terrestrial and avian wildlife species as required by the NDOW Industrial Artificial Pond Permit.

Hazardous Materials Spill

The probability of a transportation-related spill of process chemicals along the transportation route is discussed in Section 3.20, Hazardous Materials and Solid Waste. The potential for wildlife species' exposure to toxic chemicals as a result of a transportation-related spill would be limited to spills in upland habitats only due to the lack of aquatic habitat within the study area. Spills in upland habitat would pose only minimal risk to most wildlife species since these spills would be adjacent to highways and could be rapidly contained and cleaned up. The risk of a transportation related spill into a wetland area is considered to be low due to the limited extent of wetland habitat within the study area. In general, the materials of greatest concern would be sodium cyanide, diesel fuel, ammonium nitrate, sodium hydroxide, propane, lime, gasoline, carbon, and anti-scalant (Barrick 2012a). The impacts of chemicals released would be highly variable and would depend on the quantity released, the location of the release, the species exposed, and the chemical conditions at the release location. The most likely impact of a potential release of these chemicals would be the poisoning of terrestrial species. Animal species that drink contaminated water could suffer severe effects or death depending on the concentration of sodium cyanide and the volume of the water consumed. Sodium hydroxide has the potential to cause minor to extensive burns to exposed animals. A diesel spill has the potential to contaminate soil, surface water, and groundwater in addition to harming aquatic life and vegetation. Although unlikely, such a spill also could ignite from the accident and cause a range fire. Since cleanup actions would take place rapidly, diesel contamination has a low potential to result in long-term impacts to soil, surface water, or groundwater.

Hazardous chemicals would be transported via USDOT-certified containers and transporters, and transportation of sodium cyanide and other chemical reagents would be in accordance with all applicable rules and regulations and the terms of maintaining certification under the International Cyanide Code for both Barrick and sodium cyanide transporters. In addition, Barrick would implement their Emergency Response Plan, establishing responsibilities, guidelines, and procedures for response and mitigation actions taken by mine personnel in the event of an emergency at the mine. Additionally, a Spill Contingency Plan would be implemented establishing reporting and notification procedures for qualifying releases (Barrick 2012a,b).

3.7.2.2 North and South Operations Area Facilities Reconfiguration Alternative

Surface Disturbance

The Reconfiguration Alternative was developed to address potential impacts to mule deer migration and greater sage-grouse leks and associated habitats. The greater sage-grouse is a federal candidate and a BLM sensitive species and is discussed in detail in Section 3.8, Special Status Species.

Under the Reconfiguration Alternative, the total estimated temporary surface disturbance would be approximately 5,668 acres. With consideration of the 1,934 of previously authorized surface disturbance that would not be constructed under this alternative, this represents a 3,352-acre (47 percent) decrease in comparison to the Proposed Action. **Table 3.5-4** summarizes the vegetation cover types and associated acreage and percentage of the study area that would be disturbed as a result of implementation of the Reconfiguration Alternative.

Overall, Reconfiguration Alternative would result in a decrease of approximately 3,352 acres of wildlife habitat disturbance in comparison to the Proposed Action. This alternative also would result in the removal of approximately 66 fewer acres of mule deer year-round habitat; 391 fewer acres of mule deer winter range; 481 fewer acres of mule deer crucial winter range; 1,147 fewer acres of pronghorn year-round habitat and 35 fewer acres of pronghorn winter habitat; and 1,061 fewer acres of elk year-round habitat.

Water Management Activities

As discussed in Section 3.3, Water Quality and Quantity, and Section 3.5.2.1, Wetlands and Riparian Areas, groundwater drawdown under the Reconfiguration Alternative has the potential to impact two springs (South Water Canyon Seep and JBR No. 14) and 32.88 acres of associated wetland habitat and riparian habitat (**Figure 3.3-21**). Given the total of 41 acres of wetland habitat within the project area, the Reconfiguration Alternative may impact up to 80 percent of the wetland habitat within the NOA and SOA areas. Therefore, impacts to wildlife that utilize any impacted wetland and riparian habitats within the maximum extent of the 10-foot groundwater drawdown contour would increase as a result of increased groundwater pumping, but would decrease once pumping operations cease and groundwater levels rebound. Therefore, impacts would include a potential decrease in available surface water and associated riparian and wetland vegetation. Potential impacts to wildlife that utilize the two springs and associated wetlands are anticipated to be similar as described under the Proposed Action (**Figure 3.3-15**).

Willow Spring (LV-011) also is located within the anticipated maximum extent of the 10-foot groundwater drawdown contour (**Figure 3.3-17**). Multiple wildlife species including mule deer have been observed using this spring when flowing water is present (NDOW 2015d). As discussed in Section 3.3.2.2, impacts to this spring are not anticipated due to the fact that there is a large depth to groundwater and low hydraulic conductivity of the formation. This suggests that Willow Spring is controlled by shallow perched conditions that are not hydraulically interconnected with the groundwater system that would be affected by mine induced drawdown. Therefore, impacts to the flow at Willow Spring are not anticipated under the Reconfiguration Alternative.

Mule Deer Migration Corridors

This alternative has modified mining features to facilitate mule deer movement through the proposed NOA. The NDOW submitted a ‘minimum corridor width and quality’ memo to Barrick (NDOW 2012a) to assist in the development of their facility reconfigurations. Suggested migratory corridor width criteria include the following: 1) corridors no less than 2,000 feet wide; 2) corridors 1 km in width, where possible; and 3) no less than three corridors for the entire width of the proposed project. Neither the existing/authorized facilities, nor the Proposed Action (Barrick 2012a,b) currently meet all of these criteria. Under the Reconfiguration Alternative these criteria would not be fully realized due to areas of migration corridors that are less than 2,000 feet in width at certain locations.

Section 2.5.1.1, North Operations Area Project, provides details associated with facilities elimination and/or reconfiguration and the maintenance or development of mule deer migration corridors through the use of a detailed phased construction and concurrent reclamation approach within the NOA project. **Table 3.7-4** below provides a summary of the location and widths of the designated mule deer corridors included under the Reconfiguration Alternative. As a result of the implementation of the Reconfiguration Alternative, a total of three mule deer migration corridors would be maintained within the NOA project (**Figures 2.5-1** through **2.5-4**). Phased construction (i.e., mine sequencing) was identified in the Area 6 Mule Deer Working Group *Habitat Management Practices* document (2012) as an effective strategy to minimize impacts to migrating mule deer. Areas of undisturbed land within the mule deer migration corridors range from 730 to 4,450 feet in width as shown in **Table 3.7-4**.

Compared to the Proposed Action, this alternative would provide the opportunity for improved migration through the inclusion of multiple mule deer migration corridors that would not be available under the Proposed Action. The availability of multiple migration corridors throughout the project area is considered a key factor in the long-term sustainability of the Management Area 10 mule deer herd as multiple route migratory patterns are more common in temperate ungulate populations than single route patterns (Sawyer et al. 2009). These corridors fluctuate in width and are generally wider than the 2,000-foot minimum recommended by NDOW. However, there are some areas where the corridor narrows to approximately 60 to 65 percent of the recommended minimum. These include the gap between the proposed Poker Flats RDA and Duke facilities and the Poker Flats Pit and toe of the East Sage RDA.

Table 3.7-4 Reconfiguration Alternative – Summary of the Minimum Distance Between Representative Bounding Disturbance Features within Designated Mule Deer Migration Corridors

Bounding Disturbance Features	Minimum Distance of Undisturbed* Lands (feet)	Minimum Total Distance of Undisturbed and Reclaimed Lands
Numbers Pit Complex to RBM North RDA	1,925	3,940 (reclaimed 2016)
Redbird Pit to Rat Pit	2,570	NA
Rat East RDA	1,855	2,410 (reclaimed 2015)
Redbird RDA to Rat Pit	2,380	3,795
East Sage RDA to Poker Flats Pit	790	1,980 (reclaimed 2013)
Poker Flats RDA to Duke Pit	730	4,450
Poker Flats Pit to South Duke RDA1	2,675	4,235

* Although undisturbed lands are those that have existing native vegetation communities, these areas also may include existing haul roads and exploration activities.

There is currently no supporting data that would allow the quantified comparison of the effects of mule deer migration through a 1,000-foot-wide corridor compared to a 2,000-foot-wide corridor. Past research has indicated that large scale developments resulting in reduced habitat availability can have negative impacts on local mule deer populations (Johnson et al. 2000; Merrill et al. 1994; Sawyer et al. 2006). Mule deer also have demonstrated the ability to continue to use and migrate through disturbed areas when given adequate numbers of naturally vegetated movement corridor options (Merrill et al. 1994). A complete loss of migration routes due to habitat conversion or loss would be expected to have population level consequences for mule deer and other ungulates in general (Bolger et al. 2008). Therefore it is anticipated that under both the Proposed Action and Reconfiguration Alternative, negative impacts to the Management Area 10 mule deer herd would occur due to the removal and reduction of traditional migration corridors through the North Operation Area. Under the Reconfiguration Alternative,

impacts to migrating mule deer are anticipated to be reduced in scope and intensity in comparison to the Proposed Action as designated movement corridors consisting of naturally vegetated lands would exist throughout the life of the project. Any quantification of risk reduction provided by the designated mule deer migration corridors within the NOA under the Reconfiguration Alternative would be speculative due to the lack of current data and understanding of the effectiveness of this approach to the facilitation of mule deer migration through areas of disturbed habitat. For this reason, continued mule deer monitoring would be required to assess the use and effectiveness of routes under this alternative.

Two mule deer migration researchers, Hall Sawyer, Research Biologist with Western Ecosystems Technology in Laramie Wyoming, and Matthew Kauffman, mule deer migration researcher with the USGS at the Wyoming Cooperative Research Unit in Laramie, Wyoming, were consulted for professional opinions on minimum required corridor width for mule deer by NDOW biologists (NDOW 2012a). Kauffman's professional observations have lead him to the conclusion that even moderate levels of development, while not explicitly blocking migration, are likely to make the developed routes less viable. Although the likely result is that some animals will chose to utilize the corridors and some will shift their behaviors in response to changes in the corridor width, most individual migrating mule deer faced with limited undisturbed migration corridor options will suffer in terms of forage accessibility, fat gain, and mortality (i.e., they would no longer receive as many benefits of migration). Ultimately, the maintenance of a migration route is dependent on minimizing disturbance that affects available forage, cover, or increases potential mortality. Accordingly, corridor quality is affected by many complex factors including; site characteristics, location, animal awareness of corridor existence, noise, human activities, food supply, climate extremes, and natural events, such as fire or annual amounts of snowfall (NDOW 2012a) and, therefore, corridor width alone should not be the only factor used to determine the effectiveness of the migration corridor through the project area.

Potential impacts to migratory mule deer stopover habitat at South Water Canyon and JBR No. 14 springs resulting from groundwater pumping under the Reconfiguration Alternative are anticipated to be the same as described for the Proposed Action (**Figure 3.3-15**).

All of the mule deer design features described in detail under Section 2.4.3.1, and above under Proposed Action, also would be applied under this alternative. In summary, these design features include berm cuts on haul roads, contoured RDAs, timing restrictions on exploration, maximized concurrent reclamation on RDAs, and provision of shrub cover in migration routes. These design features would complement the open migration corridors that are impacted less by project disturbances under this alternative by allowing for these design features to be planned selectively maximizing the benefit of these open corridors. For example, berm cuts would be selectively placed to facilitate deer passage at haul road locations crossed by these open corridors. Interpit and RDA reclamation would be planned and scheduled to maximize corridor width and expand the potential corridor bottlenecks.

To assess the effectiveness and success of the Bald Mountain Mine EIS ROD and the accuracy of analysis and whether the decision is achieving the intended environmental goal of supporting mule deer migration through the project area between seasonal ranges, a Mule Deer Monitoring Plan was developed in consultation with the NDOW and BLM (**Appendix F**). This Mule Deer Monitoring Plan would guide the on-going data gathering on migrating mule deer which would be used to assess mule deer design features to facilitate deer migration.

Under the Reconfiguration Alternative, the provision of the undisturbed mule deer migration corridors, combined with the implementation of the mule deer design features and any modifications to these design features resulting from the mule deer monitoring would provide for continued mule deer migration through the NOA. This would substantially decrease the risk to the mule deer herds arising from severe winter events in comparison with the Proposed Action by maintaining undisturbed corridors between important seasonal habitats.

To offset the permanent loss of mule deer crucial winter range within the study area, Barrick has voluntarily committed to restore and enhance important summer and winter mule deer range located on public land managed by the BLM or State of Nevada within the vicinity of the Bald Mountain Mine at a ratio of 1:1, as presented in **Table 2.4-54**. Barrick commits to coordinating with NDOW and other appropriate land management agencies to identify appropriate areas for restoration or to provide monetary compensation sufficient to offset the loss of crucial wintering range within the NOA and SOA. Compensatory mitigation in the form of monetary compensation of up to $600 per acre of permanent disturbance would be applied to aid in funding current and future authorized habitat enhancement activities such as the Overland Pass Habitat Enhancement Decision and the Huntington and Newark Watershed Restoration Projects. Under the Reconfiguration Alternative, approximately 484 acres of mule deer crucial winter range would be permanently removed or disturbed. Restoration activities that would be used to restore important seasonal mule deer range are the same as those discussed under the Proposed Action (Section 3.7.2.1).

All other direct and indirect impacts to wildlife species associated with this alternative would be similar to the Proposed Action, with the exception of greater sage-grouse mitigation described in Section 3.8.2.2, Reconfiguration Alternative.

3.7.2.3 Western Redbird Modification Alternative

Surface Disturbance

The WRM Alternative was developed to address potential impacts to mule deer migration on the western portion of the NOA.

Under the WRM Alternative, the total estimated surface disturbance would be approximately 5,266 acres. With consideration of the 2,169 acres of previously authorized surface disturbance that would not be constructed under this alternative, this represents a 636 acre (11 percent) decrease in comparison to the Reconfiguration Alternative. **Table 3.5-5** summarizes the vegetation cover types and associated acreage and percentage of the study area that would be disturbed as a result of implementation of the WRM Alternative.

Overall, the WRM Alternative would result in a decrease of approximately 636 acres of wildlife habitat disturbance in comparison to the Reconfiguration Alternative. This alternative also would result in the disturbance and removal of approximately 211 fewer acres of mule deer crucial winter range; 298 fewer acres of pronghorn year-round habitat; and 298 fewer acres of elk year-round habitat.

Water Management Activities

As discussed in Section 3.3, Water Quality and Quantity, and based on the site conditions and model predictions, drawdown associated with groundwater pumping for the mine under the WRM Alternative is not anticipated to impact the baseflow and associated wetlands at any springs located within the study area (**Figure 3.3-21**). This represents a reduction of potential impacts in comparison to both the Proposed Action and Reconfiguration Alternative as less groundwater is pumped under the WRM Alternative (**Figure 3.3-15**).

Mule Deer Migration Corridors

This alternative has modified mining features to facilitate mule deer movement through the western portion of the proposed NOA. Section 2.5.1.1, Western Redbird Modification Alternative, provides details associated with facilities elimination and/or reconfiguration and the maintenance or development of mule deer migration corridors through the use of a detailed phased construction and concurrent reclamation approach within the NOA project. **Table 3.7-5** below provides a summary of the location and widths of the designated mule deer corridors included under the WRM Alternative that would vary in comparison to the Reconfiguration Alternative.

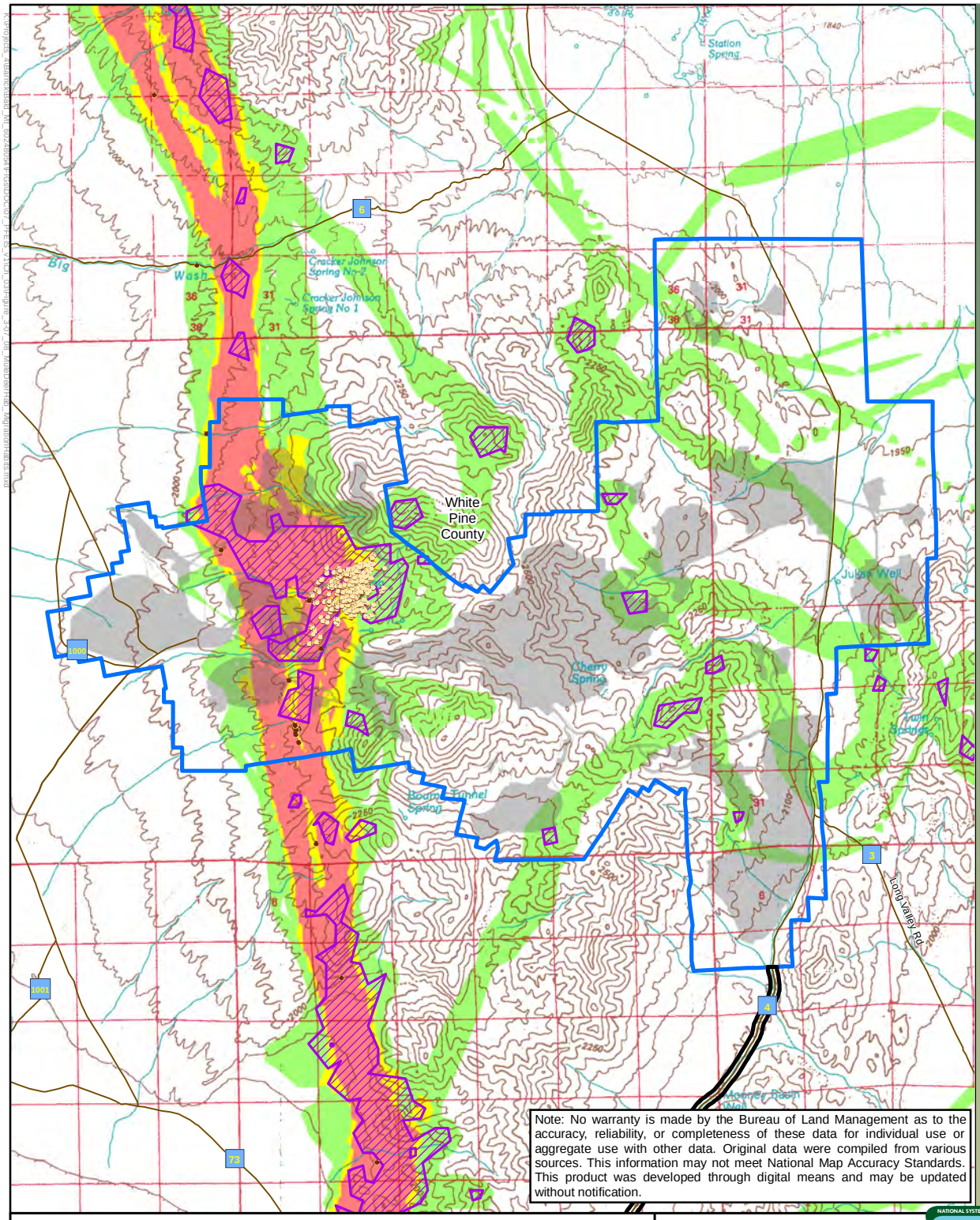
Compared to the Reconfiguration Alternative, this alternative would provide the opportunity for improved migration through the maintenance of wider corridors through the western portion of the NOA. The availability of migration corridors throughout the project area is considered a key factor in the long-term sustainability of the Management Area 10 mule deer herd as multiple route migratory patterns are more common in temperate ungulate populations than single route patterns (Sawyer et al. 2009). These corridors fluctuate in width and are generally wider than the 2,000-foot minimum recommended by NDOW (**Table 3.7-5**). The modification of proposed facilities under the WRM Alternative would further facilitate mule deer migration through the NOA by conserving important stopover sites used by mule deer in between periods of migratory movement. As discussed above, NDOW conducted a telemetry based population study from 2012 to 2014 of the Area 10 mule deer herd that has identified potential high use areas and migratory stopover sites within the NOA (Sawyer and Brittell 2014). **Figure 3.7-8** displays mule deer use area from telemetry data collected in 2012-2013 and telemetry locations of migrating mule deer (E165 and E276) recorded in the NOA between June 2014 and March 2015. The majority of mule deer migrating through the NOA during this period were observed to be using stopover areas that would be preserved under the WRM Alternative. Groundwater drawdown under the WRM Alternative is not anticipated to impact baseflows and associated wetlands at any springs in the study area as described in Section 3.3, Water Quality and Quantity, and would not affect migratory mule deer stopover habitat.

Table 3.7-5 WRM Alternative – Summary of the Minimum Distance Between Representative Bounding Disturbance Features within Designated Mule Deer Migration Corridors

Bounding Disturbance Features	Minimum Distance of Undisturbed* Lands (feet)
Numbers Pit Complex to RBM North RDA	2,525
Numbers Pit Complex to RBM Pit	4,155
Redbird Pit to Rat Pit	4,190
Redbird Pit to Rat East RDA	3,740
Redbird RDA to Rat Pit	4,300

* Although undisturbed lands are those that have existing native vegetation communities, these areas also may include existing haul roads and exploration activities.

It is anticipated that under all action alternatives, negative impacts to the Management Area 10 mule deer herd would occur due to the removal or reduction of traditional migration corridors through the NOA. Under the WRM Alternative, impacts to migrating mule deer are anticipated to be reduced in scope and intensity in comparison to the both the Proposed Action, Reconfiguration Alternative, and No Action Alternative as larger areas of contiguous movement corridors and stopover sites consisting of naturally vegetated lands would exist throughout the life of the project. In addition, the life of mining operations at the Redbird pit would be substantially reduced in comparison to the Proposed Action and Reconfiguration Alternative. Furthermore, ongoing and completed reclamation of mining features within or near designated mule deer migration corridors would allow for mule deer migration with fewer obstructions from active mine operations and conservation of a larger wintering area for non-migrant deer within the NOA. Any quantification of risk reduction provided by the designated mule deer migration corridors within the NOA under the WRM Alternative would be speculative due to the lack of current data and understanding of the effectiveness of this approach to the facilitation of mule deer migration through areas of disturbed habitat. For this reason, continued mule deer monitoring would be required to assess the use and effectiveness of routes under this alternative.



BLM

Ely District Office

Legend

- Action Alternative NOA Plan Boundary
- Action Alternative SOA Plan Boundary
- Western Redbird Alternative

Mule Deer Telemetry Locations (After June 2014)

- Animal: E165
- Animal: E276

- Mule Deer Stop-over Area

Mule Deer Use Area

- Low Use
- Moderate
- High Use

Source: NDOW 2015, Sawyer and Brittell 2014, SRK 2012.

Bald Mountain Mine North and South Operations Area Projects EIS

Figure 3.7-8
NOA Mule Deer Telemetry Locations (June 2014 - March 2015) and Overall Use Areas (2012 - 2013) WRM Alternative

0 0.5 1 2 Miles

N

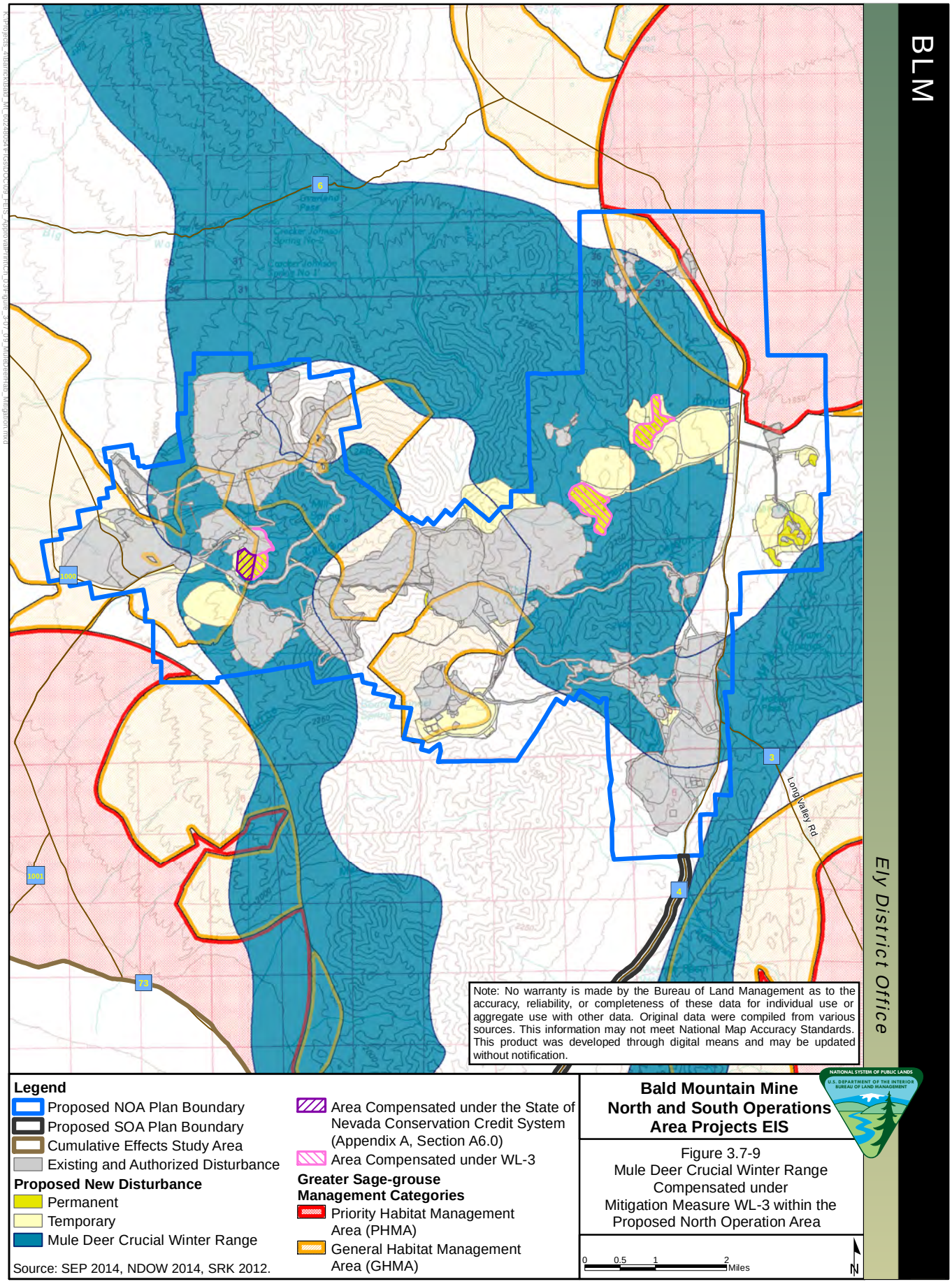
12/30/2015

All of the mule deer design features described in detail under Section 2.4.3.1, and above under Proposed Action, also would be applied under this alternative. In addition, the Mule Deer monitoring Plan discussed under the Proposed Action also would be implemented under the WRM Alternative (**Appendix F**). Barrick has committed to additional operational modifications to facilitate mule deer migration through the western portion of the NOA under the WRM Alternative. These modifications include:

- A haul truck travel restriction would be implemented on the lower portion of the LJR haul road to prohibit haul truck traffic (**Figure 2.5-7**).
- A haul truck travel restriction would be implemented on the existing haul road from the water fill stand to the Numbers Pit Complex (**Figure 2.5-7**).
- A haul truck travel restriction would be implemented on the existing haul road to the Rat Pit to prohibit haul truck traffic. Haul truck traffic would be prohibited with exceptions for reclamation activities (**Figure 2.5-7**).
- A snow management route would be implemented on the west side of the NOA during periods of increased snow accumulation (**Figure 2.5-6** and **Figure 2.5-7**). This route would be actively managed by compacting snow to facilitate mule deer movement through the NOA during severe winters and would be coordinated with BLM and NDOW.

Under the WRM Alternative, the provision of the undisturbed mule deer migration corridors, combined with the implementation of the mule deer design features and any modifications to these design features resulting from the mule deer monitoring would provide for continued mule deer migration through the NOA at levels greater than the Proposed Action or No Action alternatives. This would substantially decrease the risk to the mule deer herds arising from severe winter events in comparison with the Proposed Action and Reconfiguration Alternative by maintaining undisturbed corridors between important seasonal habitats.

To offset the permanent loss of mule deer crucial winter range within the study area, Barrick has voluntarily committed to restore and enhance important summer and winter mule deer range located on public land managed by the BLM or State of Nevada within the vicinity of the Bald Mountain Mine at a ratio of 1:1, as presented in **Table 2.4-54**. Barrick commits to coordinating with NDOW and other appropriate land management agencies to identify appropriate areas for restoration or to provide monetary compensation sufficient to offset the loss of crucial wintering range within the NOA and SOA. Compensatory mitigation in the form of monetary compensation of up to $600 per acre of permanent disturbance would be applied to aid in funding current and future authorized habitat enhancement activities such as the Overland Pass Habitat Enhancement Decision and the Huntington and Newark Watershed Restoration Projects. Under the Western Redbird Modification Alternative, approximately 380 acres of mule deer crucial winter range would be permanently removed or disturbed. Restoration activities that would be used to restore important seasonal mule deer range are the same as those discussed under the Proposed Action (**Section 3.7.2.1**). To ensure the applicant is not required to compensate twice for impacts, acreages of mule deer crucial winter range also identified by the BLM as greater sage-grouse Priority Habitat Management Area and General Habitat Management Area would not be included in the requirement for monetary compensation. Acres of impact to greater sage-grouse Priority Habitat Management Area and General Habitat Management Area would be compensated for under the Nevada Conservation Credit System, as described in **Appendix A**. After accounting for 53 acres of greater sage-grouse Priority Habitat Management Area and General Habitat Management Area, the applicant would be required to compensate for approximately permanent removal of 327 acres of mule deer crucial winter range, as displayed in **Figure 3.7-9**.


BLM
Ely District Office
Long Valley Rd
Note: No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual use or aggregate use with other data. Original data were compiled from various sources. This information may not meet National Map Accuracy Standards. This product was developed through digital means and may be updated without notification.
Legend
Proposed NOA Plan Boundary
Proposed SOA Plan Boundary
Cumulative Effects Study Area
Existing and Authorized Disturbance
Proposed New Disturbance
Permanent
Temporary
Mule Deer Crucial Winter Range
Area Compensated under the State of Nevada Conservation Credit System (Appendix A, Section A6.0)
Area Compensated under WL-3
Greater Sage-grouse Management Categories
Priority Habitat Management Area (PHMA)
General Habitat Management Area (GHMA)
Source: SEP 2014, NDOW 2014, SRK 2012.
Bald Mountain Mine North and South Operations Area Projects EIS
Figure 3.7-9
Mule Deer Crucial Winter Range Compensated under Mitigation Measure WL-3 within the Proposed North Operation Area
0 0.5 1 2 Miles
N

5/12/2016

3.7.2.4 No Action Alternative

Under the No Action Alternative, the proposed NOA and SOA projects would not be developed and associated impacts to wildlife resources would not occur. Barrick would continue its operations, closure, and reclamation activities within the NOA and SOA boundaries under the terms and current permits and approvals as authorized by the BLM and State of Nevada. Under the No Action Alternative, construction of all previously authorized expansion and associated facilities would be implemented and reclaimed as authorized. No haul road berm cuts would be required and no undisturbed corridor between the proposed Numbers and Redbird and Rat areas would remain. Under the No Action Alternative, none of the mule deer design features and protection measures proposed under action alternatives would be applied and therefore the mule deer monitoring plan would not be implemented. Accelerated mining at the Numbers Pit and the accelerated reclamation schedules for the North 4 RDA and LJ Ridge haul road also would not be implemented in addition to Barrick's commitment to only mine one pit at a time on the west side of the NOA under the No Action Alternative.

Activities under the No Action Alternative would consist of those previously analyzed and authorized under previous NEPA analysis (BLM 2009a). Impacts to wildlife and their habitats resulting from the No Action Alternative would be the same as those discussed in Section 3.8.2, Wildlife Environmental Consequences – Proposed Action (page 3-68) of the *Final Environmental Impact Statement for the Bald Mountain Mine North Operations Area Project* (BLM 2009a).

<u>Water Management Activities</u>

As discussed in Section 3.3, Water Quality and Quantity, and based on the site conditions and model predictions, drawdown associated with groundwater pumping for the mine under the No Action Alternative is not anticipated to impact the baseflow and associated wetlands at any springs within the study area (**Figure 3.3-21**). This represents a reduction of potential impacts to the two springs and associated wetlands in comparison to both the Proposed Action and Reconfiguration Alternative as less groundwater is pumped under the No Action Alternative (**Figure 3.3-15**).

3.7.2.5 Cumulative Impacts

The CESA for wildlife resources encompasses the entirety of the NDOW Big Game Management Area 10, totaling 4,077,720 acres (**Figure 3.7-1**). Past and present actions and RFFAs are discussed in Section 2.7, Past, Present, and Reasonably Foreseeable Future Actions; their locations are illustrated in **Figure 2.7-1**.

Past and present actions have resulted, or would result, in approximately 71,793 acres of total surface disturbance within the wildlife resources CESA. Of these acres, approximately 10,019 acres are attributed to past mining activity at the Bald Mountain Mine that has occurred between 1981 and the present day. The remaining total quantifiable surface disturbances are related to mining, oil and gas development, wind energy development, exploration, land, road, and utility corridor development, agriculture, livestock grazing; residential developments, and other county and government actions. RFFAs proposed within the wildlife resources CESA include, but are not limited to, the following: mineral-related actions (totaling 2,572 acres), exploration within Long Valley (acreage unknown), oil and gas lease sales within the Long, Ruby, and Huntington valleys (acreage unknown), vegetation treatments (totaling 77,896 acres), grazing by wild horses within the Triple B HMA (totaling 40,716 acres), and implementation of the USFWS Ruby Lake NWR CCP. Additionally, the Spruce Mountain Recreation RMP Amendment, Ruby Mountain Travel Management Plan (USFS), and the development of the Mustang Monument Preserve are proposed within the wildlife resources CESA.

The Proposed Action incrementally would increase disturbance to wildlife habitat by an additional 5,887 acres and remove 11 acres of existing authorized disturbance from the 71,794 acres resulting in a total cumulative disturbance of approximately 158,137 acres (2 percent of the total wildlife resources CESA). The Reconfiguration Alternative would eliminate 1,986 acres of previously authorized disturbance and incrementally increase disturbance to wildlife habitat by an additional 4,784 acres

resulting in a total cumulative disturbance of approximately 155,059 acres (4 percent of the total wildlife resource CESA). The WRM Alternative would eliminate 2,220 acres of previously authorized disturbance and incrementally increase disturbance to wildlife habitat by an additional 4,886 acres resulting in a total cumulative disturbance of approximately 154,927 acres (4 percent of the total wildlife resource CESA). A portion of the cumulative disturbance area has been, or would be, reclaimed or has recovered materially (i.e., wildfire areas). The reclaimed areas, and areas associated with habitat conversion, would be capable of supporting wildlife use; however, species composition and densities may change. Overall, most of the local wildlife populations (e.g., big game, raptors, migratory birds, reptiles, and amphibians) that occur in the wildlife resources CESA would continue to occupy their respective ranges and breed successfully, although population numbers may decrease relative to the amount of cumulative habitat loss and disturbance from incremental development.

Cumulative impacts to wildlife resources primarily would be directly related to habitat loss, habitat fragmentation, and animal displacement. Big game, especially mule deer, would be most susceptible to these cumulative impacts since encroaching human activities along Ruby Mountains and, more specifically in the active BMM, have resulted in animal displacement and habitat fragmentation in areas that are utilized as migration corridors between summer and winter ranges. NDOW collaring data has shown that mule deer movement rates and efficiency are affected by the current mine disturbances (NDOW 2012a). Specific RFFAs that would likely contribute cumulatively to impacts to migrating mule deer in Management Area 10 include the Overland Pass Exploration Mine, Victoria Mine Project, Centennial-Seligman Mine Project, Noble Energy Huntington Valley Oil and Gas Development Project, and the Long Valley Exploration Project as shown in **Figure 2.7-1**.

Nesting raptor species also would be susceptible to these cumulative impacts since encroaching human activities have resulted in bird displacement and habitat fragmentation in areas that may be at their relative carrying capacity for these resident species. Many of the local wildlife populations (e.g., small game, migratory birds) that occur in the wildlife resources CESA would continue to occupy their respective ranges and breed successfully, although population numbers may decrease relative to the amount of cumulative habitat loss and disturbance from incremental development.

Groundwater drawdown associated with the Proposed Action and Reconfiguration Alternative may result in the loss of up to 32.88 acres of wetland vegetation from the potential loss or decrease in water flow from the two seeps and springs. The impacts from the Proposed Action and Reconfiguration Alternative would add to the existing and future riparian and wetland impacts within the CESA. Groundwater drawdown associated with the WRM Alternative is not anticipated to result in the loss of areas of wetland vegetation or reduction in spring flows in the project area.

Under the No Action Alternative, cumulative impacts to wildlife resources would be the same as those described in the *Final Environmental Impact Statement for the Bald Mountain Mine North Operations Area Project* (BLM 2009a) and *Environmental Assessment for the Mooney Heap and Little Bald Mountain Expansion Project* (BLM 2011a). Under the No Action Alternative, potential fuel spill risks would continue to exist within the wildlife resources CESA; however, existing spill plans would be used to minimize impacts to wildlife species. These low level impacts would combine with other surface disturbance activities within the wildlife resources CESA.

3.7.2.6 Monitoring and Mitigation Measures

The following mitigation measures are recommended to minimize and mitigate potential impacts to wildlife resources:

Issue: Implementation of the Proposed Action and Reconfiguration Alternative would remove two existing wildlife guzzlers located within the proposed SOA.

Mitigation Measure WL-1: To offset the loss of two available water sources (Alligator Guzzler and Yankee Guzzler) within the study area, two wildlife guzzlers would be installed and maintained by BMM

within the study area prior to the removal of the existing guzzlers. The two guzzlers would be installed at locations that are determined by NDOW to support wildlife populations that are currently utilizing existing guzzlers.

Effectiveness: Implementation of this mitigation measure would provide alternate water sources to wildlife populations within the study area. Although new wildlife guzzlers are anticipated to be less effective initially due to wildlife being unfamiliar with the location of the new water source, it is anticipated that wildlife would soon become accustomed to the new guzzler locations. The BLM and NDOW have recently completed the installation of three wildlife guzzlers in the vicinity of the study area similar to those required under this mitigation measure. The installation of these guzzlers prior to removal of the existing guzzlers would further aid wildlife in acclimating to the new water sources. Some less mobile species dependent on existing guzzlers within the study area would be adversely affected by the relocation of each guzzler. It is likely that those affected individuals would be displaced by ground disturbance associated with the development of mining facilities within the study area and would be forced to seek out new water sources during the life of mine operations.

Issue: Implementation of the Proposed Action, Reconfiguration Alternative, and WRM Alternative would impede mule deer migration through the NOA, which would result in mule deer mortality and reduced Management Area 10 mule deer productivity.

Mitigation Measure WL-2:

Barrick would implement adaptive management actions if either of the following trigger events occur:

1. Excessive Snowfall – A combination of visual observations of mule deer (i.e. helicopter tracking surveys, video monitoring, on-site real-time monitoring) or radio-collar data indicate that less than 30 percent of mule deer are unable to successfully migrate through the BMM within a 5-day period AND a cumulative snow depth greater than 10 inches for a period of 5 or more days is measured at strategically located weather stations within mule deer migration corridors identified by the BLM, in coordination with NDOW.
2. Unsuccessful Passage – Less than 70 percent of collared or marked migratory mule deer, that cross into the NOA boundary, successfully migrate through the NOA during either the autumn (30 Nov – 5 Jan) or spring (15 Mar – 30 Apr) migration period. This represents a reduction of 30 percent from the baseline conditions documented prior to the expansion project. The northern and southern extent of the NOA boundary would serve as the geographic reference to determine if passage was successful for an individual marked mule deer. An autumn migration is considered successful when an individual mule deer crosses the southern extent of the NOA boundary during the autumn period (30 Nov – 5 Jan). A spring migration is considered successful when an individual mule deer crosses the northern extent of the NOA boundary during the spring period (15 Mar – 30 Apr). The adaptive management trigger would be enacted if more than 30 percent of the migratory mule deer fail to successfully migrate during either migration period.

A Wildlife Working Group (WWG) comprised of resource specialists from the BLM, NDOW, and the applicant would be convened to monitor and assess the success of adaptive management measures. Adaptive management actions would be assessed by the WWG based on collared mule deer activities on the ground and their relationship of these activities to aerial imagery and “as-built” development activities to determine the most appropriate actions and strategies to maximize opportunities to mitigate and alter impacts to migration. For example, if monitoring by the WWG reveals that mule deer are moving back and forth along a perimeter feature that relates to ground-based activities (e.g., road, noise, facilities), adaptive management actions would seek to provide a route for mule deer to move through the problem feature. Changes in stopover activity durations of collared mule deer also would be analyzed to determine the most appropriate actions to maximize opportunities to mitigate and alter

impacts to migration. Adaptive management actions considered by the WWG could include, but are not limited to, one or more of the following:

- Creation of a travel path suitable for mule deer by compacting snow with a track vehicle (i.e., snowcat, lighter weight track-mounted vehicle), plowing existing roads that are not essential to mine operations, or other actions that may allow easier passage for mule deer.
- Creation of additional temporary berm-cuts, openings, or gaps as allowable by MSHA to facilitate ease of mule deer movement across haul roads and the above travel paths. Locations of such openings would likely vary from year to year depending on conditions (e.g., snow depth, mine activities) and mule deer use.
- Limit non-essential vehicular traffic and personnel within corridors identified by NDOW during extended crepuscular hours (5 AM to 8 AM and 3 PM to 6 PM) during the autumn migration (30 Nov – 5 Jan) and spring migration (15 Mar – 30 Apr) periods.
- Conduct concurrent reclamation of select features to enlarge migration corridors or create improved passage where practicable.
- Where feasible, alter operations or sequencing to shift mining activities from areas and during periods of high density of mule deer migration.
- Where feasible, cluster haul traffic (i.e., send haul trucks in groups with rest intervals) during periods of high density of mule deer migration.
- Where NDOW and Barrick come to an agreement, Barrick would conduct habitat improvement or restoration in mule deer stopover areas to improve migration conditions.

The suggested adaptive management actions may change over time and would be dependent on understanding how the mule deer utilize the active mine site. If the adaptive management actions are not effective in protecting mule deer, BLM would work collaboratively with NDOW and Barrick to develop other adaptive management actions based on the conditions present at the time of the event to mutually develop a solution.

Effectiveness: Implementation of this mitigation measure would facilitate mule deer migration through the NOA. Mule deer would likely utilize travel paths, berm-cuts, and gaps when energy expenditure is high. Effectiveness of the mitigation also would be monitored by collaring individual mule deer per the mule deer monitoring plan (**Appendix F**).

3.7.2.7 Residual Impacts

Assuming successful reclamation of all project components, residual impacts to wildlife habitat would include the permanent loss of approximately 1,210 acres, 885 acres, and 780 acres for the Proposed Action, Reconfiguration Alternative, and the WRM Alternative, respectively. These residual impacts would be associated with open pits, which would not be reclaimed. Depending on the success of reclamation, fragmentation and the loss of shrub-dominated communities would represent a long-term change in wildlife habitat composition (i.e., shrub-dominated communities to grass/forb-dominated communities).

Additionally, under the Proposed Action, there would be residual impacts through the loss of undisturbed migration corridors through the NOA project. The loss of these migration corridors would not be permanent but would persist until reclamation occurs. However, this presents a potential residual risk to the Management Area 10 mule deer herd as these impacts would last through the life of the mine and time period required for reclamation. Some of this impact would be incrementally reduced as a result of ongoing reclamation in areas where mining activity has been completed. As these areas become fully reclaimed, it is anticipated that the level of habitat functioning also would return in order to provide enhanced suitability and migration opportunity to wildlife within the study area.

As discussed above in Section 3.7.2.1, sufficient data are lacking to accurately quantify the level of mortality that would be experienced by the Management Area 10 mule deer herd under the Proposed Action. Under the Proposed Action, the Management Area 10 mule deer herd would likely experience declines in overall fitness and recruitment due to the removal of important migratory habitat within the NOA study area. As a result of these declines in fitness, it is anticipated that seasonal mule deer mortality within Management Area 10 would be increased. This potential for increased mortality would likely be enhanced during years where severe winter conditions are present during migration periods due to the fact that mule deer would be forced to expend greater time and energy to navigate through the study area in order to reach crucial winter habitats. Indicators of severe winter conditions within the study area would include an accumulation of snow to depths of 10 inches or greater within a period of 5 days.

Over the proposed mine operations time period of 20 years, the annual probability of a severe 100-year winter storm event occurring within the study area would be 1/100 (1 percent). This 1 percent annual probability represents a 19 percent chance that a 100-year winter storm event would occur within the 20-year period of mine operations under the Proposed Action. The annual probability of a severe 25-year winter storm event occurring within the study area would be 1/25 (4 percent). This 4 percent annual probability represents a 58 percent chance that a 25-year winter storm event would occur within the 20-year period of mine operations under the Proposed Action. The annual probability of a severe 10-year winter storm event occurring within the study would be 1/10 (10 percent). This 10 percent annual probability represents an 89 percent chance that a 10-year winter storm event would occur within the 20-year period of mine operations under the Proposed Action. Given these statistical probabilities, it is likely that severe winter conditions representing a 10-year winter storm event could occur during 1 or more years of the 20-year mining operations period, resulting in attendant risk to the Management Area 10 deer population.

Any reductions to the Management Area 10 mule deer herd also would likely result in reduction of hunt tag allocations over multiple consecutive years by NDOW Management Area 10 managers in order to maintain a sustainable population. Further analysis of the impacts of potential reductions in hunt tag allocations on the availability of recreational hunting opportunity is provided in Section 3.16.2.1. Further analysis of the impacts of potential reductions in hunt tag allocations on county- and state-generated revenues from hunting activity is provided in Section 3.17.2.1 and Section 3.17.2.2.

It is anticipated that this residual impact would be reduced under the Reconfiguration Alternative and WRM Alternative due to the fact that migratory corridors consisting of larger areas of undisturbed land will remain accessible to the Management Area 10 mule deer herd throughout the life of the mine coupled with the fact that the operational period of mining activities would be reduced to 10 years under both alternatives. It is currently not possible to accurately quantify the amount of risk reduction provided to the Management Area 10 mule deer herd under the Reconfiguration Alternative and WRM Alternative in comparison to the Proposed Action due to a lack of supporting site specific information.

The likelihood that severe winter conditions during one or more years of mining operations would be reduced under the Reconfiguration Alternative and the WRM Alternative in comparison to the Proposed Action. Over the mine operations time period of 10 years under the Reconfiguration Alternative and the WRM Alternative, the annual probability of a severe 100-year winter storm event occurring within the study are would be 1/100 (1 percent). This 1 percent annual probability represents a 10 percent chance that a 100-year winter storm event would occur within the 10-year period of mine operations under the Reconfiguration and WRM alternatives. The annual probability of a severe 25-year winter storm event occurring within the study area would be 1/25 (4 percent). This 4 percent annual probability represents a 34 percent chance that a 25-year winter storm event would occur within the 10-year period of mine operations under the Reconfiguration and WRM alternatives. The annual probability of a severe 10-year winter storm event occurring within the study area would be 1/10 (10 percent). This 10 percent annual probability represents a 65 percent chance that a 10-year winter storm event would occur within the 10-year period of mine operations under the Reconfiguration and WRM alternatives. As summarized in Section 3.7.2.5 above, a Mule Deer Monitoring Plan was developed in consultation with the NDOW and

BLM to assess the status of migrating deer through the study area, as well as ensure that migration corridors and mule deer design features are effectively implemented to the maximum benefit for migrating mule deer under all action alternatives (**Appendix F**). This Mule Deer Monitoring Plan would guide the on-going data gathering on migrating mule deer which would be used to adaptively manage mule deer design features, facilitate deer migration, and reduce risk to the Management Area 10 mule deer herd. It is recognized that implementation of mitigation measure WL-2 resulting from environmental thresholds discussed in the monitoring plan could have a substantial economic impact on the mining operations.

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3.8 Special Status Species

The study area for special status species is defined as the proposed NOA and SOA plan boundaries. The CESA for special status species, excluding greater sage-grouse and special status plants, encompasses the NDOW Big Game Management Area 10 (**Figure 3.7-1**). The CESA for greater sage-grouse includes the Ruby Valley and Butte/Buck/White Pine PMUs as illustrated in **Figure 3.8-1**. The CESA for special status plants encompasses the entirety of four hydrographic basins (Huntington Valley and Central Region, Long Valley, Newark Valley, and Ruby Valley) (**Figure 3.3-1**).

3.8.1 Affected Environment

3.8.1.1 Regulatory Framework

Special status species are those species for which state or federal agencies afford an additional level of protection by law, regulation, or policy. Included in this category are federally listed species that are protected under the ESA and species designated as sensitive by the BLM. In addition, there is a Nevada State protected animal list (NAC 503.030) that the BLM has incorporated, in part, into the BLM's sensitive species list.

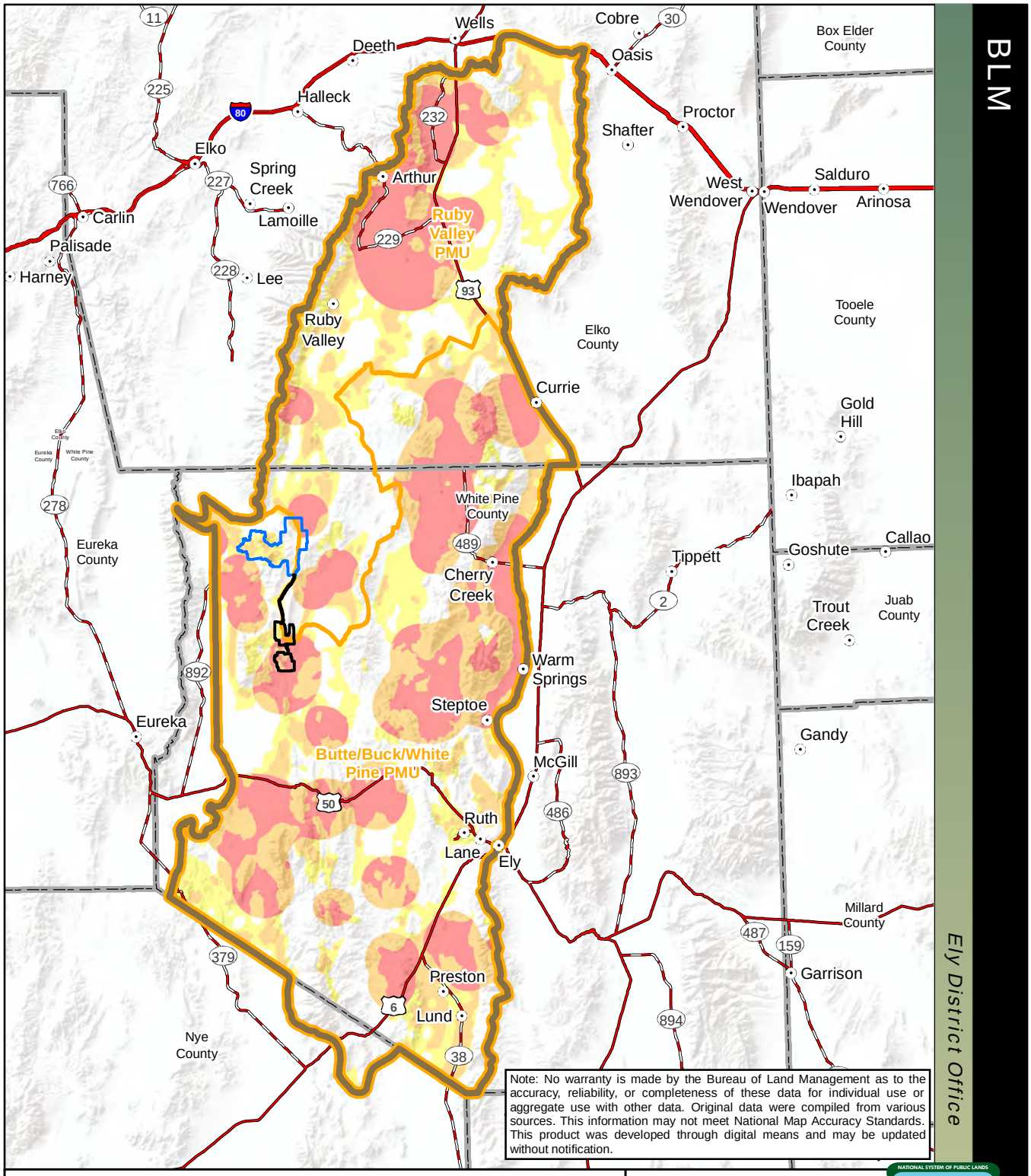
In accordance with the ESA, as amended, the lead agency (BLM) in coordination with the USFWS must ensure that any action that they authorize, fund, or carry out would not adversely affect a federally listed threatened or endangered species. In addition, as stated in Special Status Species Management Policy 6840 (6840 Policy) (Rel. 6-125), it also is the BLM's policy "to conserve and/or recover ESA-listed species and the ecosystems on which they depend so that ESA provisions are no longer needed for these species, and to initiate proactive conservation measures that reduce or eliminate threats to BLM sensitive species to minimize the likelihood of and need for listing of these species under the ESA." The following discussion summarizes known data for the special status species identified for the proposed NOA and SOA projects by the applicable agencies.

<u>Bald and Golden Eagle Protection Act</u>

Nongame birds are protected under the MBTA and are discussed in Section 3.7.1.4, Nongame Species. In addition to the MBTA, bald and golden eagles are protected under the BGEPA (16 USC 668 et seq.). This statute prohibits anyone without a permit from committing "take" of bald and golden eagles, including their parts, nests, and eggs. "Take" is defined as the actions to pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest and disturb. In 2009, the USFWS implemented two rules authorizing new permits under BGEPA.

- 50 CFR 22.26 would authorize limited "take" of bald and golden eagles where the "take" is associated with, but is not the purpose of an activity and cannot practicably be avoided.
- 50 CFR 22.27 would authorize the intentional take of eagle nests where necessary to alleviate safety hazards to people or eagles; to ensure public health and safety; where a nest prevents the use of a human-engineered structure; and when an activity, or mitigation for the activity, will provide a net benefit to eagles. Only inactive nests are allowed to be taken, except in the case of safety emergencies.

BGEPA provides the Secretary of Interior with the authority to issue eagle-take permits only if he is able to determine that the take is compatible with the preservation of the eagle. This take must be "…consistent with the goal of increasing or stable breeding populations."



Legend

- Proposed NOA Plan Boundary
- Proposed SOA Plan Boundary
- Greater Sage-grouse Cumulative Effects Study Area
- Population Management Unit Boundary

Greater Sage-grouse Management Categories

- Priority Habitat Management Area (PHMA)
- General Habitat Management Area (GHMA)
- Other Habitat Management Area (OHMA)

Source: SEP 2014, SRK 2011b.

Bald Mountain Mine North and South Operations Area Projects EIS

Figure 3.8-1

Greater Sage-grouse Cumulative Effects Study Area

0 5 10 20 Miles

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Special Status Wildlife and Plant Species

A total of 32 special status wildlife species and 38 special status plant species were identified as potentially occurring within the study area (BLM 2012k; NNHP 2012a,b; USFWS 2012). These species, their associated habitats, and their potential for occurrence within the study area are summarized in **Appendix G**, Special Status Species. Occurrence potential within the study area and CESA was evaluated for each species based on their habitat requirements and/or known distribution. Based on these evaluations, three special status species (northern goshawk, peregrine falcon, and black-rosy finch) have been eliminated from detailed analyses based on their habitat requirements and/or known distributions as discussed in **Appendix G**. The remaining 29 special status wildlife species identified as potentially occurring within the study area are described in the following sections.

Based on the evaluations, a total of 37 special status plant species were eliminated from detailed analysis based on their habitat requirements and/or know distributions as discussed in **Appendix G**. The one special status plant species carried forward for detailed analysis is the Nachlinger's catchfly (*Silene nachlingerae*).

3.8.1.2 Mammals

Special Status Bat Species

BLM and state sensitive bat species that have been identified as potentially occupying appropriate habitat types within the study area are presented in **Appendix G**. Bat species that could occur within the study area include pallid bat, Townsend's big-eared bat, big brown bat, spotted bat, silver-haired bat, hoary bat, California myotis, western small-footed myotis, long-eared myotis, little brown myotis, fringed myotis, long-legged myotis, Yuma myotis, western pipistrelle bat, and Brazilian free-tailed bat. Due to the presence of seeps and springs, suitable foraging habitat is present in portions of the study area (Bradley et al. 2006; SRK 2008). Roosting habitat within the study area includes rock outcrops, cliffs, abandoned underground mines (JBR 2006), and pinyon-juniper woodlands.

Pallid Bat (BLM Sensitive/ Nevada State Protected)

The pallid bat is a year-round resident in Nevada. Found primarily at low and mid elevations (1,300 to 8,400 feet amsl), this species occupies a variety of habitats such as pinyon-juniper, blackbrush, creosote, sagebrush, and salt desert scrub (Bradley et al. 2006). This species feeds primarily on large ground-dwelling arthropods (e.g., scorpions, centipedes, grasshoppers), but also feeds on large moths (Bradley et al. 2006). The pallid bat is a colonial species, roosting in groups of up to 100 individuals (Arizona Game and Fish Department [AGFD] 1993). Roost sites consist of rock outcrops, mines, caves, hollow trees, buildings, and bridges (AGFD 1993; Bradley et al. 2006). The pallid bat is intolerant of roost sites in excess of 40 degrees Celsius (Bradley et al. 2006). The species was documented within the study area during the 2012 AnaBat surveys (JBR 2012a) (**Table 3.7-1**). In addition to documented presence within the study area, approximately 41,909 acres of suitable roosting and foraging habitat is found within the study area; therefore, the potential for this species to occur within the study area is considered high.

Townsend's Big-eared Bat (BLM Sensitive/ Nevada State Protected)

The Townsend's big-eared bat is a year-round resident found throughout Nevada from low desert to high elevation mountain habitats (690 to 11,400 feet amsl). The Townsend's big-eared bat primarily occurs in pinyon-juniper, mountain mahogany, white fir, blackbrush, sagebrush, salt desert scrub, agricultural lands, and urban habitats (Bradley et al. 2006). This species prefers caves, mines, and buildings that maintain stable temperatures and airflow for nursery colonies, bachelor roosts, and hibernacula. It does not make major migrations and appears to be relatively sedentary, not traveling far from summer foraging grounds to winter hibernation sites. Its distribution seems to be determined by suitable roost and hibernation sites, primarily caves and mines (Harvey et al. 1999). This bat is believed to feed entirely on moths, gleaned from foliage and other surfaces (Bradley et al. 2006; Harvey et al. 1999). The species was documented within the study area during the 2012 AnaBat

surveys (JBR 2012a) (**Table 3.7-1**). In addition to documented presence within the study area, approximately 41,909 acres of suitable roosting and foraging habitat is found within the study area; therefore, the potential for this species to occur within the study area is considered high.

Big Brown Bat (BLM Sensitive)

The big brown bat is a year-round resident in Nevada. This species is found from low to high elevations (980 to 9,800 feet amsl) and occupies a variety of habitats including pinyon-juniper, blackbrush, creosote, sagebrush, and salt desert scrub. This species gleans insects over water and open landscapes, as well as in both forested and edge settings. The big brown bat is a colonial species, roosting in groups up to several hundred. Roost sites include caves, mines, buildings, bridges, and trees. This species is known to be more tolerant of human habitation than other bat species (Bradley et al. 2006). The species was documented within the study area during the 2012 AnaBat surveys (JBR 2012a) (**Table 3.7-1**). In addition to documented presence within the study area, approximately 41,950 acres of suitable roosting and foraging habitat is found within the study area; therefore, the potential for this species to occur within the study area is considered high.

Spotted Bat (BLM Sensitive/Nevada State Threatened)

The spotted bat occurs in montane forests, pinyon-juniper woodlands, and open semi-desert shrublands and is a year-round resident of Nevada. It is known from only 12 localities in Nevada but more widespread distribution throughout Nevada is likely (Bradley et al. 2006). This species forages in open habitats, primarily for moths, and is capable of flying long distances to suitable foraging areas (Bradley et al. 2006). Crevices in rocky cliffs are used for roosting habitat (Bradley et al. 2006). This species has been documented within White Pine County, Nevada (Bradley et al. 2006). Based on its known range and the presence of approximately 41,713 acres of suitable roosting and foraging habitat within the study area, the potential for this species to occur within the study area is considered high.

Silver-haired Bat (BLM Sensitive)

The silver-haired bat summers and reproduces in northern Nevada and typically occupies low to mid elevations (1,500 to 8,200 feet amsl). This species inhabits coniferous and mixed deciduous/ coniferous forests of pinyon-juniper, subalpine fir, white fir, limber pine, aspen, cottonwood, willow, and riparian areas. This species gleans insects and moths in or near wooded areas and along edges of roads, streams, or waterbodies. This species roosts both singly or in small groups in hollow trees, rock crevices, mines, caves, and houses (Bradley et al. 2006). The species was documented within the study area during the 2012 AnaBat surveys (JBR 2012a) (**Table 3.7-1**). In addition to documented presence within the study area, approximately 41,909 acres of suitable roosting and foraging habitat is found within the study area; therefore, the potential for this species to occur within the study area is considered high.

Hoary Bat (BLM Sensitive)

The hoary bat is a summer resident in Nevada found at low to mid elevations (1,870 to 8,200 feet amsl) in forest habitats including riparian areas. This species also is found in valley basins containing pure stands of Rocky Mountain juniper as well as agricultural areas. The hoary bat forages primarily at high altitudes over the tree canopy and would follow watercourses for foraging and drinking. This species roosts in trees within foliage but may roost in caves and beneath rock ledges (Bradley et al. 2006). The species was documented within the study area during the 2012 AnaBat surveys (JBR 2012a) (**Table 3.7-1**). It is likely that the majority of summer observations of hoary bats in Nevada are likely resident males and not breeding females (Bradley et al. 2006). In addition to documented presence within the study area, approximately 20,754 acres of suitable roosting and foraging habitat is found within the study area; therefore, the potential for this species to occur within the study area is considered high.

California Myotis (BLM Sensitive)

The California myotis is a year-round resident found throughout Nevada at low and mid elevations (689 to 8,957 feet amsl). This species occurs in a variety of habitats from Lower Sonoran desert scrub to higher elevation forests. The California myotis gleans insects above open habitat. This species typically roosts singly or in small groups, although some mines are known to shelter colonies of over 100 individuals. Roost sites include mines, caves, buildings, rock crevices, hollow trees, and under exfoliating bark. This species is known to forage throughout the winter (Bradley et al. 2006). The species was documented within the study area during the 2012 AnaBat surveys (JBR 2012a) (**Table 3.7-1**). In addition to documented presence within the study area, approximately 41,909 acres of suitable roosting and foraging habitat is found within the study area; therefore, the potential for this species to occur within the study area is considered high.

Western Small-footed Myotis (BLM Sensitive)

The small-footed myotis is found throughout Nevada from approximately 3,500 to 5,900 feet amsl. This species inhabits a variety of habitats including desert scrub, grassland, sagebrush steppe, blackbrush, greasewood, pinyon-juniper woodlands, pine-fir forests, agricultural lands, and urban areas. Day and maternity roosts have been found in crevices in cliffs, boulders, and on talus slopes (Bradley et al. 2006). Summer roosts are highly variable and include buildings, mines, under the bark on trees, and crevices in cliffs and boulders (AGFD 1993; Harvey et al. 1999). This species prefers small protected dry crevices. Night and hibernation roosts are located in small caves and abandoned mine adits. Buildings also are used as temporary night roosts between flights. This species forages for insects over the edge of rocky bluffs, in clearings, near rocks, and over forests (AGFD 1993; Bradley et al. 2006; Harvey et al. 1999). This species has been documented within abandoned mines (10 individuals during a survey in 2007) located within the study area (Bradley et al. 2006; SRK 2008). Based on its known occurrence within the study area and the presence of approximately 41,950 acres of suitable roosting and foraging habitat within the study area, the potential for this species to occur within the study area is considered high.

Long-eared Myotis (BLM Sensitive)

The long-eared myotis is found throughout Nevada from approximately 2,260 to 6,790 feet amsl, but primarily is found at higher elevations. The long-eared myotis primarily is associated with coniferous forests, including pinyon-juniper woodlands, but the species also utilizes sagebrush and desert scrub habitats. Day roosts include hollow trees; under loose tree bark; crevices in rock cliffs and fissures in the ground; and occasionally in caves, abandoned mines, and buildings. Night roosts primarily occur in caves, mines, and abandoned buildings (AGFD 1993; Bradley et al. 2006; Harvey et al. 1999). This species is known to roost singly or in small groups. This species gleans insects (primarily small moths) over vegetation and open water (e.g., rivers, streams, and ponds) (Bradley et al. 2006). The species was documented within abandoned mines (one individual during surveys in 2007 and numerous recorded calls during the 2012 Anabat survey) located within the study area (**Table 3.7-1**) (Bradley et al. 2006; JBR 2012a; SRK 2008). Based on its known occurrence within the study area and the presence of approximately 41,754 acres of suitable roosting and foraging habitat within the study area, the potential for this species to occur within the study area is considered high.

Little Brown Myotis (BLM Sensitive)

The little brown myotis is probably a year-round resident found primarily in the northern parts of Nevada at higher elevations. This species is often associated with coniferous forests. Foraging occurs in open areas among vegetation, along water margins, and above open water. Roost sites include hollow trees, rocky outcrops, buildings, and occasionally in mines and caves (Bradley et al. 2006). The species was documented within the study area during the 2012 AnaBat surveys (JBR 2012a) (**Table 3.7-1**). In addition to documented presence within the study area, approximately 20,754 acres of suitable roosting and foraging habitat is found within the study area; therefore, the potential for this species to occur within the study area is considered high.

Fringed Myotis (BLM Sensitive)

The fringed myotis occurs in a variety of habitats from low desert scrub to high elevation coniferous forests and is a year-round resident of Nevada. Its distribution in Nevada is more focused on the southern and central portions of the state but likely occurs in northern Nevada as well (Bradley et al. 2006). This species forages primarily on small beetles among the understory vegetation and often exhibits gleaning activity. Roost sites typically consist of mines, caves, and tress. This species has been documented within White Pine County, Nevada (Bradley et al. 2006). Based on its known range and the presence of approximately 41,909 acres of suitable roosting and foraging habitat within the study area, the potential for this species to occur within the study area is considered high.

Long-legged Myotis (BLM Sensitive)

The long-legged myotis occupies sagebrush shrublands and pinyon-juniper and montane coniferous forest habitats from approximately 3,050 to 11,220 feet amsl in Nevada. Individuals typically day roost singly or in small groups in buildings, rock crevices, caves, abandoned mines, or in hollow trees, particularly large diameter snags or live trees within lightning scars (AGFD 1993; Bradley et al. 2006; Harvey et al. 1999). Night roosts and hibernacula are often in caves and mines. Foraging typically occurs in open areas, often at canopy height (Bradley et al. 2006). The species has been documented within the study area during the 2012 AnaBat surveys (JBR 2012a) (**Table 3.7-1**). In addition to documented presence within the study area, approximately 41,909 acres of suitable roosting and foraging habitat is found within the study area; therefore, the potential for this species to occur within the study area is considered high.

Yuma Myotis (BLM Sensitive)

The Yuma myotis is a year-round resident found primarily in the southern and western half of Nevada at low to middle elevations (1,476 to 7,677 feet amsl). This species occurs in a wide variety of habitats, including sagebrush, salt desert scrub, agriculture, playa, and riparian habitats. This species gleans aquatic insects over open water and above vegetation. Roost sites include buildings, trees, mines, caves, bridges, and rock crevices. Night roosts are usually associated with buildings, bridges, or other man-made structures (Bradley et al. 2006). The species was documented within the study area during the 2012 AnaBat surveys (JBR 2012a) (**Table 3.7-1**). In addition to documented presence within the study area, approximately 21,237 acres of suitable roosting and foraging habitat is found within the study area; therefore, the potential for this species to occur within the study area is considered high.

Western Pipistrelle Bat (BLM Sensitive)

The western pipistrelle is a year-round resident in Nevada, occupying low and mid elevations (680 to 8,200 feet amsl) in desert habitats of blackbrush, creosote, salt desert scrub, and sagebrush, with occasional occurrence in ponderosa pine and pinyon-juniper, usually in association with rock features such as granite boulders and canyons. This species gleans insects over open habitats. This species roosts both singly or in small groups in mines, caves, or occasionally in buildings and vegetation. This species has been documented within White Pine County, Nevada (Bradley et al. 2006). Based on its known range and the presence of approximately 41,909 acres of suitable roosting and foraging habitat within the study area, the potential for this species to occur within the study area is considered high.

Brazilian Free-tailed Bat (BLM Sensitive/ Nevada State Protected)

The Brazilian free-tailed bat is found throughout Nevada in a wide variety of habitats ranging from desert scrub to high elevation mountain habitats (680 to 8,200 feet amsl). This species roosts in a variety of structures including cliff faces, caves, mines, buildings, bridges, and hollow trees. Some caves are used as long-term transient stopover roosts during migration. The Brazilian free-tailed bat is known to travel long distances to foraging areas and often forages at high altitudes. The species was documented within the study area during the 2012 AnaBat surveys (JBR 2012a) (**Table 3.7-1**). In addition to documented presence within the study area, and the fact that approximately 41,909 acres

of suitable roosting and foraging habitat is found within the study area; therefore, the potential for this species to occur within the study area is considered high.

Dark Kangaroo Mouse (BLM Sensitive/ Nevada State Protected)

This species is found throughout Nevada in a wide variety of habitats including intermountain desert scrub, sagebrush grasslands, badlands, desert playas, and ephemeral pools. This species primary food source is seeds but also may eat insects. It does not appear to utilize free water and is believed to store food in seed caches within burrow systems. Activity for this species has been observed from March through October with peak nocturnal activity occurring in the first 2 hours after sunset (Wildlife Action Plan Team 2006). The dark kangaroo mouse has not been documented within the study area. However, this species occurs within suitable habitats in White Pine County, Nevada and based on the presence of approximately 21,237 acres of suitable habitat within the study area, the potential for this species to occur within the study area is considered moderate.

Pygmy Rabbit (BLM Sensitive)

The pygmy rabbit is distributed throughout the northern Great Basin, primarily in habitats dominated by dense stands of big sagebrush and rabbitbrush. This species is most abundant in areas with suitable soils (e.g., high clay content) for burrowing. Pygmy rabbits usually remain near dense cover, where rabbits excavate burrows and create trail systems in the understory. Sagebrush is important forage for this rabbit and is consumed year-round (BLM 2004). Suitable sagebrush habitat occurs throughout the lower elevations of the study area based on results of habitat modeling and field surveys conducted in 2011 (SRK 2011b). Approximately 15,853 acres of undisturbed (e.g., undeveloped, unburned) potentially suitable pygmy rabbit habitat occurs within the study area (**Figure 3.8-2**).

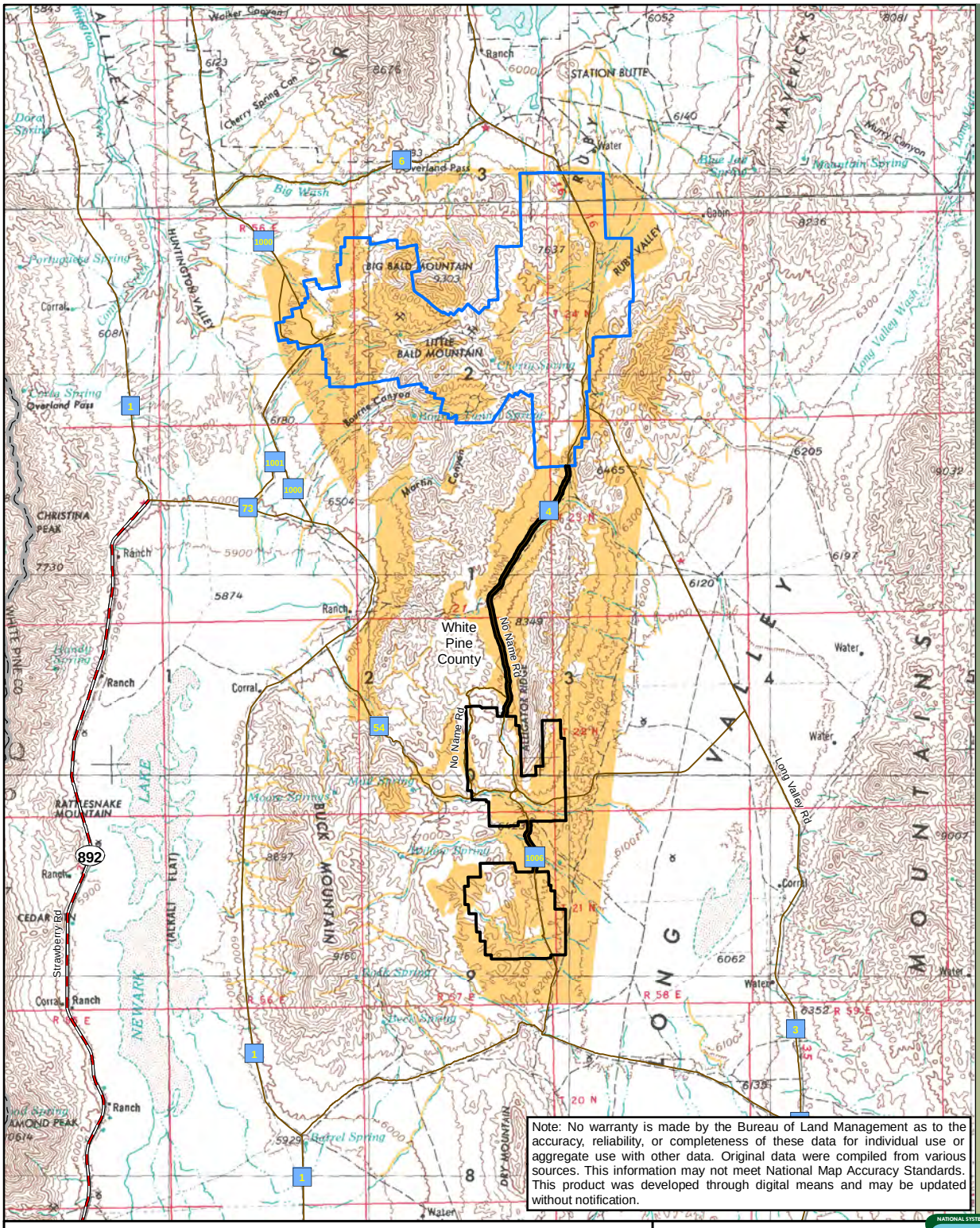
Consultation with the NNHP identified two historic observations of pygmy rabbits within the Ruby Valley approximately 3 miles northeast of the study area and approximately 5 miles northwest of the study area (JBR 2012a). During the 2012 baseline field surveys (JBR 2012a), three observations of pygmy rabbits and an unoccupied, potential older burrow system were documented. These observations are summarized in **Table 3.8-1**.

Table 3.8-1 Pygmy Rabbit Observations within the Study Area

Observation Date	UTM Coordinates		Notes
	Easting	Northing	
03/22/2012	616470	4414613	Possible older pygmy rabbit burrow system near lower Bourne Canyon Road. Unoccupied when identified but near a positive identification site. Observation was approximately 3.3 miles southwest of the survey area.
05/22/2012	621705	4422485	Pygmy rabbit observation in Water Canyon north of upper most spring. Located adjacent to road in dense sagebrush stand. Pellets also present within this area. Observation was within the northern portion of the survey area.
06/27/2012	631236	4400066	Pygmy rabbit observation along Long Canyon range front road south of pavement. Observation was approximately 1 mile east of the survey area.
08/10/2012	622910	4418596	Pygmy rabbit observation within Bourne Canyon along road midway up in taller sagebrush stand. Observation was approximately 0.4 mile west of the survey area.

Note: Coordinates are expressed in Universal Transverse Mercator, Zone 11 North, North American Datum 1983, meters.

Source: JBR 2012a.



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

Legend

- Proposed NOA Plan Boundary
- Proposed SOA Plan Boundary
- Potential Pygmy Rabbit Habitat

Source: SRK 2011b.

Bald Mountain Mine North and South Operations Area Projects EIS

Figure 3.8-2

Potential Pygmy Rabbit Habitat in the Study Area

0 1.25 2.5 5 Miles

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Based on the amount of potentially suitable habitat and observations made within the study area, the potential for this species to occur within the study area is considered high.

3.8.1.3 Birds

Bald Eagle (BLM Sensitive/Nevada State Protected/Bald and Golden Eagle Protection Act)

The bald eagle is found throughout Nevada but mainly as a migrant and winter resident (Floyd et al. 2007; Herron et al. 1985). This species generally roosts in close proximity to large water bodies including rivers, lakes, and reservoirs (Johnsgard 1990; Wildlife Action Plan Team 2012). Nests are typically very large stick nests located in large trees such as cottonwoods. Bald eagles typically begin nesting in February and young fledge by July (Herron et al. 1985). This species has not been documented within the study area. However, this species has been documented north of the study area at the Ruby Lake NWR and may occasionally forage within the study area (BLM 2009a; SRK 2008). Due to the lack of suitable habitat (i.e., large trees near waterbodies) within the study area, occurrences would be limited to migrating and foraging individuals. Therefore, the potential for this species to occur within the study area is considered low in the summer and moderate in the winter.

Swainson's Hawk (BLM Sensitive)

The Swainson's hawk is a summer resident of Nevada and, like the golden eagle, is most abundant in the northern third of the state (Floyd et al. 2007; Herron et al. 1985). The majority of documented breeding territories in Nevada have been located in agricultural valleys. This species nests in a wide variety of vegetative communities from 4,000 to 6,500 feet in elevation. Nest sites primarily are found in deciduous trees; however, nests also have been documented in other vegetation types such as buffaloberry, serviceberry, and sagebrush. Swainson's hawks begin nesting in April and young typically fledge by July (Herron et al. 1985; Johnsgard 1990). This species has been documented nesting approximately 1 mile west of the study area and has been seen within the study area near the Bald Mountain Mine offices during field surveys (JBR 2012b, 2011b). In addition to documented presence within the study area, approximately 41,909 acres of suitable nesting and foraging habitat is found within the study area; therefore, the potential for this species to occur within the study area is considered high.

Ferruginous Hawk (BLM Sensitive)

The ferruginous hawk is a common breeder in many areas of Nevada, particularly the central and east-central portions of the state (Floyd et al. 2007; Herron et al. 1985). The Newark Valley, immediately southwest of the study area, supports the highest density of breeding pairs in Nevada (SRK 2008). This species often nests in trees, on promontory points, rocky outcrops, cut banks, or on the ground. Preferred breeding habitat in most of the state is scattered juniper forests at the interface between pinyon-juniper and desert shrub communities that overlook broad valleys used for foraging. However, this species also is common in sagebrush shrublands. Ferruginous hawks begin nesting in March and young fledge by July (Herron et al. 1985; Johnsgard 1990). Sixteen nest sites have been documented within 5 miles of the study area during biological surveys (JBR 2012b, 2011b, Stantec 2016). Based on the presence of active nest sites and approximately 41,909 acres of suitable nesting and foraging habitat within the study area, the potential for this species to occur within the study area is considered high.

Golden Eagle (BLM Sensitive/ Bald and Golden Eagle Protection Act)

The golden eagle is a year-long resident and is considered to be a common breeder throughout Nevada; however, eagle densities and nesting activity are greatest in the northern third of Nevada (Floyd et al. 2007; Herron et al. 1985). Golden eagle populations are monitored by the USFWS across designated Bird Conservation Regions (BCR). Nevada is located within BCR 9 (Great Basin) western Utah, Southern Idaho, eastern Oregon, and eastern Washington. Recent surveys of the golden eagle population in the western United States have estimated that between 2006 and 2013, a total of

5,898 individual eagles occurred in BCR 9 on average (Nielson et al. 2013). Nesting golden eagles prefer suitable cliffs that overlook sagebrush flats, pinyon-juniper woodlands, salt desert shrub, or other habitat capable of supporting a suitable prey base. Highest densities of nesting eagles typically are found along river systems where cliffs border the entire length of the river, and lower densities are found in pinyon-juniper habitat and salt desert shrub communities. Golden eagles begin nesting in March and young fledge by July. Wintering golden eagles tend to congregate in broad valleys interspersed with agricultural croplands or sagebrush and desert shrub communities (Herron et al. 1985; Johnsgard 1990). Twelve nest sites have been documented within 5 miles of the study area (JBR 2012b, 2011b; Stantec 2015). Based on the presence of active nest sites and approximately 41,909 acres of suitable nesting and foraging habitat within the study area, the potential for this species to occur within the study area is considered high.

Greater Sage-grouse (BLM Sensitive/Federal Candidate)

As discussed above, the study area for special status species, including greater sage-grouse is defined as the proposed NOA and SOA plan boundaries. The CESA for greater sage-grouse includes the Ruby Valley and Butte/Buck/White Pine PMUs as illustrated in **Figure 3.8-1**.

The greater sage-grouse is found throughout Nevada in sagebrush dominated habitats (Floyd et al. 2007). Sagebrush is a key component of greater sage-grouse habitat on a year-long basis. Sagebrush provides forage and nesting, security, and thermal cover for this species. Moist areas that provide succulent herbaceous vegetation during the summer months are used extensively as brood rearing habitat. Open, often elevated areas within sagebrush habitats usually serve as breeding areas (strutting grounds or lek sites). In Nevada, greater sage-grouse males begin displaying on leks in early March, and hens typically begin nesting in April and May. During winter, greater sage-grouse often occupy wind exposed areas where sagebrush is available (e.g., drainages, southern or western slopes, or exposed ridges) (Connelly et al. 2000; Floyd et al. 2007; Neel 1999; Wildlife Action Plan Team 2012).

Strutting/Breeding/Nesting Habitat

The center of breeding activity for the greater sage-grouse is referred to as a strutting ground or lek. Leks are characterized as flat, sparsely vegetated areas within large tracts of sagebrush (Connelly et al. 2004). Males begin to appear on leks in March, with peak attendance of leks occurring from late-March to mid- April (Connelly et al. 2004). Nesting generally commences 1 to 2 weeks after mating and may continue as late as early June (NDOW 2012b). Greater sage-grouse nesting habitat typically is centered around active leks and consists of medium to tall sagebrush with a perennial grass understory (Connelly et al. 2000). Studies have shown that taller sagebrush with larger canopies and more residual understory cover usually lead to higher nesting success for this species (Connelly et al. 2004, 2000). **Table 3.8-2** presents data on the 9 active leks and 7 unknown leks that occur within the vicinity of the study area. Of the 10 leks within 3 miles of the study area, 6 leks are active and 4 leks are of unknown status.

In response to the USFWS 2010 “warranted, but precluded” ESA listing petition, the BLM initiated a review of conservation measures and policy within existing Resource Management Plans for field offices and districts that contain greater sage-grouse habitat. This review process was recently completed with the preparation of an Approved Resource Management Plan Amendment, commonly referred to as the Greater Sage-grouse Amendment (GRSG Amendment) and associated EIS to identify and incorporate conservation measures intended to conserve, enhance, and restore greater sage-grouse habitat (BLM 2015a). The GRSG Amendment provides guidance on measures to avoid and minimize potential impacts resulting from proposed projects in addition to providing appropriate measures to compensate for impacts that are unavoidable to greater sage-grouse habitat resulting from development projects that access existing and valid rights. A summary of the Proposed Action and other action alternatives is provided in Section 1.5, Consistency and Compliance. A detailed analysis of the Proposed Action and other action alternatives is provided in **Appendix A**.

Table 3.8-2 Greater Sage-grouse Leks within the Vicinity of the Study Area

Name	NDOW Lek Status[6]	Distance from Nearest Existing Haul Road (miles)	Distance from Existing Disturbance[1] (miles)	Lek Counts (Maximum Number of Birds[2])						
				2008	2009	2010	2011	2012	2013	2014
Beck Pass 3	Active	3.8	3.6	5	7	-	17	27	36	51
Beck Pass 4	Active	1.6	2.2	-	0	-	0	12	13	30
Blue Jay Road	Active	1.9	2.0	-	-	9	24	16	13	22
Buck Mountain East[3]	Active	0.8	0.8	-	-	-	-	21	30	6
Buck Mountain East 2[3]	Active	1.2	1.5	-	-	-	-	4	3	28
Long Valley North Central West	Active	4.2	4.0	0	0	0	0	7	13	12
Long Valley Well 2	Active	1.1	1.7	0	0	0	0	7	11	5
Warm Springs North	Active	5.3	4.8	-	24	15	16	4	15	19
Warm Springs South	Active	5.0	5.3	-	5	-	0	8	15	10
Central Long Valley	Unknown	5.5	5.5	-	-	-	-	0	0	0
Little Bald Mountain Southwest	Unknown	4.9	4.1	0	0	-	-	0	2	1
Long Valley North Central[5]	Unknown	5.1	4.6	0	0	0	0	0	0	13
Overland Road	Unknown	2.7	3.0	-	-	-	-	0	0	0
Ruby Valley South	Unknown	1	1.1	-	-	-	0	1[4]	0	0
Ruby Valley South 2	Unknown	1.8	2.2	-	-	-	-	0	0	0
Station Butte	Unknown	2.9	3.5	-	-	0	-	0	0	0
	Total			**5**	**36**	**24**	**57**	**107**	**151**	**197**

[1] Existing and/or previously authorized.

[2] Both male and female birds reported.

[3] New leks located by JBR in 2012.

[4] One female was observed on lek but no males were documented using the lek.

[5] Lek location shifted approximately 1.4 miles to the northeast.

[6] NDOW lek status is based on number of males observed at lek locations.

"-" indicates the lek was not surveyed.

Source: JBR 2013a, 2012a; NDOW 2012b; Stantec 2014.

Under the GRSG Amendment, habitat management categories have been identified by the BLM in coordination with respective wildlife agencies to help apply management guidelines designed to protect and/or manage greater sage-grouse habitat. These habitat management categories are referred to as Priority Habitat Management Areas (PHMA), General Habitat Management Areas (GHMA), and Other Habitat Management Areas (OHMA) (BLM 2015a). The management categories are defined under the Approved Resource Management Plan Amendment as follows:

PHMA - BLM-administered lands identified as having the highest value to maintaining sustainable GRSG populations. Areas of PHMA largely coincide with areas identified as priority areas for conservation in the USFWS's Conservation Objectives Team report. These areas include breeding, late brood-rearing, and winter concentration areas and migration or connectivity corridors. Approximately 7,410 acres of undisturbed (e.g., undeveloped) PHMA occurs within the study area (**Figure 3.8-3** and **Figure 3.8-4**).

GHMA - BLM-administered lands where some special management will apply to sustain GRSG populations; these are areas of occupied seasonal or year-round habitat outside of PHMA. Approximately 9,828 acres of undisturbed (e.g., undeveloped) GHMA occurs within the study area (**Figure 3.8-3** and **Figure 3.8-4**).

OHMA - BLM-administered lands previously identified as unmapped habitat in the Draft GRSG Amendment that are within the planning area and contain seasonal or connectivity habitat areas. These areas also were identified in recent habitat modeling efforts (Coates et al. 2014) as containing characteristics of unmapped but suitable greater sage-grouse habitat. Approximately 10,951 acres of undisturbed OHMA occurs within the study area (**Figure 3.8-3** and **Figure 3.8-4**).

Field surveys have documented greater sage-grouse within the study area (SRK 2008). However, due to pinyon-juniper encroachment in much of the sagebrush shrubland habitat within and around the study area, the amount of suitable greater sage-grouse habitat is declining in comparison to historic conditions within the study area (SRK 2008). The eastern half of the southern block of the SOA contains areas of suitable winter and early brood-rearing habitat. Existing disturbance in this area has compromised these historic brood rearing habitats. Due to the lack of perennial water sources, particularly those which provide riparian areas within sagebrush shrubland habitat, brood rearing habitat is very limited within the study area. Nonetheless based on the documented occurrence of birds within the study area (NDOW 2012b), the presence of suitable breeding and nesting habitat, and the close proximity of active leks to the study area, the potential for this species to occur within the study area is considered high.

Studies indicate that acoustic communication is an important component in the reproductive behavior of greater sage-grouse. Females use vocalizations to find lek habitats and upon arrival at the lek site in addition to using male vocalizations to choose a mate (Blickely and Patricelli 2012). While the aggregate effects of increased anthropogenic noise upon greater sage-grouse breeding and nesting success are not currently well understood, evidence of declines in lek attendance at locations exposed to noise levels measurably above ambient conditions has been recently observed (Blickley et al. 2012).

Noise modeling and monitoring was conducted at selected lek locations in 2013 in an effort to evaluate impacts to greater sage-grouse breeding activity from future mining activity in the vicinity of the NOA and SOA projects. On March 1, 2013, the BLM and NDOW identified 9 leks to be included in the noise modeling and ambient noise monitoring. Barrick contracted with JBR and J.C. Brennan and Associates to conduct the ambient noise monitoring at the lek locations identified for data collection.

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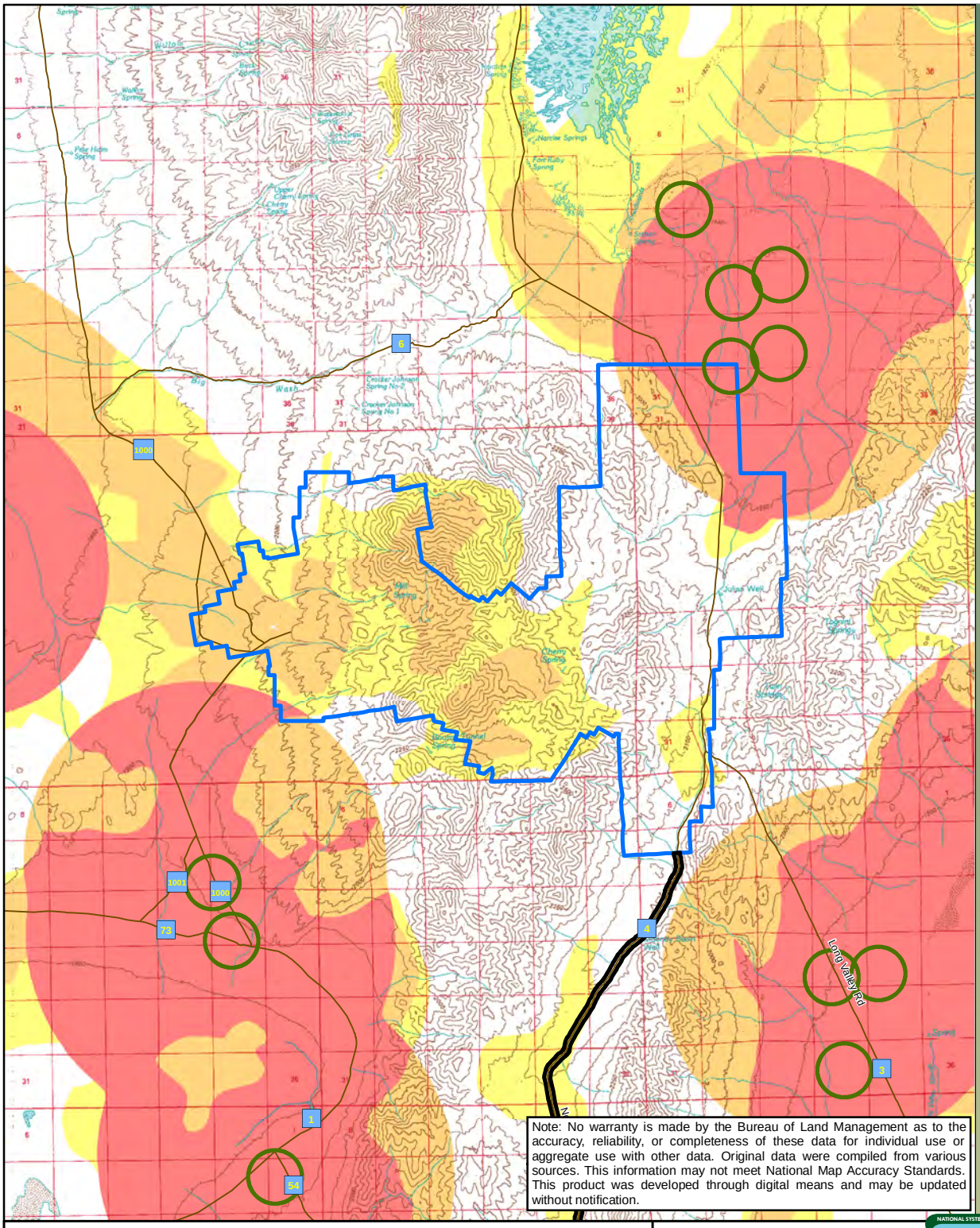

BLM

Ely District Office

Legend

- Proposed NOA Plan Boundary
- Proposed SOA Plan Boundary
- Leks (half-mile buffer)

Greater Sage-grouse Management Categories

- Priority Habitat Management Area (PHMA)
- General Habitat Management Area (GHMA)
- Other Habitat Management Area (OHMA)

Source: SEP 2014, NDOW 2012b, SRK 2011b.

Bald Mountain Mine North and South Operations Area Projects EIS

Figure 3.8-3

Greater Sage-grouse PHMA, GHMA, and OHMA within the Proposed North Operations Area

0 1 2 4 Miles

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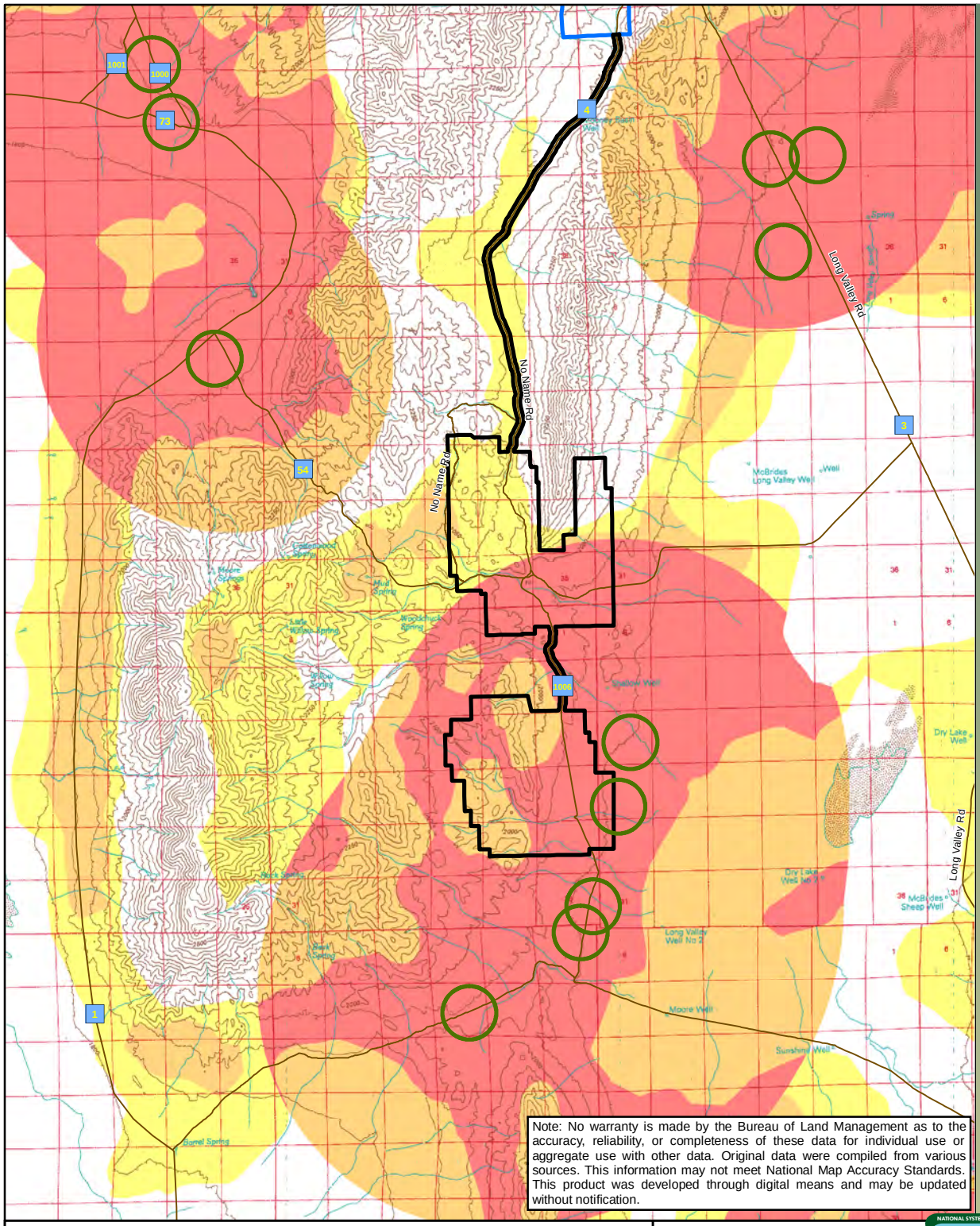

Legend

- Proposed NOA Plan Boundary
- Proposed SOA Plan Boundary
- Leks (half-mile buffer)

Greater Sage-grouse Management Categories

- Priority Habitat Management Area (PHMA)
- General Habitat Management Area (GHMA)
- Other Habitat Management Area (OHMA)

Source: SEP 2014, NDOW 2012b, SRK 2011b.

Bald Mountain Mine North and South Operations Area Projects EIS

Figure 3.8-4

Greater Sage-grouse PHMA, GHMA, and OHMA within the Proposed South Operations Area

0 1 2 4 Miles

N

BLM

Ely District Office

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Lek activity monitoring was conducted between March 18 and May 2, 2013; and baseline noise monitoring was conducted between May 15 and May 30, 2013. JBR and J.C. Brennan and Associates placed noise monitoring equipment at the lek edge locations as discussed with NDOW. Once the monitoring period was over for each lek, equipment was collected and J.C. Brennan and Associates analyzed the data following the BLM's guidance. The equipment used for the noise measurements included Larson Davis Laboratories Models 831, 824, and 820 precision integrating sound level meters. All equipment met the ANSI Type 1 standard for noise and frequency measurements. Noise monitoring equipment was calibrated before and after the measurements. **Table 3.8-3** presents the nine leks that were monitored for baseline noise conditions and the results of the monitoring study.

Table 3.8-3 Baseline Ambient Noise Levels at Monitored Leks

Lek Name	Acoustic Monitoring Dates	Baseline Noise Levels (dBA)*
Warm Springs North	5/22/2013 – 5/30/2013	16.3
Warm Springs South	5/22/2013 – 5/30/2013	17.6
Buck Mountain East	5/14/2013 – 5/22/2013	18.7
Buck Mountain East #2	5/14/2013 – 5/22/2013	17.5
Beck Pass #3	5/22/2013 – 5/30/2013	19.9
Beck Pass #4	5/14/2013 – 5/22/2013	16.7
Long Valley Well #2	5/14/2013 – 5/22/2013	19.3
Long Valley North Central West	5/22/2013 – 5/30/2013	19.8
Blue Jay Road	5/22/2013 – 5/30/2013	18.2

* dBA = decibels on the A-weighted scale using the L_{90} metric.

Source: JBR 2013a.

Western Burrowing Owl (BLM Sensitive)

The burrowing owl is known to breed throughout Nevada. The majority of the breeding population is known to migrate from northern Nevada to southern California and Mexico during the winter months. However, observations of this owl have been recorded in Nevada during all months of the year (Floyd et al. 2007; Herron et al. 1985). Breeding by burrowing owls is strongly dependent on the presence of burrows constructed by prairie dogs, ground squirrels, or badgers. Prime burrowing owl habitat must be open, have short vegetation, and contain an abundance of burrows. Burrowing owls begin nesting in April and young typically fledge by August (Floyd et al. 2007; Herron et al. 1985; Neel 1999). Two nest sites have been documented within 5 miles of the study area during biological surveys (JBR 2012a; Stantec 2015). Additionally, based on the presence of approximately 19,445 acres of suitable nesting and foraging habitat within the study area, especially recently reclaimed grassland areas and lower elevation shadscale and sagebrush shrubland habitats, the potential for this species to occur within the study area is considered high.

Lewis's Woodpecker (BLM Sensitive)

The Lewis's woodpecker breeds in isolated pockets in the northern half of Nevada. This species is found in open forest habitats such as ponderosa pine forests, burned over Douglas fir forests, pinyon-juniper woodlands, oak woodlands, and riparian areas. Nesting habitat consists of these habitats with a grassy or brushy understory (Floyd et al. 2007; Neel 1999; Wildlife Action Plan Team 2012). The breeding season for this species is April 15 through July 15. This species has not been documented within the study area. Therefore, based on the presence of approximately 20,754 acres of suitable foraging and breeding habitat within the study area, the potential for this species to occur within the study area is considered moderate.

Pinyon Jay (BLM Sensitive)

The pinyon jay occurs throughout the western U.S. and is a permanent resident of Nevada. This species is strongly associated with pinyon-juniper forest habitats and can be found along the pinyon-juniper belt extending from the Humboldt River south to the Mojave Desert. Pinyon jays are semi-colonial nesters and occur in large groups where food is abundant (Floyd et al. 2007; Neel 1999; Wildlife Action Plan Team 2012). The breeding season for this species is determined by the availability of pinyon nuts and typically occurs March 1 through July 15. The species was documented within the study area during field surveys (JBR 2012a; SRK 2011a). Therefore, based on the documented occurrence of this species and the presence of approximately 20,713 acres of suitable nesting and foraging habitat within the study area, the potential for this species to occur within the study area is considered high.

Loggerhead Shrike (BLM Sensitive/Nevada State Protected)

The loggerhead shrike is a common resident throughout Nevada. This species is found in open grasslands along valley floors and foothills of the Great Basin. In Nevada, it is commonly found in scrub habitat types such as sagebrush and greasewood. Loggerhead shrikes prefer shrubs or small trees for nesting, but nesting also can occur in pinyon-juniper woodlands. This species can be found perching on wire, fences, or poles (Floyd et al. 2007; Neel 1999; Wildlife Action Plan Team 2012). The breeding season for this species is April 15 through July 15. This species has been documented within the study area during field surveys (JBR 2012a). Therefore, based on the documented occurrence of this species and the presence of approximately 19,720 acres of suitable nesting and foraging habitat within the study area, the potential for this species to occur within the study area is considered high.

Sage Thrasher (BLM Sensitive/Nevada State Protected)

The sage thrasher is a common resident throughout sagebrush shrublands and desert scrub habitats in Nevada (Floyd et al. 2007). This species spends the summer months in sagebrush shrublands of the Great Basin and winters in the desert scrub of the Great Basin and Mojave Desert (Stokes and Stokes 1996). This species is often observed singing from prominent perches on tall shrubs during the breeding season. The breeding season for this species is April 15 to July 15. The species was documented within the study area during field surveys (JBR 2012a; SRK 2011a). Therefore, based on the documented occurrence of this species and the presence of approximately 19,445 acres of suitable nesting and foraging habitat within the study area, the potential for this species to occur within the study area is considered high.

Brewer’s Sparrow (BLM Sensitive/Nevada State Protected)

The Brewer’s sparrow, much like the sage thrasher, is common throughout Nevada in sagebrush shrublands and desert scrub habitats (Floyd et al. 2007). Except for singing males during the breeding season, this species is very inconspicuous and typically spends most of the time in understory vegetation (Stokes and Stokes 1996). The breeding season is April 15 to July 15. This species has been documented within the study area during field surveys (JBR 2012a; SRK 2011a). Therefore, based on the documented occurrence of this species and the presence of approximately 19,445 acres of suitable nesting and foraging habitat within the study area, the potential for this species to occur within the study area is considered high.

3.8.1.4 Amphibians

Northern Leopard Frog (BLM Sensitive/Nevada State Protected)

The northern leopard frog is broadly distributed in limited and isolated habitats from eastern Nevada to northern and western Nevada. Most Nevada populations are highly localized and isolated from one another (NatureServe 2012; Wildlife Action Plan Team 2012). This species inhabits permanent water with rooted aquatic vegetation such as springs, slow streams, marshes, bogs, ponds, canals, flood plains, reservoirs, and lakes. In summer, it commonly inhabits wet meadows and fields. When inactive,

it takes cover underwater, in damp niches, or in caves. Eggs are laid and larvae develop in shallow, still, permanent water (typically), generally in areas well exposed to sunlight. Eggs are typically attached to vegetation just below the surface of the water. Females begin laying eggs in late April and May and tadpoles emerge by August (NatureServe 2012; Wildlife Action Plan Team 2012). The species has not been recorded within the study area; however, marginal habitat does occur within the study area at several seeps and springs (SRK 2008). Based on the presence of approximately 41 acres of marginal habitat and the lack of occurrence records for this species, the potential for this species to occur within the study area is considered low.

3.8.1.5 Mollusks

Springsnails, a group of mollusks that are found in perennial springs and seeps, are considered important invertebrates because of their restricted and native origin. The BLM considers springsnails to be a sensitive group of invertebrates and manages the public lands in the Great Basin to protect springsnails and their habitat (USGS et al. 1998). Springsnails usually inhabit spring sources or outflow areas located immediately downstream of the spring outlet. Perennial springs are considered potential habitat for this group of mollusks and springs which are subject to occasional drying are not expected to support springsnails (BLM 2009a). While potentially suitable habitat does occur within study area at two springs (e.g., Lower Mill Springs and South Water Canyon), the potential for this species to occur within the project area is considered low. Springsnails were not documented within the study area during field surveys in 2007 and (SRK 2007).

3.8.1.6 Plants

<u>Nachlinger's Catchfly (BLM Sensitive)</u>

The Nachlinger's catchfly (*Silene nachlingerae*), a BLM sensitive species, is a perennial herb with white to purple petaled flowers. A Nevada endemic, the species is found in Elko, Nye, and White Pine counties. In Elko County, the species is found in the southern portion of the Ruby Mountains, while in White Pine County, it is found in the Cherry Creek, Egan, Schell Creek, and Snake ranges (BLM 2009a). Two locations have been recorded in Nye County: one in the Horse Range and one in the Grant Range (BLM 2009a).

The species is typically found on dry, exposed or somewhat sheltered carbonate (rarely quartzite) crevices in ridgeline outcrops, talus, or very rocky soils on or at the bases of steep slopes or cliffs. The species is found on all aspects; however, it is predominantly found on northwesterly to northeasterly exposures at 7,160 to 11,250 feet amsl. Typically, the species is found in the subalpine conifer zone with associated species including sparse mat rockspirea (*Petrophytum caespitosum*), onestem fleabane (*Erigeron simplex*), limber pine (*Pinus flexilis*), Great Basin bristlecone (*P. longaeva*), little sagebrush (*Artemisia arbuscula*), birchleaf mountain mahogany (*Cercocarpus betuloides*), Watson's goldenbush (*Ericameria watsonii*), fourpetal cliffbush (*Jamesia tetrapetala*), and Nevada primrose (*Primula nevadensis*).

Potential habitat for this species occurs in the northwestern portion of the study area. Surveys in the area associated with the previous NEPA documents, did not identify any occurrences or suitable habitat in the respective project areas (BLM 2011a, 2009a). As part of the baseline biological surveys for the proposed NOA and SOA projects, a habitat predictability model for the Nachlinger's catchfly was developed (SRK 2008) and surveys were conducted in 2012 (JBR 2012a). The species was recorded at eight locations along a limestone ridge in the northern portion of the survey area. The locations were associated with curl-leaf mountain mahogany stands within pinyon-juniper vegetation communities (JBR 2012a). The potential for this species to occur within areas of suitable habitat within the study area is considered to be moderate.

3.8.2 Environmental Consequences

This section discusses project related impacts to special status species, resulting from the Proposed Action, Reconfiguration Alternative, WRM Alternative and No Action Alternative. Primary issues related to special status species include the loss or alteration of native habitats, increased habitat fragmentation, animal displacement, direct loss of animals, and impacts associated with water management. Impacts to special status wildlife and plant species within the Ruby Lake NWR could potentially occur from the increase of vehicle traffic from construction and mine personnel commuting to the project area. These impacts could include increased mortality from collisions with vehicles, increased vehicle noise, and reductions of habitat suitability as a result of increased fugitive dust and reduced water quality of water bodies located adjacent to county roads. Potential impacts for 30 special status species identified as potentially occurring within the study area are further discussed in the following sections.

3.8.2.1 Proposed Action

Surface Disturbance

Similar to impacts discussed in Section 3.7, Wildlife and Fisheries Resources, potential impacts to special status species include the temporary (short-term and long-term) and permanent reduction or loss of habitat. Short-term impacts arise from habitat removal and disturbance as well as from activities associated with mine operation and are anticipated to occur over a 5- to 10-year period, dependent upon the activity and reclamation success. These impacts would cease upon mine closure and successful reclamation. Long-term impacts consist of changes to habitats and the wildlife populations that depend on those habitats, irrespective of reclamation success. Habitat loss or alteration would result in direct losses of smaller, less mobile species of wildlife, such as small mammals, and the displacement of more mobile species into adjacent habitats. In areas where habitats are at, or near, carrying capacity, animal displacement could result in some unquantifiable reductions in local wildlife populations. Mining and exploration surface disturbance also would result in an incremental increase in habitat fragmentation in the study area until vegetation has been re-established.

Under the Proposed Action, implementation of surface disturbance activities as a result of proposed development and expansion would remove approximately 4,357 acres within the proposed NOA; and approximately 2,740 acres within the proposed SOA. With the exception of open pits, all project components would be revegetated, representing a permanent loss of 863 acres of wildlife habitat within the proposed NOA; and a permanent loss of 347 acres of wildlife habitat within the proposed SOA.

Mammals

Bats

Of the 15 bat species that could occur in the study area discussed in Section 3.8.1.1, 12 species (i.e., pallid bat, Townsend's big-eared bat, big brown bat, silver-haired bat, hoary bat, California myotis, western small-footed myotis, long-eared myotis, little brown myotis, long-legged myotis, Yuma myotis, and Brazilian free-tailed bat) have been documented within the study area (Bradley et al. 2006; JBR 2012a; SRK 2008). Potentially suitable habitat for the remaining three species (i.e., spotted bat, fringed myotis, and the western pipistrelle bat) occurs within the study area. Implementation of the proposed NOA and SOA projects could result in direct and indirect impacts to local bat species and their habitat. Direct impacts would include the permanent loss of foraging habitat, including approximately 1,210 acres (3 percent) of potentially suitable habitat from the development of the proposed NOA and SOA projects. Impacts to bat species also could result from exposure to mine-related process solutions within the study area.

Dark Kangaroo Mouse

Implementation of the proposed NOA and SOA projects would result in the long-term loss of approximately 2,706 (41 percent) acres of available potential habitat for this species within the study area until reclamation has been completed and vegetation has been re-established. In areas where reclamation would not occur, a permanent loss of approximately 344 acres (2 percent) of potential habitat is anticipated. This impact would be considered low, considering the large amount of suitable habitat located within the study area and the fact that habitat for this species within the project area was determined to be of marginal suitability (JBR 2012a). Indirect impacts associated with noise and human presence currently occurs at the site and would continue under the proposed NOA and SOA projects. However, project construction likely would result in the direct mortalities of individual mice, if present. The loss of individuals is not anticipated to result in range wide population-level effects.

Pygmy Rabbit

Implementation of the proposed NOA and SOA projects would result in the long-term loss of approximately 2,706 acres of the 19,249 acres (14 percent) of potential habitat (big sagebrush-dominated habitats) for this species within the study area, until reclamation has been completed and vegetation has been re-established. In areas where reclamation would not occur, a permanent loss of approximately 344 acres (2 percent) of the 19,249 acres of potential habitat is anticipated. Indirect impacts associated with noise and human presence currently occurs at the site and would continue under the proposed NOA and SOA projects. These impacts would be considered low, considering the large extent of potentially suitable habitat (big sagebrush) located within the study area. However, project construction likely would result in the direct mortalities of individual rabbits, if present. The loss of individual pygmy rabbits (a game species in Nevada) would not result in population-level effects.

Birds

Impacts to sensitive raptors and migratory bird species identified in association with the construction and operation of the proposed NOA and SOA projects and are discussed in Section 3.7.2.1. Other potential species-specific impacts are discussed in the following sections.

Bald Eagle

No bald eagle nests occur within the study area. Occurrence by this species would be limited to migrating and dispersing individuals. Direct impacts would include the long-term loss of approximately 5,887 acres (14 percent) of available potential foraging habitat within the study area, until reclamation has been completed and vegetation has been re-established. In areas where reclamation would not occur, a permanent loss of approximately 1,210 acres (3 percent) of available potential foraging habitat within the study area is anticipated. Indirect impacts associated with noise and human presence currently occurs at the site and would continue under the proposed project. Based on the lack of nest sites within the study area, potential impacts to this species as a result of the proposed NOA and SOA projects would be considered negligible.

Swainson's Hawk

One Swainson's hawk nest has been identified within 1 mile of the study area. In addition, suitable nesting and foraging habitat occurs within the study area. Direct impacts would include the long-term loss of approximately 5,887 acres (14 percent) of available potential foraging habitat within the study area until reclamation has been completed and vegetation has been re-established. In areas where reclamation would not occur, a permanent loss of approximately 1,210 acres (3 percent) of potential foraging habitat is anticipated. Indirect impacts would continue to result from mine and mineral exploration noise and human presence. Based on the distance of the active nest site from the proposed mining activities, potential impacts to this species as a result of the proposed NOA and SOA projects would be considered negligible.

Ferruginous Hawk

One active ferruginous hawk nest has been identified approximately 2 miles from areas of disturbance. Direct impacts would include the long-term loss of approximately 5,887 acres (14 percent) of available potential nesting and foraging habitat within the study area until reclamation has been completed and vegetation has been re-established. In areas where reclamation would not occur, a permanent loss of approximately 1,210 acres (3 percent) of potential foraging habitat is anticipated. However, this impact would be considered negligible based on the overall availability of suitable foraging habitat in the study area. Indirect impacts would continue to result from mine and mineral exploration noise and human presence. Based on the distance of the active nest site from the proposed mining activities, potential impacts to this species as a result of the proposed NOA and SOA projects would be considered negligible.

Golden Eagle

Twelve active golden eagle nest sites occur within 5 miles of the study area. Two of the active nests occur within areas of existing disturbance. Direct impacts would include the long-term loss of approximately 5,887 acres (14 percent) of available potential foraging habitat within the study area until reclamation has been completed and vegetation has been re-established. In areas where reclamation would not occur, a permanent loss of approximately 1,210 acres of potential foraging habitat is anticipated.

The Water Canyon eagle nest (WC-1) is located within the NOA in the area, approximately 500 feet to the southeast of the boundary of the proposed Redbird Pit. This nest would not be directly removed by mining activity but would likely be disturbed by visible mining activity under the Proposed Action within the Redbird Pit area and along the existing haul road at this location. Nesting surveys in 2010 observed one young golden eagle successfully fledging from nest WC-1. Surveys conducted in 2011 through 2014 of nest WC-1 have observed limited golden eagle activity in the vicinity of the nest and no successful nesting attempts have been recorded during that time. Although surveys in 2013 did not record the presence of breeding eagles near this nest at any time during the season, a single egg was observed in the nest during the aerial nest search. Golden eagles were observed to have successfully fledged a single eagle from the WC-1 nest in 2015 (Kinross, unpublished data).

Nesting surveys conducted in 2014 observed a pair of golden eagles breeding at a nest located within the Yankee Pit area of the SOA (Stantec 2015). The South Yankee Pit (YP-1) nest was observed to successfully fledge a single golden eagle on July 8, 2014. Previous surveys had not observed activity at this location, therefore the nest was not previously attributed to a specific species. Confirmation of golden eagle nesting activity at this location results in the nest receiving protection provided to all known eagle nests under the BGEPA, regardless of activity status. This nest would be removed under the Proposed Action and other action alternatives. In order to comply with the BGEPA and MBTA, Barrick has actively been consulting with the USFWS to obtain authorization to remove or relocate the nest prior to any disturbance related to mining activity, in addition to developing appropriate mitigation. In addition to the development of a BBCS discussed in Section 3.7.2.1, Barrick is actively coordinating with the USFWS regional migratory bird office to develop an Eagle Conservation Plan (ECP) prior to conducting further mining operations that would potentially result in take of an eagle or eagle nest within the project area whether through the removal or disturbance of a nest site. The BLM would require consultation with the USFWS on completion of an ECP and approval of a permit to take eagle nests within the project area as part of an approval of any action alternatives discussed in this EIS. Conservation measures to avoid and minimize potential impacts to golden eagles are identified in **Table 2-54** and include:

- Where possible, protect and preserve potential roost and nest sites by retaining mature trees, particularly within 0.5 mile from water;
- Where eagles are likely to nest in human-made structures, such as radio towers, and such use may impede the operation and maintenance of the structures or jeopardize the safety of the birds, the structures would be equipped with either devices engineered to discourage eagles from nest-building or would be constructed with nesting platforms that would safely accommodate eagle nests without interfering with structure performance;
- Employ industry-accepted BMPs to prevent eagles from colliding with or being electrocuted by utility lines, towers, and poles;
- Process areas would be designed to prevent contact between eagles and process solution by using BLM approved avian deterrents that could include installing bird balls on process ponds and placing overliner or other material over conveyance ditches;
- Speed limits would be maintained to reduce vehicle/bird collisions; and
- During annual training, Barrick would remind employees of their individual and company-defined responsibilities toward protecting eagles.

With implementation of these measures, impacts to nesting golden eagles, and other raptor species within the study area would be limited primarily to temporary and permanent habitat loss.

Indirect impacts associated with mine operations, mineral exploration noise, and human presence currently occur at the YP-1 nest site and would continue under the proposed project. Based on the recent breeding activity at nest YP-1 and the presence of 5 active nest sites within 5 miles of the study area (JBR 2012b; Stantec 2015) and the existing level of activity at the project site, potential impacts to this species within the vicinity of the mine as a result of the proposed project would be considered high.

Greater Sage-grouse

Six active leks and four leks of unknown status occur within 3 miles of the study area (**Table 3.8-2**). The nearest active lek site, Buck Mountain East, occurs approximately 0.8 mile from a proposed disturbance footprint. As a result, no direct removal of greater sage-grouse leks would be anticipated from project activities.

Indirect impacts to breeding greater sage-grouse as a result of noise from project activities may include avoidance or accommodation depending upon the intensity and frequency of disturbance. Anthropogenic noise has been recognized as an influence that can adversely impacts animals including greater sage-grouse (Barber et al. 2010; Blickley and Patricelli 2012; Kight and Swaddle 2011; Mcclure et al. 2013; Rabin and McCowan 2003; Shannon et al. 2014). Anthropogenic noise specifically is distinct in intensity, periodicity, and frequency when compared to other common natural sources of noise (Warren et al. 2006). Greater sage-grouse may avoid areas because of noise from vehicle traffic (Lyon and Anderson 2003). Males typically gather on lekking grounds from March until June for several hours in the early morning when conditions are quiet and still. During this time greater sage-grouse may be particularly vulnerable to disturbance from noise pollution (Blickley and Patricelli 2012). Recent studies also provide evidence that anthropogenic noise causes some males to avoid attending leks with introduced noise (Blickley et al. 2012).

The importance of sound as a means of communication in sage-grouse has been demonstrated by the observation that a significant relationship exists between acoustic signaling and mating success in male sage-grouse (Gibson 1989; Gibson and Bradbury 1985). The importance of male acoustic signals was confirmed in a subsequent study of male greater sage-grouse mating success that concluded that acoustic signals produced by breeding individuals were highly correlated with breeding success (Gibson et al. 1991). Sound is normally defined as “vibrations that travel through the air or

another medium and can be heard when they reach a person's or animal's ear" (Stevenson and Lindberg 2010). These vibrations have both a frequency and an amplitude, with frequency measured in Hertz and heard by humans across a range from about 20 to 20,000 Hertz (Ambrose and Florian 2014). Although the range of perceptible frequencies likely varies by species, most animals can perceive sound across a wide range of frequencies. Amplitude is perceived as the loudness of sound, and is commonly measured in decibels, a logarithmic unit for quantifying the intensity of sound. Due to the fact that sound is measured on a logarithmic scale, it is difficult to interpret decibels levels naturally because of the nonlinear relationship of the scale of measure. For example purposes, a sound measured at 20 decibels above the ambient conditions observed at the edge of a greater sage-grouse lek produces a 10 fold increase in the sound pressure and a four-fold increase of the perceived loudness of the noise. A complete review of anthropogenic sound and the resulting impacts to greater sage-grouse in Nevada is provided in the NDOW publication *Acoustic Impacts and Sage-grouse: A Review of Current Science, Sound Measurement Protocols, and Management Recommendations* (Tull 2015).

Of the 9 active leks in the project vicinity, 6 leks are within 3 miles of existing disturbance areas and 3 leks are located between 3 and 6 miles from the study area. **Table 3.8-4** provides a summary of the noise propagation modeling of construction activity, mining activity, and road activity recently conducted at 9 of the 10 lek sites located within 3 miles of the proposed NOA and SOA projects.

Table 3.8-4 Summary of Noise Propagation Modeling of Construction, Mining, and Road Activity[1]

Lek Name	Ambient Noise Level (dBA[2])	Activity Type/Location	Distance to Activity (miles)	Projected Noise Level (Combined L_{eq}[3])
Warm Springs North	16.3	Construction/Proposed County Road Improvements	4.5	27.0
	16.3	Mining	5.4	20.5
	16.3	Road Traffic	0.3	39.1
Warm Springs South	17.6	Construction/County Access Road #818 Reroute	4.5	27.0
	17.6	Mining	5.1	24.5
	17.6	Road Traffic	0.2	41.3
Buck Mountain East	18.7	Construction/Yankee Process Area	0.7	43.1
	18.7	Mining	0.8	33.8
	18.7	Road Traffic	0.7	31.4
Buck Mountain East #2	17.5	Construction/Yankee Process Area	1.4	36.9
	17.5	Mining	1.5	29.7
	17.5	Road Traffic	1.2	27.0
Beck Pass #3	19.9	Construction/Yankee Process Area	4.1	27.8
	19.9	Mining	3.5	24.5
	19.9	Road Traffic	3.1	18.4
Beck Pass #4	16.7	Construction/Yankee Process Area	2.2	33.2
	16.7	Mining	2.0	29.3
	16.7	Road Traffic	0.1	52.3

Table 3.8-4 Summary of Noise Propagation Modeling of Construction, Mining, and Road Activity[1]

Lek Name	Ambient Noise Level (dBA[2])	Activity Type/Location	Distance to Activity (miles)	Projected Noise Level (Combined L_{eq}[3])
Long Valley Well #2	19.3	Construction/Yankee Process Area	1.8	35.1
	19.3	Mining	1.7	30.7
	19.3	Road Traffic	0.1	50.9
Long Valley North Central West	19.8	Construction/Mooney Deep South Process Area	4.2	27.7
	19.8	Mining	4.4	22.4
	19.8	Road Traffic	0.1	46.9
Blue Jay Road	18.2	Construction	2.0	34.2
	18.2	Mining	2.7	27.5
	18.2	Road Traffic	2.0	22.6

[1] Noise modeling was completed in 2013.

[2] dBA = decibels on the A-weighted scale using the L_{90} metric.

[3] L_{eq} = equivalent sound level.

Source: JBR 2013a, 2012a.

Current NDOW recommendations include limiting anthropogenic noise increases to 10 dBA above ambient conditions at the perimeter of active and pending leks within 3.1 miles of mining or other disturbance related activities. To prevent disruption of greater sage-grouse breeding activities, noise monitoring during periods of active construction and mining under the Proposed Action would be conducted by a qualified biologist according to NDOW recommended protocols (Tull 2015) to establish and identify potential effects of project-related noise on greater sage-grouse. Noise monitoring would be conducted on greater sage-grouse leks that are occupied and active and any new leks that are identified and confirmed within 3.1 miles of the project activities or roads. Under proposed mitigation measure **SSS-1,** specific noise-mitigation measures would be outlined in a detailed noise mitigation plan developed by the BLM in coordination with Barrick and NDOW, as described in **Appendix A**.

Impacts are anticipated to occur as a result of disturbance to sagebrush habitat from project construction and operation activities. As shown in **Table 3.8-5**, potential direct impacts would include the long-term loss of approximately 1,156 acres (14 percent) of the 7,410 acres of PHMA within the study area, and 1,577 acres (16 percent) of the 9,828 acres of GHMA, and approximately 1,571 acres (14 percent) of the 10,951 acres of OHMA within the study area (**Figure 3.8-3**). These direct impacts to greater sage-grouse habitat also represent approximately 0.11, 0.16, and 0.20 percent of all PHMA, GHMA, and OHMA currently available within the Ruby Valley and Butte/Buck/White Pine PMUs, respectively. Recent research has observed that 99 percent of existing active greater sage-grouse leks are located in landscapes where less than 3 percent of the area was disturbed or developed (Knick et al. 2013).

Table 3.8-5 Summary of Greater Sage-grouse Habitat Proposed Action Impact Acreages

Proposed Action Area	Habitat Type	Proposed Impact[1] (acres)	Existing Acreage within Study Area	Percentage of Existing Acreage within Study Area
Northern Operation Area	PHMA	88	2,122	4%
Northern Operation Area	GHMA	1,055	7,949	13%
Northern Operation Area	OHMA	648	8,186	8%
Southern Operations Area	PHMA	1,068	5,288	20%
Southern Operations Area	GHMA	522	1,879	28%
Southern Operations Area	OHMA	923	2,765	33%
Total PHMA	PHMA	1,156	7,410	16%
Total GHMA	GHMA	1,577	9,828	16%
Total OHMA	OHMA	1,571	10,951	14%
Combined Total			28,189	

[1] Impact acreages do not include facilities for which site-specific locations are unavailable (e.g., exploration, communication sites, piezometer and monitoring well sites, secondary/exploration roads and pads, and radio towers). These facilities would impact 6 acres in the NOA and 96 acres in the SOA.

Impacts to greater sage-grouse could occur from the construction and operation of the proposed transmission line. Construction impacts to greater sage-grouse would include increased disturbance resulting from human presence, the alteration and fragmentation of sagebrush habitats, potential alterations of the native sagebrush understory resulting from noxious weed invasions, and increased predation pressure resulting from improved access to predators. Construction activities have the potential to directly impact greater sage-grouse through mortalities resulting from collisions with construction equipment and the destruction of active nests. The loss of sagebrush habitat may result in the alteration of seasonal movements of greater sage-grouse and the degradation of remaining sagebrush habitats. Impacts to greater sage-grouse migrating between seasonal habitats could potentially occur along the haul road connecting the NOA and SOA. Mortality of greater sage-grouse hens and their broods could potentially occur due to collisions with mine vehicles and equipment. This impact would be reduced by applicant-committed speed limits within the project area as shown in **Table 2.4-54**.

Transmission line structures also can impact greater sage-grouse populations by enhancing local raptor and corvid populations. Raptors and corvids nest and perch on transmission structures, which create vertical structure in generally treeless shrub-steppe habitats (Knight and Kawashima 1993; Steenhof et al. 1993). Raptors and corvids may then occur at higher densities than normal due to increased nesting locations and perches (Steenhof et al. 1993). Greater sage-grouse and other prairie gallinaceous birds have evolved in habitat largely devoid of tall structures. Although it is unclear how these species react to different structure heights, pellet transects have reported declining habitat use by greater sage-grouse up to 600 meters from power lines (Braun 1998). Recent research in southern Wyoming has reported greater sage-grouse avoidance of brood–rearing habitats within 2.9 miles of transmission lines (LeBeau 2012). Knick et al. (2013) observed increased lek activity and persistence in areas of greater sage-grouse habitat characterized as having lower densities of transmission lines in comparison to greater sage-grouse habitats with increased densities of transmission lines and infrastructure.

Due to the perception of danger from proposed power lines within the NOA and SOA project areas, an additional "zone of influence" would be affected. It is currently thought that the "zone of influence" for power lines includes a 600-meter buffer (Braun 1998). Under the Proposed Action, approximately 258 acres of PHMA, 563 acres of GHMA, and 1,207 acres of OHMA are located within 600 meters of the proposed transmission lines. These acreages are a sub-set of the impact acreages reported above in **Table 3.8-5** and do not represent additional habitat impacts. These areas of sensitive habitat would presumably decrease in suitability for greater sage-grouse due to the presence of tall structures across the landscape and an increase in number of perching locations available to raptors and corvids. As a result, greater sage-grouse may avoid these areas altogether due to the increase in predation activity.

Human Presence and Noise

Recent studies on greater sage-grouse have shown that development activities can negatively impact populations as a result of increased noise and increased human disturbance (Holloran 2005; Walker et al. 2007). Greater sage-grouse have been observed to abandon lek sites in areas with increased road development (Braun 1986; Holloran 2005; Walker et al. 2007). Compared to hens near undisturbed leks, greater sage-grouse hens that used leks within approximately 2 miles of development activities moved further away from leks to nesting areas and had lower nest initiation rates (Lyon and Anderson 2003). Furthermore, greater sage-grouse hens that utilized nesting habitats further from roads had greater brood survivorship than those hens utilizing habitat near roads (Lyon and Anderson 2003). Of the 16 known leks within 5 miles of the study area, 7 are located within 2 miles of existing mine disturbance and of those 7 leks, 5 are located within 2 miles of the proposed project area. Research also has shown that, as a result of increased food sources associated within development activities (e.g., road kill, litter, etc.), population levels of predators, especially corvids, generally increase over time unless deterrents are used on tall structures (Andren 1992; Avery and Genchi 2004).

Results of ambient noise monitoring conducted in the spring of 2013 (JBR 2013a) and noise propagation modeling (2012a) are provided in **Table 3.8-4** above. Analysis of the results of these efforts indicate that noise levels resulting from construction and operation will remain within 10 dBA of ambient levels at 1 of 9 leks (Beck Pass #3) within the study area. Modeled noise levels would exceed the current recommended threshold of 10 dBA above observed ambient noise levels at 8 of 9 leks as indicated in **Table 3.8-4**. Of these 8 leks, a total of 2 leks (Buck Mountain East #2 and Blue Jay Road) would experience minor recommendation exceedences (between 10 and 20 dBA) above observed ambient levels. A total of 4 leks (Warm Springs North, Warm Springs South, Buck Mountain East, and Long Valley Central West) would experience moderate recommendation exceedences (between 20 and 30 dBA) above observed ambient levels. A total of 2 leks (Beck Pass #4 and Long Valley Well #2) would experience recommendation exceedences greater than 30 dBA above observed ambient levels.

As discussed in following sections, noise monitoring during periods of active construction and mining would be conducted by a qualified biologist to establish and identify potential effects of project-related noise on greater sage-grouse. These actions are outlined under proposed mitigation measure **SSS-1** in **Appendix A**.

Western Burrowing Owl

Two active burrowing owl nests, WSR-1 and WSR-2, have been detected along Warm Springs Road during the raptor surveys conducted for the proposed NOA and SOA projects since 2012 (JBR 2012b; Stantec 2015). However, both nests are located approximately greater than 3.5 miles from areas of disturbance. Although nest WSR-1 was observed to be occupied in 2012 and nest WSR-2 was observed to be occupied in 2014, the success or failure of both nest sites was not confirmed in either year. Direct impacts would include the long-term loss of approximately 2,706 acres (14 percent) of available potential nesting and foraging habitat within the study area until reclamation has been completed and vegetation has been re-established. In areas where reclamation would not occur, a

permanent loss of approximately 344 acres (2 percent) of available potential nesting and foraging habitat within the study area is anticipated. Indirect impacts associated with mine and mineral exploration noise and human presence currently occurs at the site and would continue under the proposed project. Direct mortality to individuals or nests may result from being crushed by, or colliding with maintenance vehicles. However, in the case that project construction would result in the direct mortalities of individual owls, the loss of individual burrowing owls would not result in population-level effects.

Lewis's Woodpecker, Pinyon Jay

Based on the presence of suitable habitat (e.g., pinyon-juniper woodland) in the study area, direct impacts to these species would result from the long-term loss of approximately 3,168 acres (16 percent) of available pinyon-juniper woodland habitat within the study area. In areas where reclamation would not occur, a permanent loss of approximately 859 acres (4 percent) of available suitable habitat within the study area is anticipated. Indirect impacts would continue to result from mine and mineral exploration noise and human presence. Based on the implementation of the ACEPMs, the overall availability of suitable habitat in the study area, and the existing level of activity within the existing/authorized NOA and SOA, potential impacts to these species as a result of the proposed NOA and SOA projects would be considered low.

Loggerhead Shrike

Based on the presence of potential breeding habitat (e.g., mountain brush, big sagebrush) within the study area, direct impacts to this species would include the long-term loss of approximately 5,887 acres (14 percent) of available potential breeding and foraging habitat within the study area until reclamation has been completed and vegetation has re-established. In areas where reclamation would not occur, a permanent loss of approximately 1,210 acres (3 percent) of available potential breeding and foraging habitat within the study area is anticipated. Indirect impacts would continue to result from mine and mineral exploration noise and human presence. Based on the implementation of the ACEPMs, the overall availability of suitable habitat in the study area, and the existing level of activity within the existing/authorized NOA and SOA, potential impacts to this species as a result of the proposed NOA and SOA projects would be considered low.

Sage Thrasher, Brewer's Sparrow

Based on the presence of potential breeding habitat (e.g., big sagebrush) within the study area, direct impacts to these species would include the long-term loss of approximately 2,706 acres (14 percent) of available potential breeding and foraging habitat within the study area until reclamation has been completed and vegetation has re-established. In areas where reclamation would not occur, a permanent loss of approximately 1,210 acres (2 percent) of available potential breeding and foraging habitat within the study area is anticipated. Indirect impacts would continue to result from mine and mineral exploration noise and human presence. Based on the implementation of Bald Mountain's committed environmental protection measures, the overall availability of suitable habitat in the study area, and the existing level of activity at the Bald Mountain mine, potential impacts to these species as a result of the proposed project would be considered low.

Amphibians

The northern leopard frog has not been recorded in the study area and habitat within the study area is considered marginal for this species. However, potential habitat exists in wetlands and springs located within the study area. Impacts on habitat could include the loss of up to 33 acres of potential wetland habitat due to groundwater drawdown from pumping within the NOA, until reclamation has been completed and vegetation has been re-established. Based on the lack of presence within the study area potential direct impacts to the northern leopard frog as a result of the proposed NOA and SOA

projects would be considered negligible. An expanded analysis and discussion of groundwater quality and quantity is provided in Section 3.3, Water Quality and Quantity.

This species and its habitat occur within the Ruby Lake NWR. Potential indirect adverse impacts to this species habitat could occur from changes in water quality as a result of increased sedimentation and fugitive dust. Information regarding potential impacts to water quality and proposed mitigation is located in Section 3.3, Water Quality and Quantity.

Mollusks

Groundwater pumping for the proposed NOA and SOA projects could potentially reduce flows at South Water Canyon, one of the two springs that provide potential springsnail habitat in the NOA. As discussed above, springsnails have not been documented to occur by previous surveys within the NOA and SOA. Impacts to potential springsnail habitat could include the loss of up to 33 acres of wetland habitat. This potential loss of potential habitat would occur until groundwater pumping has ceased, reclamation has been completed, and vegetation has been successfully re-established. Based on the lack of documented presence within the study area, potential impacts to springsnails as a result of the proposed NOA and SOA projects would be considered negligible. An expanded analysis and discussion of groundwater quality and quantity is provided in Section 3.3, Water Quality and Quantity.

Plants

Surveys for this species were conducted in 2012 in areas identified as suitable habitat for this species, no occurrences were recorded in these areas. Based on the limited availability of suitable habitat and the lack of known occurrences for the Nachlinger's catchfly in the project area, no impacts to the species and its habitat are anticipated.

Human Presence and Noise

Impacts to special status species from increased human presence and noise from construction and operation activities would be the same as those discussed in Section 3.7, Wildlife and Fisheries Resources.

Water Management Activities

Under the Proposed Action, Barrick would continue groundwater pumping operations at the BMM and increase pumping rates from current levels of 400 gpm to an estimated maximum of 1,516 gpm. As discussed in Section 3.3, Water Quality and Quantity, and Section 3.5.2.1, Wetlands and Riparian Areas, groundwater drawdown under the Proposed Action has the potential to impact two springs (South Water Canyon Seep and JBR No. 14) and 33 acres of associated wetland habitat and riparian habitat (**Figure 3.3-17**). Given the total of 41 acres of wetland habitat within the project area, the Proposed Action may impact approximately up to 80 percent of the wetland habitat within the NOA and SOA areas. Therefore, impacts to special status species that utilize any groundwater drawdown impacted wetland and riparian habitats would increase as a result of increased groundwater pumping, but would decrease once pumping ceases and groundwater levels rebound. Therefore, impacts would include a potential decrease in available riparian and wetland vegetation.

The entire 33 acres of wetland and riparian habitat within the NOA that would be potentially impacted by groundwater drawdown under the Proposed Action is currently designated as greater sage-grouse PHMA. These areas provide important brood-rearing habitat for local greater sage-grouse that rely upon these springs for water sources and succulent vegetation to raise their young. Changes in available water sources and wetland vegetation communities would result in negative impacts to greater sage-grouse within the project area. These acres of negatively impacted PHMA would be fully accounted for under the compensatory mitigation required as directed in the recent Approved Resource Management Plan Amendment.

A reduction in groundwater level from pumping operations would potentially reduce the water availability at each of the two affected springs as well as to associated groundwater dependent vegetation communities adjacent to spring areas. The potential loss or reduction in available water as a result of water level change could result in long-term changes in these special status wildlife habitats where the water sources are hydraulically connected to pumped areas. Reduction or loss of habitats associated with water sources would impact local terrestrial special status wildlife dependent on these sources, resulting in a possible reduction or loss of cover, breeding sites, foraging areas, and changes in both plant and animal community structure. Naturally occurring seeps and springs and provide important special status wildlife habitat in the project study area. These habitats and their associated plant communities contribute to greater wildlife species diversity, as compared to the adjacent upland areas. Since surface water and associated habitats are limiting factors for wildlife in the study area, loss of these habitat features would alter the available habitat for species that depend on these areas, resulting in: 1) a reduction of available water for consumption; 2) a reduction in amount or quality of groundwater dependent vegetation types for breeding, foraging, and cover; 3) a reduction in the local wildlife habitat carrying capacity; 4) displacement and loss of animals; 5) a reduction in the overall biological diversity; 6) a potential long-term impact to the population numbers of some species; and 7) and a reduction in prey availability. The degree of impacts to special status wildlife resources would depend on a number of variables, such as the existing habitat values and level of use, species' sensitivity (i.e., level of dependency on groundwater dependent habitats), the extent of the anticipated water and habitat reductions/shifts, and capacity for wildlife to accommodate additional effects.

Hazardous Materials Spill

Impacts to special status species would be the same as described in Section 3.7, Wildlife and Fisheries Resources.

3.8.2.2 North and South Operations Area Facilities Reconfiguration Alternative

Surface Disturbance

The Reconfiguration Alternative was developed to address potential impacts to mule deer migration and greater sage-grouse leks and associated habitats. Impacts to mule deer migration are discussed in detail in Section 3.7, Wildlife and Fisheries Resources. Under the Reconfiguration Alternative, implementation of surface disturbance activities as a result of proposed development and expansion would disturb approximately 3,255 acres within the proposed NOA; and approximately 2,414 acres within the proposed SOA. With the exception of open pits and pit backfill areas, all project components would be reclaimed, representing a permanent loss of 564 acres of vegetation within the proposed NOA; and a permanent loss of 321 acres of vegetation within the proposed SOA. Impacts to the majority of special status species potentially occurring within the study area would be the same as described for the Proposed Action except, under the Reconfiguration Alternative, with consideration of the 1,986 acres of previously authorized disturbed that would be not constructed, there would be an overall reduction of 3,352 acres of surface disturbance in comparison to the Proposed Action. This would reduce the extent of impacts associated with habitat disturbance and fragmentation.

The Reconfiguration Alternative would disturb sagebrush habitat during project construction and operation activities. As shown in **Table 3.8-6**, potential direct impacts would include the long-term loss of approximately 704 acres (10 percent) of the 7,410 acres of PHMA within the study area, and approximately 1,301 acres (13 percent) of the 9,828 GHMA, and 1,548 acres (14 percent) of the 10,951 acres of OHMA within the study area (**Figure 3.8-3**). These direct impacts to greater sage-grouse habitat also represent approximately 0.06, 0.13, and 0.21 percent of all PHMA, GHMA, and OHMA currently available within the Ruby Valley and Butte/Buck/White Pine PMUs, respectively.

Table 3.8-6 Summary of Greater Sage-grouse Habitat Direct Impact Acreages under the Reconfiguration Alternative

Proposed Action Area	Habitat Type	Proposed Impact[1] (acres)	Existing Acreage within Study Area	Percentage of Existing Acreage within Study Area
North Operation Area	PHMA	0	2,122	-
North Operation Area	GHMA	802	7,949	10%
North Operation Area	OHMA	568	8,186	7%
South Operations Area	PHMA	704	5,288	13%
South Operations Area	GHMA	499	1,879	27%
South Operations Area	OHMA	980	2,765	35%
Total PHMA	PHMA	704	7,410	10%
Total GHMA	GHMA	1,301	9,828	13%
Total OHMA	OHMA	1,548	10,951	14%
Combined Total			28,189	

[1] Impact acreages do not include facilities for which site-specific locations are unavailable (e.g., exploration, communication sites, piezometer and monitoring well sites, secondary/exploration roads and pads, and radio towers). These facilities would impact 6 acres in the NOA and 96 acres in the SOA.

Under the Reconfiguration Alternative, approximately 103 acres of PHMA, 464 acres of GHMA, and 1,060 acres of OHMA would be located within 600 meters of the proposed transmission lines. These acreages are a sub-set of the impact acreages reported above in **Table 3.8-5** and do not represent additional habitat impacts. Specific modifications made to reduce impacts to greater sage-grouse under the Reconfiguration Alternative are discussed herein.

Royale Area (North Operations Area Project)

Under the Reconfiguration Alternative, facilities at the Royale area would not be developed. These include the Royale Pit, Royale interpit, North and South Royale RDAs, and the Royale GMS, and represent a reduction of potential direct impacts to 102 acres of PGMA in comparison to the Proposed Action.

Poker Flats, East Sage, and Duke Areas (North Operations Area Project)

Under the Proposed Action the nearest known active greater sage-grouse lek would be located approximately 5,668 feet from the proposed haul road between the Poker Flats and Royale area. To minimize potential impacts to the greater sage-grouse lek from noise resulting from mining activity, this haul road would not be constructed under the Reconfiguration Alternative. Elimination of the haul road also would result in a reduction of 14 acres of sagebrush shrubland habitat in comparison to the Proposed Action (**Figure 2.5-1**).

Alligator Ridge and Vantage Areas (South Operations Area Project)

Proposed HLFs within the Alligator Ridge and Vantage areas within the proposed SOA would be eliminated from the Proposed Action to minimize disturbance to greater sage-grouse leks and associated habitats. The proposed Gator HLF and associated process facilities would not be constructed under this alternative, which result in 330 acres less disturbance in comparison to the Proposed Action. To accommodate the heap leach material from the Vantage, Luxe, and Gator pits, the proposed Vantage HLF would be expanded to the east and south by approximately 59 acres. **Table 2.5-8** provides a summary of the modified HLF under the North and South Operations Area Facilities Reconfiguration Alternative. **Figure 2.5-5** illustrates the reconfigured HLFs under the North and South Operations Area Facilities Reconfiguration Alternative.

Human Presence and Noise

Modifications to the Proposed Action mining facilities under the Reconfiguration Alternative would result in the reduction of potential disturbance to breeding greater sage-grouse resulting from mine construction and operation. Noise propagation modeling conducted for the Proposed Action was not conducted for the Reconfiguration Alternative, therefore conclusions regarding potential exceedences of the 10 dBA above ambient conditions cannot be made for this alternative. Modeling of potential noise levels under the Proposed Action provided in **Table 3.8-4** above, represent a worst case scenario of potential noise impacts to breeding greater sage-grouse. Although some of the Proposed Action facilities are located closer to active leks than under the Reconfiguration Alternative, impacts from road traffic noise are likely to be the same under all alternatives. Distances of the nearest sources of disturbance would be increased at multiple lek locations under the Reconfiguration Alternative. **Table 3.8-7** provides information regarding the approximate distances from sources of potential disturbance under the alternatives to the Proposed Action. Under the Reconfiguration Alternative, one lek location, Buck Mountain East, would be located within one mile of mining activity in the SOA. It is anticipated that noise levels resulting from mining are likely to disturb breeding greater sage-grouse at this location. Under the Reconfiguration Alternative six additional leks (Beck Pass 4, Beck Pass 3, Blue Jay Road, Buck Mountain East 2, Long Valley Well 2, and Ruby Valley South) would be located within approximately 3.1 miles of mining activity and/or road traffic.

Current NDOW recommendations include limiting anthropogenic noise increases to 10 dBA above ambient conditions at the perimeter of active and pending leks within 3.1 miles of mining or other disturbance related activities. To prevent disruption of greater sage-grouse breeding activities, noise monitoring during periods of active construction and mining under the Proposed Action would be conducted by a qualified biologist according to NDOW recommended protocols (Tull 2015) to establish and identify potential effects of project-related noise on greater sage-grouse. Noise monitoring would be conducted on greater sage-grouse leks that are occupied and active and any new leks that are identified and confirmed within 3.1 miles of the project activities or roads. Under proposed mitigation measure **SSS-1,** specific noise-mitigation measures would be outlined in a detailed noise mitigation plan developed by the BLM in coordination with Barrick and NDOW, as described in **Appendix A**.

Table 3.8-7 Distances of Leks within the Study Area to Potential Sources of Disturbance under the Reconfiguration Alternative and WRM Alternative

Lek Name	NDOW Lek Status[6]	Reconfiguration Alternative		WRM Alternative	
		Distance from Haul Road Traffic (miles)	Distance from Mining Feature (miles)	Distance from Nearest Existing Haul Road (miles)	Distance from Mining Feature (miles)
Beck Pass 3	Active	3.77	3.15	3.77	3.15
Beck Pass 4	Active	2.12	1.67	2.12	1.67
Blue Jay Road	Active	3.11	3.17	3.11	3.17
Buck Mountain East[3]	Active	0.78	0.71	0.78	0.71
Buck Mountain East 2[3]	Active	1.62	1.38	1.62	1.38
Long Valley North Central West	Active	5.39	5.00	5.39	5.00
Long Valley Well 2	Active	1.72	1.41	1.72	1.41

Table 3.8-7 Distances of Leks within the Study Area to Potential Sources of Disturbance under the Reconfiguration Alternative and WRM Alternative

Lek Name	NDOW Lek Status[6]	Reconfiguration Alternative		WRM Alternative	
		Distance from Haul Road Traffic (miles)	Distance from Mining Feature (miles)	Distance from Nearest Existing Haul Road (miles)	Distance from Mining Feature (miles)
Warm Springs North	Active	5.73	4.58	5.68	4.99
Warm Springs South	Active	5.51	5.02	5.51	5.02
Central Long Valley	Unknown	6.04	5.31	6.04	5.31
Little Bald Mountain Southwest	Unknown	4.90	3.68	4.85	4.10
Long Valley North Central[5]	Unknown	5.88	5.54	5.88	5.54
Overland Road	Unknown	4.52	4.57	4.52	4.57
Ruby Valley South	Unknown	2.67	2.73	2.67	2.73
Ruby Valley South 2	Unknown	4.04	4.09	4.04	4.09
Station Butte	Unknown	5.62	5.49	5.62	5.49

Source: NDOW 2012b.

Water Management Activities

Impacts to special status species would be similar to as described under the Proposed Action. As discussed in Section 3.3, Water Quality and Quantity and Section 3.5. 2.1, Wetlands and Riparian Areas, groundwater drawdown under the Reconfiguration Alternative has the potential to impact two springs (South Water Canyon Seep and JBR No. 14) and 33 acres of associated wetland habitat and riparian habitat. (**Figure 3.3-21**). Given the total of 41 acres of wetland habitat within the project area, the Reconfiguration Alternative may impact up to 80 percent of the wetland habitat within the NOA and SOA areas. Therefore, impacts to wildlife that utilize any groundwater drawdown impacted wetland and riparian habitats would increase as a result of increased groundwater pumping, but would decrease once pumping operations cease and groundwater levels rebound. Therefore, impacts would include a potential decrease in available surface water and associated riparian and wetland vegetation.

Hazardous Materials Spill

Impacts to special status species would be the same as described in Section 3.7, Wildlife and Fisheries Resources.

3.8.2.3 Western Redbird Modification Alternative

Surface Disturbance

The WRM Alternative was developed to further address potential impacts to mule deer migration through the NOA. Impacts to mule deer migration are discussed in detail in Section 3.7, Wildlife and Fisheries Resources. Under the WRM Alternative, implementation of surface disturbance activities as

a result of proposed development and expansion would disturb approximately 2,853 acres within the proposed NOA; and approximately 2,414 acres within the proposed SOA. With the exception of open pits and pit backfill areas, all project components would be reclaimed, representing a permanent loss of 460 acres of vegetation within the proposed NOA; and a permanent loss of 321 acres of vegetation within the proposed SOA. Impacts to the majority of special status species potentially occurring within the study area would be the same as described for the Proposed Action except, under the WRM Alternative, with consideration of the 2,220 acres of previously authorized disturbed that would be not constructed, there would be an overall reduction of 3,989 acres of surface disturbance in comparison to the Proposed Action and 636 fewer acres in comparison to the Reconfiguration Alternative. This would reduce the extent of impacts associated with habitat disturbance and fragmentation. The WRM Alternative would disturb sagebrush habitat during project construction and operation activities. As shown in **Table 3.8-8**, potential direct impacts would include the long-term loss of approximately 704 acres (10 percent) of the 7,410 acres of PHMA within the study area, 1,127 acres (11 percent) of the 9,828 acres of GHMA within the study area, and 1,323 acres (12 percent) of the10,951 acres of OHMA within the study area (**Figure 3.8-3**). These direct impacts to greater sage-grouse habitat also represent approximately 0.06, 0.11, and 0.17 percent of all PHMA, GHMA, and OHMA currently available within the Ruby Valley and Butte/Buck/White Pine PMUs, respectively.

Table 3.8-8 Summary of Greater Sage-grouse Habitat Direct Impact Acreages under the WRM Alternative

Proposed Action Area	Habitat Type	Proposed Impact[1] (acres)	Existing Acreage within Study Area	Percentage of Existing Acreage within Study Area
North Operation Area	PHMA	0	2,122	-
North Operation Area	GHMA	628	7,949	8%
North Operation Area	OHMA	343	8,186	4%
South Operations Area	PHMA	704	5,288	13%
South Operations Area	GHMA	499	1,879	27%
South Operations Area	OHMA	980	2,765	35%
Total PHMA	PHMA	704	7,410	10%
Total GHMA	GHMA	1,127	9,828	11%
Total OHMA	OHMA	1,323	10,951	12%
Combined Total			28,189	

[1] Impact acreages do not include facilities for which site-specific locations are unavailable (e.g., exploration, communication sites, piezometer and monitoring well sites, secondary/exploration roads and pads, and radio towers). These facilities would impact 6 acres in the NOA and 96 acres in the SOA.

Under the WRM Alternative, approximately 103 acres of PHMA, 495 acres of GHMA, and 1,105 acres of OHMA would be located within 600 meters of the proposed transmission lines. These acreages are a sub-set of the impact acreages reported above in **Table 3.8-5** and do not represent additional habitat impacts. Specific modifications made to reduce impacts to greater sage-grouse under the WRM Alternative are discussed herein.

Royale Area (North Operations Area Project)

Changes to the Royale Area under the WRM Alternative are the same as under the Reconfiguration Alternative: the Royale Pit, Royale interpit, North and South Royale RDAs, and the Royale GMS would

not be developed. This represents a reduction of potential direct impacts to 102 acres of sagebrush habitat in comparison to the Proposed Action (same as the Reconfiguration Alternative).

Poker Flats, East Sage, and Duke Areas (North Operations Area Project)

Changes to the Poker Flats, East Sage, and Duke Areas under the WRM Alternative are the same as under the Reconfiguration Alternative: The north-south haul road from the Poker Flats area to the Royale area would not be constructed. This would result in a reduction of 14 acres of sagebrush shrubland habitat in comparison to the Proposed Action (**Figure 2.5-1**).

Alligator Ridge and Vantage Areas (South Operations Area Project)

Changes to the Alligator Ridge and Vantage Areas under the WRM Alternative are the same as under the Reconfiguration Alternative: Proposed HLFs within the Alligator Ridge and Vantage areas would be eliminated from the Proposed Action to minimize disturbance to greater sage-grouse leks and associated habitats. The proposed Gator HLF and associated process facilities would not be constructed under this alternative, which would result in 330 acres less disturbance in comparison to the Proposed Action. To accommodate the heap leach material from the Vantage, Luxe, and Gator pits, the proposed Vantage HLF would be expanded to the east and south by approximately 59 acres (see **Table 2.5-8** for a summary of the modified HLF and **Figure 2.5-5** for an illustration of the reconfigured HLFs).

Human Presence and Noise

Modifications to the Proposed Action mining facilities under the WRM Alternative would result in the reduction of potential disturbance to breeding greater sage-grouse resulting from mine construction and operation. Noise propagation modeling conducted for the Proposed Action was not conducted for the WRM Alternative, therefore conclusions regarding potential exceedences of the 10 dBA above ambient conditions cannot be made for this alternative. Modeling of potential noise levels under the Proposed Action provided in **Table 3.8-4** above, represent a worst-case scenario of potential noise impacts to breeding greater sage-grouse. Although some of the Proposed Action facilities are located closer to active leks than under the WRM Alternative, impacts from road traffic noise are likely to be the same under all alternatives. Distances of the nearest sources of disturbance would be increased at multiple lek locations under the WRM Alternative. **Table 3.8-6** provides information regarding the approximate distances from sources of potential disturbance under the alternatives to the Proposed Action. Under the WRM Alternative, one lek location, Buck Mountain East, would be located within one mile of mining activity in the SOA. It is anticipated that noise levels resulting from mining are likely to disturb breeding greater sage-grouse at this location. Under the WRM Alternative six additional leks (Beck Pass 4, Beck Pass 3, Blue Jay Road, Buck Mountain East 2, Long Valley Well 2, and Ruby Valley South) would be located within approximately 3.1 miles of mining activity and/or road traffic.

Current NDOW recommendations include limiting anthropogenic noise increases to 10 dBA above ambient conditions at the perimeter of active and pending leks within 3.1 miles of mining or other disturbance related activities. To prevent disruption of greater sage-grouse breeding activities, noise monitoring during periods of active construction and mining under the Proposed Action would be conducted by a qualified biologist according to NDOW recommended protocols (Tull 2015) to establish and identify potential effects of project-related noise on greater sage-grouse. Noise monitoring would be conducted on greater sage-grouse leks that are occupied and active and any new leks that are identified and confirmed within 3.1 miles of the project activities or roads. Under proposed mitigation measure **SSS-1,** specific noise-mitigation measures would be outlined in a detailed noise mitigation plan developed by the BLM in coordination with Barrick and NDOW, as described in **Appendix A**.

Water Management Activities

As discussed in Section 3.3, Water Quality and Quantity, and Section 3.5. 2.1, Wetlands and Riparian Areas, groundwater drawdown under the WRM Alternative is not anticipated to impact any springs

within the study area (**Figure 3.3-21**). This represents a reduction in potential impacts in comparison to the Proposed Action and Reconfiguration alternatives due to a reduction in groundwater pumping (**Figure 3.3-15**).

Hazardous Materials Spill

Impacts to special status species would be the same as described in Section 3.7, Wildlife and Fisheries Resources.

3.8.2.4 No Action Alternative

Under the No Action Alternative, the proposed NOA and SOA projects would not be developed and associated impacts to special status species would not occur. Barrick would continue its operations, closure, and reclamation activities within the NOA and SOA boundaries under the terms and current permits and approvals as authorized by the BLM and State of Nevada. Under the No Action Alternative, construction of all previously authorized expansion and associated facilities would be implemented and reclaimed as authorized. **Table 3.8-9** provides a summary of the proximity of occupied greater sage-grouse leks to facilities previously authorized that would be constructed under the No Action Alternative.

Water Management Activities

Under the No Action Alternative, Barrick would continue groundwater pumping operations that would range from 110 gpm to 531 gpm over the remaining 13-year project life. As discussed in Section 3.3, Water Quality and Quantity, and Section 3.5. 2.1, Wetlands and Riparian Areas, groundwater drawdown under the No Action Alternative is not anticipated to impact any springs within the study area (**Figure 3.3-23**). This represents a reduction in potential impacts in comparison to the Proposed Action and Reconfiguration alternatives due to a reduction in groundwater pumping (**Figure 3.3-15**).

Table 3.8-9 Summary of Greater Sage-grouse Lek Proximity to Previously Authorized Facilities Under the No Action Alternative

Lek Name	Activity Type/Location	Distance to Activity (miles)
Warm Springs North	Construction/Proposed County Road Improvements	4.5
Warm Springs North	Mining	5.4
Warm Springs North	Road Traffic	0.3
Warm Springs South	Construction/County Access Road #818 Reroute	4.5
Warm Springs South	Mining	5.1
Warm Springs South	Road Traffic	0.2
Buck Mountain East	Construction/Yankee Process Area	0.7
Buck Mountain East	Mining	0.8
Buck Mountain East	Road Traffic	0.7
Buck Mountain East #2	Construction/Yankee Process Area	1.4
Buck Mountain East #2	Mining	1.5
Buck Mountain East #2	Road Traffic	1.2
Beck Pass #3	Construction/Yankee Process Area	4.1
Beck Pass #3	Mining	3.5

Table 3.8-9 Summary of Greater Sage-grouse Lek Proximity to Previously Authorized Facilities Under the No Action Alternative

Lek Name	Activity Type/Location	Distance to Activity (miles)
Beck Pass #3	Road Traffic	3.1
Beck Pass #4	Construction/Yankee Process Area	2.2
Beck Pass #4	Mining	2.0
Beck Pass #4	Road Traffic	0.1
Long Valley Well #2	Construction/Yankee Process Area	1.8
Long Valley Well #2	Mining	1.7
Long Valley Well #2	Road Traffic	0.1
Long Valley North Central West	Construction/Mooney Deep South Process Area	4.2
Long Valley North Central West	Mining	4.4
Long Valley North Central West	Road Traffic	0.1

Source: NDOW 2012b.

3.8.2.5 Cumulative Impacts

The CESA for special status species, excluding greater sage-grouse and special status plants, encompasses the NDOW Big Game Management Area 10 (**Figure 3.7-1**) and encompasses 4,077,720 acres. The CESA for greater sage-grouse includes the Ruby Valley and Butte/Buck/White Pine Population Management Units (4,202,675 acres), as illustrated in **Figure 3.8-1**. The CESA for special status plants encompasses the entirety of four hydrographic basins (Huntington Valley and Central Region, Long Valley, Newark Valley, and Ruby Valley) (**Figure 3.3-1**), the total of which is 2,070,999 acres. Past and present actions and RFFAs are discussed in Section 2.7, Past, Present, and Reasonably Foreseeable Future Actions. The locations of these RFFAs are illustrated in **Figure 2.7-1**.

Past and present disturbances from mineral development, exploration activities, and other development projects have resulted in fragmentation of certain wildlife populations and their habitats, including special status wildlife species. Past and present actions have resulted, or would result, in approximately 71,782 acres and 61,240 acres of total surface disturbance within the special status wildlife species and greater sage-grouse CESAs, respectively. The total quantifiable surface disturbances are related to mining, oil and gas development, wind energy development, exploration, land, road, and utility corridor development, agriculture, livestock grazing; residential developments, and other county and government actions.

RFFAs proposed within the special status wildlife species CESA include, but are not limited to, the following: mining and oil and gas development actions (totaling 3,547 acres, and including the Pan Mine and exploration (2,229 acres), Maverick Springs exploration (6 acres), and Victoria Mine leach activities (23 acres); oil and gas lease sales within the Long and Ruby valleys (acreage unknown); vegetation treatments (totaling 78,485 acres); and implementation of the USFWS Ruby Mountain National Wildlife Refuge CCP. Additionally, the Spruce Mountain Recreation RMP Amendment, Ruby Mountain Travel Management Plan (USFS) are proposed within the special status species CESA.

RFFAs proposed within the greater sage-grouse CESA include, but are not limited to, the following: 1) mineral-related actions (totaling 6,601 acres), including Gold Rock Mine and exploration (3,482), Pan Mine and exploration (2,229 acres), West Pequop exploration (300 acres), Maverick Springs

exploration (6 acres), Wheeler Ridge exploration project (75 acres), Centennial-Seligman Mine (195 acres); 2) the Noble Energy proposed oil and gas exploration (314 acres); 3) White Pine Energy Station (982 acres); and 4) vegetation treatments (totaling 78,485 acres). The greater sage-grouse CESA also includes 13 acres of riparian and spring exclosure projects. Additional RFFAs for which surface disturbance cannot be quantified include the Robinson Summit Wind Generation Project , and disturbances associated with: 1) development of active oil and gas leases within the Ruby Mountains and the Railroad and Steptoe valleys (Jake's Valley, McGill, and Duckwater leases), 2) development of 255,603 acres of oil and gas exploration leases within the Humboldt-Toiyabe National Forest; 3) disturbances associated with 3,528 acres of geothermal leasing within the Ely Ranger District ; and 4) implementation of the USFWS Ruby Mountain NWR CCP. Additionally, the White Pine County Ground Disturbance Reclamation Plan Road Closures and Site Reclamation Project, Spruce Mountain Recreation RMP Amendment, and Ruby Mountain Travel Management Plan (USFS), are proposed within the greater sage-grouse CESA.

No impacts to special status plant species or their associated habitats are anticipated under the Proposed Action, Reconfiguration Alternative, and WRM Alternative; therefore, no cumulative impacts to special status plant species are anticipated.

The Proposed Action incrementally would increase disturbance to special status wildlife species by an additional 5,887 acres and remove 11 acres of existing authorized disturbance from the 71,782 acres of past and present disturbance resulting in a total cumulative disturbance of approximately 152,023 acres (4 percent of the total special status wildlife species CESA). The Reconfiguration Alternative would eliminate 1,986 of previously authorized surface disturbance and incrementally increase cumulative disturbance to special status wildlife species by 4,784 acres resulting in a total cumulative disturbance of approximately 146,970 acres (4 percent of the total special status wildlife species CESA).

The Proposed Action incrementally would increase disturbance to greater sage-grouse by an additional 5,887 acres and remove 11 acres of existing authorized disturbance from the 61,240 acres of past and present disturbance resulting in a total cumulative disturbance of approximately 153,195 acres (4 percent of the total greater sage-grouse CESA). The Reconfiguration Alternative incrementally would increase cumulative disturbance to greater sage-grouse by an additional 4,784 acres and remove 1,986 acres of existing authorized disturbance from the 61,240 acres of past and present disturbance resulting in a total cumulative disturbance of approximately 153,306 acres (4 percent of the total greater sage-grouse CESA). The foremost effects to greater sage-grouse within the area are habitat changes associated with past and present mineral development and exploration activities, roads and utilities, wild land fire, and seeding and restoration projects.

Under the Proposed Action, implementation of surface disturbance activities as a result of proposed development and expansion would result in the long-term removal of approximately 1,156 acres of PHMA, 1,577 acres of GHMA, and 1,571 acres of OHMA within the study area. Under the Reconfiguration Alternative, implementation of surface disturbance activities as a result of proposed development and expansion would result in the long-term removal of approximately 704 acres of PHMA, 1,301 acres of GHMA, and 1,548 acres of OHMA within the study area. Under the WRM Alternative, implementation of surface disturbance activities as a result of proposed development and expansion would result in the long-term removal of approximately 704 acres of PHMA, 1,127 acres of GHMA, and 1,323 acres of OHMA within the study area. Studies have shown that development can negatively impact greater sage-grouse populations as a result of habitat loss and increased human disturbance (Holloran 2005; Walker et al. 2007). Greater sage-grouse have been observed to abandon lek sites in areas with increased road development (Braun 1986; Holloran 2005; Walker et al. 2007). Compared to hens in undisturbed leks, greater sage-grouse hens that used breeding leks within approximately 2 miles from the development area moved further away from breeding leks to nesting areas and had lower nest initiation rates (Lyon and Anderson 2003). Furthermore, greater sage-

grouse hens that utilized habitats farthest from roads had greater brood survivorship than those hens utilizing habitat near roads (Lyon and Anderson 2003).

Nesting special status raptor species also would be susceptible to these cumulative impacts since encroaching human activities have resulted in bird displacement and habitat fragmentation in areas that may be at their relative carrying capacity for these resident species. Many of the local wildlife populations (e.g., small game, migratory birds) that occur in the wildlife resources CESA would continue to occupy their respective ranges and breed successfully, although population numbers may decrease relative to the amount of cumulative habitat loss and disturbance from incremental development.

Mine groundwater pumping activities within the CESAs may result in a reduction or loss of flows in springs and seeps that support special status wildlife habitat (i.e., riparian zones and wetland areas). Reductions or elimination of flows in springs and seeps could impact wildlife species dependent on these sites (e.g., bats). Groundwater drawdown associated with the Proposed Action and Reconfiguration Alternative may result in the loss of up to approximately 33 acres of wetland vegetation from the potential loss or decrease in water flow from the two seeps and springs. The impacts from the Proposed Action and Reconfiguration Alternative would add to the existing and future riparian and wetland impacts within the CESA. Groundwater drawdown under the WRM Alternative would not add to the existing and future riparian and wetland impacts within the CESA.

Potential cumulative impacts to other special status wildlife species would parallel those described in Section 3.7, Wildlife and Fisheries Resources.

The contribution to cumulative impacts to special status species from the Reconfiguration Alternative and WRM Alternative would be the same as described for the Proposed Action, with the exception of an incremental decrease in overall habitat loss of 3,352 acres and 3,989 acres, respectively.

3.8.2.6 Monitoring and Mitigation Measures

Measures for the conservation of greater sage-grouse previously presented in the Bald Mountain Mine Draft EIS including **SSS-1, SSS-2,** and **SSS-3** are discussed in **Appendix A** of this EIS. Further information and discussion of additional greater sage-grouse management objectives, management decisions, required design features, and compensatory mitigation approaches recently adopted by the Nevada BLM under the GRSG Amendment also is presented in **Appendix A** of this EIS.

This section presents mitigation measures recommended to minimize and mitigate potential impacts to special status species other than greater sage-grouse.

Issue: Ground disturbance activities have the potential to result in pygmy rabbit habitat loss and mortality of individuals within the project area. These impacts could result in population level effects at the local level.

Mitigation Measure SSS-4: Pre-construction clearance surveys for pygmy rabbits would occur prior to any surface disturbance. Pygmy rabbits are known to be active above ground throughout the year, therefore clearance surveys would be required to be conducted regardless of the season. If occupied pygmy rabbit habitat is identified during pre-construction clearance surveys and occupied (especially natal) burrows are found, then new disturbance would not occur within 200 feet of those areas. If disturbance of these areas is determined to be unavoidable, consultation with the appropriate BLM and NDOW wildlife biologists would occur to develop avoidance strategies and mitigation techniques.

Effectiveness: By implementing mitigation measure **SSS-4**, potential direct impacts to pygmy rabbits and their habitat would be reduced.

3.8.2.7 Residual Impacts

Assuming successful reclamation of all project components, residual impacts to special status species habitat would include the permanent loss of approximately 1,210 acres, 885 acres, and 780 acres for the Proposed Action, Reconfiguration Alternative, and WRM Alternative, respectively. These residual impacts would be associated with open pits, which would not be revegetated. Residual impacts to greater sage-grouse habitat would be offset through Barrick's participation in the Nevada Conservation Credit System. Further discussion of compensatory mitigation for residual impacts to greater sage-grouse habitat under the Conservation Credit System is provided in **Appendix A**.

Depending on the success of final reclamation, fragmentation and the loss of shrub-dominated communities would represent a long-term change in wildlife habitat composition (i.e., shrub-dominated communities to grass/forb-dominated communities). No residual impacts for special status plant species are anticipated.

3.9 Livestock Grazing

The study area for range resources is defined as the proposed NOA and SOA plan boundaries. The CESA for range resources encompasses the entirety of five grazing allotments (Warm Springs, Maverick Springs, Ruby Valley, Horse Haven, and Cold Creek). **Figure 3.9-1** illustrates the study area and CESA for range resources.

3.9.1 Affected Environment

The study area is currently utilized by livestock on two grazing allotments (Warm Spring and Maverick Springs) administered by the BLM Egan Field Office in White Pine County, Nevada. The grazing allotments are managed in accordance with the Taylor Grazing Act of 1934, the FLPMA of 1976, the Public Rangelands Improvement Act of 1978, and the BLM Handbook H-4180-1.

Table 3.9-1 summarizes allotment acres and total forage availability within the grazing allotments in the study area (GeoCommunicator 2012). A total of 41,940 acres of designated grazing allotments are overlapped by the study area. Approximately 99 percent is federally managed land and 1 percent is privately owned. The combined grazing allotments produce an estimated 3,141 AUM within the study area which are grazed by cattle, wild horses, and wildlife. An AUM is defined as the amount of forage needed by an “animal unit” or a mature cow-calf pair for 1 month.

Table 3.9-1 Allotment Acreages and Available Forage

Grazing Allotment	Total Acres[1]	Acres within Study Area[1]	Average Acres per AUM[2]	Total AUMs within Allotment / Study Area[3]
Maverick Springs	43,481	2,054	28	1,500 / 73
Warm Springs	306,971	39,886	13	23,960 / 3,068

[1] Acreage data were taken from GIS files provided by the BLM.

[2] Average acres/AUM derived from GeoCommunicator 2012.

[3] AUMs for project area based on dividing acres within project area by average acres/AUM.

Table 3.9-2 details grazing permits within the Warm Springs and Maverick Springs grazing allotments. Grazing use within the Warm Springs grazing allotment is conducted in accordance with the associated grazing permit (valid period extends from 3/1/2010 to 2/28/2020). Grazing occurs in eight identified pastures or use areas of the allotment. Grazing use occurs in conjunction with grazing use in the Cold Creek (0603) and Dry Mountain (0609) grazing allotments. Grazing use also is in accordance with the Livestock Grazing Management Agreement between Tumbling JR Ranch and BLM signed 4/10/2009 (valid period extends from 3/30/2009 to 3/30/2014). The agreement identifies six pastures for purposes of livestock management practices. In 2015, the Livestock Grazing Management Agreement was agreed to by the permittee and the BLM to continue as signed through the end of the permit. Grazing use within the Maverick Springs grazing allotment is conducted in accordance with the associated grazing permit (valid period extends from 3/1/2011 to 2/28/2021).

Rangeland improvements within the study area include cattle guards, fencing, wells/pumps, vegetation treatments, troughs, and water pipelines, as summarized in **Table 3.9-3** and illustrated in **Figure 3.9-2**.

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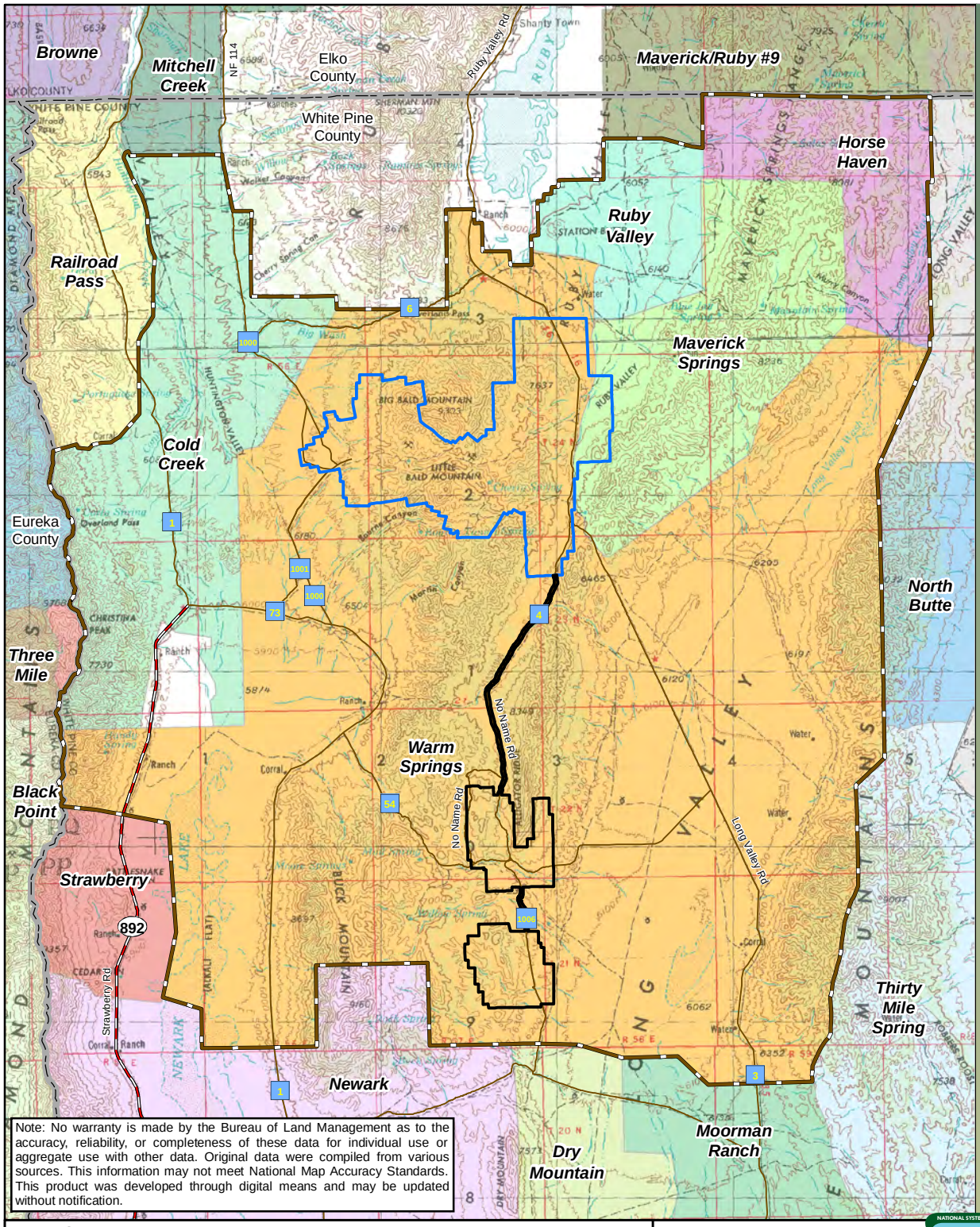


Note: No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual use or aggregate use with other data. Original data were compiled from various sources. This information may not meet National Map Accuracy Standards. This product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

Legend

- Proposed NOA Plan Boundary
- Proposed SOA Plan Boundary
- Range Resources Cumulative Effects Study Area

Source: BLM 2012a,l.

12/21/2015

Bald Mountain Mine North and South Operations Area Projects EIS

Figure 3.9-1

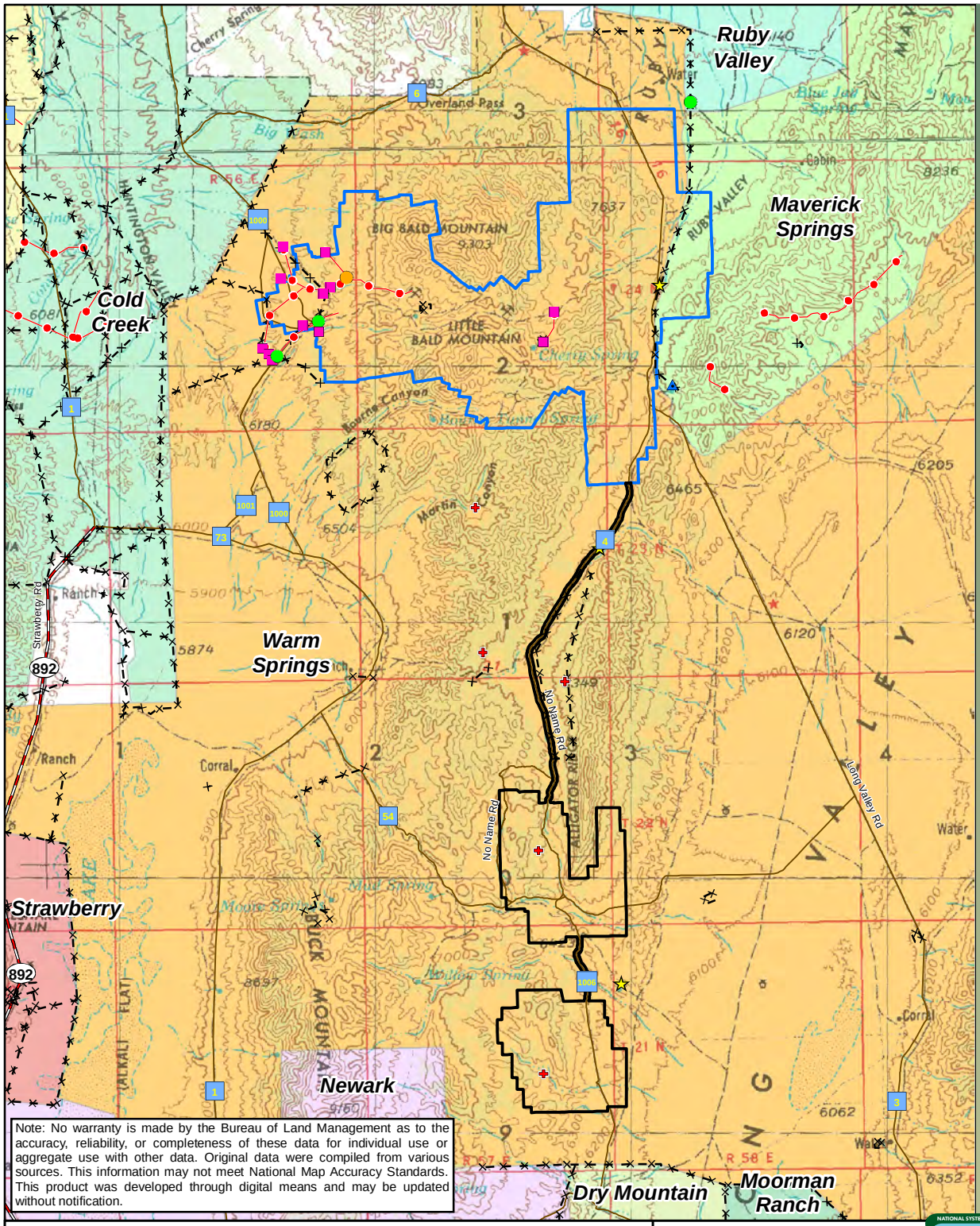
Range Resources Study Area and Cumulative Effects Study Area

0 1 2 4 Miles

N

BLM

Ely District Office



Legend

- Proposed NOA Plan Boundary
- Proposed SOA Plan Boundary
- Cattleguard
- Pump Station
- Spring (developed)
- Trough
- Well
- Wildlife Guzzler
- Fence
- Pipeline

Source: BLM 2015; 2012l,o.

Bald Mountain Mine North and South Operations Area Projects EIS

Figure 3.9-2

Rangeland Improvements

0 1 2 4 Miles

N

BLM

Ely District Office

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12/21/2015

Table 3.9-2 Grazing Permits by Grazing Allotment within the Study Area

Permit/ Allotment	Livestock Number/Kind	Grazing Period Begin/End	Public Land (percent)	Type Use	Permitted AUMs (leased)
#2702966 Warm Springs	Variable (Cattle)	Year-long	100	Active	7,709
#2704556 Maverick Springs	55 (Cattle) 175 (Cattle) 55 (Cattle)	03/01 – 03/31 04/01 – 10/31 11/01 – 02/28	100 100 100	Active Active Active	56 1,231 217

Source: BLM 2013d.

Table 3.9-3 Rangeland Improvements within Study Area by Allotment

Grazing Allotment	Cattle Guards	Fencing (miles)	Wells / Pumps	Troughs	Water Pipelines (miles)
Maverick Springs	0	4*	0	0	0
Warm Springs	1	8	3	6	5.5

* Divides the Maverick and Warm Springs allotments.

In addition to the water-related range improvements shown in **Table 3.9-3**, 15 springs and 178 ephemeral drainages (totaling 157 miles) were identified within the study area (JBR 2011a). **Figure 3.3-1** illustrates the natural water sources located within and adjacent to the study area.

Current and historical vegetation treatments within the proposed NOA and proposed TUC include emergency stabilization and noxious weed treatments within the Chrome and Jacob wildfire areas, and rangeland improvements including chaining and seeding treatments. Additional vegetation treatments within the proposed NOA include the Overland Pass Vegetation Treatment Project and the Newark and Huntington Watershed Treatment Project (BLM 2013a). **Figure 3.5-1** illustrates the historical, existing, and proposed vegetation treatments within the study area.

3.9.2 Environmental Consequences

This section discusses project related impacts to range resources, including livestock operations and natural and artificial water sources, resulting from the Proposed Action, Reconfiguration Alternative, WRM Alternative, and No Action Alternative. Primary issues related to range resources include direct and indirect impacts associated with the loss of AUMs, reductions to available water quantity and quality, effects of fugitive dust emissions on available forage, and the potential for livestock injury or death due to project activities.

3.9.2.1 Proposed Action

Under the Proposed Action, implementation of surface disturbance activities as a result of proposed development and expansion would temporarily (20 years) remove approximately 3,494 acres (249 AUMs) within the proposed NOA; and approximately 2,393 acres (184 AUMs) within the proposed SOA. With the exception of open pits and pit backfill areas, all project components would be reclaimed, representing a permanent loss of 863 acres (62 AUMs) of available grazing area and forage within the Warm Springs and Maverick Springs grazing allotments (proposed NOA); and a permanent loss of

347 acres (27 AUMs) of available grazing area and forage within the Warm Springs grazing allotment (proposed SOA). **Table 3.9-4** summarizes the surface disturbance within the Warm Springs and Maverick Springs grazing allotments as a result of the Proposed Action.

Table 3.9-4 Proposed Action – Temporary and Permanent Surface Disturbance Impacts to Grazing Allotments[1]

Grazing Allotment	North Operations Area		South Operations Area	Total (ac/AUMs)
	Warm Springs (ac/AUMs)	Maverick Springs (ac/AUMs)	Warm Springs (ac/AUMs)	
Temporary Disturbance	3,039 / 234	455 / 35	2,393 / 184	5,887 / 453
Withdrawn Disturbance	-11 / <1	0	0	-11 / <1
Permanent Disturbance	753 / 58	111 / 4	347 / 27	1,211 / 89

Note: Values may vary due to rounding.

In summary, with consideration of new and withdrawn disturbance acreages, the Proposed Action would temporarily (20 years) remove approximately 418 AUMs within the Warm Springs grazing allotment, representing a 2 percent decrease of the total available AUMs within the allotment. The permanent loss of 85 AUMs within the Warm Springs grazing allotment would represent a one percent decrease of the active permitted use of 7,709 AUMs. The Proposed Action would temporarily remove approximately 16 AUMs within the Maverick Springs grazing allotment, representing a 1 percent decrease of the total available AUMs within the allotment. The permanent loss of four AUMs within the Maverick Springs grazing allotment would be negligible (less than 1 percent) in comparison to the overall available acreage and AUMs within the Maverick Springs grazing allotment. To the extent possible, the BLM would coordinate directly with grazing permitee(s) to address potential seasonal stocking rate adjustments or seasonal usage (rest rotations) adjacent to the proposed NOA and SOA within the Warm Springs and Maverick Spring grazing allotments, as needed. The BLM has no plans to reduce AUMs within either allotment as a result of any of the alternatives, as there are abundant areas for cattle to graze given herd size; thus the reduction in AUMs would not affect grazing operations within either the Warm Springs or Maverick Springs allotments.

Under the Proposed Action, no impacts to cattle guards, wells/pumps, or troughs are anticipated based on the locations of the proposed facility footprints in relation to the range improvement. Approximately 2,583 feet of existing fencing and approximately 2,316 feet of water pipelines in the NOA would be removed as a result of implementation of the Proposed Action. In the SOA 1,650 feet of fencing would be removed. The BLM would coordinate directly with grazing permittee(s) to address the loss of existing fencing and pipeline infrastructure, as needed. A discussion of fencing within the proposed NOA and SOA is presented in the following text.

As stated in Section 3.3, Water Quality and Quantity, potential impacts to two springs (South Water Canyon and JBR No. 14 springs) are anticipated based on the locations of the proposed facility footprints in relation to seeps and springs; and the results of the 10-foot or greater modeled drawdown boundary under the Proposed Action. Groundwater drawdown from the proposed project may result in the long-term loss of two springs within the Warm Springs and Maverick Springs allotments (Section 3.3, Water Quality and Quantity). **Figure 3.3-17** illustrates the areas where groundwater water levels are predicted to decrease over time in comparison to the baseline groundwater elevations in 2014 and the

corresponding springs that may be affected under the Proposed Action. The potential loss of these water sources may affect livestock distribution within portions of these allotments. Springs with active water rights for stock watering purposes that would be affected by groundwater drawdown are discussed in detail in Section 3.3.1.2, Proposed Action. It is anticipated that groundwater drawdown would not result in direct impacts to upland vegetation within the maximum extent of the 10-foot groundwater drawdown contour but impacts to wetland and riparian vegetation communities are considered likely, as discussed in Section 3.5, Vegetation Resources.

Approximately 16 miles (15 percent) of ephemeral streams within the proposed NOA project, and approximately 9 miles (16 percent) of ephemeral streams within the proposed SOA project would be directly impacted as a result of the Proposed Action. The loss of ephemeral drainages and artificial water sources would represent a potential reduction in available water for livestock. However, this reduction is anticipated to be minimal as ephemeral streams provide access to water only during runoff events and do not serve as consistent water sources. Perennial springs, seeps, and springs provide a consistent water source for livestock. A reduction in water quality is not anticipated due to implementation of Barrick's PoO and associated ACEPMs (Barrick 2012a,b). For more information regarding impacts to water sources see Section 3.3, Water Quality and Quantity, and Section 3.20, Hazardous Materials and Solid Waste.

Construction activities and traffic along unpaved roads would result in varying degrees of fugitive dust emissions. Dust settling on nearby vegetation may reduce palatability and overall growth due to decreased photosynthetic capability. Broad horizontal leaves would be more susceptible to deposition than narrow vertical leaves or blades. The degree to which dust deposition may have an impact on forage palatability and overall health would depend on several factors such as wind conditions, type and general condition of the affected plants, frequency and effectiveness of dust control measures, and frequency and timing of precipitation events. Fugitive dust emissions also have the potential to result in negative physical effects to livestock health, particularly in calves. Bronchial pneumonia in livestock has been associated with increased dust deposition (BLM 2010f). Bovine respiratory disease (BRD) can be caused by generating airborne dust that is irritating the respiratory system. This can result in medical costs incurred by the operator or even fatal illnesses to the affected livestock. Calves are the most susceptible to BRD and managers of cow/calf operations may need to alter pasture use or modify grazing systems to avoid exposure to dust emissions as a result of construction activities or increased traffic volumes on unpaved roads.

Increased traffic volumes could result in increased rates of livestock-vehicle collisions. Cow/calf pairs would likely be the highest at risk. This could result in livestock injury or death leading to associated costs to the livestock operation. Risk of vehicular accidents will be especially pronounced along the road between the NOA and the SOA given the topography and the probable higher rate of travel speed. During their current mining operations, Barrick has effectively controlled the speed limits of project-related traffic. The continued implementation of Barrick's Traffic Management Plan, including compliance with posted speed limit signs, would minimize the risks associated with potential livestock-vehicle collisions (Barrick 2012a,b). During their current mining operations, Barrick has effectively controlled the speed limits of project-related traffic, resulting in zero livestock-vehicle collisions since January 2009.

Exposure to open pits, process ponds, storm water/event ponds, HLFs, and other areas of cyanide use could pose a risk to livestock safety and health through either physical injury or contamination. Process ponds, storm water/event ponds, and other areas of cyanide use would be fenced with 8-foot-high wildlife exclusion fence in accordance with NDOW guidelines. Where necessary, Barrick would fence proposed project facilities with a four-strand (three-stranded barbed wire and a smooth bottom strand) range fence (Barrick 2012a,b). Outside of these exclusion areas, livestock grazing would continue throughout the Warm Springs and Maverick Springs grazing allotments. Access roads would not be fenced and fencing around individual project components would not interfere with the ability for livestock to graze or inhibit their movement patterns.

3.9.2.2 North and South Operations Area Facilities Reconfiguration Alternative

Under the Reconfiguration Alternative, implementation of surface disturbance activities as a result of proposed development and expansion would temporarily remove approximately 2,690 acres (194 AUMs) within the proposed NOA; and approximately 2,094 acres (161 AUMs) within the proposed SOA. Within the NOA, 1,934 acres (149 AUMs) of previously authorized disturbance would not be constructed within the Warm Springs grazing allotment (this is noted as "withdrawn acreage" in subsequent tables and text); 163 acres (6 AUMs) of which would have been permanent disturbance. With the exception of open pits and pit backfill areas, all new project components would be reclaimed, representing a permanent loss of 564 acres (39 AUMs) of available grazing area and forage within the Warm Springs and Maverick Springs grazing allotments (proposed NOA); and a permanent loss of 321 acres (25 AUMs) of available grazing area and forage within the Warm Springs grazing allotment (proposed SOA). **Table 3.9-5** summarizes the surface disturbance within the Warm Springs and Maverick Springs grazing allotments as a result of the Reconfiguration Alternative.

Table 3.9-5 North and South Operations Area Facilities Reconfiguration Alternative – Temporary and Permanent Surface Disturbance Impacts to Grazing Allotments

Grazing Allotment	North Operations Area		South Operations Area	Total (ac/AUMs)
	Warm Springs (ac/AUMs)	Maverick Springs (ac/AUMs)[1]	Warm Springs (ac/AUMs)	
Temporary Disturbance	2,379 / 183	311 / 11	2,094 / 161	4,784 / 355
Withdrawn Disturbance	-1,934 / -149	0	0	1,934 / 149
Permanent Disturbance	454 / 35	111 / 4	321 / 25	886 / 64

Note: Values may vary due to rounding.

In summary, with consideration of new and withdrawn disturbance acreages, the Reconfiguration Alternative would temporarily remove approximately 344 AUMs within the Warm Springs grazing allotment, representing a 1 percent decrease of the total available AUMs within the allotment. The permanent loss of 60 AUMs within the Warm Springs grazing allotment would be negligible (less than 1 percent) in comparison to the overall available acreage and AUMs within the Warm Springs grazing allotment. The Reconfiguration Alternative would temporarily remove approximately 11 AUMs within the Maverick Springs grazing allotment, representing a 1 percent decrease of the total available AUMs within the allotment. The permanent loss of four AUMs within the Maverick Springs grazing allotment would be negligible (less than 1 percent) in comparison to the overall available acreage and AUMs within the Maverick Springs grazing allotment. The BLM would coordinate directly with the grazing permitees to address potential seasonal stocking rate adjustments or seasonal usage (rest rotations) adjacent to the proposed NOA and SOA within the Warm Springs and Maverick Spring grazing allotments, as needed.

Approximately 13 miles of ephemeral streams within the proposed NOA, and approximately 8 miles of ephemeral streams within the proposed SOA would be directly impacted based on the locations of the proposed facility footprints. The loss of ephemeral drainages and artificial water sources would represent a potential reduction in available water for livestock. However, this reduction is anticipated to be minimal as ephemeral streams provide access to water only during runoff events and do not serve as consistent water sources. Perennial springs, seeps, and springs provide a consistent water source for livestock, and these are not being impacted by the Reconfiguration Alternative. A reduction in water quality is not anticipated due to implementation of Barrick's Plan of Operations and associated ACEPMs

(Barrick 2012a,b). For more information regarding impacts to water sources see Section 3.3, Water Quality and Quantity and Section 3.20, Hazardous Materials and Solid Waste.

As discussed in Section 3.3, Water Quality and Quantity, and based on the site conditions and model predictions, drawdown associated with groundwater pumping for the mine under the Reconfiguration Alternative could impact (i.e., reduce) the baseflow and associated wetlands at South Water Canyon Seep and JBR No. 14 (**Figure 3.3-21**). Impacts to grazing resources from groundwater drawdown effects on the two springs and associated wetlands under the Reconfiguration Alternative would be similar to the Proposed Action. Groundwater drawdown under the Reconfiguration Alternative may result in the loss of two springs within the Warm Springs and Maverick Springs allotments (Section 3.3, Water Quality and Quantity) until pumping ceases and groundwater levels rebound. The potential loss of the two water sources may affect livestock distribution within portions of these allotments. Springs with active water rights for stock watering purposes that may be affected by groundwater drawdown are discussed in detail in Section 3.3.1.2, Water Quality and Quantity. It is anticipated that groundwater drawdown would not result in direct impacts to upland vegetation within the maximum extent of the 10-foot groundwater drawdown contour but impacts to wetland and riparian vegetation communities are considered likely, as discussed in Section 3.5, Vegetation Resources.

Impacts including fugitive dust emissions and potential livestock-vehicle collisions would be the same as the Proposed Action.

3.9.2.3 North and South Operations Area Facilities Western Redbird Modification Alternative

Impacts under the WRM Alternative would be similar to those described under the Reconfiguration Alternative, except that there would be 298 fewer acres temporarily removed (23 fewer AUMs) within allotments in the proposed NOA. Additionally, as compared to the Reconfiguration Alternative, there would be 234 acres (18 AUMs) more acres of previously authorized disturbance that would not be constructed within the NOA, of which 61 acres (5 AUMs) would have been permanent disturbance. New permanent loss of available grazing area and forage would be reduced by 104 acres (8 AUMs). **Table 3.9-6** summarizes the surface disturbance within the Warm Springs and Maverick Springs grazing allotments as a result of the WRM Alternative.

Table 3.9-6 North and South Operations Area Western Redbird Modification Alternative – Temporary and Permanent Surface Disturbance Impacts to Grazing Allotments

Grazing Allotment	North Operations Area		South Operations Area	Total (ac/AUMs)
	Warm Springs (ac/AUMs)	Maverick Springs (ac/AUMs)	Warm Springs (ac/AUMs)	
Temporary Disturbance	2,081 / 160	**311 / 11**	2,094 / 161	4,486 / 332
Withdrawn Disturbance	-1,945 / 149		0	-2,220 / 162
Permanent Disturbance	349 / 27	111 / 4	321 / 25	781 / 56

Note: Values may vary due to rounding.

In summary, with consideration of new and withdrawn disturbance acreages, the WRM Alternative would temporarily remove approximately 23 fewer AUMs within the Warm Springs grazing allotment than the Reconfiguration Alternative. As compared to the Reconfiguration Alternative, there would be 8 fewer AUMs permanently lost within the Warm Springs grazing allotment (less than 1 percent of the allotment).

Impacts to the Maverick Springs grazing allotment would be the same as under the Reconfiguration Alternative.

Impacts to ephemeral streams would be similar to the Reconfiguration Alternative, except that there would be approximately 1.6 fewer miles of ephemeral streams within the proposed NOA that would be directly impacted based on the locations of the proposed facility footprints. As discussed in Section 3.3, Water Quality and Quantity, and based on the site conditions and model predictions, drawdown associated with groundwater pumping for the mine under the WRM Alternative is not anticipated to impact springs and associated wetlands in the project area.

Impacts from fugitive dust emissions, potential livestock-vehicle collisions, loss of existing fencing and water pipelines, and the need and effects of fencing project components would be the same as the Reconfiguration Alternative.

3.9.2.4 No Action Alternative

Under the No Action Alternative, the proposed NOA and SOA projects would not be developed and associated impacts to range resources would not occur. Barrick would continue its operations, closure, and reclamation activities within the NOA and SOA boundaries under the terms and current permits and approvals as authorized by the BLM and State of Nevada. Under the No Action Alternative, construction of all previously authorized expansion and associated facilities would be implemented and reclaimed as authorized.

As discussed in Section 3.3, Water Quality and Quantity, and based on the site conditions and model predictions, drawdown associated with groundwater pumping for the mine under the No Action Alternative is not anticipated to impact springs and associated wetlands in the project area.

It is anticipated that groundwater drawdown would not result in direct impacts to upland vegetation within the maximum extent of the 10-foot groundwater drawdown contour as discussed in Section 3.5, Vegetation Resources.

3.9.2.5 Cumulative Impacts

The 496,591-acre CESA for range resources encompasses the entirety of five grazing allotments (Warm Springs, Maverick Springs, Ruby Valley, Horse Haven, and Cold Creek) and is illustrated in **Figure 3.9-1**. Past and present actions and RFFAs are discussed in Section 2.7, Past, Present, and Reasonably Foreseeable Future Actions; their locations are illustrated in **Figure 2.7-1**.

<u>Impacts from Surface Disturbance</u>

Past and present actions have resulted, or would result, in approximately 16,750 acres of past and present disturbance within the range resources CESA. The total quantifiable surface disturbances are related to mining, oil and gas development, wind energy development, vegetation treatments, and transportation and utility corridor development. RFFAs proposed within the range resources CESA include, but are not limited to, fuels reduction and vegetation treatments (34,672 acres), and livestock grazing leases (acreage unknown).

The Proposed Action would remove 11 acres of authorized disturbance from the 16,750 acres of past and present actions and incrementally increase disturbance to range resources over past and present actions by an additional 7,097 acres resulting in a total cumulative disturbance of approximately 23,836 acres (5 percent of the total range resources CESA). Vegetation treatment project acreages are not included in this total because they would have potentially countervailing effects (see below). The Reconfiguration Alternative would remove 1,934 acres of authorized disturbance from past and present actions and incrementally increase disturbance to range resources by a 5,668 acres resulting in a total cumulative disturbance of approximately 20,484 acres (4 percent of the total range resource CESA). As compared to the Reconfiguration Alternative, the WRM Alternative would remove an additional 234 acres

of authorized disturbance from the past and present disturbance and decrease proposed surface disturbance by an additional 402 acres for a total cumulative disturbance of approximately 19,847 acres (4 percent of the total range resource CESA). Under the No Action Alternative, cumulative impacts to range resources would be the same as those described in the *Final Environmental Impact Statement for the Bald Mountain Mine North Operations Area Project* (BLM 2009a) and *Environmental Assessment for the Mooney Heap and Little Bald Mountain Expansion Project* (BLM 2011a).

Other surface disturbing activities within the range resources CESA that contribute to cumulative effects of range resources include the establishment and spread of noxious weeds and invasive plant species, and wildfires. Cumulative losses for range resources potentially would include the reduction of native ecosystem functions such as soil stability and erosion control. Indirect impacts to range resources associated with surface disturbance activities would include fugitive dust accumulation and the introduction or spread of noxious weeds and invasive plant species. Fugitive dust from development activities can adversely impact native vegetation communities and alter vegetative composition (USFWS 2008a). Vegetation treatment projects could impose a mandatory rest period until vegetation management objectives have been met (a short-term impact to grazing operations), but over the long term, range improvements associated with these projects would improve distribution of livestock across the landscape (BLM 2013a). **Figure 3.5-1** includes the location of existing and proposed treatments, which total 34,672 acres within the range resources CESA. The cumulative effects of noxious weeds and invasive plant species are discussed in Section 3.6, Noxious Weeds and Invasive Species.

Past and present actions and RFFAs would cumulatively and incrementally reduce range resources until such time that reclamation is deemed successful. It is assumed that portions of past disturbances have been reclaimed, and ongoing reclamation at existing operations would continue to reduce cumulative impacts within the range resources CESA. Although the cumulative surface disturbance would be greater than the Proposed Action, Reconfiguration Alternative, or WRM Alternative surface disturbance, it would represent a small portion of the vast acreage of public lands in the area, and would have minimal effect on land uses displaced by past and present actions and RFFAs within the range resources CESA. Pending completion of successful reclamation and the removal of exclusion fencing on all project components with the exception of open pits and backfill areas, it is anticipated that the Proposed Action, Reconfiguration Alternative, and WRM Alternative would contribute 1 percent to the overall cumulative disturbance within the range resources CESA.

Water Use

Flows associated with seeps and springs potentially could decrease or cease due to impacts of groundwater drawdown, thereby reducing the amount of available water or eliminating a water source for livestock use from the Proposed Action and Reconfiguration alternatives. The potential reduction in base flow or loss of flow from two seeps and springs (South Water Canyon Seep and JBR No. 14 spring) from cumulative groundwater drawdown within the CESA would likely affect livestock distribution within the grazing allotments unless replacement water sources are developed for livestock watering. The reduction in available water within the CESA may result in a decrease in available forage from active grazing areas until such time that adequate vegetation resource objectives are met for livestock consumption. The loss of wetland vegetation adjacent to the two seeps and springs may result in a long-term change in vegetation structure, thus potentially reducing the available forage quantity for livestock grazing within these areas.

Climate Change

Climate change appears to be influencing both natural and managed ecosystems. Recent warming in the Southwest is among the most rapid in the nation, significantly more than the global average in some areas (USGCRP 2009). Projections suggest continued strong warming in the region, with significant increases in temperature (USGCRP 2009) and decreases in precipitation (Seager et al. 2007). Potential changes to the project area resulting from the effects of climate change forecasted by the Central Basin and Range Rapid EcoRegional Assessment (REA) could include higher than normal growing season

temperatures, contraction or expansion of some existing vegetation communities, the expansion of existing noxious weed populations, and the introduction of noxious weed species previously undocumented in the ecoregion and project area (Comer et al. 2013). These increases in average growing season temperatures are anticipated to result in low elevation basins throughout the Central Basin and Range ecoregion potentially transitioning from the existing cool semi-desert vegetation communities into very warm and sparsely vegetated desert landscapes more typical of the Mojave Basin and Range. Under such conditions the reduction of forage vegetation and available water may make livestock operations within the CESA unfeasible.

3.9.2.6 Monitoring and Mitigation Measures

The following mitigation measures are recommended to minimize and mitigate potential impacts to livestock and operators:

Issue: Exposure to all project components could pose a risk to livestock safety and health through either physical injury or contamination.

Mitigation Measure LG-1: Barrick would install four-strand fencing (three-stranded barbed wire and a smooth bottom strand) range fence around new HLFs, process facilities and freshwater ponds. Newly constructed fences would be maintained by Barrick throughout the life of the project, until the project component is no longer in operation, and the component has been reclaimed in accordance with BLM and State of Nevada closure requirements. During project decommissioning, Barrick would remove all exclusion fencing within the project area.

Mitigation Measure LG-2: If spring flow at JBR #14 and South Water Canyon is reduced or eliminated, water will be provided for livestock use in an alternative location to be determined by the BLM.

Effectiveness: The installation of exclusion fencing around project components would effectively eliminate injury or contamination to livestock potentially caused by project facility components. The development of alternative water sources to compensate for any spring flow at JBR #14 and South Water Canyon would ensure that overall water availability for livestock is not diminished.

3.9.2.7 Residual Impacts

Assuming successful reclamation of all project components, residual impacts to range resources would include the permanent loss for grazing of approximately 1,210 acres (89 AUMs), 885 acres (64 AUMs), and 780 acres (56 AUMs) for the Proposed Action, Reconfiguration Alternative, and WRM Alternative, respectively. These residual impacts would be associated with open pit and pit backfill areas, which would not be reclaimed. The permanent loss of AUMs within the Warm Springs and Maverick Springs grazing allotments would be negligible (less than 1 percent) in comparison to the overall available acreage and AUMs within the grazing allotments.

The generation of fugitive dust emissions can be reduced with the application of water or tackifiers; however, this would not completely eliminate dust from becoming air-borne and settling on nearby vegetation. Livestock could still be exposed to dust and the associated adverse respiratory effects; however, with implementation of mitigation measure **LG-1**, combined with the size of the grazing allotments, the risk of adverse respiratory effects would be low.

Potential impacts to livestock from groundwater drawdown would be mitigated by implementation of **LG-2**. Any drawdown to springs within the allotments would cease to exist after the cessation of groundwater pumping and it is anticipated that groundwater levels would eventually return to those experienced prior to construction and operation of the NOA and SOA projects.

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3.10 Wild Horses

The study area for wild horses is defined as the proposed NOA and SOA plan boundaries. The CESA for wild horses encompasses the entirety of the Triple B HMA. **Figure 3.10-1** illustrates the study area and CESA for wild horses including natural and artificial water sources within the study area and CESA boundaries.

3.10.1 Affected Environment

Management of wild horses on BLM administrated lands is regulated under the Wild Free-Roaming Horses and Burros Act of 1971 as amended (Public Law [P.L.] 92-195).

The Ely District ROD and Approved RMP (BLM 2008a) combined all three HMAs (Buck and Bald, Butte, and Cherry Creek HMAs) into the Triple B HMA. The Triple B HMA is located approximately 12 miles east of Eureka, Nevada in White Pine County north of U.S. Highway 50 (**Figure 3.10-1**). The 2008 Ely RMP set boundaries and reaffirmed Appropriate Management Level (AML) for the Triple B HMA. The 2007 EIS evaluated each herd management area for five essential habitat components and herd characteristics: forage, water, cover, space, and reproductive viability. Through this analysis and the subsequent Final RMP and ROD, the boundaries were established to ensure sufficient habitat for wild horses, and an AML was reviewed and set that would achieve a thriving natural ecological balance and rangeland health.

The Triple B HMA is part of the 1,682,998-acre Triple B Complex, which contains the Triple B, Maverick-Medicine, and Antelope Valley HMAs. The wild horses within the Triple B Complex move freely back and forth between the HMAs and adjacent Cherry Springs Wild Horse Territory, which is managed by the USFS. The Triple B HMA totals 1,225,000 acres; the study area overlaps approximately 40,716 acres (3 percent) of the HMA. The AML for the Triple B HMA ranges from 250 to 518 horses. The current estimated population for the Triple B HMA is 1,752 wild horses (BLM 2015).

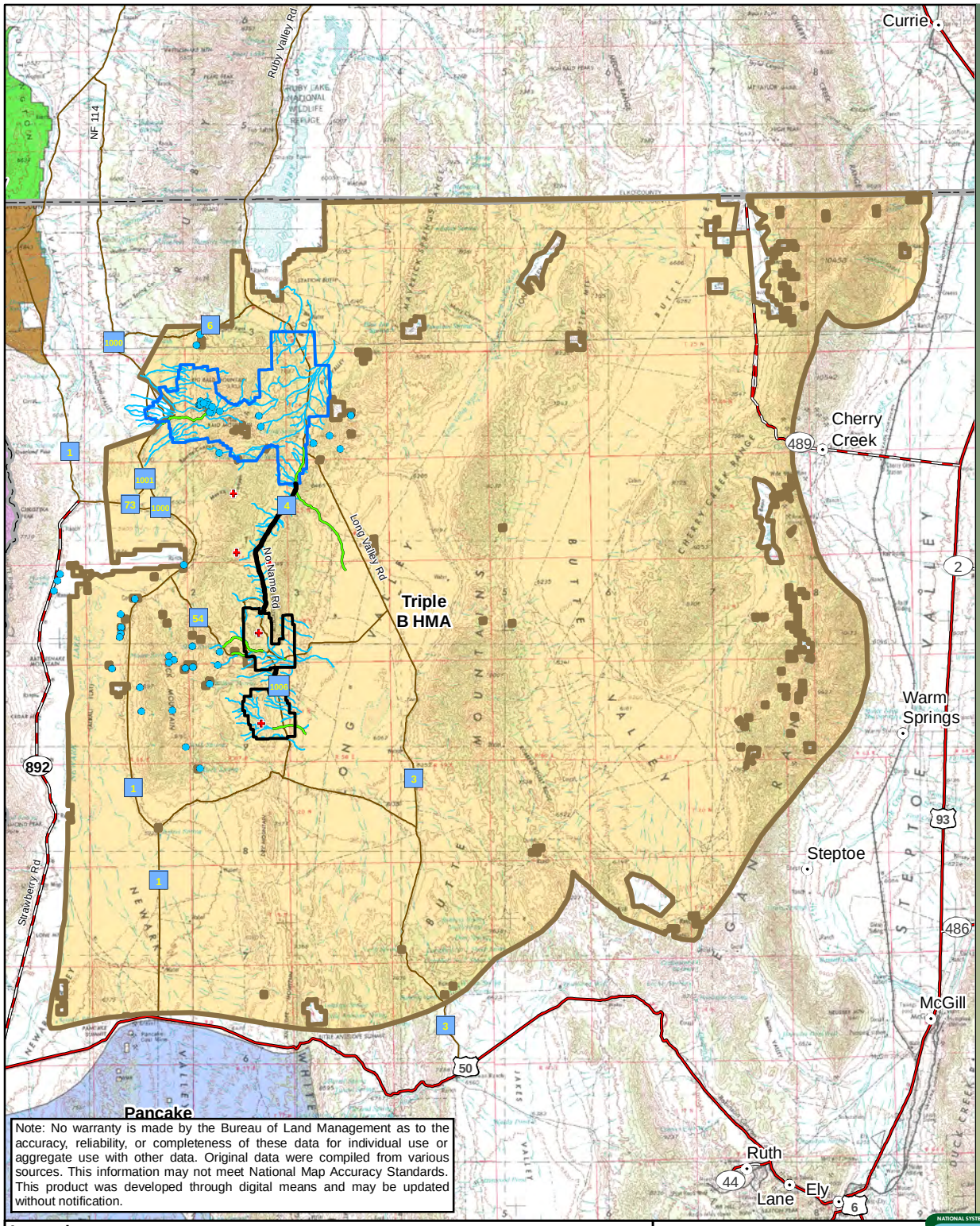
Water resources and vegetation are described in Section 3.3, Water Resources and Section 3.5, Vegetation Resources, respectively. **Figure 3.10-1** illustrates the natural and artificial water sources located within the study area.

3.10.2 Environmental Consequences

This section discusses project-related impacts to wild horses resulting from the Proposed Action, Reconfiguration Alternative, WRM Alternative, and No Action Alternative. Primary issues associated with wild horses and the associated HMA include direct and indirect impacts relative to the following: 1) loss of available forage due to surface disturbances; 2) reductions to available water quantity and quality; 3) potential risk of wild horse-vehicle collisions; and 4) habitat fragmentation due to fencing resulting in the reduction of the free-roaming nature of wild horses.

3.10.2.1 Proposed Action

Under the Proposed Action, implementation of surface disturbing activities as a result of proposed development and expansion would temporarily (20 years) remove approximately 3,469 acres of available forage within the Triple B HMA within the proposed NOA; and approximately 2,393 acres of available forage within the Triple B HMA within the proposed SOA. This disturbance would also permanently remove approximately 863 acres of available forage within the proposed NOA and 347 acres within the proposed SOA. **Table 3.10-1** identifies the acreage and percentage of proposed surface disturbance that would be temporarily and permanently lost as a result of project implementation within the Triple B HMA. With the exception of open pits and pit backfill areas, all project components including associated ancillary and support facilities would be reclaimed.



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

BLM

Ely District Office

Legend

Wild Horses Study Area:

- Proposed NOA Plan Boundary
- Proposed SOA Plan Boundary
- Wild Horses Cumulative Effects Study Area
- Seep or Spring
- Defined Drainages
- Drainages
- Guzzlers

Source: SRK 2008.

Bald Mountain Mine North and South Operations Area Projects EIS

Figure 3.10-1

Wild Horses Study Area and Cumulative Effects Study Area

0 2.5 5 10 Miles

N

12/21/2015

Table 3.10-1 Temporary and Permanent Surface Disturbance Impacts within the Triple B HMA

Herd Management Area	Proposed Action[1, 2]		North and South Operations Area Reconfiguration Facilities Alternative[1, 2]		North and South Operations Area Western Redbird Modification Alternative[1, 2]	
	Temporary Surface Disturbance (acres/ percent of HMA)	Permanent Surface Disturbance (acres)	Temporary Surface Disturbance (acres/ percent of HMA)	Permanent Surface Disturbance (acres)	Temporary Surface Disturbance (acres/ percent of HMA)	Permanent Surface Disturbance (acres)
North Operations Area						
Triple B	3,469 / <1%	863	2,664 / <1%	564	2,366 / <1%	460
South Operations Area						
Triple B	2,393 / <1%	347	2,094 / <1%	321	2,094 / <1%	321
Total	**5,862**	**1,210**	**4,757**	**885**	**4,460**	**780**

[1] Disturbance acreage for the NOA does not match the totals presented in Chapter 2.0 because there is a portion of the NOA that is not within the Triple B HMA.

[2] The acreages presented include facilities for which site-specific locations are unavailable (e.g., exploration, communication sites, piezometer and monitoring well sites, secondary/exploration roads and pads, and radio towers).These facilities would impact 6 acres within the NOA, and 96 acres within the SOA. For purposes of a providing a conservative estimate of impacts, it is assumed all acres of disturbance would occur within the Triple B HMA. These acreages are therefore included in the totals above.

Wild horse distribution may be affected as a result of the proposed mining-related activity in areas where wild horses currently use the Triple B HMA. The effects to wild horse distribution also would affect the utilization of available forage. Indirect impacts may include the introduction or spread of noxious weeds and invasive species potentially resulting in the reduction of available forage quality and quantity.

As discussed in Section 3.3, Water Quality and Quantity, and based on the site conditions and model predictions, drawdown associated with groundwater pumping for the mine under the Proposed Action could impact (i.e., reduce) the baseflow and associated wetlands at South Water Canyon Seep and JBR No. 14 Spring (**Figure 3.3-17**). Additionally, approximately 16 miles of ephemeral streams within the proposed NOA, and approximately 9 miles of ephemeral streams within the proposed SOA would be directly impacted based on the locations of the proposed facility footprints. Impacts to wild horses from potential flow reductions or elimination of water sources would be similar to those discussed in Section 3.7, Wildlife. The loss of ephemeral drainages would represent a potential reduction in available water for wild horses. However, this reduction is anticipated to be minimal as ephemeral streams provide access to water only during runoff events and do not serve as consistent water sources. A reduction in water quality is not anticipated due to implementation of Barrick's PoO and associated ACEPMs (Barrick 2012a,b). For more information regarding impacts to water sources see Section 3.3, Water Quality and Quantity, and Section 3.20, Hazardous Materials and Solid Waste.

Construction activities and traffic along unpaved roads would result in varying degrees of fugitive dust emissions. Dust settling on nearby vegetation may reduce palatability and overall growth due to decreased photosynthetic capability. Broad horizontal leaves would be more susceptible to deposition than narrow vertical leaves or blades. The degree to which dust deposition may have an impact on forage palatability and overall health would depend on several factors such as wind conditions, type and general condition of the affected plants, frequency and effectiveness of dust control measures, and frequency and timing of precipitation events. Cattle have been known to suffer from bronchial illnesses

due to fugitive dust emissions. It is unlikely that wild horses would become similarly ill because they avoid areas of human activities and roads that experience high volumes of traffic.

Increased traffic volumes could result in increased rates of wild horse-vehicle collisions, resulting in injury or death. It is anticipated that the implementation of Barrick's Traffic Management Plan would minimize the risks associated with potential wild horse-vehicle collisions (Barrick 2012a,b). During their current mining operations, Barrick has effectively controlled the speed limits of project-related traffic, resulting in zero livestock-vehicle collisions since January 2009 (BLM 2012m).

Exposure to open pits, process ponds, storm water/event ponds, HLFs, and other areas of cyanide use could pose a risk to wild horse safety and health through either physical injury or contamination. Process ponds, storm water/event ponds, and other areas of cyanide use would be fenced with 8-foot-high wildlife exclusion fence in accordance with NDOW guidelines. Where necessary, Barrick would fence proposed project facilities with a four-strand (three-stranded barbed wire and a smooth bottom strand) range fence (Barrick 2012a,b). Access roads would not be fenced and fencing around individual project components would not interfere with the ability for wild horses to roam or their movement patterns.

3.10.2.2 North and South Operations Area Facilities Reconfiguration Alternative

Under the Reconfiguration Alternative, new temporary surface disturbance within the Triple B HMA in the proposed NOA would decrease by approximately 1,104 acres compared to the Proposed Action; and new temporary surface disturbance within the Triple B HMA in the proposed SOA would decrease by 325 acres compared to the Proposed Action. **Table 3.10-1** details the new surface disturbance to the Triple B HMA that would result from the Reconfiguration Alternative compared to the Proposed Action. With consideration of the 1,934 acres of previously authorized surface disturbance that would not be constructed in the North Operations Area, total surface disturbance within the Triple B HMA under the Reconfiguration Alternative would be 3,352 acres less than the Proposed Action. All project components including associated ancillary and support facilities would be reclaimed with the exception of open pits and pit backfill areas. As a result, the permanent acreage loss under the Reconfiguration Alternative would represent a 325-acre reduction compared to the Proposed Action.

As discussed in Section 3.3, Water Quality and Quantity, and based on the site conditions and model predictions, drawdown associated with groundwater pumping for the mine under the Reconfiguration Alternative could impact (i.e., reduce) the baseflow and associated wetlands at South Water Canyon Seep and JBR No. 14 (**Figure 3.3-21**). Impacts to wild horses as a result of potential impacts to the two springs and associated wetlands are anticipated to be similar to the Proposed Action. Impacts to wild horses resulting from potential groundwater drawdown at the two spring locations would be similar to those discussed in Section 3.7, Wildlife. Additionally, approximately 11 miles of ephemeral streams within the proposed NOA, and approximately 7 miles of ephemeral streams within the proposed SOA would be directly impacted based on the locations of the proposed facility footprints. A reduction in water quality is not anticipated due to implementation of Barrick's PoO and associated ACEPMs (Barrick 2012a,b). For more information regarding impacts to water sources see Section 3.3, Water Quality and Quantity, and Section 3.20, Hazardous Materials and Solid Waste.

Under the Reconfiguration Alternative, impacts associated with fencing project components would be the same as the Proposed Action.

3.10.2.3 North and South Operations Area Facilities Western Redbird Modification Alternative

Impacts to forage under WRM Alternative would be similar to those discussed under Reconfiguration Alternative, except that new temporary surface disturbance within the Triple B HMA in the proposed NOA would decrease by an additional 402 acres; temporary surface disturbance within the Triple B HMA in the proposed SOA would remain the same. With consideration of the 2,169 acres of previously authorized surface disturbance that would not be constructed in the NOA under this alternative, total surface disturbance within the Triple B HMA under the WRM Alternative would be 636 acres less than

the Reconfiguration Alternative. All project components including associated ancillary and support facilities would be reclaimed with the exception of open pits and pit backfill areas. As a result, permanent acreage loss under the WRM Alternative would be 780 acres, a 105-acre reduction compared to the Reconfiguration Alternative.

As discussed in Section 3.3, Water Quality and Quantity, and based on the site conditions and model predictions, drawdown associated with groundwater pumping for the mine under the WRM Alternative are not anticipated to impact springs and wetlands in the project area. Based on the locations of the proposed facility footprints of the WRM Alternative, there would be approximately 1.5 fewer miles of ephemeral streams within the proposed NOA directly impacted as compared to the Reconfiguration Alternative. Impacts to ephemeral streams within the proposed SOA would remain the same. Impacts associated with fencing project components would be the same as the Proposed Action and Reconfiguration Alternative.

3.10.2.4 No Action Alternative

Under the No Action Alternative, the proposed NOA and SOA projects would not be developed and associated impacts to wild horses would not occur. Barrick would continue its operations, closure, and reclamation activities within the NOA and SOA boundaries under the terms and current permits and approvals as authorized by the BLM and State of Nevada. Under the No Action Alternative, construction of all previously authorized expansion and associated facilities would be implemented and reclaimed as authorized.

Water Management Activities

As discussed in Section 3.3, Water Quality and Quantity, and based on the site conditions and model predictions, drawdown associated with groundwater pumping for the mine under the No Action Alternative is not anticipated to impact springs and wetlands in the project area.

3.10.2.5 Cumulative Impacts

The CESA for wild horses is illustrated in **Figure 3.10-1**. Past and present actions and RFFAs are discussed in Section 2.7, Past, Present, and Reasonably Foreseeable Future Actions; their locations are illustrated in **Figure 2.7-1**.

Impacts from Surface Disturbance

Past and present actions have resulted, or would result, in approximately 18,237 acres of past and present disturbance within the wild horses CESA. The total quantifiable surface disturbances are related to mining, oil and gas development, wind energy development, vegetation treatments, and transportation and utility corridor development. RFFAs proposed within the wild horses CESA include, but are not limited to, the following: vegetation treatments (34,672 acres), and livestock grazing leases (which are present in the entire 1,225,000-acre wild horse CESA).

The Proposed Action would remove 11 acres of authorized disturbance from the 18,237 acres of past and present actions and incrementally would increase disturbance to wild horses by an additional 7,097 acres resulting in a total cumulative disturbance of approximately 25,323 acres (2 percent of the total wild horses CESA). Livestock grazing within the CESA also would remove available forage for wild horses. Fuels reduction and vegetation improvement projects are not included in this total because they would have countervailing affects through improved rangeland health (BLM 2013a). The Reconfiguration Alternative incrementally would remove 1,934 acres of authorized disturbance from past and present actions and incrementally increase disturbance to wild horses by 5,668 acres resulting in a total cumulative disturbance of approximately 21,971 acres (2 percent of the total wild horses CESA). As compared to the Reconfiguration Alternative, the WRM Alternative would remove an additional 234 acres of authorized disturbance from the past and present disturbance and decrease proposed surface disturbance by an additional 402 acres for a total cumulative disturbance of approximately 21,334 acres

(2 percent of the total wild horse resource CESA). Under the No Action Alternative, cumulative impacts to vegetation resources would be the same as those described in the *Final Environmental Impact Statement for the Bald Mountain Mine North Operations Area Project* (BLM 2009a) and *Environmental Assessment for the Mooney Heap and Little Bald Mountain Expansion Project* (BLM 2011a).

Past and present actions and RFFAs would cumulatively and incrementally reduce available forage until such time that reclamation is deemed successful and native plants are re-established. It is assumed that portions of past disturbances have been reclaimed, and ongoing reclamation at existing operations would continue to reduce cumulative impacts within the wild horse CESA; however, reclamation success can vary and depends on a variety of factors such as weather and persistent invasion of noxious weeds making the return to pre-disturbance conditions a lengthy process. Pending completion of successful reclamation and the removal of exclusion fencing, the incremental additional impacts as a result of the Proposed Action would be long-term in nature. The Proposed Action, Reconfiguration Alternative, and WRM Alternative would contribute less than 1 percent to the overall cumulative disturbance to the Triple B HMA.

Water Use

Flows associated with the South Water Canyon Seep and JBR No. 14 spring could potentially be reduced or completely cease as a result of groundwater drawdown from the Proposed Action or Reconfiguration Alternatives. This could create areas within the CESA that are no longer utilized by wild horses due to a lack of available surface water unless artificial water sources are provided. If artificial water sources are not provided this could create additional pressure on other nearby water sources; however, the more critical water sources with the HMA are not located within the CESA. Groundwater drawdown also could impact vegetation that is dependent on seeps and springs. Impacts to spring flows from groundwater pumping are not anticipated under the WRM Alternative.

Climate Change

Climate change appears to be influencing both natural and managed ecosystems. Recent warming in the Southwest is among the most rapid in the nation, significantly more than the global average in some areas (USGCRP 2009). Projections suggest continued strong warming in the region, with significant increases in temperature (USGCRP 2009) and decreases in precipitation (Seager et al. 2007). Potential changes to the project area resulting from the effects of climate change forecasted by the Central Basin and Range REA could include higher than normal growing season temperatures, contraction or expansion of some existing vegetation communities, the expansion of existing noxious weed populations, and the introduction of noxious weed species previously undocumented in the ecoregion and project area (Comer et al. 2013). These increases in average growing season temperatures are anticipated to result in low elevation basins throughout the Central Basin and Range ecoregion potentially transitioning from the existing cool semi-desert vegetation communities into very warm and sparsely-vegetated desert landscapes more typical of the Mojave Basin and Range. A transition such as this may result in a lack of adequate forage vegetation and available water rendering the Southwestern HMAs in adequate for wild horses.

3.10.2.6 Monitoring and Mitigation Measures

No mitigation measures proposed.

3.10.2.7 Residual Impacts

Assuming successful reclamation of all project components, residual impacts to wild horses would include the permanent loss of available forage and acreage within the Triple B HMA of approximately 1,210 acres, 885 acres, and 780 acres for the Proposed Action, Reconfiguration Alternative, and the WRM Alternative, respectively. These residual impacts would be associated with open pits, which would not be reclaimed.

3.11 Paleontological Resources

The study area for paleontological resources is defined as the proposed NOA and SOA plan boundaries; the CESA for paleontological resources encompasses the Regional Exploration Plan Boundary (**Figure 1-1**).

3.11.1 Affected Environment

3.11.1.1 Regulatory Framework

Federal legislative protection for paleontological resources stems from the Antiquities Act of 1906 (P.L. 59-209; 16 USC 431 et seq.; 34 Stat. 225), which calls for protection of historic landmarks, historic and prehistoric structures, and other objects of historic or scientific interest on federally administered lands. Federal protection for scientifically important paleontological resources would apply to construction or other related project impacts that would occur on federally owned or managed lands. This act provides for funding for mitigation of paleontological resources discovered during federal aid highway projects, provided that “excavated objects and information are to be used for public purposes without private gain to any individual or organization.” In addition to the foregoing, the National Registry of Natural Landmarks provides protection to paleontological resources. The BLM manages paleontological resources (fossils) on federal lands under the following statutes and regulations (BLM 2012n):

- FLPMA (P.L. 94-579);
- NEPA (P.L. 91-190);
- Title 43 of the CFR addressing the collection of invertebrate, vertebrate and plant fossils; and
- The Paleontological Resources Preservation Act of 2009 (P.L.111-011). This law authorizes the BLM and USFS to manage and provide protection to fossil resources using “scientific principles and expertise.”

In addition to the statutes and regulations listed above, fossils on public lands are managed through the use of internal BLM guidance and manuals. BLM Manual 8270 (BLM 1998a) and the BLM Handbook H-8270-1 (BLM 1998b) contain the BLM's policy and guidance for the management of paleontological resources on public land and information. The manual presents information on the authorities and regulations related to paleontological resources. The handbook gives procedures for permit issuance, requirements for qualified applicants, and information on paleontology and planning. Important guidance in the protection of paleontological resources is contained in IM 2009-011, which provides guidelines for the assessment and mitigation of impacts to paleontological resources (BLM 2008d).

3.11.1.2 Potential Fossil Yield Classification System

The BLM has adopted the Potential Fossil Yield Classification (PFYC) system to identify and classify fossil resources on federal lands (BLM 2007a). Paleontological resources are closely tied to the geologic units (i.e., formations, members, or beds) that contain them. The probability for finding paleontological resources can be broadly predicted from the geologic units present at or near the surface; therefore, geologic mapping can be used to assess the potential for occurrence of paleontological resources.

The PFYC system is a way of classifying geologic units based on the relative abundance of vertebrate fossils or scientifically significant fossils (plants, vertebrates, and invertebrates) and their sensitivity to adverse impacts. A higher class number indicates higher potential of occurrence. The PFYC is not intended to be applied to specific paleontological localities or small areas within units. Although significant localities may occasionally occur in a geologic unit, a few widely scattered important fossils or localities do not necessarily indicate a higher class; instead, the relative abundance of significant localities is intended to be the major determinant for the class assignment. The PFYC system is meant to

provide baseline guidance for predicting, assessing, and mitigating paleontological resources. The classification should be considered at an intermediate point in the analysis and should be used to assist in determining the need for further mitigation assessment or actions. The BLM intends for the PFYC system to be used as a guideline as opposed to rigorous definitions (BLM 2007a). Descriptions of the potential fossil yield classes are summarized in **Table 3.11-1**.

Table 3.11-1 Potential Fossil Yield Classification System

Class	Description	Basis	Management Considerations
1	Igneous and metamorphic (tuffs are excluded from this category) geologic units or units representing heavily disturbed preservation environments that are not likely to contain recognizable fossil remains.	• Fossils of any kind known not to occur except in the rarest of circumstances. • Igneous or metamorphic origin. • Landslides and glacial deposits.	Management concern for paleontological resources in Class 1 units is usually negligible or not applicable. Assessment or mitigation is usually unnecessary except in very rare or isolated circumstances.
2	Sedimentary geologic units that are not likely to contain vertebrate fossils or scientifically significant invertebrate fossils.	• Vertebrate fossils known to occur very rarely or not at all. • Age greater than Devonian. • Age younger than 10,000 years before present. • Deep marine origin. • Aeolian origin. • Diagenetic alteration.	Management concern for paleontological resources is generally low and assessment or mitigation is usually unnecessary except in rare or isolated circumstances.
3	Fossiliferous sedimentary geologic units where fossil content varies in significance, abundance, and predictable occurrence. Also sedimentary units of unknown fossil potential.	• Units with sporadic known occurrences of vertebrate fossils. • Vertebrate fossils and significant invertebrate fossils known to occur inconsistently; predictability known to be low. • Poorly studied and/or poorly documented. Potential yield cannot be assigned without ground reconnaissance.	Management concern for paleontological resources is moderate or cannot be determined from existing data. Management considerations cover a broad range of options as well, and could include pre-disturbance surveys, monitoring, or avoidance. Surface-disturbing activities will require sufficient assessment and may require field assessment to determine appropriate course of action.
4	Class 4 geologic units are Class 5 units (see below) that have lowered risks of human-caused adverse impacts and/or lowered risk of natural degradation.	• Significant soil/vegetative cover; outcrop is not likely to be impacted. • Areas of any exposed outcrop are smaller than two contiguous acres. • Outcrop forms cliffs of sufficient height and slope that most is out of reach by normal means. • Other characteristics that lower the vulnerability of both known and unidentified fossil localities.	Management concern for paleontological resources in Class 4 is moderate to high, depending on the proposed action. A field survey by a qualified paleontologist is often needed to assess local conditions. Management prescriptions for resource preservation and conservation through controlled access or special management designation should be considered.

Table 3.11-1 Potential Fossil Yield Classification System

Class	Description	Basis	Management Considerations
			Class 4 and Class 5 units may be combined as Class 5 for broad applications, such as planning efforts or preliminary assessments, when geologic mapping at an appropriate scale is not available. Resource assessment, mitigation, and other management considerations are similar at this level of analysis, and impacts and alternatives can be addressed at a level appropriate to the application.
5	Highly fossiliferous geologic units that regularly and predictably produce invertebrate fossils and/or scientifically significant invertebrate fossils, and that are at risk of natural degradation and/or human-caused adverse impacts.	• Vertebrate fossils and/or scientifically significant invertebrate fossils are known and documented to occur consistently, predictably, and/or abundantly. • Unit is exposed; little or no soil/vegetative cover. • Outcrop areas are extensive; discontinuous areas are larger than 2 contiguous acres. • Outcrop erodes readily; may form badlands. • Easy access to extensive outcrop in remote areas. • Other characteristics that increase the sensitivity of both known and unidentified fossil localities.	Management concern for paleontological resources in Class 5 areas is high to very high. A field survey by a qualified paleontologist is usually necessary prior to surface disturbing activities or land tenure adjustments. Mitigation will often be necessary before and/or during these actions. Official designation of areas of avoidance, special interest, and concern may be appropriate.

Source: BLM 2007a.

3.11.1.3 Paleontological Resources in the Study Area

Table 3.11-2 provides a list of sedimentary geologic units that have the potential to contain fossils. No units have been formally assigned a PFYC system class, but a probable PFYC ranking has been assigned to each unit in order to provide a description of relative potential of fossil resources. The probable ranking is applicable to the study area only. If the fossil resource descriptions in the table indicate that fossils have not been reported in the study area that is because the sources listed at the bottom of the table did not report them; however, that does not completely preclude the possibility that fossils are present in these formations.

Igneous and metamorphic rocks are not listed on **Table 3.11-2** since those rocks have no potential to contain any fossils. It also should be noted that sedimentary rocks in the study area have been subjected to metamorphism, which would further decrease their potential for having valuable fossil material.

Table 3.11-2 Fossil Potential in the Study Area

Age	Unit	Rock Description	Fossil Resource Description	Probable PFYC Rank
Eocene/Cretaceous	Unnamed Limestone	Fine-grained thick-bedded to massive limestone.	Pelecypods and gastropods (Nutt and Hart 2004).	2
Pennsylvanian	Moleen Fm. (Ely Limestone)	Sandy to silty fossiliferous limestone.	Fusulinid coquinas, biostromal beds with brachiopods, bryozoans, and corals; fossils not reported in study area.	2
Mississippian	Diamond Peak Formation	Siltstone, silty claystone, and minor sandstone and conglomerate.	Hose and Blake (1976) describe “diverse marine fauna” in local areas; fossils not identified in study area.	2
Mississippian	Chainman Shale	Dark gray to black shale with siltstone.	Regionally may contain brachiopods, bryozoans, corals, crinoids, gastropods, pelmatazoans, and pelecypods; fossils not specifically reported in study area.	2
Mississippian	Joana Limestone	Medium- to coarse-grained thin to thick bedded limestone.	Contains abundant crinoid stem fragments in the study area.	2
Mississippian	Pilot Shale	Calcareous siltstone with interbedded thinbedded micritic limestone.	Regionally may contain conodonts, corals, brachiopods, and plant fragments; fossils not identified in study area.	2
Devonian	Guilmette (Devils Gaste) Limestone	Fine- medium-grained massive to thick- and thin bedded, limestone.	May be highly fossiliferous in localized areas. Stromatoliths (fossilized algae) observed in study area.	2
Devonian	Simonson Dolomite	Thick- to thin-bedded dolomite.	Fossils not reported in study area.	2
Devonian	Sevy Dolomite	Thick- to thin-bedded dense crystalline dolomite.	Regionally there are concentrations of brachiopods, bryozoans and crinoids have been found, but no fossils have been reported in the study area.	2
Devonian, Silurian, and Ordovician	Undifferentiated dolomites	Variable crystalline dolomites.	No fossils reported in study area.	2
Ordovician	Fish Haven Dolomite	Fine- to medium-grained, thick-bedded dolomite.	Regionally may contain brachiopods, corals, and gastropods; fossils not reported in study area.	2
Ordovician	Eureka Quartzite	Thick-bedded to massive quartzite.	Fossils not reported in study area.	1

Table 3.11-2 Fossil Potential in the Study Area

Age	Unit	Rock Description	Fossil Resource Description	Probable PFYC Rank
Ordovician	Pogonip Group	Thin- to thick-bedded limestone with sandstone lenses.	Fossiliferous beds identified by Nutt and Hart (2004), but fossils not reported in study area.	2
Cambrian	Windfall Formation	Thin- to thick-bedded limestone with silt and sandstone beds.	Stromatoliths in upper part.	2
Cambrian	Dunderberg	Shale and interbedded fine- to medium-grained, thin-bedded limestone.	Contains “numerous” trilobite fragments in the study area (Nutt and Hart 2004).	2
Cambrian	Hamburg Formation	Fine- to medium-grained limestone.	Contains trilobites in the southern Ruby Mountains (Western Cordillera 2006).	2
Cambrian	Secret Canyon Shale	Shale, siltstone, and limestone.	Contains abundant trilobites (Nutt and Hart 2004).	3
Cambrian	Geddes Limestone	Thin-bedded silty, carbonaceous limestone.	Localities regionally contain trilobites (Palmer 1954); fossils not reported in study area.	3
Cambrian	El Dorado Formation	Thick-bedded to massive limestone and dolomite.	Fossils not reported in study area.	2

Sources: Hose and Blake 1976; Nutt 2000; Nutt and Hart 2004; Palmer 1954; Western Cordillera 2006.

3.11.2 Environmental Consequences

This section discusses project related impacts to paleontological resources resulting from the Proposed Action, Reconfiguration Alternative, WRM Alternative, and No Action Alternative. Primary issues related to paleontological resources include the direct and indirect impacts associated with the loss or degradation of fossils.

3.11.2.1 Proposed Action

Potential impacts to any paleontological resources from the Proposed Action would be the result of surface disturbing activities physically destroying or degrading fossils. If fossils are destroyed, this impact would be long-term and significant as any destroyed fossils are lost to science. The risk of this impact is represented by how much surface disturbance the Proposed Action would cause, and the likelihood of significant fossil resources being found in those formations where that disturbance would occur.

Under the Proposed Action, implementation of surface disturbance activities as a result of proposed development and expansion would remove approximately 4,357 acres within the proposed NOA; and approximately 2,740 acres within the proposed SOA. No formal assessments have been conducted for determination of PFYC rankings of formations that may contain fossils within the proposed NOA and SOA projects; however, for the purposes of analysis, the probable PFYC rank provides a useful measure of the likelihood of finding fossils in the study area. As shown in **Table 3.11-2**, most of the formations

impacted by the Proposed Action show very little potential of having vertebrate fossils. This is supported by the few reports of fossils in these formations during the history of mining operations. Accordingly, the Proposed Action would have a low risk of impact to significant paleontological resources.

Since fossils generally are buried, their locations cannot be confirmed until excavation occurs. Per the BLM Ely District RMP, when paleontological resources of potential scientific interest are encountered, they would be left intact and immediately brought to the attention of the BLM Authorized Officer. Indirect impacts including the potential increased accessibility to fossil beds from improved access to remote areas and subsequent illegal collection, would be mitigated by prohibiting public access within the proposed NOA and SOA during operations.

3.11.2.2 North and South Operations Area Facilities Reconfiguration Alternative

Under the Reconfiguration Alternative, implementation of surface disturbance activities as a result of proposed development and expansion would remove approximately 3,254 acres within the proposed NOA; and approximately 2,414 acres within the proposed SOA. As with the Proposed Action, the likelihood of finding fossils would be considered low based on the information summarized in **Table 3.11-2**. With consideration of the 1,934 acres of existing authorized disturbance that would not be constructed under the Reconfiguration Alternative, implementation of this alternative would result in 3,352 acres less surface disturbance compared with the Proposed Action and as a result, impacts to paleontological resources would be less than described for the Proposed Action in Section 3.11.2.1.

3.11.2.3 North and South Operations Area Western Redbird Modification Alternative

The WRM Alternative is the same as the Reconfiguration Alternative except for the reduction or elimination of some facilities within the proposed NOA plan boundary (see Section 2.6.2, North and South Operations Area Western Redbird Modification Alternative). Effects would be similar to, but slightly reduced from, the Reconfiguration Alternative, as there would be 636 fewer acres of proposed surface disturbance within the proposed NOA.

3.11.2.4 No Action Alternative

Under the No Action Alternative, the proposed NOA and SOA projects would not be developed and associated potential impacts (discovery or loss) of paleontological resources would not occur. Barrick would continue its operations, closure, and reclamation activities within the NOA and SOA boundaries under the terms and current permits and approvals as authorized by the BLM and State of Nevada. Under the No Action Alternative, construction of all previously authorized expansion and associated facilities would be implemented and reclaimed as authorized.

3.11.2.5 Cumulative Impacts

The 140,795-acre CESA for paleontological resources encompasses the Regional Plan Exploration Boundary (**Figure 1-1**). Past and present actions and RFFAs are discussed in Section 2.7, Past, Present, and Reasonably Foreseeable Future Actions; their locations are illustrated in **Figure 2.7-1**.

Past and present actions have resulted, or would result, in approximately 15,457 acres of total surface disturbance within the paleontological resources CESA. The total quantifiable surface disturbances are related to mining, oil and gas development, wind energy development, exploration, land, road, and utility corridor development, agriculture, livestock grazing, residential developments, and other county and government actions. One RFFA, a fuels and vegetation treatment totaling approximately 10,300 acres, is proposed within the paleontological resources CESA.

The Proposed Action would remove 11 acres of authorized disturbance from the 15,457 acres of past and present actions and would increase potential disturbance to paleontological resources by an additional 7,097 acres resulting in a total cumulative disturbance of approximately 32,843 acres (23 percent of the total paleontological resources CESA). It should be noted that 10,300 acres of this

total disturbance (7 percent of the CESA) would be due to fuels reduction or vegetation treatments, which would not result in direct surface disturbance that could uncover or destroy paleontological resources, but rather, would consist of vegetation removal that could expose paleontological resources on or near the surface. The Reconfiguration Alternative would remove 1,934 acres of authorized disturbance from past and present actions and incrementally increase potential disturbance to paleontological resources by 5,668 acres, resulting in a total cumulative disturbance of approximately 29,491 acres (21 percent of the total paleontological resource CESA). The WRM Alternative would remove 235 acres of previously authorized disturbance and 402 acres of the proposed surface disturbance that would occur under the Reconfiguration Alternative for a total cumulative disturbance of approximately 28,854 acres (20 percent of the CESA, of which about a third of which would consist of vegetation removal projects). Under the No Action Alternative, cumulative impacts to paleontological resources would be the same as those described in the *Final Environmental Impact Statement for the Bald Mountain Mine North Operations Area Project* (BLM 2009a) and *Environmental Assessment for the Mooney Heap and Little Bald Mountain Expansion Project* (BLM 2011a).

The proposed NOA and SOA projects, when added to past and present actions and RFFAs would not be expected to significantly contribute to cumulative impacts to paleontological resources within the CESA.

3.11.2.6 Monitoring and Mitigation Measures

No mitigation or monitoring is proposed for these resources.

3.11.2.7 Residual Impacts

Some scientifically valuable fossils may be disturbed and lost during ground disturbing activities under the Proposed Action, Reconfiguration Alternative, and WRM Alternative. As a consequence, there would be a small incremental loss of fossil material, however this would be offset by the material that is recovered and preserved for scientific study purposes.

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3.12 Cultural Resources

The study area for cultural resources is defined as the area of potential effect (APE). Under Section 106 of the NHPA, the APE is defined as "those areas in which impacts are planned or are likely to occur." Specifically, "the geographic area or areas within which an undertaking may directly or indirectly cause changes in the character or use of historic properties, if any such properties exist. Additionally, the APE is influenced by the scale and nature of an undertaking and may be different for various types of effects caused by the undertaking (36 CFR 800.16[d])." The APE comprises the PoO boundary plus a 5-mile buffer (**Figure 3.12-1**). The limits of the APE were designed to encompass the area of direct project disturbance, as well the area that includes significant known cultural sites from which the proposed project would be visible. In additional to direct disturbance, visibility of mine construction and operations from cultural sites is a key element in determining the potential impacts to the cultural setting, and therefore, integrity, of the sites. These sites include the Pony Express National Historic Trail, Fort Ruby National Historic Landmark, Ruby Valley Pony Express Station, and Sunshine Locality National Register District, as well as parts of Newark Valley, Ruby Valley, and Long Valley. The Pony Express National Historic Trail is located approximately 2 miles north of the proposed NOA; whereas the Sunshine Locality National Register District is located approximately 1 mile south of the proposed SOA. The CESA for cultural resources also encompasses the PoO boundary plus a 5-mile buffer (see **Figure 3.12-1**).

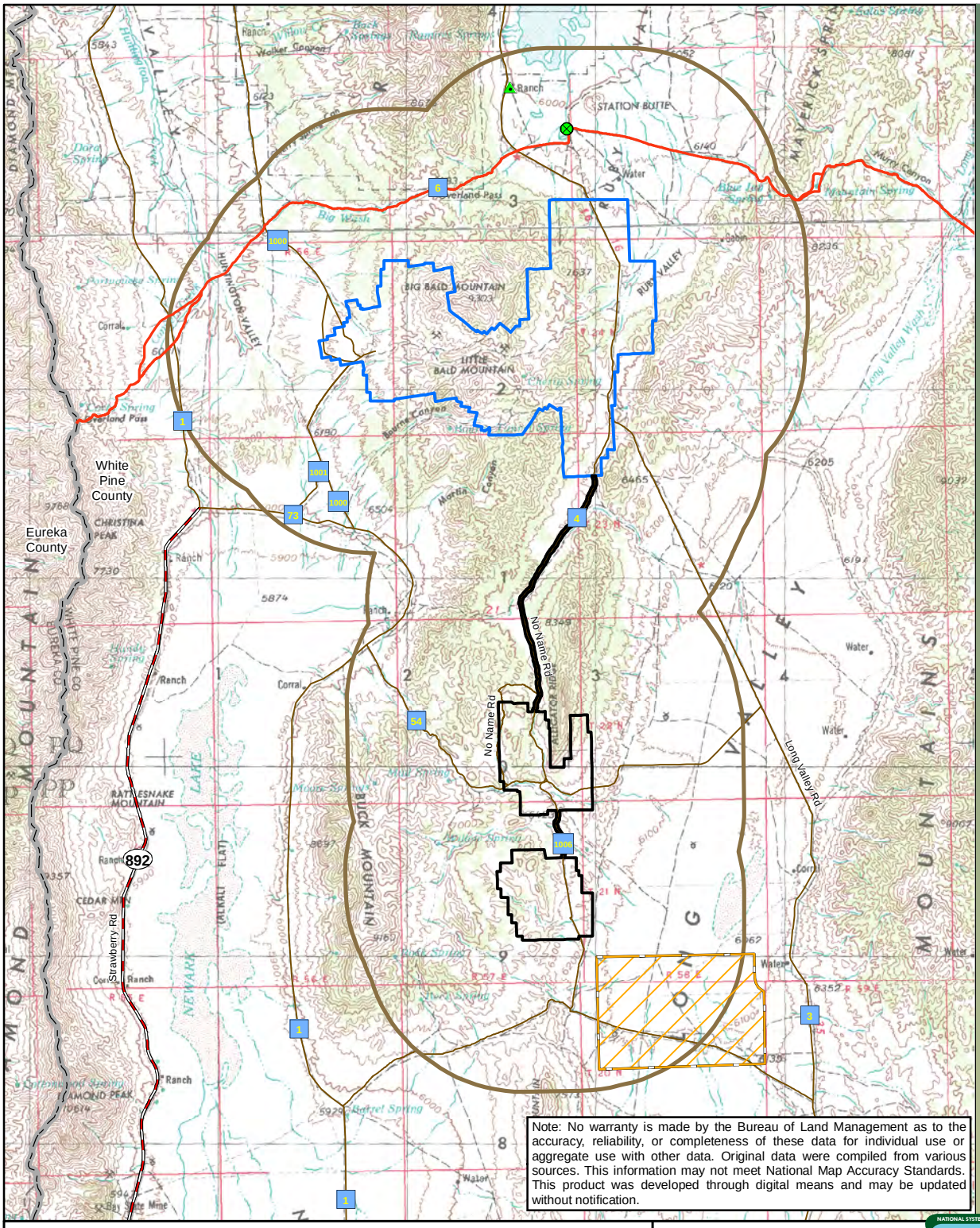
3.12.1 Affected Environment

Cultural resources are definite locations of human activity, occupation, or use identifiable through field inventory (survey), historical documentation, or oral evidence. The term includes: archaeological, historic, or architectural sites; structures or places with important public and scientific uses; and may include definite locations (sites or places) of traditional, cultural, or religious importance to specified social and/or cultural groups. Cultural resources are concrete, material places and things that are located, classified, ranked, and managed through the system of identifying, protecting, and utilizing for public benefit (BLM 8100 Manual).

3.12.1.1 Regulatory Framework

The National Historic Preservation Act of 1966, as amended, established the Advisory Council on Historic Preservation (ACHP) , State Historic Preservation Offices (SHPOs), and the National Register of Historic Places (NRHP) and mandates that federal agencies consider an undertaking's effects on cultural resources that are listed or eligible for listing on the NRHP (see 36 CFR Part 800). In addition to the NHPA, other relevant federal historic preservation laws include, but are not limited to, the Antiquities Act of 1906 (16 USC 431-433), the Archaeological Resources Protection Act of 1979 (16 USC 470aa-mm), and National Trails System Act of 1968 (P.L. 90-543 as amended through P.L. 111-11, March 30, 2009). NEPA states that federal agencies shall take into consideration impacts to the natural environment with respect to an array of resources, and that alternatives must be considered. The courts have made clear that cultural resources are regarded as part of the natural environment.

Cultural resources that are listed or eligible for inclusion in the NRHP are referred to as "historic properties." The ACHP is authorized by Section 211 of the NHPA to issue regulations to govern the implementation of Section 106 of the NHPA. These regulations, "Protection of Historic Properties" (36 CFR Part 800), establish the process that federal agencies must follow in order to take into account the effects of their undertakings on historic properties and provide the ACHP its required opportunity to comment. Section 106 establishes a four-step review process by which historic properties are given consideration during the conduct of federal undertakings, and requires that agencies consult with the SHPO/THPO to determine if the agency's undertaking could affect historic properties. The four steps are as follows:



Legend

- Proposed NOA Plan Boundary
- Proposed SOA Plan Boundary
- Cultural Resources and Native American Traditional Values Cumulative Effects Study Area
- Sunshine Locality National Register District
- Pony Express National Historic Trail
- Ruby Valley Pony Express Station
- Fort Ruby Historic Landmark

Source: Barrick 2012a,b; BLM 2012a.

Bald Mountain Mine North and South Operations Area Projects EIS

Figure 3.12-1

Cultural Resources and Native American Traditional Values Cumulative Effects Study Area

0 1.25 2.5 5 Miles

N

BLM

Ely District Office

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12/21/2015

1. Initiate the Section 106 process by establishing the undertaking, defining the APE, and consulting with the appropriate parties, including federal agencies, SHPOs, ACHP, Indian tribes, local governments, and the public;
2. Identify historic properties through inventory and evaluation;
3. Assess adverse effects by applying the criteria of adverse effects; and
4. If adverse effects would occur, then take appropriate steps to avoid or mitigate those effects.

The BLM has developed a nationwide Programmatic Agreement (NPA) governing the manner in which the BLM shall meet its responsibilities under the NHPA. Within the State of Nevada, there is a State Protocol Agreement (SPA) prescribing the manner in which the BLM and the Nevada SHPO implement the NPA. The SPA outlines specific procedures for each of the 4 steps identified above.

For complex projects, the SPA includes the option of negotiating a project-specific PA between the proponent, agency, SHPO, and ACHP to lay out agreed-upon steps that the agency and the consulting parties will take to consider and resolve any adverse effects that the project might have on historic properties. For the Bald Mountain Mining District Project, a PA has been developed among the BLM Egan Field Office, Nevada SHPO, and Barrick. The PA outlines general and specific measures that the BLM would take to fulfill its objectives and responsibilities regarding the protection of historic properties under the NHPA. A copy of the PA is contained as **Appendix I**.

3.12.1.2 Criteria of Eligibility

The NRHP, maintained by the National Park Service (NPS) on behalf of the Secretary of the Interior, is the nation's inventory of historic properties. The NPS has established three main standards that a property must meet to qualify for listing on the NRHP: age, integrity, and significance. To meet the age criteria, a property generally must be at least 50 years old. Per 36 CFR 60.4, to meet the integrity criteria, a property must "possess integrity of location, design, setting, materials, workmanship, feeling, and association" and be significant according to one or more of the following criteria:

Criterion A – Be associated with events that have made a significant contribution to the broad patterns of our history;

Criterion B – Be associated with the lives of persons significant in our history;

Criterion C – Embody the distinctive characteristics of a type, period, or method of construction, or represent the work of a master, or possess high artistic values, or represent a significant and distinguishable entity whose components may lack individual distinction; or

Criterion D – Have yielded, or may be likely to yield, information important in prehistory or history.

3.12.1.3 Prehistoric and Historic Overview

The following brief summaries provide a general overview of the prehistory and history of the region encompassing the study area. Information included in the summaries was extrapolated from Elston (1986), Grayson (1993), Marwitt (1986), McBride (2002), Pomerleau and Harmon (2013), Schroedl (1995), and SHPO (2012).

<u>Prehistoric Overview</u>

Paleoarchaic Period (ca. 12,000 years Before Present [B.P.] to 8,000/7,000 years B.P.)

Recently discovered evidence suggests humans were present in the Great Basin as early as 11,000 to 12,000 years ago; evidence of human occupation in the Great Basin becomes more common after 11,000 years B.P. This period is marked by cool, moist conditions. Paleoarchaic sites typically are situated in places that would have been adjacent to pluvial lakes or near other wetland settings. Population density was low and groups were highly mobile hunter-gatherers who hunted small animals

such as waterfowl and greater sage-grouse, and gathered wetlands plants (e.g., cattail pollen, shoots, and seeds). Diagnostic tools associated with the Paleoarchaic include stemmed and fluted projectile points.

An early Terminal Pleistocene-Early Holocene site located within approximately 1 mile of the study area is the Sunshine Locality National Register District (**Figure 3.12-1**). The District is a preserve of more than 90 archaeological sites located within a 35,000-acre area representing an 11,000-year-old land-and-marsh adapted culture known as the Western Pluvial Lakes Tradition.

Early Archaic (ca. 8,000/7,000 years B.P. to 4,000 years B.P.)

The shift from the Paleoarchaic to the Early Archaic period corresponds approximately to the beginning of the middle Holocene period and is characterized by a transition to a warmer, drier environment that resulted in the drying out of lakes, streams, and springs. There is a limited amount of well-dated sites or artifact assemblages from this period, which may suggest a sparse population living in the region at that time. Artifact assemblages dated to this period indicate that Early Archaic people practiced a forager-type subsistence/settlement pattern in small groups; while other assemblages indicate that the Early Archaic practiced large game hunting. Diagnostic tools associated with the Early Archaic periods in the central Great Basin include Northern Side-notched points, Gatecliff Series points, and Elko Series points.

Middle Archaic (ca. 4,000 years B.P. to 1,500 years B.P.)

This period is marked by a shift to cooler, moister conditions in which streams and springs began to flow again and marshes were re-established in some places. The Middle Archaic falls within the transition period from the middle to the late Holocene (ca. 4,500 B.P.). Middle Archaic populations exploited a wide range of habitats and re-occupied residential sites and seasonal camps. Overall settlement patterns were relatively mobile, with movements timed to take advantage of resources maturing at different times in different elevation zones. Diagnostic tools associated with the Middle Archaic periods in the central Great Basin include Gatecliff Series points and Elko Series points.

Late Archaic (ca. 1,500 years B.P. to 250/150 years B.P.)

The Late Archaic period is associated with the appearance of the bow and arrow. During this period, the climate became warmer and drier, similar to the current climate. Subsistence and settlement patterns varied and ranged from nomadic groups that used a variety of ecological zones to more sedentary groups that primarily used cultivated and locally procured wild resources. Ground stone implements, such as manos, metates, and pestles, remain a part of archaeological assemblages. There appears to be an expansion in the quantity and kinds of sites, with specialized “localities” such as assaying stations, kill sites, and processing stations.

Specific Late Holocene chronological issues pertinent to the study area and surrounding area include the following Fremont Culture and Numic Expansion.

The Fremont Culture (ca. 1,500 to 700 years B.P.)

During the Late Archaic, the eastern Great Basin saw the emergence of the Fremont Culture. The Fremont people manufactured well-made, thin-walled, black-on-grey carbon pottery and frequently lived in sizable villages. Fremont components occur throughout the Ely District. Newark Cave, located some 25 miles northeast of the project area on an ancient shoreline of Newark Lake, contains deposits spanning from the Early Archaic through at least 1100 A.D. (Fowler 1968). Artifacts typically associated with the Fremont include Rosegate Series (Rose Spring and Eastgate) projectile points and Desert Series (Cottonwood Triangular and Desert Side-Notched) points. Other artifacts of note include “Utah” metates, with a shelf on one end; distinctive projectile point types such as Parowan basal-notched and Nawthis side-notched; and an elaborated bone tool industry. Village structures include circular and quadrilateral semi-subterranean pithouses, as well as coursed adobe and jacal structures. Though a distinct culture, the Fremont Culture shared the development of corn agriculture and the expansion of

organized sedentary villages with contemporary farming cultures. After 700 B.P., Fremont people are replaced by Numic speakers, whose expansion may be related to climatic change, population growth, and/or ethnic replacement.

Numic Expansion (ca, 1,000 B.P.)

Current scientific research suggests that Numic speakers are ancestral Ute, Paiute and Shoshone who are thought to have moved into the Great Basin around 1,000 years ago. The primary archaeological marker for Numic expansion in the Great Basin is the appearance of Great Basin Brownware pottery, which typically is conical and flat-bottomed in shape. Pots were formed using the paddle-and-anvil method. Another possible Numic marker is Desert Series projectile points, especially Desert Side-notched and Cottonwood Triangular points. Changes in basketry technology by 1,000 B.P. also are thought to document the expansion of Numic speakers.

Protohistoric Period

Protohistoric is defined as the period or stage of human development or of a particular culture immediately prior to the emergence of writing. The Protohistoric Period was a critical time in the evolution of indigenous populations. Encroachment by European explorers during the 16th Century and their imposition of cultural values compromised the lifeways and traditions of Native Americans. At the time of European contact, the Great Basin was inhabited by hunters and gatherers who were related culturally and linguistically. Early European descriptions of Nevada Native Americans describe them as a poor, starving people living in a barren land. The indigenous populations exploited their environment through a series of patterned movements from season to season based on information derived from traditional knowledge, input from their neighbors, and observations from individuals within the group.

Historic Overview

The historic context for eastern Nevada includes five major themes associated with the Bald Mountain Mining District and surrounding vicinity: 1) exploration and emigration; 2) Indians and the military; 3) transportation and communication; 4) mining activity; and 5) ranching and agriculture. Each of these themes represents specific periods of time.

Exploration and Emigration

The first Euroamerican explorer to travel through White Pine County was Jedediah Smith in 1827. Although his exact route remains unknown, it appears to have followed the modern route of U.S. Highway 6. In 1828, Peter Skene Ogden's fifth Snake Country Expedition crossed the Ruby Mountains via Secret Pass en route from the Great Salt Lake to present-day Elko. The party was primarily interested in beaver pelts, and they trapped along the Humboldt River and its tributaries, moving westward and eventually reaching the vicinity of present-day Winnemucca. Captain John C. Frémont led several military surveys through the western U.S. between 1842 and 1854, one of which came close to the study area. The major purpose of the surveys was to explore the Great Basin and ascertain if a road could be built connecting the Great Salt Lake with eastern Nevada. In 1859, Captain James H. Simpson led a military survey to find a route connecting Camp Floyd in Provo, Utah, with Genoa, Nevada. Simpson and his men ultimately discovered a route that subsequently was used by the Overland Stage, and ultimately became the Central Route through Nevada.

The first emigrant party to cross Nevada was the Bidwell-Bartleson party. After entering the eastern part of the state in Toana Valley, they passed through the vicinity of the study area in 1841, crossing the Ruby Mountains at Secret Pass on the way to the Humboldt River. A second emigrant route through the immediate region was the cutoff used by Lansford W. Hastings in 1846. In 1848, the "Hastings Cut-off" became an important road to the gold fields; however, with the end of the initial gold rush in 1850, the cut-off was abandoned.

Indians and the Military

Many of the problems between the emigrants and the local Indians resulted from the emigrant trains following the Humboldt Trail. The influx of Euroamericans and their quest to settle on lands originally open to the Indians for hunting and gathering negatively impacted the Indian lifestyle. The U.S. government attempted to resolve issues by implementing farm programs for the local Indians. Although the local Indians accepted the programs, they failed due to lack of federal funding. With continued loss of their lands, survival became more and more difficult for local Indians. Without adequate lands to support their hunting and gathering lifestyle, survival became a choice between earning low wages on farms or stealing.

In 1860, the first military troops arrived in the Ruby Valley area of the Overland Mail route. The soldiers established a temporary camp near the Ruby Valley Station (Overland Mail and Telegraph station) and associated Pony Express Station. Late that same year the camp was abandoned, but was used intermittently during 1861 by a military unit out of the newly formed Fort Churchill in western Nevada. In 1862, Fort Ruby was established at the southern end of Ruby Valley by California volunteer militia under the leadership of Colonel Patrick Connor at the halfway point between Salt Lake City, Utah, and Carson City, Nevada, to protect the Overland mail service and emigrant travelers. During Fort Ruby's early years, the Treaty of Ruby Valley was negotiated with the Goshute Shoshone and Western Shoshone, and signed by 12 Western Shoshone leaders. The treaty was ratified but never fully implemented. The troops at Fort Ruby dealt with many of the local Indian issues, but also were responsible for providing food and clothing to the Indians in the region. Fort Ruby was declassified as a camp in 1867, and the last troops left for Fort Halleck in 1869.

Fort Ruby was designated a National Historic Landmark by the NPS in 1961. In 2002, the archaeological remains of the Fort and prehistoric occupation were determined eligible for the NRHP. The Ruby Lake NWR, USFWS, and USFS are collaborating on a project to "re-commission" the historic fort site. Re-commission activities will include surveying the fort site, piecing together the fort's appearance by archaeological and archival methods, protecting two buildings from further deterioration, creating an accessible foot trail through the fort, and providing interpretive text, photographs, and maps that inform the visiting public about this period of time in the history of Nevada. The goal is to enhance the site of this Civil War-era fort so that it is accessible to the public. A plaque commemorating Fort Ruby was situated in front of the Fort Ruby site in 1994. The Fort Ruby site is located approximately 2 miles north of the study area (**Figure 3.12-1**).

Transportation and Communication

During the 1850s, a series of ventures were established to provide mail and passenger service between the west and east coasts. In 1860-1861, a deal was made between the Central Overland Company and Butterfield Overland Mail Company in which the former carried mail from Salt Lake City to the east and the latter carried mail to California. Roads were constructed or improved along the mail line, and 36 stations were built between Salt Lake City and Austin, Nevada. Many of the stations were used by the Overland Stage and Pony Express. In 1866, Wells, Fargo & Company purchased interest in the Overland Stage Line and continued to operate the line until the completion of the transcontinental railroad in 1869.

For a brief period of 19 months from 1860 to 1861, the Pony Express mail service used the Central Overland Route (Pony Express Trail) as part of their fast 10-day mail and delivery from St. Joseph, Missouri, to Sacramento, California (**Figure 3.12-1**). Pony Express mail carriers would stop at the many stations along the Central Overland Route and change to a fresh horse, taking only the mail pouch with them. The Pony Express station closest to the study area was the Ruby Valley Pony Express Station, which was moved and restored in 1960 and is now part of a display at the Northeastern Nevada Museum in Elko, Nevada. The site of the Ruby Valley Pony Express Station is approximately 2 miles north of the study area (**Figure 3.12-1**).

In 1861, telegraph lines were constructed along the Central Overland Route. The telegraph service ultimately replaced the Pony Express. When the Central Pacific Railroad was completed 1869, the telegraph line was moved north along the railroad. Following settlement of White Pine County in the 1860s, a system of wagon roads was developed. In the Bald Mountain Mining District and surrounding region, wagon roads were constructed to connect ranches and settlements, and to transport timber and minerals from the region. By 1910, the road system was well developed. Some of the old wagon roads survived and now carry automobile traffic; a few have been paved. One of those roads is the Lincoln Highway. U.S. Highway 50, which passes south of the study area, follows much of the original Lincoln Highway. The Victory Highway, later known as U.S. Highway 40, comprises much of I-80 to the north of the study area.

Ranching and Agriculture

Agricultural activities within and near the study area have included livestock ranching and farming (hay, grain, fruit, and vegetables). Cattle were first present in 1841, but major cattle raising operations did not begin until after the Civil War. During the 1870s and 1880s, the number of cattle in White Pine County increased and decreased depending on weather conditions. During the 1880s, White Pine County became a focal point for the sheep industry and, in time, eastern Nevada became a large grazing area for sheepherders. Competition between cattlemen and sheepherders intensified during the 1890s, which ultimately led to the passage of federal legislation regulating water use and grazing rights.

As the farming industry expanded, so did the need for irrigation. In White Pine County, ditches diverted irrigation water from mountain streams and springs. By 1874, 60 ditches irrigated over 3,000 acres in White Pine County. By 1900, there were an estimated 500 ditches bringing water to approximately 10,000 acres of land. During the 20th Century and up to now, surface irrigation waters have become increasingly supplemented or replaced by ground water pumped by wells.

Mining Activity

Mining in the district began slowly during the late 19th Century with limited placer mining by Chinese immigrants near Water Canyon followed by the establishment of three mines on Little Bald Mountain and on a pass between Water and Cherry canyons during the early 1880s.

From 1905 to 1907, mining expanded, capitalized mining commenced, numerous claims were filed, and interest was displayed by outside investors such as Nevada capitalist George Wingfield. In 1907, the Copper Basin Mining and Smelting Company shipped 50,000 pounds of ore by rail to Salt Lake City, though company ownership had changed as a result of the “panic of 1907.” Joy, which is located at the east end of Water Canyon, became a company town during this early mining period with a continuous population of between 50 and 75 persons. However, by the winter of 1918, Joy had been abandoned after Copper Basin folded. Between 1914 and 1919, there were small shipments of antimony ore from the district. Tungsten was discovered prior to 1917, but was not cost-effective to mine until WW II, and later during the 1950s. In 1921, Robert Skaggs and Frank McDermott recorded the locations of three mines in the Bald Mountain Mining District. In November 1928, W. Bellinger and the Brandt brothers found a rich source of gold, silver, and copper in a vein at the old workings of the Copper Basin Mining and Smelting Company.

Between 1939 and 1942, the Pioneer Copper Mine was the active mining property within the district. Placer Amex acquired an option on claims in the Bald Mountain Mining District in 1976, with subsequent discoveries in the late 1970s and 1980s, but actual mining operations did not really begin until the mid-1980s at the Top Pit. Other operators worked various areas in the district including Alligator Ridge, Casino/Winrock, Little Bald Mountain mines, and Yankee Mine. All these were purchased by Placer Dome U.S. in 1993. Instead of placer or shaft-type mining, open pits are used today along with in-house reclamation programs that are often concurrent with mining operations. Placer Dome was acquired by Barrick Gold Corporation in April 2006.

Cultural Resources in the Study Area

During prehistoric times, the Bald Mountain Mining District played a role in the region as a producer of tool stone in the form of both sedimentary silicates and fine-grained volcanics. It is likely that the sedimentary silicates utilized prehistorically are jasperoid breccias,[1] which outcrops in Mahoney Canyon, Mooney Basin, Alligator Ridge, and on the western side of Little Bald Mountain (Harmon and Kautz 2011). Prehistoric archaeology of the Bald Mountain Mining District is dominated by small flaked stone scatters that represent primary and secondary reduction of these locally available raw tool stone materials, as well as quarry locations from which these materials have been extracted (BLM 2009a). Hunting localities, seed and plant processing localities, and long-term residential locations are rare or unknown in the Bald Mountain Mining District, indicating that extraction and utilization of the locally available tool stone constitutes the primary activity in the region. Prehistoric sites with habitation features are present within and adjacent to the study area, but are rare. Projectile points identified at these sites include Desert, Rosegate, Elko, and Gatecliff Series points.

Historic archaeology of the Bald Mountain Mining District is related to mining activities. Historic roads encountered within the Bald Mountain Mining District owe their origin and maintenance to mining. The common roadside can scatters are almost entirely a consequence of the activities of miners. Features normally associated with ranching, such as local corrals and fence lines, are there to accommodate the animals used in mining or mineral exploration, while local domestic cabins are all dedicated to use by local miners (BLM 2009a).

Previous studies conducted in the Bald Mountain Mining District have shown that prehistoric assemblages in the District are related to extraction and reduction of local sedimentary silicates. Within the proposed NOA project is the Mahoney Canyon Quarry Complex, a NRHP-eligible archaeological district located in Mahoney Canyon (Harmon and Kautz 2011). The Mahoney Canyon Quarry Complex was defined on the basis of the relationship of the sites to the jasperoid breccia that outcrops in Mahoney Canyon. Ongoing research in the Bald Mountain Mining District suggests that the jasperoid in Mahoney Canyon are likely the same jasperoid that outcrop in other areas and which appear to have been similarly utilized (Harmon and Kautz 2011). The body of data has increased substantially since the time that the Mahoney Canyon Quarry Complex was originally proposed. Based on this accumulated information, it is hypothesized that the Mahoney Canyon Quarry Complex was actually a small subset within a larger complex of archaeological assemblages related directly to the procurement and reduction of locally available toolstone sources. In 2011, the Bald Mountain Archaeological District was established to better guide archaeological research within this region. The Bald Mountain Archaeological District is defined by occurrences of extraction and reduction of locally available sedimentary silicates and fine-grained volcanic tool stone. Consequently, archaeological sites considered as elements of the Bald Mountain Archaeological District are those sites that contain evidence of extraction, reduction, or use of local tool stone material. Sites identified as elements (of the District) are evaluated for their contribution to the District based on a District-specific research design. These sites are identified as contributing or non-contributing elements of the District depending on their information potential to address questions associated with the District's research design.

Class I site file searches and Class III pedestrian inventories were completed for the proposed NOA and SOA projects. A Class I inventory is a professionally prepared study that includes a compilation and analysis of all reasonably available cultural resource data and literature, and a management-focused, interpretive, narrative overview, and synthesis of the data. The overview also defines regional research questions and treatment options. Existing cultural resource data are obtained from published and unpublished documents, BLM cultural resource inventory records, institutional site files, State and National registers, interviews, and other information sources (BLM Manual 8110). A Class III intensive field survey determines the distribution, number, location, and condition of historic properties in an area in order to determine effects and potential mitigation methods. A Class III is used when it is necessary to

[1] Jasperoid breccia is a very dense and hard, siliceous and ferriginous rock most commonly derived from Paleozoic limestones.

know precisely what historic properties exist in a given area or when information sufficient for later evaluation and treatment decisions is needed on individual historic properties (BLM Manual 8110).The Class III pedestrian inventories initially focused on those areas located within the NOA and SOA plan boundaries that had not been previously inventoried to Class III standard, and later involved revisits to formerly evaluated archaeological sites within the proposed NOA and SOA plan boundaries.

Prior to the Class III inventories, Class I files searches were conducted using a database of all known cultural resource records for the Bald Mountain Mine area on file at the BLM Ely District Office. The files searches encompassed the areas to be inventoried plus a 1-mile buffer. In addition, searches were conducted through the online Nevada Cultural Resources Information System for additional site data. Finally, General Land Office plat maps and land status records along with historic topographic maps were reviewed for the presence of historic cultural features.

Within the proposed NOA and SOA plan boundaries, 41,229 acres of the 41,950 acres have been inventoried since in 1994. The remaining 651 acres were not inventoried due to existing, modern ground disturbance. Within the 41,229 acres inventoried there are a total of 1,308 archaeological sites, including 990 prehistoric sites, 198 historic sites, and 120 multi-component sites. Eligibility determinations have been made by BLM, and concurred with by SHPO on all 1,308 sites located within the project area. Of the 1,308 sites, 170 are eligible for the NRHP, 1,011 are not eligible, 15 remain unevaluated, 10 have been mitigated, 25 could not be relocated, and 77 sites have been destroyed by previous disturbance (Harmon 2012; Harmon and Kautz 2011; Harmon and Wiley 2012; Kautz 2013a,b; Kautz and Spidell 2012; Pomerleau and Harmon 2014, 2013).

3.12.2 Environmental Consequences

This section discusses project related impacts to cultural resources resulting from the Proposed Action, Reconfiguration Alternative, WRM Alternative, and No Action Alternative. Primary issues pertaining to historic properties located within or near the study area include: ground disturbing activities associated with construction and operation of the proposed NOA and SOA projects; illegal collecting of artifacts and inadvertent damage to historic properties due to the increased numbers of people in the study area during construction activities; visual effects to the Pony Express National Historic Trail, Ruby Valley Pony Express Station, Fort Ruby National Historic Landmark, and Sunshine Locality; and, effects to unknown historic properties that may be discovered during project construction.

Section 106 of the NHPA requires that federal agencies take into account the effect of an undertaking on “historic properties” and provide the ACHP an opportunity to comment. Historic property, as defined by the regulations that implement Section 106, means “any prehistoric or historic district, site, building, structure, or object included, or eligible for inclusion, in the NRHP maintained by the NPS.” The term includes properties of traditional religious and cultural importance to any Native American tribe that meet the National Register criteria.

Potential impacts to historic properties are assessed using the “criteria of adverse effect” (36 CFR 800.5[a][1]): “An adverse effect is found when an undertaking may alter, directly or indirectly, any of the characteristics of a historic property that qualify the property for inclusion in the National Register in a manner that would diminish the integrity of the property’s location, design, setting, materials, workmanship, feeling, or association.” There are five broad categories of effect:

1. Physical destruction or alteration of a property or relocation from its historic location;
2. Isolation or restriction of access;
3. Change in the character of the property’s use or of physical features within the property’s setting, or the introduction of visible, audible, or atmospheric elements that are out of character with the significant historic features of the property;

4. Neglect that leads to deterioration or vandalism; and
5. Transfer, sale, or lease from federal to non-federal control, without adequate and legally enforceable restrictions or conditions to ensure the preservation of the historic significance of the property.

For the purposes of this NEPA analysis, direct effects are defined as those are caused by an undertaking and occurring at the same time and place (see 40 CFR 1508.8[a]). Indirect effects are defined as those that are a result of an undertaking and "later in time or farther removed in distance, but are still reasonably foreseeable" (see 40 CFR 1508.8[b]). Indirect effects often are not quantifiable.

3.12.2.1 Proposed Action

Potential Effects

Table 3.12-1 provides a summary of impacts to cultural resources under the Proposed Action and compares it to impacts from the other alternatives analyzed in detail in the EIS. Surface disturbance associated with development and expansion of the proposed NOA and SOA projects could result in direct effects to historic properties. Implementation of the Proposed Action would result in approximately 4,357 acres of surface disturbance within the proposed NOA and approximately 2,740 acres of surface disturbance within the proposed SOA, but would not construct 11 acres of previously authorized disturbance. These effects could result in the vertical and horizontal displacement of soil containing cultural resources and the resulting loss of integrity, loss of information, and alteration of a site's setting.

A total of 596 sites are located within currently proposed disturbance areas of the Proposed Action. These 596 sites consist of 446 prehistoric sites, 82 historic sites and 68 multi-component sites. Eligibility determinations have been made by BLM, and concurred with by SHPO on all of the 596 sites located within the Proposed Action. Of the 596 sites, 64 are eligible for the NRHP, 429 are not eligible, 3 remain unevaluated, 10 have been mitigated, 13 could not be relocated, and 77 sites have been destroyed by previous disturbance (Pomerleau and Harmon 2014, 2013; Kautz 2015).

Potential indirect effects associated with the proposed NOA and SOA projects could include changes in erosion patterns caused by construction, soil compaction, or vegetation removal, and vandalism, inadvertent damage, and/or illegal artifact collection due to increased numbers of people in the study area. Other potential indirect effects could include the introduction of visual or auditory elements that diminish the integrity of the historic property's significant historic features, including setting and feeling. These effects could result from introducing modern structures and associated auditory emissions into an otherwise rural or natural setting. Located outside of the proposed NOA and SOA plan boundaries but within the viewshed of the proposed NOA and SOA projects are the Pony Express National Historic Trail, Ruby Valley Pony Express Station, Fort Ruby National Historic Landmark, and Sunshine Locality National Register District.

Potential visual effects to the setting of the Pony Express National Historic Trail, Ruby Valley Pony Express Station, Fort Ruby National Historic Landmark, and Sunshine Locality National Register District were analyzed using the procedures outlined in the BLM Visual Contrast Rating Handbook H-8431-1. Refer to Section 3.19, Visual Resources, for an expanded discussion of the visual contrast ratings. As stated in Section 3.19, the development and expansion of the proposed NOA and SOA projects would increase the amount of visual contrast that currently exists between the existing/authorized facilities and the natural character of the landscape. The primary change in visual effects from the currently approved levels would be the addition of the RDAs, HLFs, open pits, process areas, structures, and ancillary facilities.

As part of the visual effects study, KOPs were identified as the viewpoints for conducting the characteristic landscape, impacts, and VRM compliance analysis. KOPs were located near the Pony Express National Historic Trail (KOP-1, KOP-2), Sunshine Locality National Register District (KOP-7), Fort Ruby National Historic Landmark (KOP-8), and Ruby Valley Pony Express Station (KOP-9).

Table 3.12-1 Impacts to Cultural Resources by Alternative

Impact Indicator	Proposed Action	Reconfiguration Alternative	Western Redbird Modification Alternative	No Action
Acres Surface Disturbance	4,357 in NOA; 2,740 in SOA	3,254 in NOA; 2,414 in SOA	2,852 in NOA; 2,414 in SOA	Construction of all previously authorized expansion and associated facilities would be implemented and reclaimed as authorized. Prior to construction of the authorized facilities, adverse effects to historic properties located in the area of the activities were, or would be, fully mitigated in accordance with the PA.
Number Historic Properties	596 sites (446 prehistoric, 82 historic sites, and 68 multi-component)	472 sites (356 prehistoric, 63 historic, and 53 multi-component)	465 sites (355 prehistoric, 61 historic, and 49 multi-component)	
Eligibility Determination	64 eligible for NRHP; 429 not eligible; 3 unevaluated; 10 mitigated; 13 could not be relocated; 77 destroyed	54 eligible for the NRHP; 323 not eligible; 2 unevaluated; 9 mitigated; 7 could not be relocated; 77 destroyed	54 eligible for the NRHP; 316 not eligible; 2 unevaluated; 9 mitigated; 7 could not be relocated; 77 destroyed	
Likely/Potential Direct Effects	Vertical and horizontal displacement of soil containing cultural resources and resulting loss of integrity, information, and setting alteration. Potential for historic properties to be discovered during project construction.	Similar in type to the Proposed Action but there would be 3,158 fewer acres (46 percent) of surface disturbance.	Same as the Reconfiguration Alternative except additional elimination of facilities would reduce proposed surface disturbance by an additional 636 acres.	
Likely/Potential Indirect Effects	Changes in erosion patterns; potential vandalism, inadvertent damage, and/or illegal artifact collection due to increased numbers of people in the study area. Introduction of visual, auditory, or atmospheric (dust) elements that diminish the integrity of significant historic features, including the Pony Express National Historic Trail, Ruby Valley Pony Express Station, Fort Ruby National Historic Landmark, and Sunshine Locality National Register District. At the Pony Express National Historic Trail, Ruby Valley Pony Express Station, and Fort Ruby National Historic Landmark, noise levels are estimated to range from 31 to 38 dBA	Similar to the Proposed Action except potential visual effects to the Pony Express National Historic Trail, the Fort Ruby National Historic Landmark, and the Ruby Valley Pony Express Station would be reduced substantially due to reduced development in the NOA. At the Pony Express National Historic Trail, Ruby Valley Pony Express Station, and Fort Ruby National Historic Landmark, noise levels are estimated to range from 29 to 32 dBA during construction and 20 to	Generally the same as the Reconfiguration Alternative except reduction of Redbird RDA and Pit footprints would further reduce visual effects to the Pony Express National Historic Trail. Noise effects would remain similar.	Operational noise levels would remain for 7 years. At the Pony Express National Historic Trail, Ruby Valley Pony Express Station, and Fort Ruby National Historic Landmark, noise levels from active mining would range from 20 to 22.5 dBA. Noise levels at the Sunshine Locality National Register District would about 20 dBA.

Table 3.12-1 Impacts to Cultural Resources by Alternative

Impact Indicator	Proposed Action	Reconfiguration Alternative	Western Redbird Modification Alternative	No Action
	during construction and 23 to 28.5 dBA during operations. Noise levels at the Sunshine Locality National Register District are estimated at 28 dBA during construction and 20 dBA during operations. Operational noise and other effects would remain for a 20-year project duration.	22.5 dBA during operations. Noise levels at the Sunshine Locality National Register District would be the same as the Proposed Action. Operational noise and other effects would remain for a 10-year project duration.		
Likely/Potential Cumulative Effects	With consideration of past, present and reasonable foreseeable future actions, the total cumulative disturbance of approximately 51,787 acres (16 percent of the total cultural resources CESA).	Total cumulative disturbance of approximately 48,629 acres (15 percent of the total cultural resource CESA).	Total cumulative disturbance of approximately 47,992 acres (15 percent of the total cultural resource CESA).	Same as described in the Final EIS for the Bald Mountain Mine North Operations Area Project (BLM 2009a) and Environmental Assessment for the Mooney Heap and Little Bald Mountain Expansion Project (BLM 2011a).

Appendix H contains photographs of the existing conditions and simulations of visual effects as a result of implementation of the Proposed Action (post-mining) as seen from each KOP. For KOP-1, the visual effects of the expanded and reconfigured facilities (Redbird RDA, Rat West RDA, BMM 2/3 HLF Expansion) would be apparent to the casual observer and would be seen as moderate impacts to scenery and viewers because the facilities would be seen as an extension of the existing/authorized disturbances. For KOP-2, visual effects of the proposed Poker Flats and Duke Areas and Royale Area facilities would be the same as described for KOP-1; however, the proposed North Poker Flats HLF would cause moderate to strong visual contrasts as seen from KOP-2 because the facility would reach the skyline. For KOP-7, the proposed facilities would not dominate the viewer's attention and the existing, natural character of the landscape would be "partially retained" because of the distance (greater than 6 miles) between the observer and the project. Lastly, for KOP-8 and KOP-9, visual effects associated with the proposed North Poker Flats HLF would be the same as described for KOP-2; visual effects associated with the proposed Poker Flats and Duke Areas, Royale Area, and Winrock Area facilities would be the same as described for KOP-1. Refer to Section 3.19, Visual Resources, for an expanded discussion of visual impacts.

Under the Proposed Action, the closest area of active mining to the Pony Express National Historic Trail (KOP-2), Ruby Valley Pony Express Station (KOP-8), and Fort Ruby National Historic Landmark (KOP-9), would be the Royale Pit. The Royale Pit would be approximately 2.4 miles from KOP-2, 2.9 miles from KOP-9 and 4.6 miles from KOP-8. During construction of process areas, noise levels at these KOPs would range from 31 to 38 dBA. During operations, which would be approximately 20 years, noise levels at these KOPS would range from 23 to 28.5 dBA. During construction of the Yankee Pit and associated processing areas, noise levels at the Sunshine Locality National Register District (KOP-7) would be approximately at 28 dBA; operational noise levels would be about 20 dBA (**Table 3.12-1)**. These estimates are without consideration of topography or vegetation that might reduce noise levels further (AECOM 2015).

The potential for the discovery of unanticipated archaeological deposits during construction activities exists within newly proposed disturbance areas and could result in direct effects. Unanticipated discoveries could result in displacement or loss (either complete or partial) of the discovered material. Displacement of archaeological deposits affects the potential to understand the context of the site and limits the ability to extrapolate data regarding prehistoric settlement and subsistence patterns.

Resolution of Effects

The PA developed for the proposed NOA and SOA projects outlines the steps to be taken to: 1) identify cultural resources; 2) evaluate them for eligibility for listing on the NRHP; 3) identify potential adverse effects; 4) develop measures to avoid, reduce, or mitigate adverse effects to historic properties; and 5) address unanticipated discoveries as per the SPA. Additionally, the PA assigns roles and responsibilities for its implementation, which ensures that all consulting parties (such as Barrick and interested tribes) are given an opportunity to comment on the effects of an undertaking on historic properties and any mitigation of such effects.

In consultation with the Nevada SHPO, interested tribes, and other consulting parties to the PA (including the USFWS), the BLM would determine whether construction and facility maintenance of the NOA and SOA projects would have an adverse effect on any historic properties listed or eligible for listing on the NRHP. If the BLM determines that a historic property would be adversely affected, measures to minimize or mitigate such effects would be proposed in accordance with the PA. Measures to minimize or mitigate effects may include, but would not be limited to, one or more of the following:

- Data recovery, which might include the systematic professional excavation and removal of archaeological resources;
- The use of landscaping or other techniques that would minimize or eliminate visual effects on a historic property's setting; or

- Historic American Buildings Survey/Historic American Engineering Record/Historic American Landscapes Survey or other agreed upon historic recordation process.

Mitigation measures would be based on the types of impacts relevant to the site type. Per the PA, unavoidable adverse effects to historic properties would be mitigated through implementation of a Treatment Plan. For sites that are eligible under National Register Criteria A, B, or C, other forms of mitigation (e.g., oral history, historic markers, exhibits, interpretive brochures, or publications) may be considered in the Treatment Plan in lieu of, or in addition to, data recovery. If data recovery is the preferred treatment option for a site, then the BLM would ensure that the developed treatment is based on an appropriate research design and is reviewed and approved by the BLM, SHPO, interested tribes, and other consulting parties. Following approval by the BLM, SHPO, interested tribes, and other consulting parties, the BLM would ensure that the Treatment Plan is implemented within the timelines set forth in the plan.

Based on the visual assessment, adverse visual effects to the setting of the Pony Express National Historic Trail, Ruby Valley Pony Express Station, and Fort Ruby National Historic Landmark would be anticipated as a result of the project. The expanded and reconfigured facilities would result in moderate visual effects because the facilities would be seen as extensions of the existing/authorized (past and present) disturbances; however, under the Proposed Action, the proposed North Poker Flats HLF facility would reach the skyline and, as such, would cause moderate to strong contrasts within the viewshed of the trail, station, and landmark. Visual effects to the setting of the Sunshine Locality National Register District are not anticipated because the proposed facilities would be located more than 6 miles from the district. In sum, both the Proposed Action and Reconfiguration Alternative incrementally would increase visual effects to the setting of the Pony Express National Historic Trail, Ruby Valley Pony Express Station, and Fort Ruby National Historic Landmark.

Potential indirect effects to archaeological sites as a result of surface water runoff are anticipated to be minor based on implementation of erosion control measures discussed in Section 2.4.3, Design Features and Applicant-committed Environmental Protection Measures for the Proposed North and South Operations Area projects. In order to minimize the potential for illegal collection, vandalism, and inadvertent damage associated with increases in the number of people in the study area, Barrick would provide in-house training to ensure that all its personnel and all the personnel of its contractors and subcontractors are directed not to engage in the illegal collection of prehistoric and historic materials (per the PA and ACEPMs).

As provided in the PA and ACEPMs, if any previously unknown cultural resources are discovered during construction, all construction activities would immediately cease within 300 feet of the discovery and the BLM Authorized Officer would be notified of the find. Steps would be taken to protect the site from vandalism or further damage until the BLM Authorized Officer evaluated the nature of the discovery. Construction would not resume in the area of the discovery until the BLM Authorized Officer issued a Notice to Proceed.

Unanticipated Discoveries

The potential for the discovery of unanticipated archaeological deposits during construction activities exists within newly proposed disturbance areas and could result in direct effects. Unanticipated discoveries could result in displacement or loss (either complete or partial) of the discovered material. Displacement of archaeological deposits affects the potential to understand the context of the site and limits the ability to extrapolate data regarding prehistoric settlement and subsistence patterns.

Stipulations of the PA and the SPA are intended to identify and mitigate historic properties. Unplanned discoveries of buried cultural resources are not anticipated. Per the PA, in the case of an unplanned discovery, the BLM will ensure that provisions in the Section VI.B of the SPA and the following provisions are met.

- When previously unidentified cultural resources are discovered or an unanticipated impact situation occurs, all BMMD related activities within 100 meters of the discovery/impact will cease immediately. Barrick, through its contractor or its authorized representative, shall secure the location to prevent vandalism or other damage. Barrick or its authorized representative shall immediately notify the BLM Authorized Officer of the discovery followed by written confirmation. Activity at the location shall be suspended until the discovery has been evaluated and any necessary mitigation measures completed.
- BLM shall notify SHPO, Tribes, and other consulting parties as appropriate, within 1 working day of the discovery or unanticipated impact notification, and consider their initial comments on the situation. Within 2 working days after initial discovery, BLM shall notify SHPO or other parties, of the decision to either allow BMMD Activities to proceed or to require further evaluation and/or mitigation.
- If BLM determines, in consultation with SHPO, that mitigation for discoveries or unanticipated impacts is required, BLM shall solicit comments from SHPO, Tribes, and other consulting parties, as appropriate, to develop mitigating measures. SHPO, Tribes, and other consulting parties, as appropriate, will have 2 working days to provide BLM with comments on the nature and extent of mitigative efforts. Within 7 working days of initial SHPO notification, BLM will inform SHPO of the nature of the mitigation required, and ensure that such mitigative actions are implemented before allowing BMMD activities to resume.
- BLM shall ensure that reports of mitigation efforts for discoveries or unanticipated impacts are completed in a timely manner and conform to the Department of Interior's Formal Standards for Final Reports of Data Recovery Program (42 FR 5377-79). Drafts of such reports shall be submitted to the SHPO for a 15-day review and comment period. BLM will submit final reports to the SHPO, other Signatories, Tribes, and other consulting parties, as appropriate for informational purposes.
- Any disputes or objections arising during a discovery or unanticipated impact situation regarding the treatment of historic properties that cannot be resolved by BLM and SHPO shall be referred to the Nevada BLM State Office for consultation. The Nevada BLM State Office shall be given 7 days to provide BLM with comments.
- BMMD related activities in the area of the discovery or unanticipated impact will be halted until Barrick is notified by the BLM Authorized Officer in writing that mitigation is complete and activities can resume.

3.12.2.2 North and South Operations Area Facilities Reconfiguration Alternative

Under the Reconfiguration Alternative, all project components would be the same with the exception of the modifications outlined in Section 2.5.1, North and South Operations Area Facilities Reconfiguration Alternative. As compared to the Proposed Action, implementation of surface disturbance activities as a result of proposed development and expansion would remove approximately 1,103 fewer acres within the proposed NOA; and 326 fewer acres within the proposed SOA (see **Table 3.12-1**). With consideration of the 1,934 acres of previously authorized disturbance that would not be constructed under the Reconfiguration Alternative, implementation of this alternative would result in a 3,363-acre (47 percent) decrease in surface disturbance as compared to the Proposed Action. The reduction in acres of disturbance potentially would decrease direct effects to known and unknown historic properties and other cultural resources. In general, direct impacts to historic properties and other cultural resources decrease or increase in relation to the amount of ground disturbance associated with project construction.

A total of 472 sites are located within currently proposed disturbance areas associated with this alternative. These 472 sites consist of 356 prehistoric sites, 63 historic sites, and 53 multi-component sites. Eligibility determinations have been made by BLM, and concurred with by SHPO on all of the 472 sites located within the Reconfigured Alternative (Pomerleau and Harmon 2014, 2013; Kautz 2015).

Of the 472 sites, 54 are eligible for the NRHP, 323 are not eligible, 2 are unevaluated, 7 could not be relocated, 9 have been mitigated, and 77 have been destroyed by previous disturbance.

Under the Reconfiguration Alternative, potential visual effects to the Pony Express National Historic Trail (KOP-2), the Fort Ruby National Historic Landmark (KOP-8), and the Ruby Valley Pony Express Station (KOP-9) would be reduced substantially as compared to the Proposed Action. This is due to the removal in the North Operations Area of the Royale Pit, Royale North RDA, Royale South RDA, North Poker Flats HLF, Winrock HLF, Winrock Process Area, and associated ancillary facilities, which would have been visible from KOP-2, KOP-8, and KOP-9 (see **Figures H-2, H-8**, and **H-9** in **Appendix H**). Potential visual effects to the setting of the Sunshine Locality National Historic District (KOP-7) would be reduced from minor to negligible due to the removal of the Gator HLF, Gator Process Area, and associated ancillary facilities (see **Figure H-7** in **Appendix H**). All other visual effects associated with this alternative would be similar to the Proposed Action. Refer to Section 3.19, Visual Resources, for a detailed discussion of visual impacts.

Because the Royale Pit would not be developed under this alternative, the closest area of active mining from the Pony Express National Historic Trail (KOP-2), Ruby Valley Pony Express Station (KOP-8), and Fort Ruby National Historic Landmark (KOP-9) would be the North 3 RDA. The North 3 RDA would be approximately 4.6 miles from KOP-2, 6.1 miles from KOP-9 and 6.5 miles from KOP-8. During construction of process areas, noise levels at these KOPs would range from 29 to 32 dBA. During operations, which would be approximately 10 years, noise levels at these areas would range from 20 to 22.5 dBA (see **Table 3.12-1**). Noise levels at the Sunshine Locality National Register District (KOP-7) would be the same as the Proposed Action. These estimates are without consideration of topography or vegetation that might reduce noise levels further (AECOM 2015).

3.12.2.3 North and South Operations Area Western Redbird Modification Alternative

The WRM Alternative would be the same as the Reconfiguration Alternative except for the elimination of some facilities within the proposed NOA plan boundary (see Section 2.6.2, North and South Operations Area Western Redbird Modification Alternative), which would reduce proposed surface disturbance by 637 acres (see **Table 3.12-1**). The reduction in proposed disturbance potentially would decrease direct effects to known and unknown historic properties and other cultural resources. As compared to the Reconfiguration Alternative, the WRM Alternative would have seven fewer sites within proposed disturbance areas (one prehistoric site, two historic sites and four multi-component sites). Fifty-four of the sites are eligible for the NRHP, 316 are not eligible, 2 remain unevaluated, 9 have been mitigated, 7 could not be relocated, and 77 sites have been destroyed by previous disturbance (Kautz 2015). Impacts to Pony Express National Historic Trail at intersection of the trail and the Strawberry Road/Nevada State Highway 892 (KOP-1) would be reduced in comparison to the Reconfiguration Alternative due to the reduction of the Redbird RDA and Pit footprints, which would have been visible from this point. Visual and noise effects to the Pony Express National Historic Trail (at KOP-2), the Fort Ruby National Historic Landmark (KOP-8), and the Ruby Valley Pony Express Station (KOP-9) would be the same as the Reconfiguration Alternative (see **Table 3.12-1**).

3.12.2.4 No Action Alternative

Under the No Action Alternative, the proposed NOA and SOA projects would not be developed and associated impacts to cultural resources would not occur. Barrick would continue its operations, closure, and reclamation activities within the NOA and SOA boundaries under the terms and current permits and approvals as authorized by the BLM and State of Nevada. Under the No Action Alternative, construction of all previously authorized expansion and associated facilities would be implemented and reclaimed as authorized. Noise levels associated with previously approved operations would be in place for approximately 7 years. Noise sources would be about the same distance from key cultural sites as the Reconfiguration Alternative (AECOM 2015). Prior to construction of the authorized facilities, adverse effects to historic properties located in the area of the activities were, or would be, fully mitigated in accordance with the PA.

3.12.2.5 Cumulative Impacts

The CESA for cultural resources encompasses the proposed NOA and SOA plan boundaries plus a 5-mile buffer, totaling 319,092 acres (**Figure 3.12-1**). Past and present actions and RFFAs are discussed in Section 2.7, Past, Present, and Reasonably Foreseeable Future Actions; their locations are illustrated in **Figure 2.7-1**.

Past and present actions have resulted, or would result, in approximately 16,023 acres of total surface disturbance within the cultural resources CESA. The total quantifiable surface disturbances are related to mining, oil and gas development, wind energy development, exploration, land, road, and utility corridor development. RFFAs proposed within the cultural resources CESA include, but are not limited to, the following: oil and gas lease sales within the Long, Ruby, and Huntington valleys and the Maverick Springs Range (acreage unknown), vegetation treatments (totaling 28,872 acres), and livestock grazing leases. Together, these past, present, and reasonably foreseeable projects have or will result in approximately 50,695 acres of surface disturbance or vegetation manipulation that may uncover or destroy cultural resources.

The Proposed Action would remove 11 acres of authorized disturbance from the 16,023 acres of past and present disturbance and incrementally increase surface disturbance by an additional 7,097 acres resulting in a total cumulative disturbance of approximately 51,981 acres (16 percent of the total cultural resources CESA). The Reconfiguration Alternative would remove 1,934 acres of authorized disturbance and incrementally increase potential disturbance to paleontological resources by approximately 5,668 acres (resulting in a total cumulative disturbance of approximately 48,629 acres (15 percent of the total cultural resources CESA). The WRM Alternative would remove 235 acres of the previously authorized disturbance and 402 acres of the proposed surface disturbance that would occur under the Reconfiguration Alternative for a total cumulative disturbance of approximately 47,992 acres (15 percent of the total cultural resources CESA). Under the No Action Alternative, cumulative impacts to cultural resources would be the same as those described in the *Final Environmental Impact Statement for the Bald Mountain Mine North Operations Area Project* (BLM 2009a) and *Environmental Assessment for the Mooney Heap and Little Bald Mountain Expansion Project* (BLM 2011a).

As directed by law, cultural resources inventories are conducted for any actions involving federal lands, and adverse effects to historic properties are avoided or mitigated as appropriate. Avoidance through project redesign is the preferred method of mitigation; however, when avoidance is not feasible, data recovery or other forms of mitigation are implemented prior to ground-disturbing activities. Adverse effects (including direct, indirect, and visual) would be minimized or mitigated in accordance with the PA and Treatment Plan developed for the proposed NOA and SOA projects. In addition, any previously unknown historic properties that may be discovered during construction activities would be handled in accordance with the PA and ACEPMs. Data recovery most likely would be completed at historic properties that cannot be avoided by construction activities. With data recovery, some data about the site are lost, especially to future generations of archaeologists who will have new questions and theories to investigate, and new means or methods of doing so. A principal disadvantage of this form of mitigation is that the recovery process itself is destructive, preventing future opportunities for scientific research, preservation, or public appreciation. Over time, this represents a cumulative loss.

Illegal collecting of artifacts has occurred and most likely would continue to occur in the CESA through increased access, development, and increased human presence, as a result of past and present actions and RFFAs. All RFFAs would be evaluated through a NEPA process and further planned according to the BLM protocols and procedure

3.12.2.6 Monitoring and Mitigation Measures

Adverse effects to historic properties would be minimized or mitigated in accordance with the PA and Treatment Plan. Any previously unknown historic properties that may be discovered during construction

activities would be treated in accordance with the PA and ACEPMs. Therefore, no additional mitigation or monitoring measures are recommended.

3.12.2.7 Residual Impacts

Under the Proposed Action, Reconfiguration Alternative, and WRM Alternative, implementation of surface disturbance activities would result in the loss of cultural resources. Although these sites would be recorded to BLM standards and the information integrated into local and statewide databases, the sites ultimately would be destroyed by project construction. In accordance with the PA, unavoidable adverse effects to historic properties would be minimized or mitigated through implementation of data recovery, the use of landscaping to minimize visual effects, development of interpretive materials, or other mitigation determined by the BLM in consultation with the SHPO and interested tribes. Some of the cultural values associated with these properties cannot be fully mitigated; therefore, it is anticipated that residual impacts to these properties would occur.

3.13 Native American Traditional Values

In general, ethnographic resources are associated with the cultural practices, beliefs, and traditional history of a community. Examples of ethnographic resources include places in oral histories or traditional places, such as particular rock formations, the confluence of two rivers, or a rock cairn; large areas, such as landscapes and viewscapes; sacred sites and places used for religious practices; social or traditional gathering areas, such as dance areas; natural resources, such as plant materials or clay deposits used for arts, crafts, or ceremonies; and places and natural resources traditionally used for non-ceremonial uses, such as trails or camping locations.

3.13.1 Affected Environment

The study area and CESA for Native American traditional values encompasses the proposed NOA and SOA plan boundaries plus a 5-mile buffer. **Figure 3.12-1** illustrates the study area and CESA for Native American traditional values. The limits of the study area and CESA were designed to encompass cultural sites and areas of importance to Native Americans from which mining construction and operations would be visible. These include the Pony Express National Historic Trail and Sunshine Locality National Register District, as well as parts of Newark Valley, Ruby Valley, and Long Valley. The CESA may be revised as a result of government-to-government consultation currently being conducted by the BLM.

3.13.1.1 Regulatory Framework

Federal laws, regulations, and agency guidance require the BLM to consult with Native American tribes concerning the identification of cultural values, religious beliefs, and traditional practices of Native American people that may be affected by actions on BLM-administered lands. This consultation includes the identification of places (i.e., physical locations) of traditional cultural importance to Native American tribes. Places that may be of traditional cultural importance to Native American people include, but are not limited to:

- Locations associated with the traditional beliefs concerning tribal origins, cultural history, or the nature of the world;
- Locations where religious practitioners go, either in the past or the present, to perform ceremonial activities based on traditional cultural rules or practice;
- Ancestral habitation sites;
- Trails;
- Burial sites; and
- Places from which plants, animals, minerals, and waters possessing healing powers are used for other subsistence purposes, may be taken.

The 1992 amendments to the NHPA place major emphasis on the role of Native American groups in the Section 106 review process. Subsequent revisions to the regulations of the ACHP published in May 18, 1999, incorporate specific provisions for federal agencies to involve Native American groups in land or resource management decisions and for consulting with these groups throughout the process. Before making decisions or approving actions that could result in changes in land use, physical changes to lands or resources, changes in access, or alienation of lands, federal agencies must determine whether Native American interests would be affected, observe pertinent consultation requirements, and document how this was done. Tribal participation in the Section 106 process, including the use of tribal monitors, is designed to identify properties of cultural or religious significance, as well as to offer solutions to eliminate or reduce potential adverse effects.

The NHPA also was amended to explicitly allow that "properties of traditional religious and cultural importance to an Indian tribe may be determined to be eligible for inclusion on the National Register of Historic Places (NRHP)." If a resource has been identified as having importance in traditional cultural practices and the continuing cultural identity of a community, it may be considered a traditional cultural property (TCP). The term "traditional cultural property" first came into use within the federal legal framework for historic preservation and cultural resource management in an attempt to categorize historic properties containing traditional cultural significance. To qualify for eligibility to the NRHP, a TCP must:

- Be more than 50 years old;
- Be a place with definable boundaries;
- Retain integrity; and
- Meet certain eligibility criteria as outlined for cultural resources in the NHPA (see Section 3.12, Cultural Resources).

In addition to NRHP eligibility, some properties of traditional religious and cultural importance also must be evaluated to determine if they should be considered under other federal laws, regulations, directives, or policies. These include, but are not limited to, the Native American Graves Protection and Repatriation Act (NAGPRA) of 1990, American Indian Religious Freedom Act (AIRFA) of 1978, and EO 13007 (Sacred Sites) of 1996.

The NAGPRA established a means for Native Americans, including Indian Tribes, to request the return of human remains and other sensitive cultural items held by federal agencies or federally assisted museums or institutions. NAGPRA also contains provisions regarding the intentional excavation and removal of, inadvertent discovery of, and illegal trafficking of Native American human remains and sensitive cultural items.

The AIRFA established federal policy for protecting and preserving the inherent right of individual Native Americans to believe, express, and exercise their traditional religions including, but not limited to, access to sites, use and possession of sacred objects, and the freedom to worship through ceremonials and traditional rites.

EO 13007 requires federal agencies to the extent practicable, permitted by law, and not clearly inconsistent with essential agency functions to: 1) accommodate access to and ceremonial use of Indian sacred sites by Indian religious practitioners; and 2) avoid adversely affecting the physical integrity of such sacred sites. It also requires agencies to develop procedures for reasonable notification of proposed actions or land management policies that may restrict access to or ceremonial use of, or adversely affect, sacred sites. Sacred sites are defined in the EO as "any specific, discrete, narrowly delineated location on federal land that is identified by an Indian tribe, or Indian individual determined to be an appropriately authoritative representative of an Indian religion, as sacred by virtue of its established religious significance to, or ceremonial use by, an Indian religion; provided that the tribe or appropriately authoritative representative of an Indian religion has informed the agency of the existence of such a site."

3.13.1.2 Native American Consultation

On June 11, 2012, the BLM initiated government-to-government consultation for the proposed NOA and SOA projects (entitled Bald Mountain Mine Project EIS) by sending letters to the following federally recognized Native American tribes: South Fork Band Council, Ely Shoshone Tribe of Nevada, Battle Mountain Band Council, Wells Band Council, Te-Moak Tribe of the Western Shoshone Indians of Nevada, Confederated Tribes of the Goshute Indian Reservation, Duckwater Shoshone Tribe of the Duckwater Reservation, Moapa Band of Paiute Indians of the Moapa River Reservation, Yomba

Shoshone Tribe of the Yomba Reservation, and Las Vegas Paiute Tribe of the Las Vegas Indian Colony. The letters were sent to inform the various tribes of the proposed undertaking and to solicit their concerns regarding the possible presence of properties of traditional religious and cultural importance in the study area.

Prior to the government-to-government consultation letter, the BLM sent a letter to the Native American tribes listed in **Table 3.13-1** informing them of the public scoping meetings being held in Ely, Elko, Eureka, and Reno, Nevada, on May 7, 8, 9, and 10, 2012, respectively. The meetings offered the public an opportunity to learn more about the proposed NOA and SOA projects, ask questions, and express any concerns they may have with the proposed NOA and SOA projects. Attached to the public scoping letter was a proposed NOA and SOA projects figure and comment sheet to be filled out and returned to the BLM with any issues, concerns, or questions regarding the proposed NOA and SOA projects. None of the contacted tribes attended the public scoping meetings.

Table 3.13-1 Native American Tribes Contacted by the BLM

South Fork Band Council	Lovelock Paiute Tribe
Ely Shoshone Tribe of Nevada	Reno-Sparks Indian Colony
Skull Valley Band of Goshutes	Confederated Tribes of the Goshute Indian Reservation
Battle Mountain Band Council	Kaibab Band of Paiute Indians
Wells Band Council	Duckwater Shoshone Tribe of the Duckwater Reservation
Elko Band Council	Indian Peaks Band
Cedar City Band of Paiutes	Moapa Band of Paiute Indians of the Moapa River Indian Reservation
Winnemucca Indian Colony of Nevada	Yomba Shoshone Tribe of the Yomba Reservation
Paiute Indian Tribe of Utah	Las Vegas Paiute Tribe of the Las Vegas Indian Colony
Te-Moak Tribe of the Western Shoshone Indians of Nevada	

On July 2, 2012, the BLM had a face-to-face meeting with the Duckwater Shoshone Tribe of the Duckwater Reservation to provide updates on the proposed NOA and SOA projects and to discuss any concerns the Tribe may have regarding the proposed NOA and SOA projects. No concerns were expressed by the Duckwater Shoshone Tribe during the meeting. On August 10, 2012, the BLM had a face-to-face meeting with the Yomba Shoshone Tribe also to provide updates on the proposed NOA and SOA projects and to discuss any tribal concerns. During the meeting, the Tribe expressed concerns with potential adverse effects to groundwater during mining operations and closure, and how the EIS would describe mitigation recommendations to avoid environmental consequences. In response, the BLM told the Tribe that the EIS will analyze and describe the potential environmental effects to groundwater, as well as analyze and describe cumulative effects associated with the proposed NOA and SOA projects.

Follow-up face-to-face meetings were held with the Ely Shoshone Tribe of Nevada (September 15, 2015), Confederated Tribes of the Goshute Reservation, NV-UT (November 13, 2015), Duckwater Shoshone Tribe of the Duckwater Reservation, NV (September 22, 2015), and Te-Moak Tribe of the Western Shoshone Indians of Nevada: Elko Band and South Fork Band (September 15, 2015). The

tribes expressed concern of having a tribal monitor out on site during construction and mining operational activities. A field visit was made to the Bald Mountain Mine in White Pine County, Nevada on October 2, 2015. The Elko Band, the South Fork Band, the Duckwater Shoshone Tribe, and the Ely Shoshone Tribe all attended. On December 1, 2015, a site visit to Bald Mountain was made for the Confederated Tribe of the Goshute Reservation, NV-UT and Duckwater Shoshone Tribe of the Duckwater Reservation.

As of this date, no properties of traditional religious and cultural importance, including TCPs or sacred sites, have been identified within the study area either through cultural resources inventories or government-to-government consultation. The BLM continues to provide opportunities to meet and coordinate with tribal governments and interested tribal members to address their concerns and to work together in developing appropriate measures to protect sites of tribal importance or concern that may be identified within the study area.

3.13.2 Environmental Consequences

This section discusses project related impacts to Native American traditional values resulting from the Proposed Action, Reconfiguration Alternative, WRM Alternative, and No Action Alternative. Primary issues pertaining to properties of traditional religious and cultural importance, including TCPs and sacred sites include ground-disturbing activities associated with construction and operation, and illegal collecting of artifacts and inadvertent damage to areas of tribal concern. An additional issue identified by the tribes during the consultation efforts is impacts to groundwater during mining operation and closure.

Environmental impacts to properties of traditional religious and cultural importance would be significant if the Proposed Action, Reconfiguration Alternative, or WRM Alternative were to result in any of the following:

- Adverse effects to properties of traditional religious and cultural importance, including TCPs and sacred sites; or
- Adverse effects to Native American grave sites.

The effects of federal undertakings on properties of traditional religious and cultural importance to contemporary Native Americans are given consideration under the provisions of EO 13007, AIRFA, NAGPRA, and recent amendments to the NHPA. As amended, the NHPA now integrates Indian tribes into the Section 106 compliance process, and also strives to make the NHPA and NEPA procedurally compatible. Furthermore, under NAGPRA, culturally affiliated Indian tribes and federal agencies jointly may develop procedures to be taken when Native American human remains are discovered on federal lands.

3.13.2.1 Proposed Action

Under the Proposed Action, implementation of surface disturbance activities as a result of proposed development and expansion would remove approximately 4,357 acres within the proposed NOA; and approximately 2,740 acres within the proposed SOA. These potential direct impacts would include the temporary loss of lands potentially used by Native Americans for hunting, pine nut gathering, and other traditional uses. The disturbed areas associated with the proposed project would be reclaimed following completion of mining activities with the exception of open pits, representing a permanent loss of 1,210 acres available for traditional uses within the proposed NOA and SOA. To date, no properties of traditional religious and cultural importance to the tribes have been identified within the proposed NOA and SOA through tribal consultation or cultural resource inventory. Tribal consultation remains ongoing and would continue through completion. If a property of traditional religious and cultural importance is identified by tribal representatives, and avoidance is not feasible, specific operating procedures, stipulations, or mitigation measures would be developed in consultation with the affected tribal groups with the goal of reducing or eliminating impacts to the identified site. If mitigation is required at a site of

tribal importance, a Treatment Plan would be developed in consultation with interested tribal groups, and in accordance with the PA (see Section 3.12, Cultural Resources, for a description of the PA).

As provided in the PA and ACEPMs (Section 2.4.3, Design Features and Applicant-committed Environmental Protection Measures for the Proposed North and South Operations Area Projects), if any previously unknown cultural resources (including human remains and associated funerary objects) are discovered during construction, all construction activities would immediately cease within 300 feet of the discovery and the BLM Authorized Officer would be notified of the find. Steps would be taken to protect the site from vandalism or further damage until the BLM Authorized Officer evaluated the nature of the discovery. Construction would not resume in the area of the discovery until the BLM Authorized Officer issued a Notice to Proceed.

As previously stated, the BLM had a face-to-face meeting with the Yomba Shoshone Tribe on August 10, 2012, during which the Tribe expressed concerns with potential adverse effects to groundwater during mining operations and closure. According to Western Shoshone beliefs, all living things depend on water, and without it, life would cease. Therefore, the drying up of springs or reduction of flow due to groundwater pumping is of great concern to the Western Shoshone tribe who consider water sources as being sacred (Steele 2006). Drawdown effects resulting from mine groundwater pumping under the Proposed Action are anticipated to occur within the NOA at South Water Canyon Seep and JBR No. 14 Spring. No drawdown impacts are anticipated within the SOA under the Proposed Action. For an expanded discussion of potential drawdown impacts to groundwater quality and quantity, refer to Section 3.3, Water Quality and Quantity.

3.13.2.2 North and South Operations Area Facilities Reconfiguration Alternative

Under the Reconfiguration Alternative, all project components would be the same with the exception of the modifications outlined in Section 2.5.1, North and South Operations Area Facilities Reconfiguration Alternative. Implementation of surface disturbance activities as a result of proposed development and expansion would remove approximately 3,254 acres within the proposed NOA; and 2,414 acres within the proposed SOA. With consideration of the 1,934 acres of existing authorized disturbance that would not be constructed under the Reconfiguration Alternative, implementation of this alternative would result in a 3,352-acre (47 percent) decrease in surface disturbance as compared to the Proposed Action. The disturbed areas associated with the proposed project would be reclaimed following completion of mining activities with the exception of open pits, representing a permanent loss of 885 acres available for traditional uses within the proposed NOA and SOA. Potential impacts to properties of traditional religious and cultural importance, including TCPs and sacred sites, would be the same as described for the Proposed Action. Drawdown effects resulting from mine pumping under the Reconfiguration Alternative are anticipated to occur within the NOA at South Water Canyon Seep and JBR No. 14 Spring. These impacts would be similar to those experienced under the Proposed Action. No drawdown impacts are anticipated within the SOA under the Reconfiguration Alternative. For an expanded discussion of potential drawdown impacts to groundwater quality and quantity, refer to Section 3.3, Water Quality and Quantity.

3.13.2.3 North and South Operations Area Western Redbird Modification Alternative

The WRM Alternative is the same as the Reconfiguration Alternative except for the elimination of some facilities within the proposed NOA plan boundary (see Section 2.6.2, North and South Operations Area Western Redbird Modification Alternative). Effects would be similar to, but slightly reduced from, the Reconfiguration Alternative, as there would be 402 fewer acres of proposed surface disturbance within the proposed NOA, and 105 fewer acres of permanent loss from open pits. As discussed in Section 3.3, Water Quality and Quantity, and based on the site conditions and model predictions, drawdown associated with groundwater pumping for the mine under the WRM Alternative is not anticipated to impact springs in the project area.

3.13.2.4 No Action Alternative

Under the No Action Alternative, the proposed NOA and SOA projects would not be developed and associated impacts to vegetation resources would not occur. Barrick would continue its operations, closure, and reclamation activities within the NOA and SOA boundaries under the terms and current permits and approvals as authorized by the BLM and State of Nevada. Under the No Action Alternative, construction of all previously authorized expansion and associated facilities would be implemented and reclaimed as authorized. Prior to construction of the authorized facilities, adverse effects to properties of traditional religious and cultural importance, including TCPs and sacred sites located in the area of the approved facilities were, or would be, fully mitigated in accordance with the PA. As discussed in Section 3.3, Water Quality and Quantity, and based on the site conditions and model predictions, drawdown associated with groundwater pumping for the mine under the No Action Alternative is not anticipated to impact baseflow of springs in the project area.

3.13.2.5 Cumulative Impacts

The CESA for Native American traditional values encompasses the proposed NOA and SOA plan boundaries plus a 5-mile buffer totaling 319,092 acres (**Figure 3.12-1**). Past and present actions and RFFAs are discussed in Section 2.7, Past, Present, and Reasonably Foreseeable Future Actions; their locations are illustrated in **Figure 2.7-1**.

The proposed project would result in impacts to two springs within the maximum extent of the 10-foot groundwater drawdown contour (Section 3.3.1.2, Water Quality and Quantity, Proposed Action). These impacts would be in addition to impacts caused by mining development within the Long Valley and Huntington Valley hydrographic areas. These cumulative impacts would result from ongoing surface disturbance by mining and other land uses, from mine dewatering and pumping discharges, and from groundwater drawdown. Within the context of Native American traditional values, this represents a cumulative impact to the intrinsic value of water in tribal culture. For an expanded discussion of cumulative impacts to water resources see Section 3.3, Water Quality and Quantity.

Pending further tribal consultation, no further cumulative effects to Native American traditional values are anticipated as a result of the Proposed Action, Reconfiguration Alternative, or WRM Alternative; and no incremental impacts to these values would occur when added to past and present actions and RFFAs within the CESA. Cultural resources inventories and government-to-government consultation would be completed for any future proposed development within the CESA, and potential adverse effects to any Native American traditional values would be avoided or mitigated, as appropriate.

It should be noted that illegal collecting of artifacts and inadvertent damage to sites of tribal importance has occurred and most likely would continue to occur in the CESA through increased access, development, and increased human presence as a result of past and present actions and RFFAs.

3.13.2.6 Monitoring and Mitigation Measures

At this time, no properties of traditional religious and cultural importance, including TCPs and sacred sites, have been identified in the study area. If tribal representatives were to identify any sites of tribal importance, impacts to these resources would be mitigated through specific operating procedures, stipulations, or mitigation measures developed in consultation with the affected tribes. Any Native American human remains discovered during construction activities would be treated in accordance with the PA and ACEPMs. Therefore, no additional monitoring and mitigation measures are recommended.

3.13.2.7 Residual Impacts

It is assumed that through continued consultation with participating tribal groups, and by following the procedures outlined in the PA, no residual impacts to Native American traditional values would occur as a result of the Proposed Action, Reconfiguration Alternative, or WRM Alternative.