BLM

United States Department of the Interior
Bureau of Land Management
Las Cruces District Office
1800 Marquess Street
Las Cruces, NM 88005

Environmental Assessment for

Little Rock Mine
Amendment to Mine Plan of Operations (NMNM091644)
Grant County, New Mexico

EA # DOI-BLM-NM-L000-2014-0001

/s/ Joseph Navarro, Environmental Protection Specialist	7/10/15
Signature and Title of Project Lead	Date

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Signature and Title of Lead Reviewer	Date

NATIONAL SYSTEM OF PUBLIC LANDS

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ACRONYMS AND ABBREVIATIONS

AERMOD	American Meteorological Society/ Environmental Protection Agency Regulatory Model
BCR	Bird Conservation Region
BISON-M	Biota Information System of New Mexico
BLM	U.S. Department of Interior, Bureau of Land Management
BMPs	best management practices
CCP	Closure/Closeout Plan
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
cfs	cubic feet per second
CO	carbon monoxide
CO_2	carbon dioxide
Corps	U.S. Army Corps of Engineers
dBA	decibel
DP	Discharge Permit
EA	Environmental Assessment
EIS	Environmental Impact Statement
EPA	U.S. Environmental Protection Agency
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Map
FONSI	Finding of No Significant Impact
gpm	gallons per minute
HDPE	high density polyethylene
HPD	Historic Preservation Division
HUC	Hydrologic Unit Code
IPaC	Information, Planning, and Conservation System
km	kilometer
kV	kilovolt
mg/L	milligrams per liter
MMD	Mining and Minerals Division of the New Mexico Energy, Minerals and Natural Resources Department
MPO	1993 Mine Plan of Operations
MPO Amendment	2013 Amendment to Mine Plan of Operations NMNM091644
MSGP	Multi-Sector General Permit
MSHA	Mine Safety and Health Administration
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NMAAQS	New Mexico Ambient Air Quality Standards
NMAC	New Mexico Administrative Code
NMDGF	New Mexico Department of Game and Fish
NMED	New Mexico Environment Department
NMMA	New Mexico Mining Act
NMPIF	New Mexico Partners in Flight
NMSA	New Mexico Statutes Annotated
NO_2	nitrogen dioxide
NPDES	National Pollutant Discharge Elimination System
NRCS	U.S. Department of Agriculture, Natural Resources Conservation Service
NRHP	National Register of Historic Places
NSR	New Source Review
NWI	National Wetlands Inventory
PM_{10}	particulate matter less than 10 microns in diameter
$PM_{2.5}$	particulate matter less than 2.5 microns in diameter

PNM	Public Utility of New Mexico
p-plant	precipitation plant
ppb	parts per billion
ppm	parts per million
PSD	Prevention of Significant Deterioration
RMP	Resource Management Plan
ROD	Record of Decision
SO_2	sulfur dioxide
SPCC	Spill Prevention, Control and Countermeasures
Stockpile MPO Amendment	2009 Stockpile MPO Amendment
SWPPP	Storm Water Pollution Prevention Plan
SX/EW	solution extraction/ electrowinning
TDS	total dissolved solids
TSP	total suspended particulates
Tyrone	Freeport-McMoRan Tyrone Inc.
$\mu g/m^3$	micrograms per cubic meter
USFS	U.S. Department of Agriculture, Forest Service
USFWS	U.S. Department of the Interior, Fish and Wildlife Service
USGS	U.S. Geological Survey
USCB	U.S. Department of Commerce, Census Bureau
VOC	volatile organic compound
VRM	Visual Resource Management
WQA	New Mexico Water Quality Act
WQCC	New Mexico Water Quality Control Commission

1.0 INTRODUCTION

Freeport-McMoRan Tyrone Inc. (Tyrone) submitted the *Amendment to Mine Plan of Operations NMNM091644 for the Little Rock Mine* (MPO Amendment) to the U.S. Department of the Interior, Bureau of Land Management (BLM), Las Cruces District Office in September 2013. The MPO Amendment proposes the expansion of the existing Little Rock Mine (an open pit copper mine) and the surface disturbances necessary for the construction, operation, monitoring, closure, and post-closure of the mine. The Little Rock Mine is located in Grant County, New Mexico, approximately 11 miles southwest of the town of Silver City within Sections 16 and 17 of Township 19 South, Range 15 West of the New Mexico Principal Meridian (Figure 1 and Figure 2).

Pursuant to the BLM Surface Management Regulations in Title 43 of the Code of Federal Regulations (CFR), Part 3809, this environmental assessment (EA) documents the environmental review of the proposed action under the National Environmental Policy Act of 1969 (NEPA), as amended. The objectives of this EA are to facilitate the evaluation of the potential effects of the proposed action on lands administered by the BLM and to provide interested parties with an awareness of the project and an opportunity to participate in the BLM's decision-making process regarding the MPO Amendment.

1.1 BACKGROUND

The Little Rock Mine and its vicinity have been subject to previous mining activities, with the first record of mining in the area in the 1890s. Development of an open pit mine began in the 1970s; approximately one million tons of leachable ore were removed, stockpiled, and leached, in addition to the removal and stockpiling of approximately 660,000 tons of waste rock.

In the early 1990s, Phelps Dodge Corporation and its subsidiary, Phelps Dodge Tyrone Inc. (now known as Freeport-McMoRan Tyrone Inc. and referred to herein as "Tyrone"), entered into a lease-purchase agreement with the property owner and began the process of obtaining the regulatory permits required to mine at the site. Tyrone submitted the *Copper Leach Claim Group Plan of Operations* (MPO) in 1993. The *Little Rock Mine Final Environmental Impact Statement* (EIS) was completed in September 1997 (BLM, 1997a), and a Record of Decision (ROD) and MPO approval were completed in December 1997 (BLM, 1997b). However, the commencement of mining was delayed at this time due to fluctuations in the copper market.

In 2009, the BLM approved a modification to the MPO (also referred to as the "Stockpile MPO Amendment") to allow for in-place reclamation of an existing heap leach stockpile and precipitation plant (p-plant) (Tyrone, 2009). The BLM completed the *Little Rock Mine Stockpile Reclamation Final EA* (BLM, 2009a) and issued a Finding of No Significant Impact (FONSI) in 2009 to approve the modification (BLM, 2009b). Approval of a Determination of NEPA Adequacy by the BLM (2010) authorized Tyrone to reestablish operations at Little Rock. Construction and development of the mine began in 2011. In 2013, the BLM accepted minor modifications to the MPO that authorized an adjustment to the pit configuration (BLM, 2013a), the installation of the replacement monitoring well 1236-2012-01 and related access (BLM, 2013b), and dewatering pipeline alignment #1 across BLM-managed land (BLM, 2013c). This EA incorporates by reference the previous NEPA documents, analyses, and related

approvals prepared for the Little Rock Mine, thus minimizing repetitive discussions of the issues and focusing on the specific issues associated with the proposed action.

1.2 PURPOSE AND NEED FOR ACTION

The purpose of the proposed action is to authorize the additional surface disturbances necessary for Tyrone to: (1) profitably mine and process the ore body through the expansion and continued development and extraction of mineral deposits at the Little Rock Mine that were not previously considered recoverable using efficient and effective methods and equipment, (2) reconfigure utilities, haul roads, water management facilities, and other features to support mineral extraction, (3) provide for the efficient and effective reclamation of mine facilities and features, and (4) respond to the global market demand for copper.

The need for the action is established by the policies and mandates set out in the Mimbres Resource Management Plan (RMP), the Federal Land Policy and Management Act of 1976, and the General Mining Law of 1872. As such, the BLM is required to respond to a request to modify an existing mine plan of operations, submitted by the proponent pursuant to 43 CFR 3809 for additional surface disturbances to public lands administered by the BLM.

1.3 DECISION TO BE MADE

After review of the proponent's MPO Amendment, including the analysis and decision documents under NEPA, consideration of public comments, and completing any consultation requirements, the BLM will decide whether or not to:

- Approve the complete MPO Amendment;
- Approve the MPO Amendment subject to certain conditions imposed to ensure the operation meets the performance standards and does not result in unnecessary or undue degradation of public lands; or
- Withhold approval of the MPO Amendment.

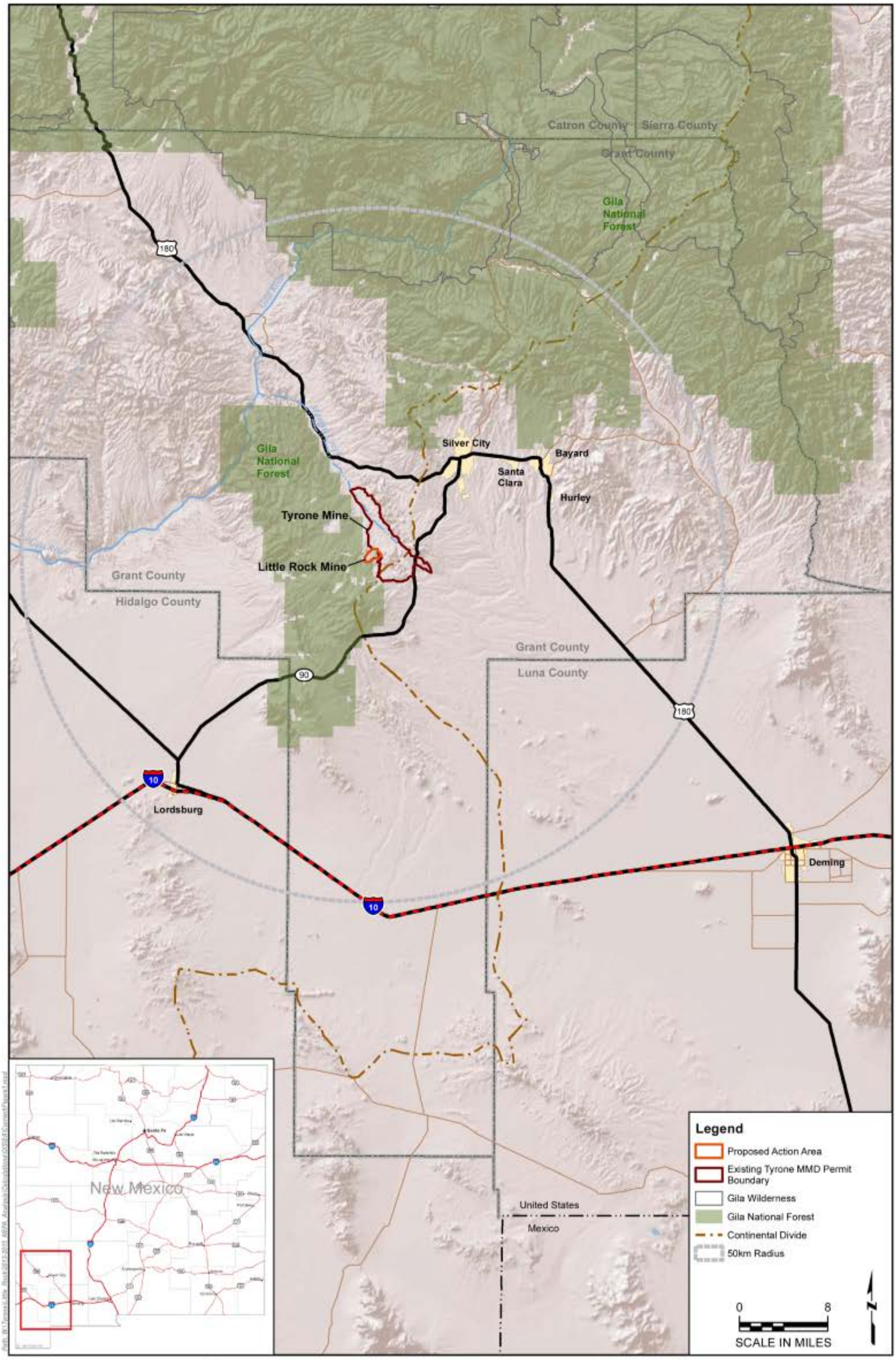
1.4 RELATIONSHIP TO STATUTES, REGULATIONS, AND PLANS

1.4.1 Relationship to Statutes and Regulations

This EA was written in conformance with the BLM regulations for surface mining on public lands under the General Mining Law of 1872, which is implemented through the Surface Management Regulations at 43 CFR 3809, as mandated by the Federal Land Policy and Management Act of 1976, and in accordance with the NEPA and its implementing regulations. This EA has been prepared in accordance with the BLM NEPA and Surface Management handbooks (H-1790-1 (2008) and H-3809-1 (2012), respectively).

1.4.2 Plan Conformance

The BLM Mimbres RMP is the current resource plan for Grant, Dona Ana, Luna, and Hidalgo counties (BLM, 1993). The RMP provides management guidance to minimize environmental damage from mineral development and rehabilitate affected lands. The Mimbres RMP directs BLM to encourage and



PREPARED BY:
TELESTO
SOLUTIONS INCORPORATED

FIGURE 1
REGIONAL OVERVIEW
LITTLE ROCK MINE

FREEPORT-MCMORAN

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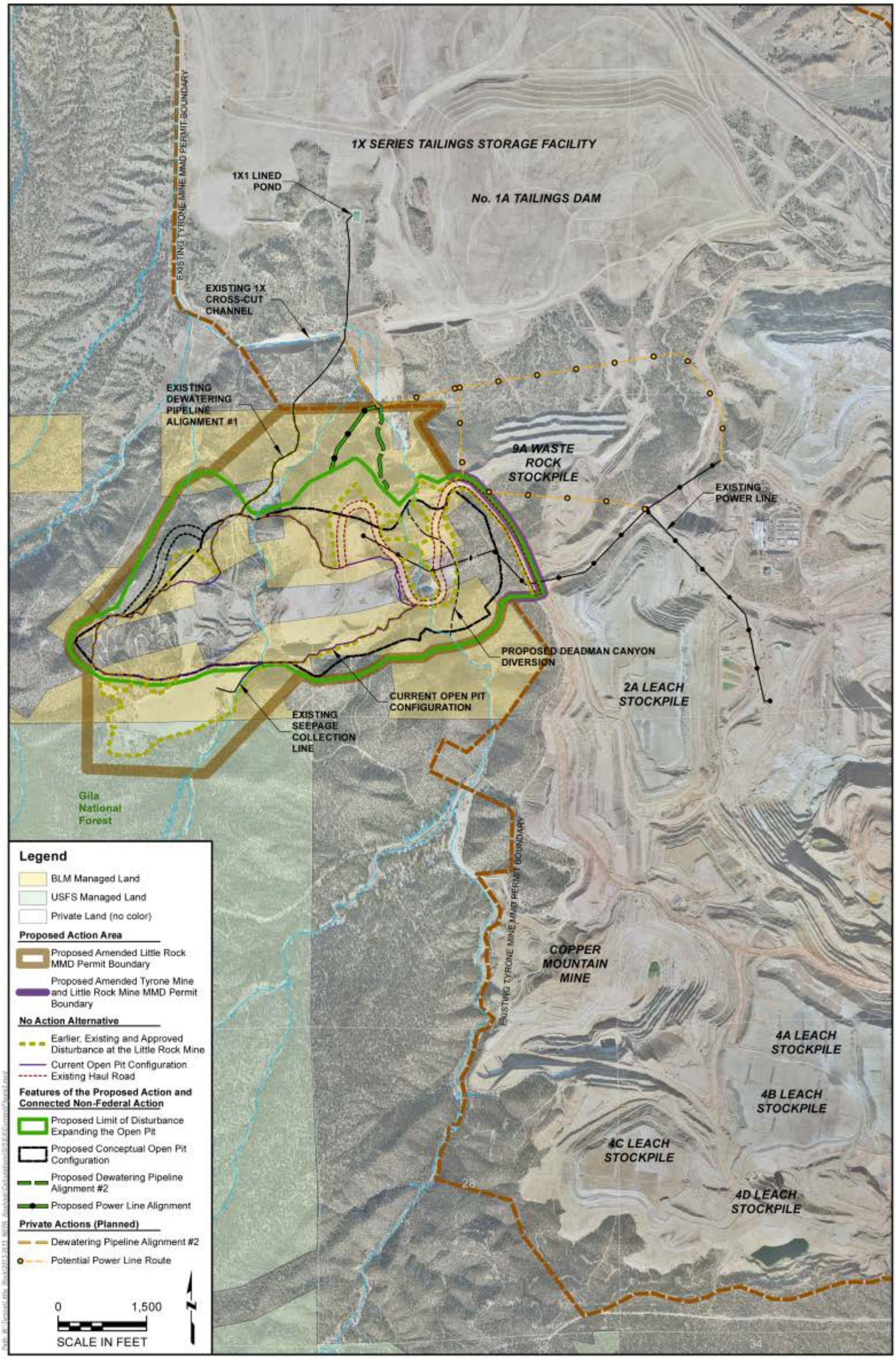

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FIGURE 2
PROJECT VICINITY
LITTLE ROCK MINE

FREEPORT-McMoRan

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facilitate the development by private industry of public land mineral resources in a manner that satisfies national and local needs and provides for economically sound exploration, extraction, and reclamation activities. The activities proposed on land managed by the BLM under the proposed action are consistent with and in compliance with the Mimbres RMP guidelines and policies [pages 2-3 through 2-7 and Appendix B of the Mimbres RMP (BLM, 1993)].

The Grant County Comprehensive Plan states that the Grant County Mining District is an important and distinctive area, with a focus on economic development efforts in the county (Grant County, 2004). One of the county's strategic actions includes a revitalization of the Mining District for the benefit of local residents and property owners, and is inextricably linked to the prosperity of the entire county. According to the county's land use and community design, the land use for the Tyrone and Little Rock mines is designated for mining activities. The activities proposed under the proposed action are consistent with and in compliance with the Comprehensive Plan guidelines and policies.

1.5 SCOPE OF ANALYSIS

The BLM's authority under the Surface Management Regulations (43 CFR 3809) extends to surface mining on public lands. The patented and unpatented claims established under the General Mining Law of 1872, the approved MPO (as modified in 2009; Section 1.1) prepared in accordance with 43 CFR 3809, and conformance with the Mimbres RMP (Section 1.4.2) demonstrate the designated use of the land as mining. This section explains that, while the proposed action includes changes to the type of disturbance, these changes do not alter the existing and established land use associated with the ongoing mining on public and private land at the Little Rock Mine.

In addition, this section evaluates the scope of the analysis. Pursuant to the NEPA implementing regulations at 40 CFR 1508.25(a)(1), "scope consists of the range of actions, alternatives, and impacts to be considered" in an environmental analysis. The scope of this EA considers three types of actions for inclusion in the analysis, pursuant to 40 CFR 1508.25(a).

- Connected actions consist of actions that are "closely related" and "should be discussed" in the same NEPA document. Actions are connected if they:
    - Automatically trigger other actions which may require environmental impact statements,
    - Cannot or will not proceed unless other actions are taken previously or simultaneously, or
    - Are interdependent parts of a larger action and depend on the larger action for their justification.
- Cumulative actions, which when viewed with other proposed actions have cumulatively significant impacts and should therefore be discussed in the same impact statement.
- Similar actions, which when viewed with other reasonably foreseeable or proposed agency actions, have similarities that provide a basis for evaluating their environmental consequences together, such as common timing or geography.

As such, in addition to activities proposed on BLM-managed land, this section also describes connected non-federal action that would not proceed unless other actions are taken previously or simultaneously. The connected non-federal action includes activities contemplated on private land where the BLM does not have jurisdiction, but where the BLM's decision-making could affect or modify the activities, given

the intermingled configuration of land ownership within the Proposed Action Area. Therefore, effects from the connected non-federal action could be prevented or modified by BLM decision-making and should be analyzed and considered as indirect effects of the BLM action.

Further, private actions (*i.e.*, non-federal actions) that would occur entirely on private land and are not considered connected actions are discussed herein. As directed by the BLM NEPA Handbook (Section 6.5; (2008)), "If the non-Federal action cannot be prevented by BLM decision-making and its effects cannot be modified by BLM decision-making, the effects of the non-Federal action may still need to be analyzed in the cumulative effects analysis for BLM action, if they have a cumulative effect together with the effects of the BLM action. While analysis of the effects of these non-Federal actions provides context for the analysis of the BLM action, their consideration in the determination of the significance of the BLM action is limited."

No cumulative or similar actions have been identified for this analysis; no other actions are currently planned or proposed (*i.e.*, "ripe for decision") that have a relationship, interdependence, or common timing or geography to the proposed action. Past, present, and reasonably foreseeable future actions, however, are evaluated and analyzed, as appropriate, in the cumulative effects analysis in Section 4.0.

1.5.1 Use of Public Land

Tyrone holds legal interests in the areas proposed for disturbance in the MPO Amendment through the ownership of patented claims, as well as the ownership of unpatented claims located on BLM-managed public lands. The proposed MPO Amendment conforms to BLM regulations for surface mining on public lands under the General Mining Law of 1872, which is implemented under 43 CFR 3809, in accordance with the Federal Land Policy and Management Act.

Throughout this EA, the phrase "earlier, existing and approved disturbance" is used to identify surface disturbances to BLM-managed land within the proposed amended Little Rock Mine MMD permit boundary (shown on Figure 2 and referred to herein as the "Proposed Action Area"). "Earlier, existing and approved disturbance" includes:

- The earlier surface disturbance, representing the areas disturbed by mining and exploration activities prior to May 4, 1993, as generally discussed in Section 1.1 of the MPO Amendment (Tyrone, 2014a) and as delineated in the 1997 Final EIS (BLM, 1997a) and 2010 Closure/Closeout Plan (Tyrone, 2010);
- The current Federal and state authorizations for surface disturbance, whether they have occurred to date or not; and
- The disturbed areas reported to the Mining and Minerals Division of the New Mexico Energy, Minerals and Natural Resources Department (MMD) in the 2012 annual report (Tyrone, 2013a).

The earlier, existing and approved disturbance to BLM-managed land establishes the baseline condition against which the new surface disturbances proposed in the MPO Modification (the proposed action) are measured. In addition to new surface disturbance, the proposed action identifies changes to the type of disturbance associated with portions of the earlier, existing, and approved disturbance, which would support the continued use of the land for mining purposes. While these changes to the type of surface

disturbance are discussed in conjunction with the proposed action, the proposed action is limited to the BLM's approval of new surface disturbance on BLM-managed land.

The no action alternative would allow mining at the Little Rock Mine in accordance with the existing approvals, as detailed in Section 2.2. Therefore, this EA analyzes potential environmental impacts of the net difference between new surface disturbances under the proposed action and those already permitted under existing approvals (the no action alternative).

1.5.2 Connected Actions

As introduced above, the description of the proposed action incorporates discussion of a connected non-federal action. The connected non-federal action includes activities contemplated on private land where the BLM does not have jurisdiction, but where the BLM's decision-making could affect or modify the activities, given the intermingled configuration of land ownership within the Proposed Action Area. The specific activities proposed as a connected non-federal action are contained within the proposed limit of disturbance expanding the open pit and are described in detail in Section 2.1.1. Potential indirect impacts to the environment resulting from the proposed connected non-federal action on private land are analyzed in addition to the direct and indirect impacts that may result from the proposed action.

Pursuant to the BLM NEPA Handbook (2008), "the consideration of a non-federal connected action is limited in [the] NEPA analysis, because the NEPA process is focused on agency decision making." The connected non-federal action is not an aspect of a broader proposal to be analyzed in a single NEPA document, because proposals are limited to Federal actions.

1.5.3 Private Actions

The two linear facilities included as part of the proposed action (Section 2.1.2) are located on BLM-managed land within the Proposed Action Area. Interconnection of the two linear facilities proposed on BLM-managed land to existing facilities are planned on private land (Figure 2). Because the routing of the two linear facilities to the Proposed Action Area could be accomplished entirely on private land, independent of any Federal action, the interconnections of the two linear facilities beyond the Proposed Action Area are not connected actions for the purposes of the EA. These interconnections are therefore "private actions" and, aside from consideration for potential cumulative effects, are beyond the scope of BLM decision-making and this EA.

In addition, the Tyrone Mine stockpiles, operations, and processing facilities discussed in this EA are situated on private land. Ore from the Little Rock Mine would be transported to approved, permitted facilities at the Tyrone Mine for leaching and subsequent processing of leachates at the Tyrone solution extraction/electrowinning (SX/EW) facility. Waste rock would either be stockpiled at the Tyrone Mine or within a portion of the Little Rock Mine open pit, used for reclamation material, or hauled to the Tyrone Mine for disposal. However, no increased capacity to stockpile materials or process leachate at Tyrone Mine facilities beyond current approvals is necessary to accommodate the additional ore and waste rock materials that would be generated under the proposed action and connected non-federal action. Operations, leach and waste rock stockpiles, processing facilities, and related activities at the Tyrone Mine cannot be prevented by BLM decision-making, and their effects cannot be modified by BLM decision-making because they are not connected actions to the proposed action. Therefore, operations and

related activities at the Tyrone Mine are also "private actions" and, aside from consideration of potential cumulative effects, are beyond the scope of BLM decision-making and this EA. Further, the Tyrone Mine life is not affected by ongoing or expanded operations at the Little Rock Mine, the stockpiling of ore and waste rock at the Tyrone Mine, or processing of the leachate at Tyrone Mine facilities. The Tyrone Mine does not require any new state or Federal permits to receive ore and waste rock or to continue its ongoing and expanded processing and production of copper from the Little Rock Mine.[1]

1.6 SCOPING AND ISSUES

As required by NEPA, the BLM solicited input from the public on the proposed project to assist in identifying key issues and defining the scope of the project and environmental analysis. The BLM conducted scoping via mail and an announcement of the project scoping was posted on the BLM Las Cruces District Office website. Project information was sent out to individuals, agencies, non-governmental organizations, and elected officials that have expressed an interest in the subject area or project vicinity. The mailing list was comprised of the interested parties identified by Tyrone and BLM, and included property owners within a 3-mile radius of the Proposed Action Area. The mailing included a summary of the MPO Amendment, a regional vicinity map, and a map of the proposed mine features. Detailed information on how to provide comments electronically or via regular mail using a pre-addressed comment form was also included in the announcements. The comment period was initiated December 16, 2013 and closed on January 16, 2014.

Seven comment letters were received during the public scoping period. Individual comments within each letter were identified and each comment was analyzed per BLM's criteria for determining key issues for consideration in the EA. A summary of the scoping comments received is presented in Appendix A.

1.6.1 Resource Issues Identified

Using the scoping comments submitted and input from the BLM interdisciplinary team, a list of issues to address in the EA was developed in accordance with guidelines set forth in the BLM NEPA Handbook (2008). Issues were considered non-significant if they were:

- Beyond the scope of the proposed action,
- Irrelevant to the decision to be made,
- Already decided by law, regulation, or policy, or
- Conjectural in nature or not supported by scientific evidence.

[1] The continued operations at the Tyrone Mine are not dependent on the approval of the proposed MPO Amendment; the proposed action and connected non-federal action are unrelated to the "life of mine" or "mine life" of Tyrone Mine operations and facilities. Mine life is a component or expression of a methodology to estimate operating and capital costs for a mineral deposit given its tonnage, grade, and depth. In short, mine life is an expression of a mine's economic modeling, namely the amount of time that an assumed amount of ore (reserve) can be recovered at given rate (Camm).

The key issues identified during public and agency scoping and this analysis are summarized below:

- Geology/mineral resources
  - What effect would activities associated with mine construction, operation, and reclamation have on the handling and management of potentially acid generating materials?
- Water resources
  - What effect would activities associated with mine construction, operation, and reclamation have on groundwater quality?
  - What effect would activities associated with mine construction, operation, and reclamation have on surface water quality?
- Biological resources
  - What effect would the construction, operation, and reclamation of the Deadman Canyon diversion have on wildlife movement, habitat, and habitat connectivity?
  - What effect would mine construction, operation, and reclamation have on vegetation?
  - What effect would activities associated with mine construction, operation, and reclamation have on birds, wildlife, and sensitive species?
- Cultural resources
  - What effect would mine construction and operation have on cultural resources?

1.6.2 Project Resource Review

Potential effects to resources and uses of the human environment are evaluated preliminarily to determine if detailed analysis is necessary, including consideration of established laws, statutes, regulations, and Executive Orders which impose certain requirements upon Federal actions. The BLM also considers resources and uses that occur on public lands and the issues that may result from the implementation of the proposed action or alternatives. A preliminary analysis of resources is presented in Table 1. The resources that are deemed not present in the Proposed Action Area, or present but not affected, are noted as such with a description of the rationale. The resources that are present in the Proposed Action Area and may be affected by the proposed action are assessed in the referenced section of this EA.

Table 1 Project Resource Review

Resource Area	Element	Not Present	Present/ Not Affected	Present/ May be Affected	Rationale/ Reference Section
Earth Resources	Soils			●	Section 3.1.1
	Geology/mineral resources			●	Section 3.1.2
	Seismicity		●		Seismicity was evaluated in the 1997 Final EIS. The Little Rock Mine is located in the Basin and Range physiographic province which is typified by low seismic activities and long recurrence intervals; therefore no further analysis is presented in this EA.

Resource Area	Element	Not Present	Present/ Not Affected	Present/ May be Affected	Rationale/ Reference Section
Earth Resources (continued)	Paleontological resources	●			Based on the surficial geologic analysis in the 1997 Final EIS, the surface materials in the vicinity of the Little Rock Mine are dominated by granitic rocks, which typically do not host fossils. Similarly, the Quaternary alluvial and conglomeratic deposits within the proposed limit of disturbance are unlikely to contain paleontological resources. Therefore, no further analysis is presented in this EA.
Water Resources	Surface water			●	Section 3.2.1
	Floodplains		●		Alteration of the Deadman Canyon watercourse as contemplated by the proposed action would assure that its flood carrying capacity is maintained and that flood flows to downgradient properties or communities would not increase. In addition, there are no structures in the vicinity of the Proposed Action Area; therefore, no structures would be affected by the proposed action. The engineering design of the Deadman Canyon diversion would also comply with applicable local, state, and Federal law and regulations. Therefore, no further analysis is presented in this EA.
	Groundwater			●	Section 3.2.2
	Water chemistry			●	Section 3.2
	Wetlands/riparian zones			●	Section 3.3
	Wild and scenic rivers	●			There are no rivers in the vicinity of the Proposed Action Area designated as wild and scenic.
Biological Resources	Vegetation			●	Section 3.3.1
	Terrestrial wildlife (general) and wildlife habitat			●	Section 3.3.2
	Aquatic wildlife and fish habitat		●		Impacts to aquatic wildlife were evaluated in the 1997 Final EIS; no perennial aquatic habitat or fisheries exist within the immediate vicinity of the Proposed Action Area; no further analysis is presented in this EA.
	Threatened or endangered species and other special status species			●	Section 3.3.3
	Migratory birds			●	Section 3.3.4

Resource Area	Element	Not Present	Present/ Not Affected	Present/ May be Affected	Rationale/ Reference Section
Land Use, Transportation, Recreation, and Range	Existing and planned land use			●	Section 3.4
	Farmlands (prime or unique)	●			There are no prime or unique farmlands within or near the Proposed Action Area.
	Forests and rangelands	●			The project is not subject to the Healthy Forests Restoration Act of 2003.
	Grazing management			●	Section 3.4.1
	Recreation			●	Section 3.4.2
	Transportation and access		●		Impacts to transportation and access were evaluated in the 1997 Final EIS. No regional transportation routes or transportation plans would be affected within or in the immediate vicinity of the Proposed Action Area.
	Wilderness	●			Designated wilderness or wilderness study areas do not exist within or adjacent to the Proposed Action Area. The nearest designated wilderness area is the Gila Wilderness, more than 25 miles to the north/northeast.
	Utilities			●	Section 3.4.3
Cultural Resources	Archaeological and historical sites			●	Section 3.5
	Special status cultural resources	●			Impacts to special status cultural resources were evaluated in the 1997 Final EIS; no special status cultural resources are located within or in the immediate vicinity of the Proposed Action Area.
	Traditional cultural places/Native American religious concerns	●			Impacts to traditional cultural places were evaluated in the 1997 Final EIS; no known traditional cultural places are located within or in the vicinity of the Proposed Action Area.
Air Resources	Air quality			●	Section 3.6.1
	Climate change			●	Section 3.6.2
Human Resources	Visual resources			●	Section 3.7.1
	Noise and blasting vibrations			●	Section 3.7.2
	Socioeconomic values			●	Section 3.7.3
	Environmental justice			●	Section 3.7.4
	Solid or hazardous wastes		●		Solid and hazardous waste disposal was addressed in the 1997 Final EIS. The proposed action would not change operations or the handling and management of solid or hazardous waste.

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2.0 PROPOSED ACTION AND ALTERNATIVES

This section provides a summary of the proposed action on BLM-managed lands and the connected non-federal action on private land, the no action alternative, and alternatives considered but eliminated from detailed analysis.

2.1 PROPOSED ACTION

Under the proposed action, the BLM would approve the MPO Amendment authorizing surface disturbances to BLM-managed land that are necessary for the expansion of the current open pit configuration and the continued construction, operation, and reclamation of the Little Rock Mine. The proposed action and connected non-federal action (see Section 1.5) would extend the same mine production methods and activities that are ongoing pursuant to existing approvals an estimated, additional four years, through 2020.[1] Within the Proposed Action Area, the MPO Amendment proposes:

- A limit of disturbance expanding the open pit, which includes:
    - Construction, operation, and reclamation of the expanded open pit
    - Construction, operation, and reclamation of the western haul road
    - Installation of instrumentation, utilities, and access for various operational, monitoring, closure, and post-closure activities
- Two alignments for linear facilities on BLM-managed land[2]
    - Dewatering pipeline alignment #2
    - Power line alignment

As delineated in Table 2 and depicted in Figure 3, the proposed action would authorize new surface disturbance to approximately 109 acres of land managed by the BLM. Under the connected non-federal action, new surface disturbance of up to approximately 91 acres of private land would occur. The approximately 14 acres of earlier, existing, and approved disturbance on land managed by the U.S. Department of Agriculture, Forest Service (USFS) would continue to be maintained; no new disturbances are proposed on USFS-managed land as part of the proposed action.

[1] The projected schedule is based on current production sequencing and is subject to change.

[2] Refer to Section 1.5.

Table 2 Approximate New Disturbance Areas within the Proposed Action Area

	Proposed New Disturbance Area (acres)		**Total Proposed New Disturbance Area (acres)**
	Proposed Action (BLM-managed land)	**Connected Non-federal Action (private land)**	
Proposed limit of disturbance	106	91	197
Linear facilities Dewatering pipeline alignment #2 Power line alignment	 < 1 < 2	 -- --	 < 1 < 2
Total	**109**	**91**	**200**

- Slight discrepancies may exist in subtotal and total values due to rounding.
- Proposed disturbances on private land are not subject to BLM authorization; however, potential indirect impacts to the environment resulting from the connected non-federal action on private land are analyzed in addition to the direct and indirect impacts that may result from the proposed action in Section 3.0.
- Tyrone will continue to use and maintain existing exploration roads in the vicinity of the Little Rock Mine for light vehicle access and maintenance of reclaimed areas; exploration and existing roads and reclaimed areas beyond the proposed limit of disturbance are not delineated in this table.
- Post-approval, the MPO Amendment may be updated or appended so as to reflect other agency permits, final designs, or certain stipulations as more specific and detailed engineering designs or information become available. Accordingly, the areas delineated in this table are approximations, and minor deviations from these areas may result during construction and implementation.

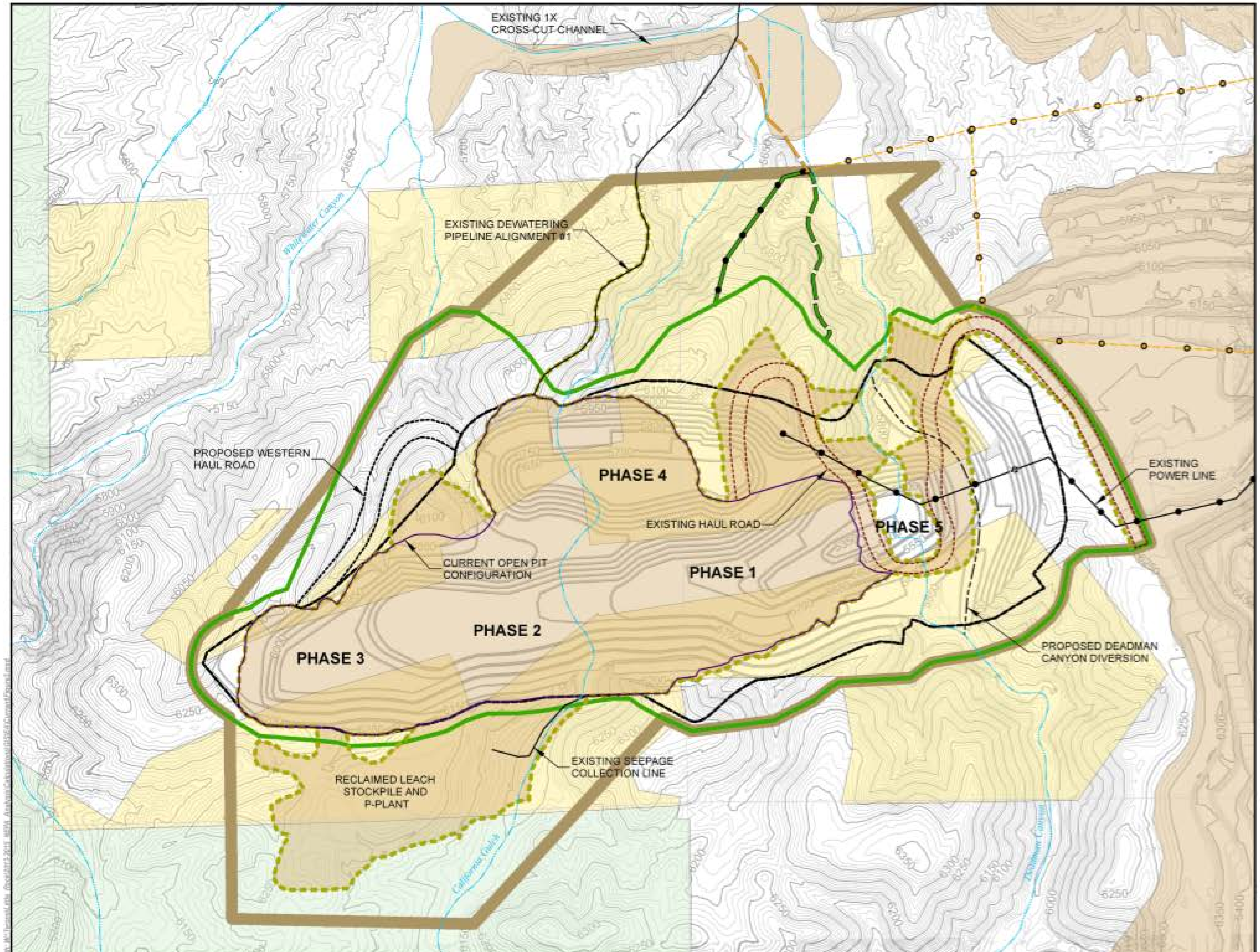
2.1.1 Proposed Limit of Disturbance

Within the Proposed Action Area, the proposed limit of disturbance encompasses the area needed for the construction, operation, and reclamation of the expanded open pit and western haul road, as shown in Figure 3. In addition, the proposed limit of disturbance provides for the installation of instrumentation, utilities, and access for various activities in support of mine operations, monitoring, closure, and post-closure.

Under the proposed action, the new surface disturbance to BLM-managed land would include 106 acres within the proposed limit of disturbance, as listed in Table 2 (an additional, approximately 3 acres of BLM managed land would be necessary for the two linear facilities, as discussed in Section 2.1.2). As generally discussed in Section 1.5.2, the type of disturbance associated with 153 acres of earlier, existing, and approved disturbances to BLM-managed land within the Proposed Action Area would change to support the continued use of the land for mining purposes (*e.g.*, a portion of the existing haul road would be converted to open pit). A summary of the new surface disturbance included in the proposed action and connected non-federal action and the changes to earlier, existing, and approved disturbance are detailed in Table 3. In total, 259 acres of BLM-managed land are included within the proposed limit of disturbance.

Under the connected non-federal action, new surface disturbances are proposed on 91 acres of private land. Including the new and earlier, existing and approved[1] disturbance areas to both BLM-managed and private land, the proposed limit of disturbance includes 466 acres.

[1] Earlier, existing, and *planned* disturbances (in light of existing BLM approvals and the intermingled ownership) on private land are not subject to BLM authorization; refer to Section 1.5.1.



Legend

- Proposed Action Area
- BLM Managed Land
- Earlier, Existing, and Approved Disturbance
- USFS Managed Land

No Action Alternative

- Earlier, Existing and Approved Disturbance at the Little Rock Mine
- Current Open Pit Configuration
- Existing Haul Road

Features of the Proposed Action and Connected Non-Federal Action

- Proposed Limit of Disturbance Expanding the Open Pit
- Proposed Conceptual Open Pit Configuration
- Proposed Dewatering Pipeline Alignment #2
- Proposed Power Line Alignment

Private Actions (Planned)

- Dewatering Pipeline Alignment #2
- Potential Power Line Route

Surface topography dated Jan 2012. Contours within the Proposed Action Area reflect the conceptual topography at the end of mining.

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SCALE IN FEET

COORDINATE SYSTEM
TYRONE LOCAL MINE

FIGURE 3
PROPOSED ACTION AND CONNECTED NON-FEDERAL ACTION LITTLE ROCK MINE

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Table 3 Summary of New and Earlier, Existing, and Approved Disturbance Areas within the Proposed Limit of Disturbance

	Proposed New Disturbance Area (acres)		**Earlier, Existing, and Approved Disturbance Area (acres)**		
	Proposed Action (BLM-managed land)	**Connected Non-federal Action (private land)**	**BLM-Managed Land**	**Private Land**	**Total Area (acres)**
Proposed new disturbance	106	91	--	--	197
Current open pit configuration	--	--	100	97	197
Existing haul road	--	--	42	18	60
Earlier North Stockpile	--	--	7	1	8
Reclaimed leach stockpile and p-plant	--	--	4	--	4
Total Area within Proposed Limit of Disturbance	106	91	153	116	466

Notes:

- Slight discrepancies may exist in subtotal and total values due to rounding.
- Post-approval, the MPO Amendment may be updated or appended so as to reflect other agency permits, final designs, or certain stipulations as more specific and detailed engineering designs or information become available. Accordingly, the areas delineated in this table are approximations, and minor deviations from these areas may result during construction and implementation.
- The conceptual open pit configuration would not be advanced southward into the existing reclamation of the leach stockpile and p-plant; potential activities would maintain the integrity of the existing reclamation.
- "Earlier, existing, and approved disturbance" is defined in Section 1.5.1.

2.1.1.1 Open Pit Expansion

As depicted in Figure 3 and delineated in Table 4, the conceptual open pit configuration would expand the approximately 197 acres included in the current open pit configuration, adding approximately 131 acres of BLM-managed and private lands. Under the proposed action and connected non-federal action, the conceptual open pit configuration[1] would generate an additional, approximately 35 million tons of ore that was not previously considered recoverable, but is currently projected to be economic to mine. The proposed action and connected non-federal action would also remove an additional, approximately 80 million tons of waste rock compared to the no action alternative (Section 2.2). As with the no action alternative, ore from the Little Rock Mine would continue to be transferred to the adjacent Tyrone Mine facility for copper extraction, and waste rock would be stockpiled in a portion of the open pit or be transported to the Tyrone Mine where it would be stockpiled at permitted facilities and eventually reclaimed.[2]

[1] The actual open pit configuration may vary to accommodate slope stability, safety, access, or other operational demands, but would lie within the proposed limit of disturbance.

[2] Refer to Section 1.5.3.

Table 4 Conceptual Open Pit Expansion within the Proposed Limit of Disturbance

	Proposed New Disturbance Area (acres)		**Earlier, Existing, and Approved Disturbance Area (acres)**		
	Proposed Action (BLM-managed land)	**Connected Non-federal Action** (private land)	**BLM-Managed Land**	**Private Land**	**Total Area (acres)**
Proposed action and connected non-federal action (conceptual configuration of the open pit)	54	32	136	106	328
No action alternative (current open pit configuration)	--	--	100	97	197
Proposed open pit expansion area (difference between proposed/non-federal action and no action alternative)	**54**	**32**	**36**	**9**	**131**

- Slight discrepancies may exist in subtotal and total values due to rounding.
- Post-approval, the MPO Amendment may be updated or appended so as to reflect other agency permits, final designs, or certain stipulations as more specific and detailed engineering designs or information become available. Accordingly, the areas delineated in this table are approximations, and minor deviations from these areas may result during construction and implementation.
- "Earlier, existing, and approved disturbance" is defined in Section 1.5.1.

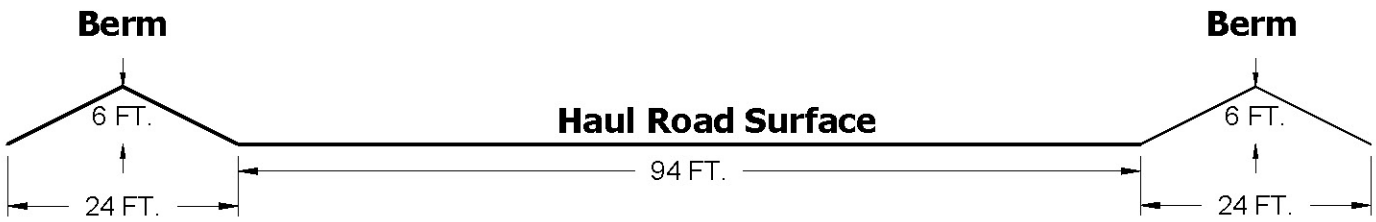
As shown in Figure 3, the majority of the existing haul road that connects the Little Rock Mine to the Tyrone Mine would be shortened by the expansion of the open pit. Currently, this haul road runs approximately 5,000 linear feet. Under the proposed and connected non-federal action, the length of this haul road would be reduced by more than half, to approximately 2,200 linear feet.

2.1.1.2 Western Haul Road

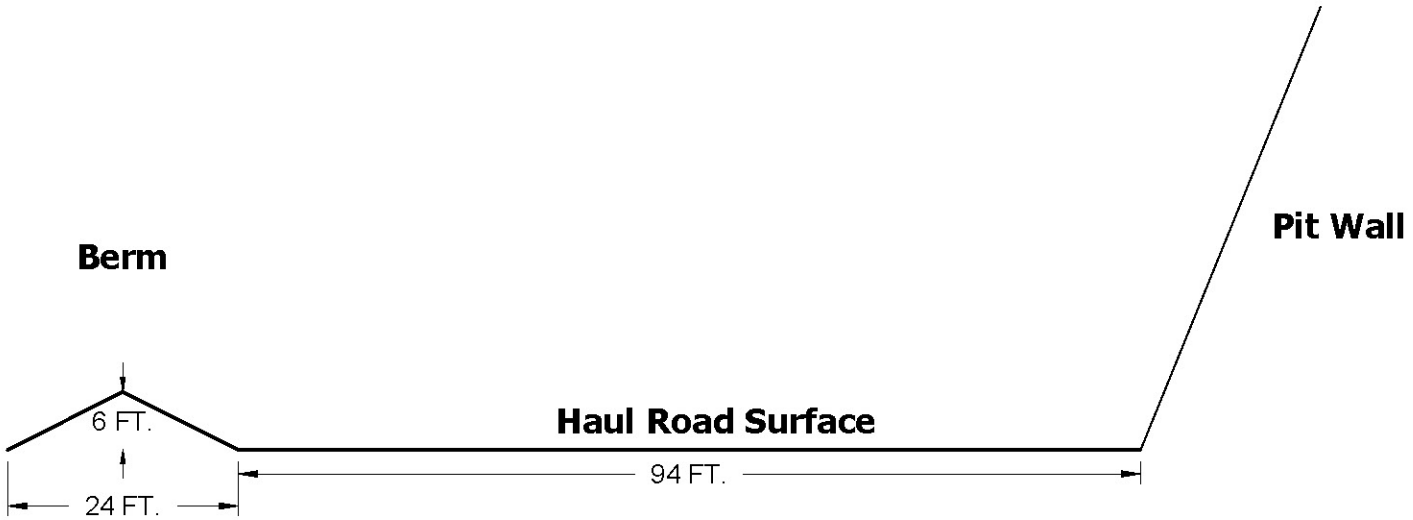
In addition to the existing haul road to the east, the western haul road would be constructed along the northwestern edge of the conceptual open pit configuration (Figure 3) within the proposed limit of disturbance under the proposed action and connected non-federal action. The western haul road would provide access to the west end of the pit to facilitate stockpiling overburden material in the open pit. The western haul road would be approximately 2,200 feet in length with an average width of approximately 94 feet. Depending on the location of the haul road with respect to the wall of the open pit, the road surface would be flanked by single or dual berms. Each berm would measure approximately 24-feet wide and 6-feet tall to accommodate the largest haul trucks that would use the road. Figure 4 depicts typical haul road cross sections for single and dual berm configurations. Storm water management controls and facilities would also be incorporated into the engineering design.

2.1.1.3 Deadman Canyon Diversion

The proposed expansion of the open pit would incorporate a portion of the ephemeral Deadman Canyon. Therefore, the proposed action and connected non-federal action include a diversion channel to intercept and convey surface water flows from Deadman Canyon around the open pit via gravity. The diversion would intercept the natural course of Deadman Canyon on the southern, upgradient side of the open pit, direct flows along the eastern edge of the open pit, and return flows to the natural channel on the northern,



Typical Haul Road Cross Section
Dual Berm



Typical Haul Road Cross Section
Single Berm

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PROJECT: 200531	TASK: 01

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FIGURE 4
TYPICAL HAUL ROAD CROSS SECTIONS
LITTLE ROCK MINE

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downgradient side. The surface disturbance associated with the Deadman Canyon diversion is included in the proposed limit of disturbance, as listed in Table 3.

As conceptualized, the natural channel of Deadman Canyon would fall approximately 150 feet in elevation over the anticipated, roughly 2,500-foot length of the diversion channel. The diversion would be integrated into the bedrock along the eastern edge of the open pit. The bedrock consists of inert material which would be removed to accommodate the diversion and to provide access to the mineable ore materials which generally underlie Deadman Canyon.

An inlet structure would be designed and constructed to direct storm water flows from the natural channel of Deadman Canyon. Storm water flows from a small canyon on the south side of the open pit, west of Deadman Canyon (Figure 3) may also be directed to the inlet structure and diversion channel. The diversion would be constructed as an open channel, designed with the capacity to convey the 100-year, 24-hour return storm event; the diversion would also be designed to convey more routine flows generated by smaller storm events. The diversion would be designed to comply with applicable local, state, and Federal law and regulations. Storm water flows exceeding the 100-year, 24-hour return storm event would be directed into the open pit. The channel design would incorporate standard engineering practices and design criteria to: (1) ensure the safety, stability, capacity, durability, maintenance, and function of the conveyance; (2) minimize potential degradation of the channel bed and maintain stability; (3) control the channel grade; and (4) minimize erosion. A typical cross section of the diversion channel is depicted in Figure 5.

Runoff from the natural canyon and pit walls lying above the channel would flow into the channel. At the downgradient end of the diversion, on the north side of the open pit, storm water flows would be returned to the natural channel of Deadman Canyon. At this point, an outlet structure would transition the hydraulic properties of the flow from the constructed channel to the existing condition of the flow in the natural channel.

The construction of the Deadman Canyon diversion would be anticipated to occur over a period of approximately four to twelve months. During the construction period, a series of temporary outlets would be required as the channel grade for the diversion is completed. The temporary outlets would discharge to the open pit. Following the completion of construction, the diversion and associated structures would operate passively, requiring minimal maintenance. In accordance with the *Updated Closure/Closeout Plan for the Little Rock Mine* (CCP), the Deadman Canyon diversion would remain in place post-mining to convey storm water flows around the open pit (Golder, 2014).

2.1.1.4 Instrumentation, Utilities and Access

The proposed action and connected non-federal action would also accommodate instrumentation, utilities, and access to support various operational, monitoring, closure, and post-closure activities. Given that the proposed MPO Modification presents a planning level of detail, the location of these features are not specifically identified. However, the surface disturbances associated with these features are included in the proposed limit of disturbance, as listed in Table 3. These features would likely include (but would not be limited to):

- Geotechnical instrumentation and monitoring facilities
- Power distribution system and components

- Communications facilities
- Surface water and groundwater management and dewatering facilities
- Access to facilities and components

GEOTECHNICAL INSTRUMENTATION AND EQUIPMENT

Geotechnical equipment and monitoring facilities would be deployed around the rim of the open pit to provide advanced warning of slope movement and failures. Geotechnical equipment may include devices such as robotic total stations and slope stability monitoring radars.

POWER DISTRIBUTION SYSTEM

The power distribution system within the proposed limit of disturbance would include substations and power lines. The primary power supply (refer to Section 2.1.2.2) would feed three-phase, 46-kilovolt (kV) power to the proposed limit of disturbance. Within the proposed limit of disturbance, the primary power supply would continue southward to one or more substations. The existing substations would be relocated and/or new substations would be constructed to step down the power supply to support operations. Preliminarily, substations are planned along the northern edge of the conceptual open pit configuration. In general, the substations would include perimeter grounding, perimeter fencing, switching and controlling equipment, and voltage step down transformers.

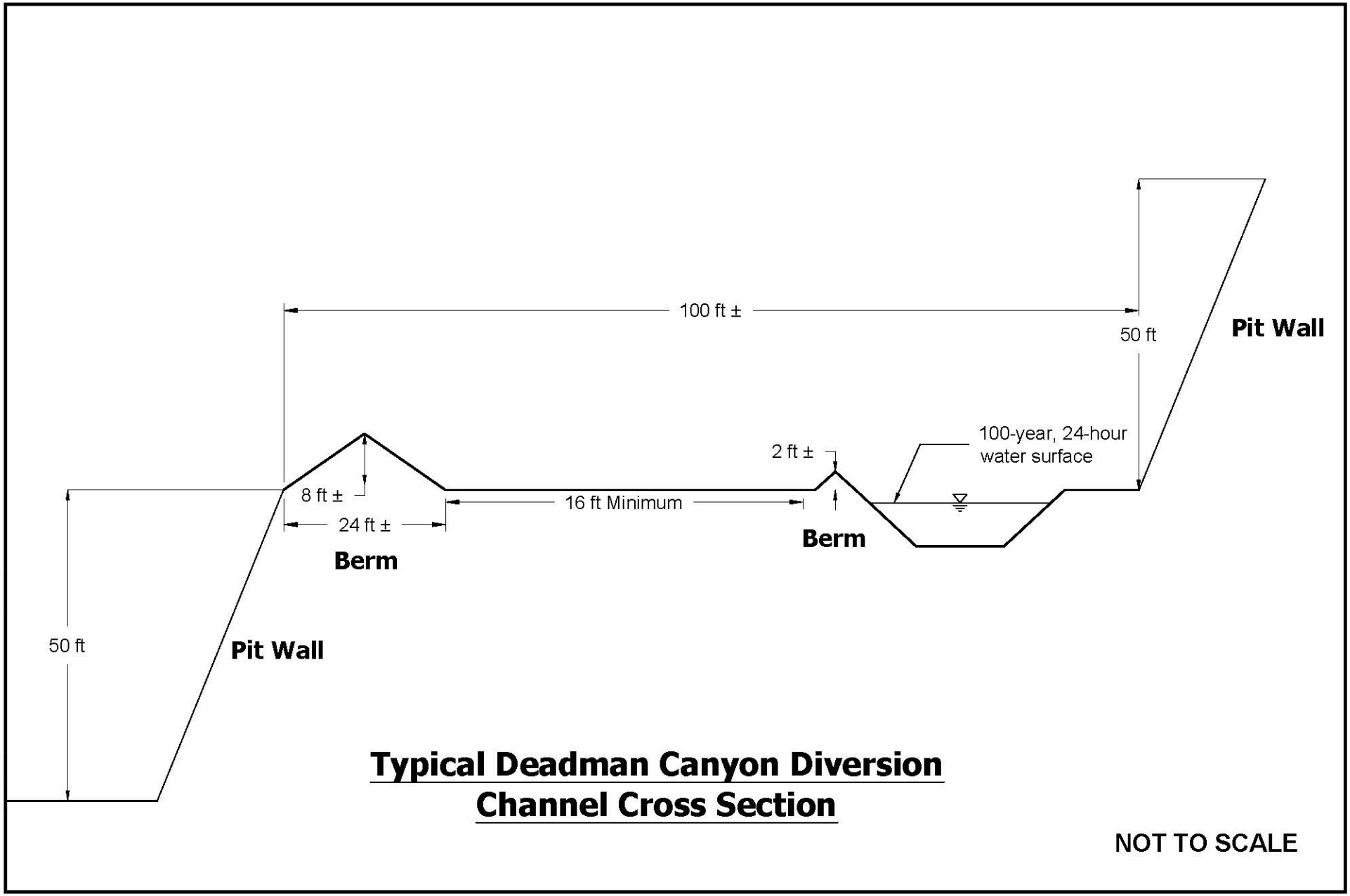
The power supply to support operations would generally consist of 7.2-kV power lines erected on utility poles within the proposed limit of disturbance. The power supply would provide power to one or more shovels, booster pump stations, sumps, and ancillary facilities. The location of power lines within the proposed limit of disturbance would shift with operations as mining progresses, but would generally follow haul roads, cut across benches, or follow established routes. Tyrone would ensure that the installation of power lines or other potential activities would maintain the integrity of the existing reclamation of the leach stockpile and p-plant (refer to Section 1.1).

COMMUNICATIONS UTILITY FACILITIES

Radio towers may be required to support voice and data communications and the operation of monitoring equipment. Cameras may be mounted on the towers to collect additional visual information during mining operations. Radio towers generally would be co-located with geotechnical instrumentation, and would have a maximum height of 60 feet.

WATER MANAGEMENT FACILITIES

Under the proposed action and connected non-federal action, the proposed limit of disturbance would accommodate a dewatering system which may include (but is not limited to) booster pump stations, pit dewatering sumps, decant ponds, high density polyethylene (HDPE) pipelines, and power supply for these facilities, as needed. Generally, pumps would be installed in the active bottom of the open pit to maintain adequate working conditions and would transfer water to in-pit dewatering sumps, temporary collection tanks, decant ponds, and/or booster pump stations. The location of dewatering system components would change as mining progresses, but would be located within the proposed limit of disturbance (with the exception of the existing and proposed linear facilities discussed in Section 2.1.2.1);



Typical Deadman Canyon Diversion Channel Cross Section

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FIGURE 5
TYPICAL DEADMAN CANYON DIVERSION
CROSS SECTION

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water would continue to be conveyed to the 1X1 lined pond (Figure 2) for use in the Tyrone Mine process water management system.

ACCESS TO FACILITIES AND COMPONENTS

The proposed limit of disturbance would also provide corridors during and after mining to allow access for construction, operations, monitoring, maintenance, and reclamation. Roads may be constructed within the proposed limit of disturbance for light vehicle access to support activities including, but not limited to, the installation and maintenance of storm water management facilities, fill slope reduction and grading prior to reclamation, maintenance of access for environmental, reclamation, and monitoring personnel, slope movement monitoring, and installation of safety features.

The existing haul road at the eastern end of the current open pit configuration would continue to provide access to Tyrone facilities, and would be reconfigured within the proposed limit of disturbance and the conceptual open pit configuration as needed to provide access for mining operations.

In addition, many exploration roads and waste rock stockpiles exist in the vicinity of the Little Rock Mine, both within and beyond the proposed limit of disturbance. Tyrone will continue to utilize and maintain existing roads in the vicinity; new roads or substantial changes to existing roads beyond the proposed limit of disturbance are not anticipated or proposed. Tyrone would also continue to maintain the reclaimed facilities that exist within and beyond the proposed limit of disturbance.

2.1.2 Linear Facilities

Two linear facilities are proposed that would require additional surface disturbance to BLM-managed land beyond the proposed limit of disturbance, as depicted in Figure 3. These features include an alignment for a pipeline to support dewatering of the open pit and a power line alignment required to reroute the primary power supply for the Little Rock Mine. Within the Proposed Action Area, these features only propose surface disturbances to BLM-managed land (and do not cross intermingled private land). As discussed in Section 1.5.3, the extension of the linear facilities north of the Proposed Action Area across private land could be accomplished independent of any Federal action. For these reasons, the two linear facilities in the Proposed Action Area are components of the proposed action, as identified in Figure 3. For purposes of this EA, the portions of the two linear facilities beyond the Proposed Action Area, and lying entirely on private land, are private non-federal actions, and are not connected actions.

2.1.2.1 Dewatering Pipeline Alignment #2

Under the proposed action, a new dewatering pipeline alignment (#2) would be required to replace or relieve the function of the existing dewatering pipeline alignment #1 as mining advances into the northern portion of the open pit. The existing dewatering pipeline alignment #1 conveys water captured by the open pit and flows from the existing seepage collection at the reclaimed leach stockpile and p-plant to the Tyrone Mine's 1X1 lined pond. From the 1X1 lined pond, water would continue to be conveyed for use in the Tyrone process water management system.

The existing dewatering pipeline alignment #1 generally follows a ridgeline west of California Gulch. Under the proposed action, the new dewatering pipeline alignment #2 would generally follow an existing, unimproved road along a ridgeline west of Deadman Canyon, extending approximately 2,000 feet across

land managed by the BLM. The alignments of the existing (#1) and proposed (#2) dewatering pipelines are depicted in Figure 2.

Where necessary, the surface of the existing, unimproved road would be widened to 20 feet and berms would be installed, as appropriate, to ensure safe access for mine personnel during operations and maintenance. The footprint associated with the construction of dewatering pipeline alignment #2 would disturb approximately 1 acre of BLM-managed land within the Proposed Action Area.[1] Dewatering pipeline alignment #2 would include one or more parallel HDPE pipelines, anticipated to range in size from 8 to 16 inches in diameter, and would generally be above ground and at grade. Segments of pipeline along the alignment may be buried to facilitate access and/or to incorporate storm water best management practices (BMPs). The final number and sizing of the pipelines would be based on hydrologic modeling and the flows encountered during mining. Depending on the need for and timing of capacity, additional HDPE pipelines may also be extended on a temporary or long-term basis in parallel to the existing pipeline along some or all of alignment #1.

2.1.2.2 Power Line Alignment

The second linear facility included in the proposed action would provide for the rerouting of a portion of the power supply line to the Little Rock Mine. The existing, three-phase, 46-kV power line spans Deadman Canyon; relocation of the existing power line is necessary to accommodate the expansion of the open pit. Under the proposed action, power line alignment would generally follow an existing ridge line on the north side of the proposed limit of disturbance, extending approximately 1,750 feet across the Proposed Action Area. Assuming that the alignment would require an estimated 50-foot-wide footprint (inclusive of the access road surface, power line, and utility poles), approximately 2 acres of BLM-managed land would be disturbed under the proposed action.

Construction of the power line would require surface disturbances such as clearing of rocks and brush, grading, surfacing an access road with gravel or base course to provide all-weather access, and installing safety berms. Light vehicle access would be required for power line construction, inspections, and maintenance. Preliminarily, utility poles would be spaced approximately every 250 feet; however, utility pole spacing may vary depending on topography and other factors.

2.1.3 Surface Mine Operations

Under the proposed action and the connected non-federal action, surface mine operations would remain substantially the same as operations under the no action alternative, which include conventional open pit mining techniques and equipment.

2.1.3.1 Mining Techniques

As with the no action alternative, areas of new surface disturbance would be cleared of vegetation, and potential topsoil would be evaluated for future reclamation use. If suitable for reuse and in a location suitable for recovery, cleared topsoil would be salvaged and stockpiled on the 9A Stockpile or other

[1] Existing surface disturbance associated with this existing, unimproved road has not been delineated in the earlier, existing, and approved disturbances.

location within the proposed limit of disturbance for use during reclamation activities in accordance with the topsoil salvaging plan detailed in the CCP (Golder, 2014).

Under both the proposed action/connected non-federal action and the no action alternative, mining would take place along benches, generally drilled and blasted to produce 50-foot bench heights; in some locations, two 50-foot benches may be merged to form a 100-foot bench. Additional equipment is not anticipated under the proposed action/connected non-federal action beyond what would be required for the no action alternative. Trucks with a targeted load capacity of 265 tons (generally Caterpillar 793 haul trucks) would be loaded at the working face by shovels (generally P&H 4100 electric shovels or similar) or front end loaders (such as Caterpillar 994).

Material management, determinations, and destinations would not change under the proposed action/connected non-federal action in comparison to the no action alternative. The trucks would continue to haul loads of material to permitted facilities at the Tyrone Mine for processing or stockpiling or to a portion of the open pit for stockpiling within the pit. Material determinations would continue to be completed in the same manner as current operations (and the no action alternative). The ore cutoff grade would vary based on economics. A material handling plan, developed under the terms of the Tyrone Mine's DP-435 and the Little Rock Mine's DP-1236, would continue to ensure that suitable cover material is segregated and placed in overburden stockpiles and that other materials would be placed in permitted leach or waste rock stockpiles, as summarized in Table 5 (Tyrone, 2011).

Table 5 General Material Management

General Classification	Rock Material	Predominant Mineral(s)	Material Destination	Acid Generating and Neutralizing Potential
Ore	ore (copper oxide)	chrysocolla	permitted leach stockpiles at the Tyrone Mine	non-acid generating; moderate to strong potential to neutralize acid
	ore (sulfide bearing rock)	calcite chalcocite chalcopyrite	permitted leach or waste rock stockpiles at the Tyrone Mine (depending on mine economics)	very low potential to generate acid; moderate to high potential to neutralize acid
Waste rock	waste rock (sulfide bearing rock)			
	overburden (leach cap)	goethite hematite (inert)	stockpiled within a portion of the Little Rock Mine open pit, placed in the 9A stockpile at the Tyrone Mine, and/or used for fill material or reclamation	non-acid generating; moderate potential to neutralize acid

(Golder, 2014)

While the material generated from the Little Rock Mine is predominantly non-acid generating copper oxide ore and overburden (leach cap), small pockets of sulfide bearing waste rock may be encountered. There is no change to the types of material encountered or generated under the proposed action/connected non-federal action in comparison to the no action alternative. As summarized in the CCP (Golder, 2014):

> The collective [acid-base accounting] data show that the sulfides have a very low potential to generate acid, with sufficient neutralizing capacity to neutralize all of the acid that may potentially be produced. The sulfide zone rocks therefore also can be classified as having a moderate to high potential to neutralize acid. This mineral type is generally considered to be non-ore rock and constitutes a very small amount of the material being mined.

As with the ongoing mining operations, haul roads internal to the open pit would be extended from their current elevations and locations and would progress downward as pit excavation advances. In compliance with the current Tyrone Mine air quality permits (inclusive of the Little Rock Mine), control of fugitive dust emissions would continue to be maintained through the continued application of BMPs such as haul road watering and management of the number of haul truck trips per hour. Posted truck speeds would continue to be limited to 35 miles per hour, noting that trucks typically travel at substantially lower speeds, particularly when loaded and/or traveling uphill.

2.1.3.2 Production and Safety

Currently, the average production rate at the Little Rock Mine varies between 65,000 and 160,000 tons per day of combined leach ore and overburden material. No change to the average production rate would be anticipated under the proposed action/ connected non-federal action in comparison to the no action alternative. The Little Rock Mine would continue to operate 365 days per year with each work day composed of two, 12-hour shifts.

Under the proposed action/connected non-federal action and no action alternative, security personnel would continue to patrol and control access to the facility 24 hours per day. Similarly, fencing would be constructed and maintained around the perimeter of the mining areas, and access roads would continue to be gated and locked to prevent the public from accessing active mining areas, where appropriate.

The Little Rock Mine and the processing/stockpiling operations located at the adjacent Tyrone Mine would continue to adhere to safety regulations and standards promulgated by the Mine Safety and Health Administration (MSHA; primarily 30 CFR Parts 47, 48, 56, 58 and 62), including safety training, personal protective equipment, mining-related work, and health standards governing occupational exposure to regulated substances and noise. In addition, Tyrone would continue to implement supplementary safety programs to reflect corporate policies and site-specific considerations. All employees would continue to be trained to observe and report suspicious or unusual activity that threatens safety or security.

2.1.3.3 Storm Water Pollution Prevention

Under the proposed action/connected non-federal action and no action alternative, the Little Rock Mine would continue to implement and comply with the requirements of the Discharge Permit (DP-1236), the U.S. Environmental Protection Agency's (EPA's) National Pollutant Discharge Elimination System (NPDES) Multi-Sector General Permit (MSGP), and other applicable Federal and state permits and regulations; surface water and groundwater quality and quantity would continue to be protected. The existing Little Rock Mine has been engineered to minimize water use, control erosion and sedimentation, and manage surface water and groundwater.

Under the proposed action and connected non-federal action, additional water management facilities would be installed as needed, including structural and non-structural controls and BMPs to minimize erosion, control sedimentation, and reduce pollutants in storm water discharges. In some instances, storm water may be diverted into the open pit, where it would be incorporated into the pit dewatering system, including the continued diversion of storm water from the California Gulch drainage and the temporary diversion of storm water from Deadman Canyon during the construction of the channel.

Tyrone holds surface water rights issued by the New Mexico Office of the State Engineer for the waters that would be temporarily and permanently collected or diverted under both the proposed action/connected non-federal action and no action alternative.

2.1.4 Reclamation

The BLM Surface Management Regulations include requirements for reclamation of the features and facilities included in the proposed action. Concurrent with this EA process, Tyrone is requesting the appropriate amendments to the Mining Act Permit with the Mining and Minerals Division of the New Mexico Energy, Minerals and Natural Resources Department (MMD) and the Discharge Permit with the New Mexico Environment Department (NMED). Amendments to the Mining Act Permit and the Discharge Permit require the review and approval of an updated closure/closeout plan, which combines the requirements for the New Mexico Mining Act (NMMA) Closeout Plan and the New Mexico Water Quality Act (WQA) Closure Plan. The updated CCP was submitted for review by the BLM in July 2014, concurrent with the review and approval by the MMD and NMED (Golder, 2014). The CCP dictates the reclamation requirements for the Little Rock Mine and addresses the applicable elements of 40 CFR 3809.401(b)(3).

Under the proposed action/connected non-federal action and no action alternative, the mine reclamation and revegetation practices would continue to promote a viable post-mining land use, reduce impacts to surface water and groundwater, and provide for post-mining public safety. Reclamation activities for the Little Rock Mine would enhance, stabilize, and revegetate the disturbed areas and achieve compliance with state and Federal regulations for mine reclamation and water quality protection. Reclamation of the site would provide for the establishment of a self-sustaining ecosystem consistent with the designated post-mining land use and life zone of the surrounding area, with consideration of the site-specific conditions that would exist at the Little Rock Mine at the time of closure. Monitoring and maintenance activities would follow final reclamation and continue for approximately 30 years (BLM, 2012).

2.1.4.1 Limit of Disturbance

Figure 6 and Figure 7 depict the anticipated post-mining condition of the open pit under the proposed action/ connected non-federal action, including reclamation of overburden material that would be stockpiled within a portion of the open pit during mining operations and the development of one or more pit lakes. Stockpiling of materials in the open pit during mining and the development of one or more pit lakes post-mining would also occur under the no action alternative. The stockpiled materials are expected to be similar to the materials that are currently exposed in the pit, and no additional cover material would be required. The stockpiled materials would be graded to reduce the potential for erosion and sedimentation, and would be revegetated by seeding with a variety of native and adapted grasses, shrubs, and forbs in accordance with the CCP.

The majority of the existing haul road that provides access to the Tyrone Mine would be incorporated into the conceptual open pit configuration. Haul roads located within the interior of the open pit and the existing access haul road are not expected to expose acid generating rock and are located outside areas of known mineralization. Under the proposed action/connected non-federal action and the no action alternative, reclamation of the existing haul road would be accomplished in accordance with the requirements of the CCP.

Under the proposed action/connected non-federal action, the proposed limit of disturbance accounts for the surface disturbances necessary to complete final reclamation of the western haul road, including slope reduction and installation and maintenance of storm water controls and facilities. Haul roads and access roads not needed for closure and post-closure access would be reclaimed in accordance with the CCP; this would occur under the proposed action/connected non-federal action and the no action alternative. Similarly, culverts or other man-made drainage structures that are not needed for long term protection of reclaimed surfaces or access would be removed under the proposed action/connected non-federal action and the no action alternative. Under the proposed action/connected non-federal action, the Deadman Canyon diversion would remain in place to convey storm water flows around the open pit post-mining. The diversion channel would not be constructed under the no action alternative.

Consistent with the terms of the current CCP and under the proposed action/connected non-federal action and the no action alternative, storm water flows in California Gulch would discharge to the reclaimed open pit post-mining; groundwater inflow would also contribute to the formation of one or more pit lakes. Predictions of post-mining pit lake water levels and water quality have been assessed in support of the amended DP-1236 and are subject to routine review and re-estimation under the conditions of this permit.

2.1.4.2 Linear Facilities

Under the proposed action, dewatering pipeline alignments #1 and/or #2 would continue to convey seepage water post-closure from the reclaimed leach stockpile and p-plant to the 1X1 lined pond for use in the Tyrone Mine process water management system. The sections of dewatering pipeline alignment #1 and dewatering pipeline alignment #2 located within the open pit that would not be required for post-closure conveyance of water from the open pit would be buried or removed and disposed in an approved manner. Disturbed areas within the Proposed Action Area would be seeded to reestablish vegetation in accordance with the CCP.

Post-mining, utility poles associated with the proposed power line within the Proposed Action Area would be left in place as bird perches to support the designated post-mining land use. Components of the electrical distribution system, including substations, transmission lines, and temporary portable operations and maintenance facilities used to support mining and not needed for post-closure purposes would be removed. The power line and access road would be reclaimed by ripping the disturbed areas and reseeding in accordance with the CCP.

2.1.5 Schedule of Operations

Operations at the Little Rock Mine have been divided into five phases. The anticipated production, closure/reclamation, and post-closure schedule is summarized by phase and time span in Table 6. The five

EXISTING 1X CROSS-CUT CHANNEL

EXISTING DEWATERING PIPELINE ALIGNMENT #1

Whitewater Canyon

PROPOSED WESTERN HAUL ROAD

NORTH STOCKPILE

CURRENT OPEN PIT CONFIGURATION

A

B

B'

C

C'

A' EXISTING POWER LINE

PROPOSED DEADMAN CANYON DIVERSION

EXISTING SEEPAGE COLLECTION LINE

RECLAIMED LEACH STOCKPILE AND P-PLANT

California Gulch

Deadman Canyon

Legend

- Proposed Action Area
- BLM Managed Land
- USFS Managed Land
- Private Land (No Color)

No Action Alternative

- Earlier, Existing and Approved Disturbance at the Little Rock Mine
- Current Open Pit Configuration
- Existing Haul Road

Features of the Proposed Action and Connected Non-Federal Action

- Proposed Limit of Disturbance Expanding the Open Pit
- Proposed Conceptual Open Pit Configuration
- Proposed Dewatering Pipeline Alignment #2
- Proposed Power Line Alignment
- In-pit Stockpile Contour (20' interval)
- Predicted Future Pit Lake Surface (80 years following closure)

Private Actions (Planned)

- Dewatering Pipeline Alignment #2
- Potential Power Line Route

Surface topography dated Jan 2012. Contours within the Proposed Action Area reflect the conceptual topography at the end of mining.

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SCALE IN FEET

N

COORDINATE SYSTEM
TYRONE LOCAL MINE

FIGURE 6
CONCEPTUAL FINAL RECLAMATION CONFIGURATION
LITTLE ROCK MINE

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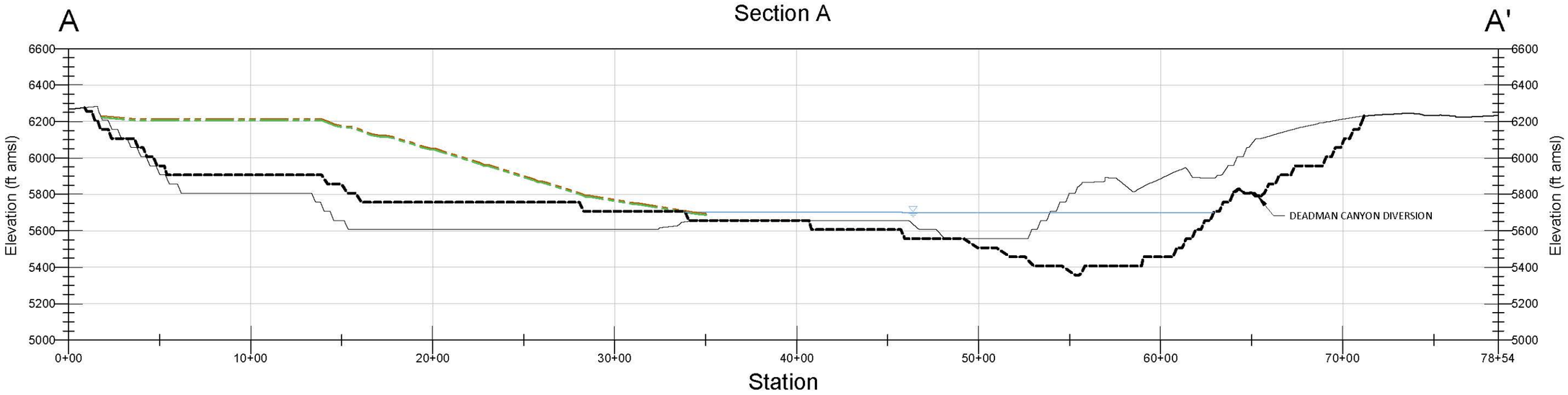

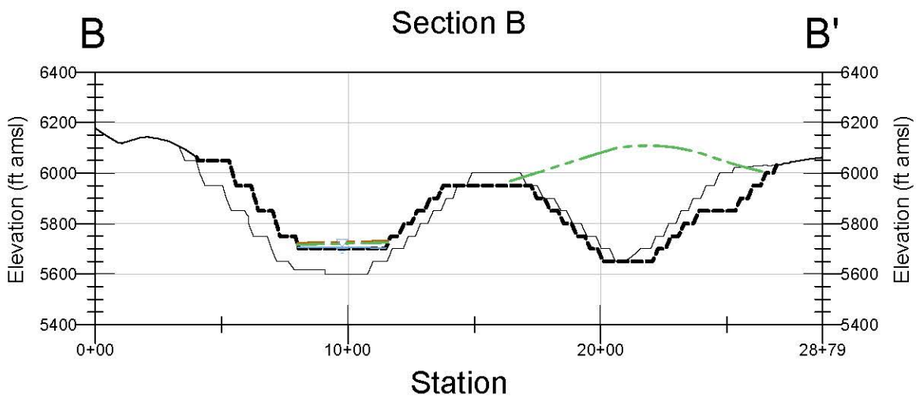

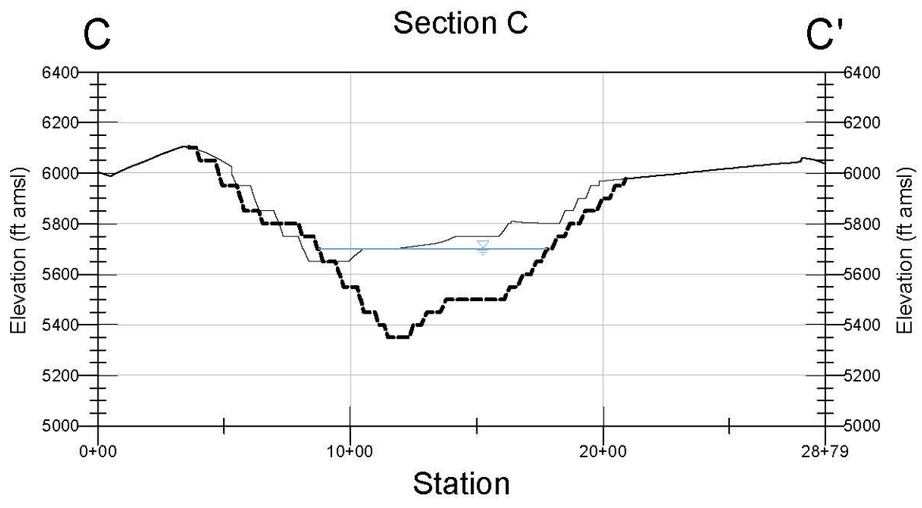

LEGEND

No Action Alternative

- Post-mining Open Pit Configuration
- Reclaimed In-pit Stockpile Surface
- Predicted In-pit Pit Lake Surface

Proposed Action and Connected Non-Federal Action

- Conceptual Post-mining Open Pit Configuration
- Conceptual Reclaimed In-pit Stockpile Surface
- Predicted Future Pit Lake Surface Elevation (80 Years Following Closure)

FIGURE 7
CROSS SECTIONS OF POST-MINING TOPOGRAPHY
LITTLE ROCK MINE

PROJECT:	TASK:
200531	01

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phases are depicted in Figure 3. Tyrone may elect to progress in a different order and/or redefine the approximate areas of the phases.

Reclamation activities at the Little Rock Mine are expected to occur concurrently to the extent possible and would be fully initiated upon final closure of the mine, after mining ceases. Mining on BLM-managed and private land is anticipated through approximately 2020, depending upon economic conditions. Final reclamation of the site is estimated to take approximately 2 years, followed by approximately 30 years of post-closure monitoring. Monitoring would occur until post-mining land uses have been achieved and the appropriate agencies (including BLM, MMD, and NMED) have approved the completed reclamation activities.

Table 6 Little Rock Mine Plan by Phase

Phase	Estimated Time Span	Data	Estimated Tons of Material
Little Rock 1	2011 – 2013	Ore	26,300,000
		Waste rock	23,900,000
Little Rock 2	2013 – 2014	Ore	28,500,000
		Waste rock	9,800,000
Little Rock 3	2014 – 2015	Ore	35,700,000
		Waste rock	16,900,000
Little Rock 4	2015 – 2016	Ore	7,600,000
		Waste rock	19,600,000
Little Rock 5	2017 – 2020	Ore	35,700,000
		Waste rock	68,500,000
Total	2011-2020	Ore	113,800,000
		Waste rock	138,700,000
Mining completed	2020	----	----
Final reclamation	2021 – 2022	----	----
Post-closure monitoring	2022 – 2052	----	----

2.2 NO ACTION ALTERNATIVE

With this alternative, new surface disturbing activities proposed in the MPO Amendment would not be authorized on BLM-managed land. Tyrone would continue with activities previously authorized under existing permits and approvals, including the surface disturbances depicted in Figure 3. Table 7 lists the area of earlier, existing, and approved disturbance that would continue under the no action alternative. The evaluation of the no action alternative provides a baseline from which the other alternatives are compared.

Table 7 Earlier, Existing, and Approved Disturbance Area under the No Action Alternative

	BLM-Managed Land Area (acres)	**USFS-Managed Land Area (acres)**	**Private Land Area (acres)**	**Total Area (acres)**
Current open pit configuration	100		97	197
Existing haul road	42		18	60
Dewatering pipeline alignment #1	1		1	2
Reclaimed leach stockpile and p-plant	24	5		29
Earlier North Stockpile	7		1	8
Other earlier disturbance	15	9		24
Total Area	**189**	**14**	**117**	**320**

Notes:

- Slight discrepancies may exist in subtotal and total values due to rounding.
- Disturbances on private land are not subject to BLM authorization.
- Tyrone will continue to use and maintain existing exploration roads in the vicinity of the Little Rock Mine for light vehicle access and maintenance of reclaimed areas; exploration and existing roads are not delineated in this table.
- The areas delineated in this table are approximations, and minor deviations from these areas may result during construction and implementation of approved surface disturbances.
- "Earlier, existing, and approved disturbance" is defined in Section 1.5.1. Portions of the currently approved open pit configuration may not be presently disturbed; however, as an active mining operation, the amount of existing disturbance is subject to change in accordance with existing approvals. The remaining facilities listed above reflect existing surface disturbances.

2.2.1 Mine Features

Under the no action alternative, the development of the open pit would occur pursuant to the 1993 MPO, as modified. Approximately 160 million tons of mine rock would be removed under the no action alternative, including approximately 100 million tons of leach ore and an estimated 60 million tons of waste rock material. Ore from the Little Rock Mine would continue to be transferred to the adjacent Tyrone Mine facility for copper extraction, and waste rock would be stockpiled in a portion of the open pit or be transported to the Tyrone Mine where it would be stockpiled at permitted facilities and eventually reclaimed. A dewatering system aligned along the haul road or existing routes and the existing 46-kV power distribution system would continue to serve the Little Rock Mine.

2.2.2 Surface Mine Operations

Surface mine operations under the no action alternative, including conventional open pit mining techniques and equipment, material management, production, safety, and storm water pollution prevention, would generally be the same as described for the proposed action/connected non-federal action in Section 2.1.3.

2.2.3 Reclamation

Under the no action alternative, reclamation requirements would generally be the same as described for the proposed action/connected non-federal action. Distinctions between the proposed action/connected non-federal action and the no action alternative are noted in Section 2.1.4.

2.3 ALTERNATIVES CONSIDERED BUT ELIMINATED FROM DETAILED ANALYSIS

Alternatives considered but eliminated from further study include alternatives that either did not or could not achieve the proposed action satisfactorily or had the potential to create unnecessary and excessive environmental impacts.

Since the purpose and need for the action includes the expansion and continued development and extraction of mineral deposits at the Little Rock Mine, the range of alternatives is spatially constrained. One alternative was considered that did not include a diversion to route storm water flow from Deadman Canyon around the open pit; instead storm water flow would be directed into the open pit. This alternative would require a substantial upgrade to the existing dewatering facilities, including an expansion of the 1X1 lined pond. Considering the additional cost and disturbance footprint of the pond, this alternative did not meet the need for the action and was eliminated from detailed analysis.

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3.0 AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

This section describes the existing condition of the natural and human environment in the Proposed Action Area (the affected environment) and analyzes the potential environmental consequences that may result from the implementation of the proposed action and connected non-federal action and the no action alternative. As described in Section 1.1, an extensive project record documents the existing approvals and NEPA analyses associated with the Little Rock Mine. Collectively, the project record and associated approvals have established the baseline condition at the Little Rock Mine, and the current and ongoing operations, in accordance with the 1993 MPO, as modified, comprise the no action alternative. The condition of the affected environment resulting from implementation of the no action alternative defines the baseline against which impacts of the proposed action and connected non-federal action are compared. A number of resource areas are not expected to experience long-term adverse impacts or to be affected directly, indirectly, or to any measurable degree. These were identified in Section 1.6.2 of this EA and are not considered further in the analysis.

The discussion of environmental consequences considers potential direct and indirect effects. Direct impacts are those which would be caused by the proposed action and would occur at the same time and place as that action. Indirect impacts are caused by actions that are not a direct part of the project, but occur either later in time or outside the study area. Indirect impacts include those which may result from the connected non-federal action, in accordance with the BLM NEPA Handbook, which states, "If the connected non-federal action and its effects can be prevented by BLM decision-making, then the effects of the non-federal action are properly considered indirect effects of the BLM action…" (2008).

Cumulative impacts which may result from the implementation of the alternatives considered in this EA are discussed in Section 4.0.

3.1 EARTH RESOURCES

This section describes the soils and geologic resources occurring in the Proposed Action Area. The description includes a summary of the data, investigations, and assessments presented in the 1997 Final EIS (BLM, 1997a), updated to reflect new information or analyses where appropriate. Additionally, this section analyzes the potential environmental consequences for the activities associated with the proposed action/connected non-federal action and no action alternative presented in Section 2.0 of this EA.

From Section 1.6.1, one key issue related to earth resources was identified during public and agency scoping:

- What effect would activities associated with mine construction, operation, and reclamation have on the handling and management of potentially acid generating materials?

3.1.1 Soils

3.1.1.1 Affected Environment

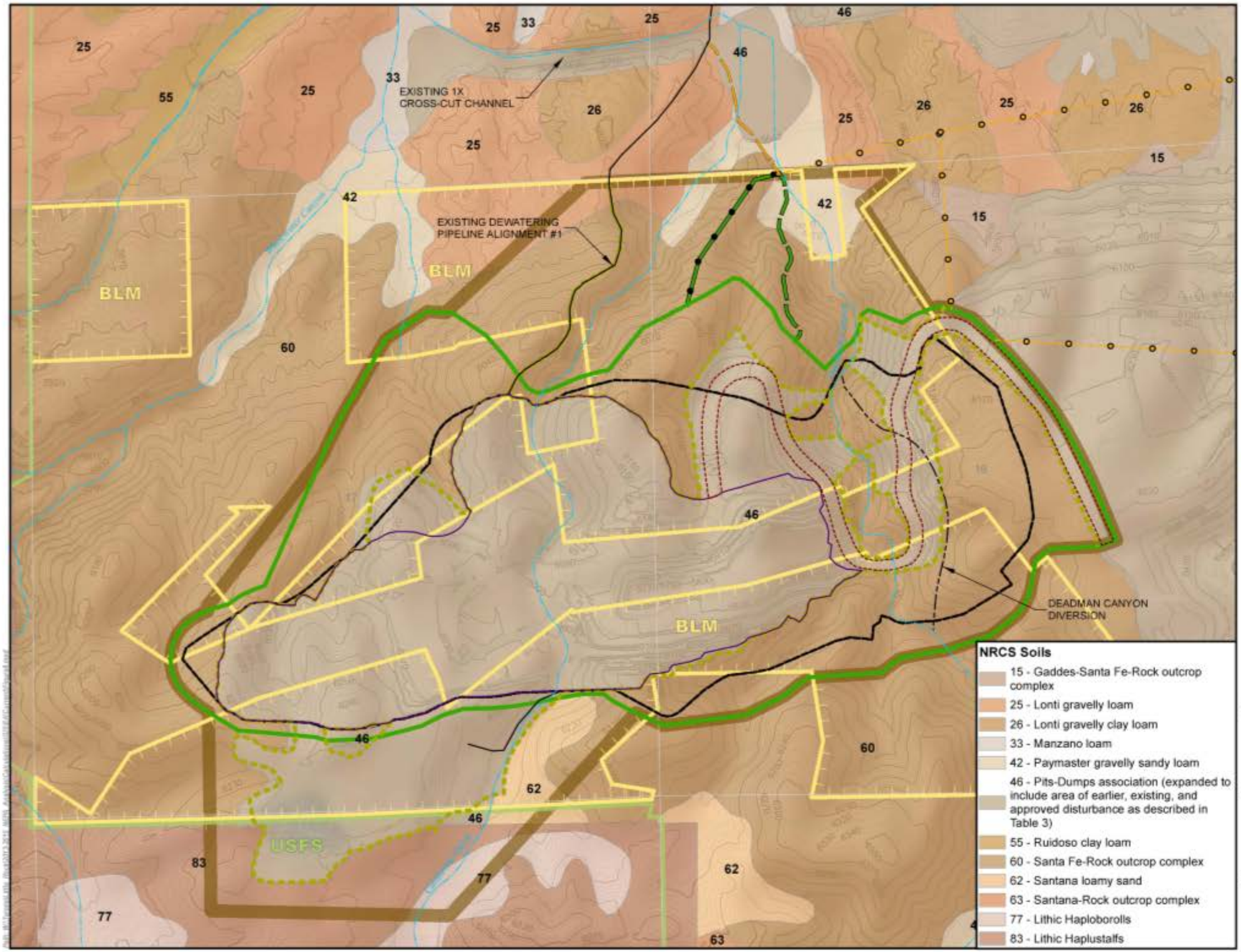
Soil units occurring in the project vicinity, mapped by the Natural Resource Conservation Service (NRCS; (NRCS, 2008)), are depicted in Figure 8. Table 8 lists the soil units occurring in the Proposed Action Area with select physical characteristics, including the general texture and composition of the soil. Table 8 also indicates the NRCS ratings for:

- The hazard of soil loss from unsurfaced roads and trails, which is used as an indication of the erosion potential for disturbed areas under the proposed action. The rating is based on the soil erosion factor K, slope of the land surface, and the content of rock fragments. The erosion hazard is described as "slight," "moderate," or "severe." A rating of "slight" indicates that little or no erosion would be likely; "moderate" indicates that some erosion is likely and that simple erosion-control measures would be needed; and "severe" indicates that erosion would be expected and that more robust erosion-control measures would be needed.
- Use as a potential source of reclamation material. The ratings are based on the amount of suitable material and the soil properties that affect the ease of excavation and the performance of the material after it is in place.

Table 8 Characteristics of Soil Units within the Proposed Action Area

Map Unit Symbol	Map Unit Name	Surface Texture	Percent Clay	Percent Sand	Percent Silt	Erosion Hazard Rating (Road/ Trail)	Source of Reclamation Material Rating
60	Santa Fe-rock outcrop complex	gravelly sandy loam	30.8	38.0	31.1	severe	poor (droughty, limited thickness)
46	Pits-dumps association	bedrock	0.5	97.9	1.6	severe	not rated
25	Lonti gravelly loam	gravelly loam	30.2	46.9	22.9	severe	fair (low content of organic matter; too clayey)
26	Lonti gravelly clay loam	gravelly clay loam	30.9	46.3	22.8	slight	fair (low content of organic matter; too clayey)
42	Paymaster gravelly sandy loam	gravelly sandy loam	11.5	65.7	22.8	moderate	fair
15	Gaddes-Santa Fe-rock outcrop complex	gravelly sandy loam	28.4	56.6	15.0	severe	poor (droughty, limited thickness)
62	Santana loamy sand	loamy sand	14.8	57.2	28.0	severe	poor (wind erosion, droughty, limited thickness, low content of organic matter)
83	Lithic Haplustalfs, loamy-Skeletal, mixed, mesic-Lithic	gravelly sandy clay loam	37.5	39.2	23.3	severe	poor (droughty, limited thickness, too clayey, low content of organic matter)
77	Lithic Haploborolls, loamy, mixed, warm	gravelly sandy clay loam	37.5	39.2	23.3	moderate	poor (droughty, limited thickness, too clayey, low content of organic matter)

(NRCS, 2008)



Legend

- Proposed Action Area
- Current Open Pit Configuration
- BLM Managed Land
- USFS Managed Land

No Action Alternative

- Earlier, Existing and Approved Disturbance at the Little Rock Mine
- Current Open Pit Configuration
- Existing Haul Road

Features of the Proposed Action and Connected Non-Federal Action

- Proposed Limit of Disturbance Expanding the Open Pit
- Proposed Conceptual Open Pit Configuration
- Proposed Dewatering Pipeline Alignment #2
- Proposed Power Line Alignment

Private Actions (Planned)

- Dewatering Pipeline Alignment #2
- Potential Power Line Route

Surface topography dated Jan 2012.

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SCALE IN FEET

COORDINATE SYSTEM
TYRONE LOCAL MINE

NRCS Soils

- 15 - Gaddes-Santa Fe-Rock outcrop complex
- 25 - Lonti gravelly loam
- 26 - Lonti gravelly clay loam
- 33 - Manzano loam
- 42 - Paymaster gravelly sandy loam
- 46 - Pits-Dumps association (expanded to include area of earlier, existing, and approved disturbance as described in Table 3)
- 55 - Ruidoso clay loam
- 60 - Santa Fe-Rock outcrop complex
- 62 - Santana loamy sand
- 63 - Santana-Rock outcrop complex
- 77 - Lithic Haploborolls
- 83 - Lithic Haplustalfs

FIGURE 8
PROJECT AREA SOILS
LITTLE ROCK MINE

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Two mapped soil units, including the Santa Fe-rock outcrop complex (soil map unit 60) and the pits-dumps association (soil map unit 46), occur within the proposed limit of disturbance expanding the open pit under the proposed action and connected non-federal action. As detailed in the following section, 98 percent of the area proposed for disturbance occurs within Santa Fe-rock outcrop complex soils,

The Santa Fe-rock outcrop complex is characterized as shallow and rocky soils, typical of that found in mountainous terrain. An estimated 25 percent of the area mapped in this soil unit is void of soil (rock outcrop); where soils do occur, the depth to bedrock is shallow (typically 8 to 20 inches). The Santa Fe-rock outcrop complex is rated as a poor source of reclamation material due to the limited soil thickness and substantial amount of rock outcrop areas.

The pits-dumps association is indicative of areas previously disturbed by mining or other anthropogenic activities. The area mapped as pits and dumps in Figure 8 has been expanded to include the area of earlier, existing, and approved disturbance for this analysis.

Under the proposed action, the two linear facilities would cross Santa Fe-rock outcrop complex soils and Paymaster gravelly sandy loam (soil map unit 42). The Paymaster gravelly sandy loam soil unit is characterized as deep, well-drained soils that formed in stratified alluvium, typically forming on floodplains and alluvial fans.

The soil types occurring in the Proposed Action Area are not suitable for agricultural crop production, and the Proposed Action Area does not include prime or unique farmlands. Hydric soils do not occur in the Proposed Action Area.

3.1.1.2 Environmental Consequences

3.1.1.2.1 Proposed Action

Implementation of the proposed action and connected non-federal action would result in the disturbance and alteration of in-place, native soils by the expansion of the open pit, construction of the western haul road, and installation of instrumentation, utilities, and access roadways. As shown in Figure 8 and detailed in Table 9, the proposed limit of disturbance includes Santa Fe-rock outcrop complex soils and the disturbed, pits-dumps association. The construction of dewatering pipeline alignment #2 and power line would affect less than three acres of soils, as detailed in Table 9 and depicted in Figure 8.

Soil material from previously undisturbed areas would be salvaged and stored at designated sites within the proposed limit of disturbance or at the Tyrone Mine for future reclamation and closure activities in accordance with the CCP. However, the Proposed Action Area includes rugged terrain with limited topsoil; the depth to bedrock is shallow (typically 8 to 20 inches). Thus, the quantity of soil material available for salvage is expected to be limited.

Potential indirect effects of the destabilization and removal of soils include increased vulnerability to erosion by wind and water. The majority of the proposed limit of disturbance expanding the open pit would drain to the open pit where potential erosion and sedimentation would be captured and controlled. Storm water from portions of the proposed action and connected non-federal action (such as the western haul road and proposed linear facilities) would include BMPs mandated by the continued adherence to the

Tyrone Storm Water Pollution Prevention Plan (SWPPP; (Tyrone, 2014b)) and the design features in Section 2.1.3.3 to minimize erosion, control sedimentation, and reduce pollutants in storm water discharges from new disturbance areas. Potential indirect effects from wind erosion would be reduced by the continued implementation of dust control practices (Section 2.1.3.1). Based on the existing level of activity at the site, continued implementation of the BMPs and design features, the proposed action and connected non-federal action would not result in substantial impacts to soil.

Table 9 Proposed New Disturbance Area by Soil Unit

Map Unit Symbol	Map Unit Name	**Proposed Action** (BLM-managed land; acres)			**Connected Non-federal Action** (private land; acres)	Total Area (acres)
		Proposed Limit of Disturbance	**Dewatering Pipeline Alignment #2**	**Power Line Alignment**	**Proposed Limit of Disturbance**	
60	Santa Fe-rock outcrop complex	104	< 1	< 2	91	196
46	Pits-dumps association	< 2	-	-	-	< 2
42	Paymaster gravelly sandy loam	-	< 1	< 1	-	< 1
	Total Area	**106**	**< 1**	**< 2**	**91**	**200**

- Slight discrepancies may exist in subtotal and total values due to rounding.

3.1.1.2.2 No Action

Under the no action alternative, no additional disturbance to soils would occur beyond those which have been previously authorized, as depicted in Figure 8.

3.1.2 Geology/Mineral Resources

3.1.2.1 Affected Environment

The surficial geology in the vicinity of the Little Rock Mine is presented in Figure 9, and associated geologic cross sections are presented in Figure 10. The lithology of the rocks and sediments exposed in the area are primarily igneous and sedimentary, ranging from Precambrian to Quaternary in age. The surficial geology at the mine predominately consists of Precambrian granite; Tertiary intrusive rocks are present throughout much of the area immediately south of the Proposed Action Area. Younger geologic units, such as Gila conglomerate, Mangas conglomerate, and Quaternary alluvial deposits occupy the Mangas Valley north of the Little Rock Mine (Kolessar, 1982). Quaternary alluvium was deposited unconformably on Gila conglomerate, granite, and quartz-monzonite in many present-day drainages, including Mangas Creek and its tributary drainages, California Gulch, Deadman Canyon, and Whitewater Canyon (DBSA, 2014). On the south side of Little Rock, several large, regionally extensive quartz-monzonite porphyry dikes intrude the Precambrian granite.

The copper deposit at the Little Rock Mine is hosted in mostly Precambrian granite that has been altered by hydrothermal and supergene processes. The deposit consists of a supergene zone of copper oxides overlain by an iron oxide horizon (or leach cap) and underlain by a hypogene zone containing minor and

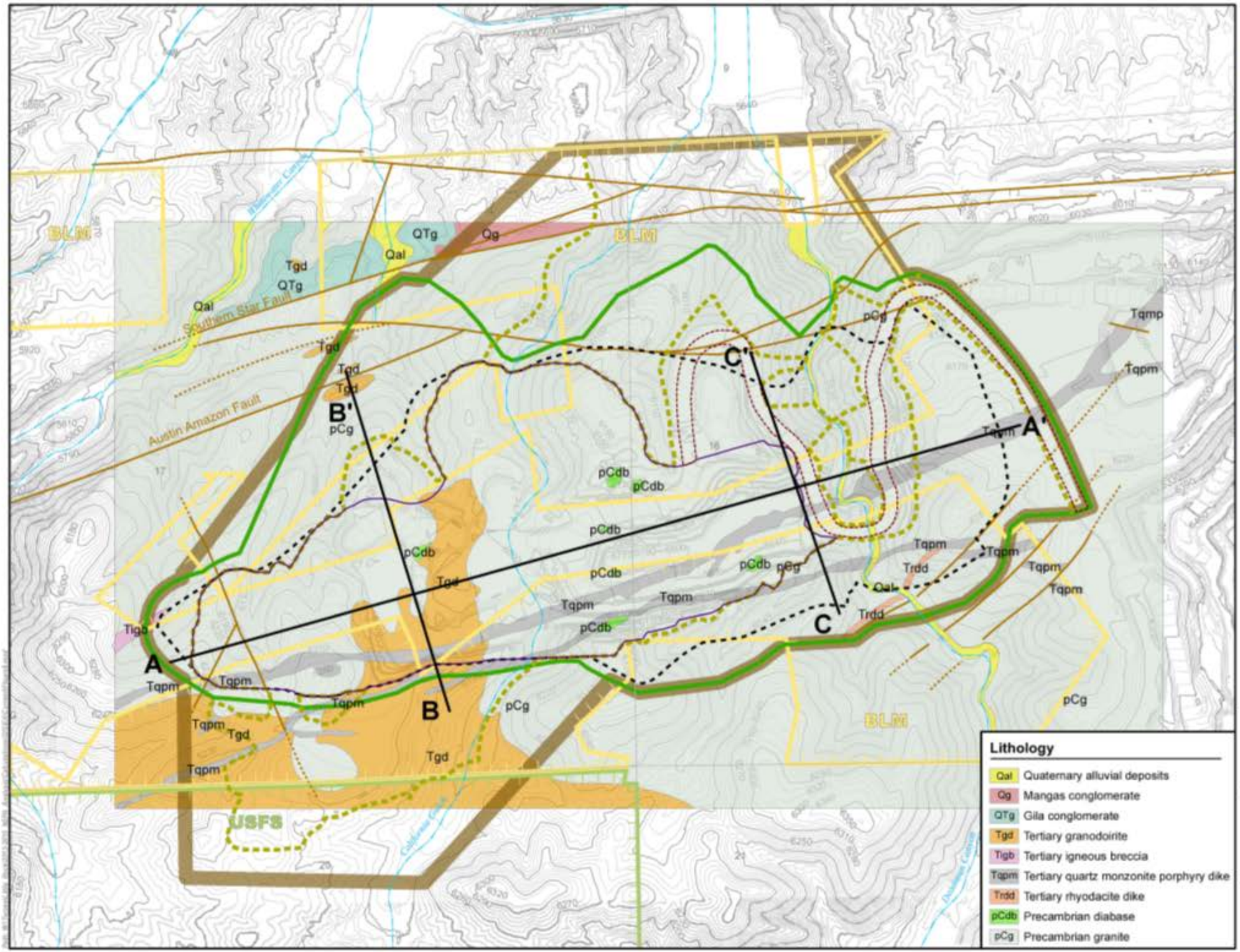

FIGURE 9
SURFICIAL GEOLOGY AND FAULTS
LITTLE ROCK MINE

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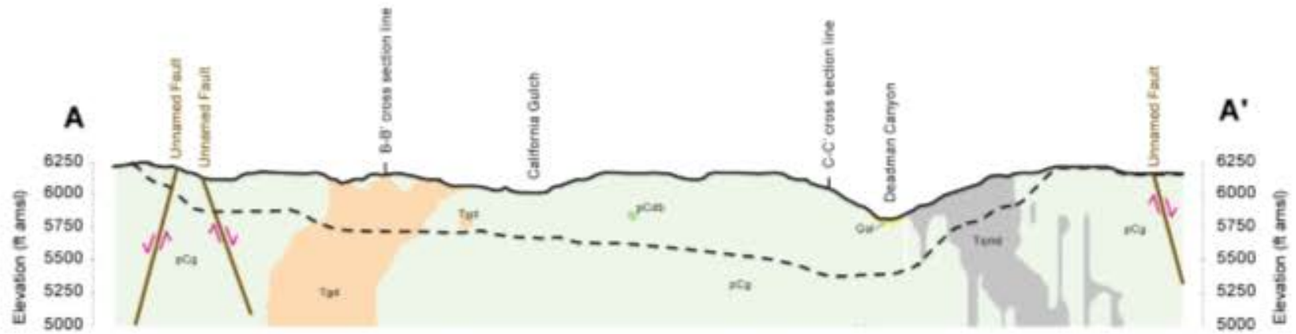

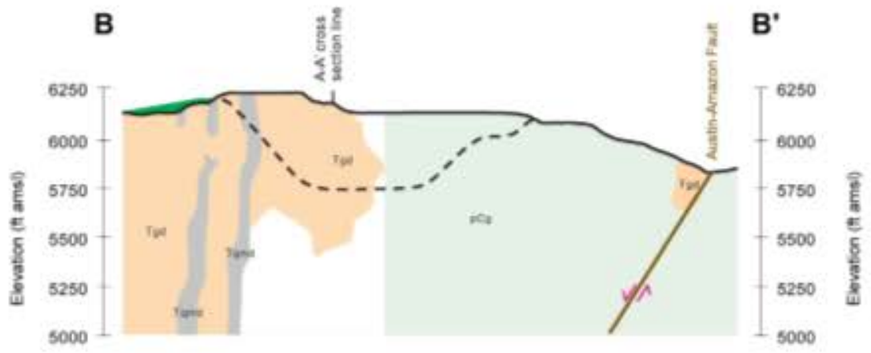

Legend

- 2010 Land Surface
- Conceptual Post-mining Open Pit Configuration
- Fault (minor faults not shown)

Lithology

- Qal Quaternary alluvial deposits
- Tgd Tertiary granodiorite
- Tqmp Tertiary quartz monzonite porphyry dike
- pCg Precambrian granite
- pCdb Precambrian diabase
- Reclaimed Copper Leach Stockpile and P-Plant Area

Adapted from Groundwater Flow and Geochemical Modeling, Little Rock Mine (DBSA, 2014)

N

FIGURE 10
GEOLOGIC CROSS SECTIONS
LITTLE ROCK MINE

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uneconomic amounts of chalcopyrite and pyrite with lesser amounts of chalcocite (DBSA, 2014). The majority of the copper oxide mineralization is steeply dipping and east-northeast trending (Figure 11). Figure 12 shows the associated cross sections of the predicted post-mining mineralization with the conceptual open pit configuration.

The predominant geologic structures in the region are sets of southwest-northeast trending faults, as depicted in Figure 9. These include the northeast-striking Austin-Amazon Fault and the east-west trending Southern Star Fault.

3.1.2.2 Environmental Consequences

3.1.2.2.1 Proposed Action

Under the proposed action and connected non-federal action, Tyrone would continue to operate the Little Rock Mine with the same techniques as currently permitted. The proposed action and connected non-federal action would affect the geology by removing an additional 115 million tons of mine rock, increasing mining from approximately 160 million tons under the no action alternative to approximately 275 million tons. The proposed action and connected non-federal action would enable mining of an additional 35 million tons of leach ore and an estimated 80 million additional tons of waste rock material beyond the no action alternative. Including current approvals (the no action alternative), a total of approximately 135 million tons of leach ore and 140 million tons of waste rock would be mined.

Material management, determinations, and destinations would not change under the proposed action/ connected non-federal action in comparison to the no action alternative, as described in Section 2.1.3.1. Ore would continue to be transported to approved, permitted facilities at the Tyrone Mine for leaching and subsequent processing of leachates at the Tyrone SX/EW facility. Waste rock would either be stockpiled at the Tyrone Mine or within a portion of the Little Rock Mine open pit, used for reclamation material, or hauled to the Tyrone Mine for disposal. The material handling plan, developed under the terms of the Tyrone Mine's DP-435 and the Little Rock Mine's DP-1236, would continue to ensure that suitable cover material is segregated and placed in overburden stockpiles and that other materials would be placed in permitted leach or waste rock stockpiles (refer to Table 5 in Section 2.1.3.1).

The material generated from the Little Rock Mine is predominantly non-acid generating copper oxide ore and overburden (leach cap), small pockets of sulfide bearing waste rock may be encountered. There is no change to the types of material encountered or generated under the proposed action/connected non-federal action in comparison to the no action alternative. As summarized in the CCP (Golder, 2014):

> The collective [acid-base accounting] data show that the sulfides have a very low potential to generate acid, with sufficient neutralizing capacity to neutralize all of the acid that may potentially be produced. The sulfide zone rocks therefore also can be classified as having a moderate to high potential to neutralize acid. This mineral type is generally considered to be non-ore rock and constitutes a very small amount of the material being mined.

There are no identified geologic conditions that would be exacerbated by the proposed action and connected non-federal action which would result in geological hazards in comparison to the no action

alternative. Mine features would be constructed in conformance with regulatory standards to minimize instability. Based on the existing level of activity at the site, the proposed action and connected non-federal action would not result in substantial impacts to geology.

3.1.2.2.2 No Action

Under the no action alternative, approximately 160 million tons of mine rock would continue to be removed, including approximately 100 million tons of leach ore and an estimated 60 million additional tons of waste rock material. No additional disturbance would occur beyond what has been previously authorized.

3.2 WATER RESOURCES

This section describes the surface water and groundwater resources occurring in the Proposed Action Area. The description includes a summary of water resources data, investigations, and assessments, updated to reflect new information or analyses where appropriate (BLM, 1997a; Tierra EC, 2010). Additionally, this section analyzes the potential environmental consequences for the activities associated with the proposed action/connected non-federal action and no action alternative presented in Section 2.0 of this EA.

Key issues related to water resources in Section 1.6.1 identified during public and agency scoping include:

- What effect would activities associated with mine construction, operation, and reclamation have on surface water quality?
- What effect would activities associated with mine construction, operation, and reclamation have on groundwater quality?

3.2.1 Surface Water

3.2.1.1 Affected Environment

3.2.1.1.1 Surface Water Hydrology

CLIMATE

Climatic variables have a direct correlation to water resources. The Little Rock Mine is located in a region of warm and dry, semiarid climate. The mean annual precipitation in the vicinity is approximately 16 inches, falling primarily as rain during the monsoon season from July through October. Snow may fall between November and March. The estimated mean annual open water evaporation rate for the Proposed Action Area is 56.5 inches (DBSA, 2014).

REGIONAL HYDROLOGY

The Little Rock Mine is located within the Upper Gila-Mangas Subbasin (Hydrologic Unit Code (HUC8) 15040002), which encompasses approximately 2,049 square miles (Figure 13). The primary drainage in this watershed is the Gila River, conveying flows from the mountains in southwestern New Mexico along the Continental Divide westward towards Arizona and the Colorado River. The Proposed Action Area lies

EXISTING 1X
CROSS-CUT CHANNEL

EXISTING DEWATERING
PIPELINE ALIGNMENT #1

BLM

BLM

PROPOSED WESTERN
HAUL ROAD

NORTH
STOCKPILE

B'

C'

A'

EXISTING
POWER LINE

PROPOSED DEADMAN
CANYON DIVERSION

A

B

C

EXISTING SEEPAGE
COLLECTION LINE

RECLAIMED LEACH
STOCKPILE AND
P-PLANT

USFS

BLM

Surface topography dated Jan 2012.
Contours within the Proposed Action Area
reflect the conceptual topography
at the end of mining.

Legend

- Proposed Action Area
- Ore (copper oxide)
- Overburden (leach cap)
- Ore (sulfide bearing rock)
- Waste rock (sulfide bearing rock)
- Unmineralized Dike
- Stockpile/fill
- BLM Managed Land
- USFS Managed Land

No Action Alternative

- Earlier, Existing and Approved Disturbance at the Little Rock Mine
- Current Open Pit Configuration
- Existing Haul Road

Features of the Proposed Action and Connected Non-Federal Action

- Proposed Limit of Disturbance Expanding the Open Pit
- Proposed Conceptual Open Pit Configuration
- Proposed Dewatering Pipeline Alignment #2
- Proposed Power Line Alignment

Private Actions (Planned)

- Dewatering Pipeline Alignment #2
- Potential Power Line Route

0 800

SCALE IN FEET

COORDINATE SYSTEM
TYRONE LOCAL MINE

FIGURE 11
PLAN VIEW OF THE PREDICTED POST-MINING MINERALIZATION
LITTLE ROCK MINE

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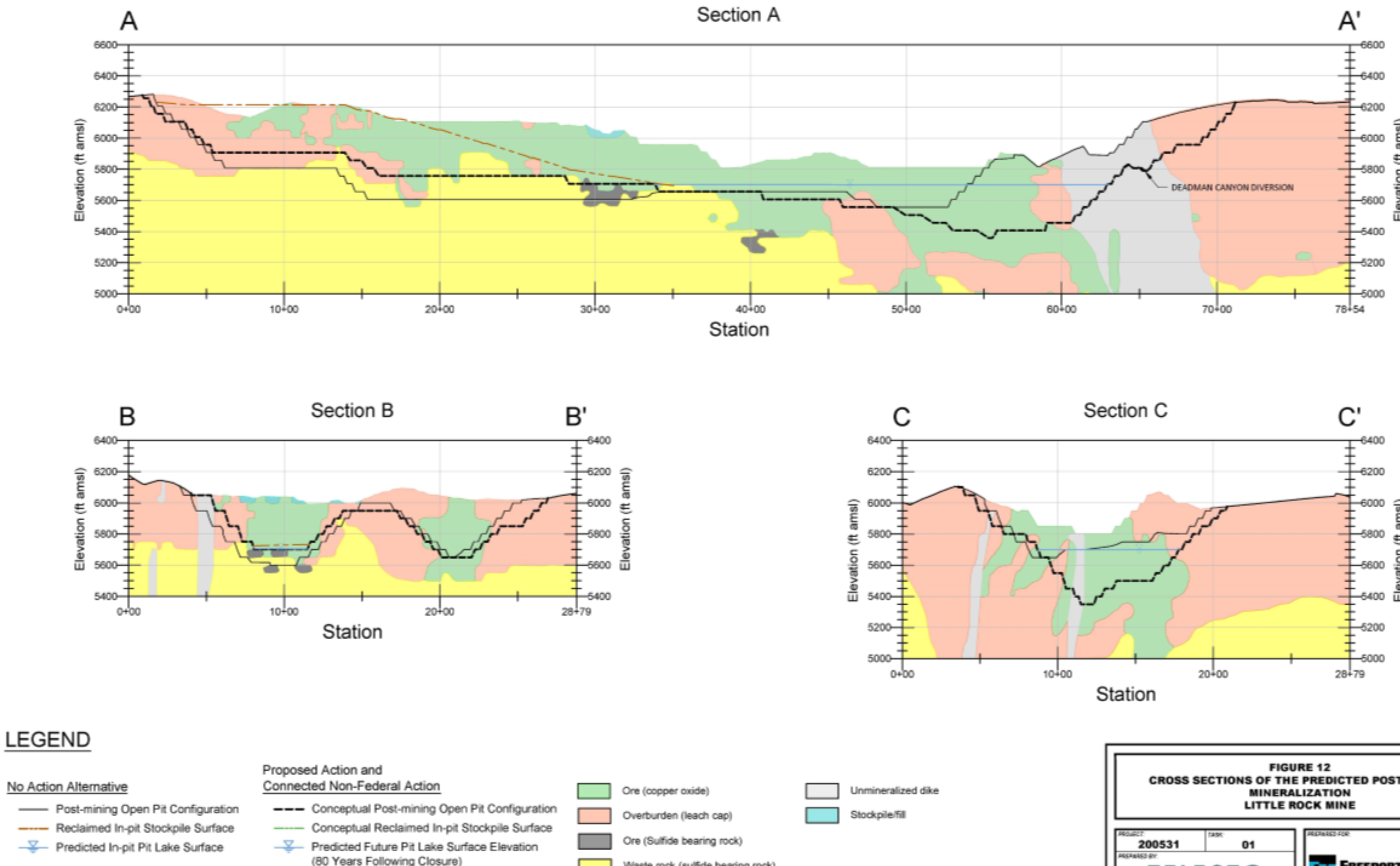
Section A
A
A'
Elevation (ft amsl)
6600
6400
6200
6000
5800
5600
5400
5200
5000
DEADMAN CANYON DIVERSION
0+00
10+00
20+00
30+00
40+00
50+00
60+00
70+00
78+54
Station
Section B
B
B'
6400
6200
6000
5800
5600
5400
0+00
10+00
20+00
28+79
Station
Section C
C
C'
6400
6200
6000
5800
5600
5400
5200
5000
0+00
10+00
20+00
28+79
Station
LEGEND
No Action Alternative
Post-mining Open Pit Configuration
Reclaimed In-pit Stockpile Surface
Predicted In-pit Pit Lake Surface
Proposed Action and Connected Non-Federal Action
Conceptual Post-mining Open Pit Configuration
Conceptual Reclaimed In-pit Stockpile Surface
Predicted Future Pit Lake Surface Elevation (80 Years Following Closure)
Ore (copper oxide)
Overburden (leach cap)
Ore (Sulfide bearing rock)
Waste rock (sulfide bearing rock)
Unmineralized dike
Stockpile/fill

FIGURE 12
CROSS SECTIONS OF THE PREDICTED POST-MINING MINERALIZATION
LITTLE ROCK MINE

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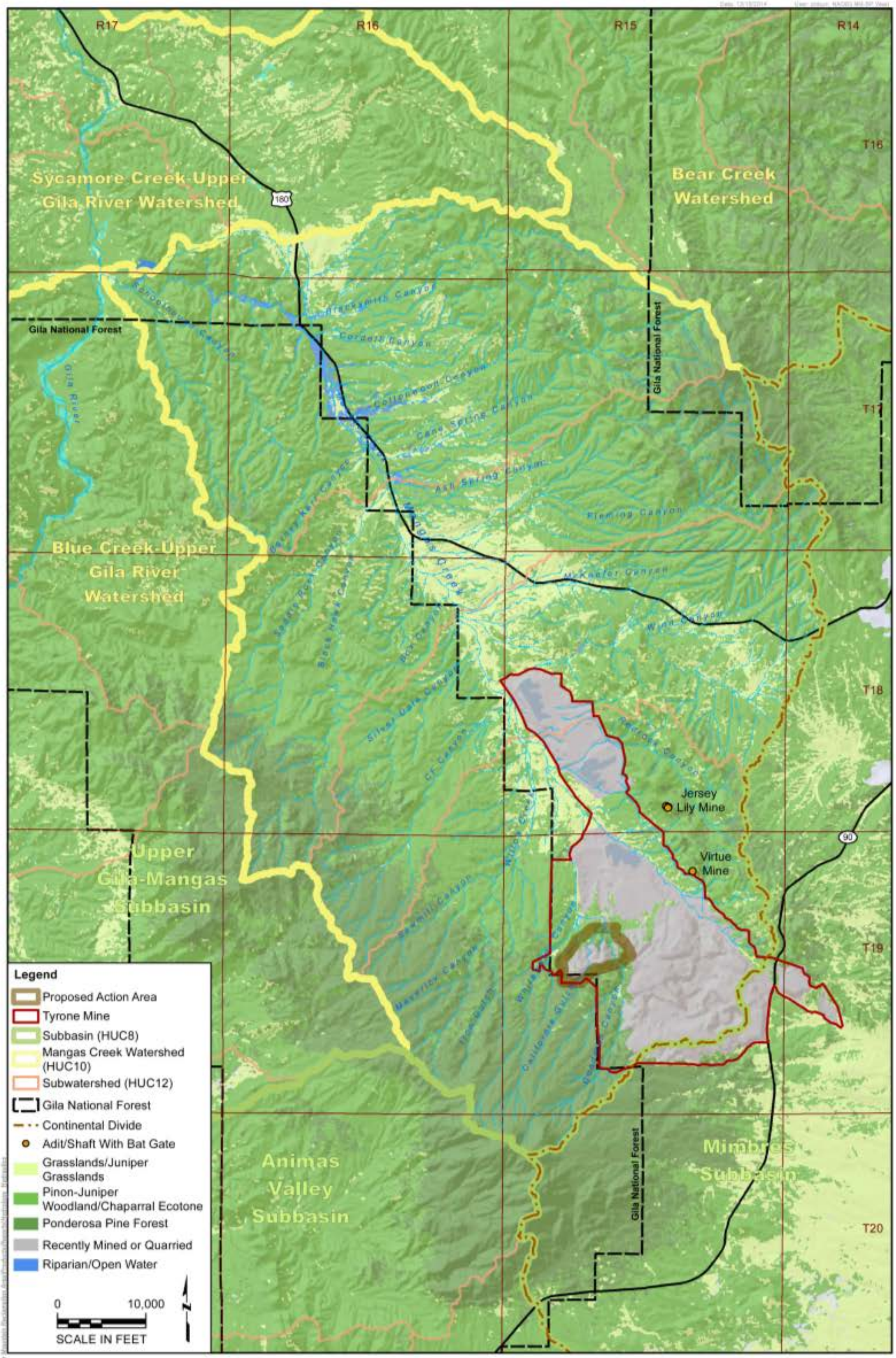

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FIGURE 13
REGIONAL SURFACE WATER HYDROLOGY AND LANDCOVER
LITTLE ROCK MINE

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within the Mangas Creek Watershed (HUC 1504000203) within the Upper Gila-Mangas Subbasin, as depicted in Figure 13.[1] The Mangas Creek Watershed includes approximately 204 square miles. Flow within Mangas Creek is ephemeral for approximately 16 miles downgradient of the Proposed Action Area until perennial flow begins at Mangas Spring, continuing approximately four additional miles to the Gila River.

LOCAL HYDROLOGY

The Proposed Action Area intersects three specific drainage areas within the Mangas Creek Watershed: Whitewater Canyon, California Gulch, and Deadman Canyon (Figure 14). These drainages have relatively steep watersheds with channels above the regional aquifer; the drainages are ephemeral, flowing from south to north in direct response to precipitation events or snowmelt.

The headwaters of Deadman Canyon originate on the northeast side of the Big Burro Mountains at an elevation of approximately 8,020 feet above mean sea level. Deadman Canyon drains an area of approximately 5.6 square miles, passing adjacent to earlier and existing mining areas of the Tyrone Mine upgradient of the Little Rock Mine. A small canyon immediately south of the current open pit configuration contributes storm water flow from approximately 54 acres and joins Deadman Canyon just upgradient of the existing spanning arch culvert.

Within the Proposed Action Area, existing, authorized disturbances along Deadman Canyon are located intermittently along the reach one-half mile north of the existing haul road crossing. These disturbances resulted from construction of the existing haul road between the Little Rock and Tyrone mines and the spanning arch culvert crossing over Deadman Canyon. Downgradient of the Little Rock Mine, Deadman Canyon transitions from a steep and narrow canyon to a distributary flow condition; California Gulch also joins Deadman Canyon in this area. In the area of the distributary flow condition, the storm water velocities slow, and sedimentation occurs. An existing earthen dike, which protects the Tyrone Mine 1X series tailings storage facility, interrupts the natural flow path; storm water flows are directed westward through the existing 1X cross-cut channel (Figure 14).[2]

California Gulch begins approximately two miles south of the Little Rock Mine and divides the Whitewater Creek and Deadman Canyon drainage areas. The current open pit configuration interrupts California Gulch; storm water flows from the upgradient, approximately 0.8 square mile watershed are directed to the main sump at the bottom of the open pit. Under existing approvals, accumulated storm water, along with groundwater inflow, is pumped to the existing 1X1 pond for use in the Tyrone Mine process water management system. Approximately one-half mile downgradient of the open pit, California Gulch joins Deadman Canyon, and empties into the 1X cross-cut channel (Figure 14).

[1] USGS HUC boundaries have been adjusted to the Watershed Boundary Dataset (NRCS, 2014), which includes changes to the Upper-Gila Mangas Subbasin (USGS, 2014).

[2] The "1X cross-cut channel" is an existing diversion of the lower reach of Deadman Canyon downgradient of the Little Rock Mine, and is sometimes labeled as "Deadman Canyon Diversion" in reference materials and reports. This terminology should not be confused with the diversion of Deadman Canyon contemplated as a part of the proposed action.

The Whitewater Canyon drainage area includes approximately 5.2 square miles to the west of the Little Rock Mine (Figure 14). The western, downgradient end of the existing 1X cross-cut channel gains the confluence of Whitewater Canyon. At this confluence, the natural flow path of Whitewater Canyon is also interrupted by an earthen dike (also diverting flows around the reclaimed, Tyrone Mine 1X series tailing storage facility). The combined flows from Deadman Canyon, California Gulch, and Whitewater Canyon are routed further to the west and then to the north in a constructed, ephemeral channel before reaching a tributary to Mangas Creek. The confluence of Deadman Canyon and California Gulch lies more than three "river" miles from Mangas Creek.

Based on the *Surface Water Hydrologic Evaluation for the Little Rock Mine* (Telesto, 2014), the estimated 100-year, 24-hour storm event reporting to the upgradient boundary of the proposed limit of disturbance from Deadman Canyon, the tributary canyon to Deadman Canyon, and California Gulch have peak flows of approximately 4,243 cubic feet per second (cfs), 182 cfs, and 385 cfs, respectively.

Springs, seeps, stock tanks, and other surface water features in the project vicinity are generally very small and produce a surface expression for small areas and/or only a short distance (Tierra EC, 2010). Springs do not contribute substantially to the surface flows in Whitewater Canyon, California Gulch, and Deadman Canyon. The springs and seeps coincide with the ephemeral washes and localized low points, providing evidence that these features are associated with local, topographically-driven flow systems rather the regional aquifer (Tierra EC, 2010). Two springs, Sugarloaf Spring and McCain Spring, are monitored quarterly under the Tyrone and/or Little Rock discharge permits.

3.2.1.1.2 Surface Water Quality

Existing Little Rock Mine permits mandate adherence to water quality standards in accordance with the New Mexico WQA and the New Mexico Water Quality Control Commission (WQCC) regulations [New Mexico Administrative Code (NMAC) 20.6]. Under the WQA and the WQCC regulations, a Discharge Permit (DP-1236) has been issued by the NMED to address operational, closure and post-closure water quality issues. Conditions of the DP-1236 provide for specific water quality monitoring and reporting. Quarterly reports are required by the NMED and must contain monitoring well water quality laboratory analyses, surface water analyses, water level data, potentiometric surface maps, leach stockpile subsurface collection trenches seep quality, leach stockpile collection trenches and Ohio Dam flow rates, spring discharge rates, and summaries of daily weather data. Water quality monitoring and sampling points are shown in Figure 15. In addition, the NMMA Closeout Plan is protective of air quality, surface water quality, and groundwater quality.

DP-1236 also requires an Operational Plan, a Corrective Action Plan, a Contingency Plan, and a Closure Plan. Collectively, these plans provide the mechanisms for the regulatory agencies to collect ongoing and real-time data related to mine operations, continuously monitor, model and project potential impacts to the environment, document compliance, and immediately react and mitigate these potentials where conditions warrant. Specific requirements of the Discharge Permit related to water quality are summarized in the 2010 analysis by Tierra EC and are detailed in the permit itself.

In addition, the MSGP requires implementation of BMPs as specified in the Tyrone SWPPP. The SWPPP requires that impacts from erosion and sedimentation in downgradient surface waters be controlled.

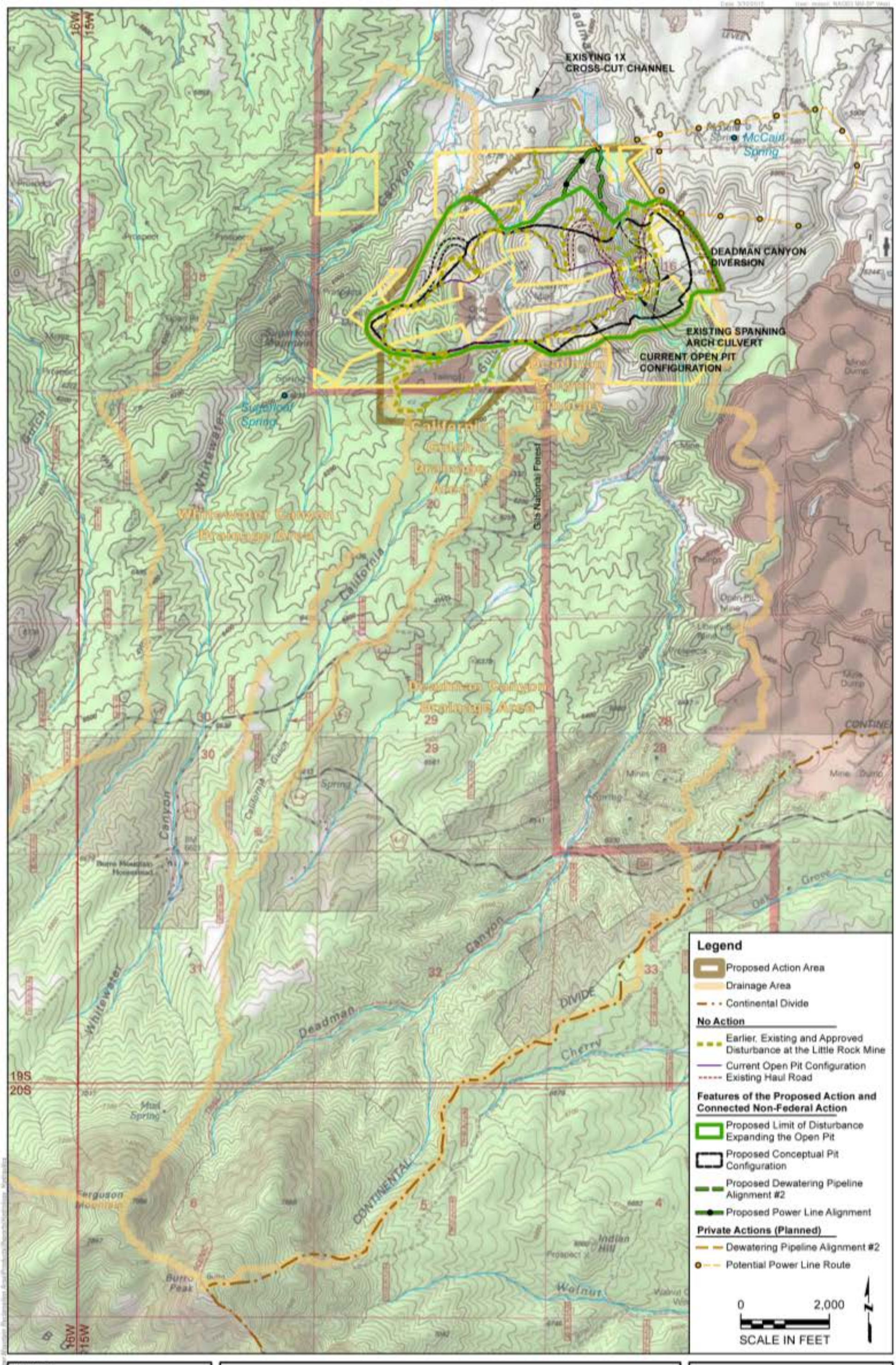

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FIGURE 14
PROPOSED ACTION AREA DRAINAGES
LITTLE ROCK MINE

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EXISTING 1X CROSS-CUT CHANNEL

LRW-6

EXISTING DEWATERING PIPELINE ALIGNMENT #1

1236-2012001

Bluebird Canyon

PROPOSED WESTERN HAUL ROAD

LRFS-3

DM-4

LRAI-1

Drop Dam

EXISTING HAUL ROAD

CURRENT OPEN PIT CONFIGURATION

LRW-5

LRFS-2

SWDM-6

SWDM-7

SWDM-9

SWDM-8

SWDM-10

SWDM-12

SWDM-11

EXISTING POWER LINE

PROPOSED DEADMAN CANYON DIVERSION

CLDS-1

LRW-4

CLDS

LRFS-1

EXISTING SEEPAGE COLLECTION LINE

RECLAIMED LEACH STOCKPILE AND P-PLANT

Sugarloaf Spring

California Gulch

Deadman Canyon

LRW-5

Surface topography dated Jan 2012. Contours within the Proposed Action Area reflect the conceptual topography at the end of mining.

Legend

- Proposed Action Area
- Regional Monitor Well
- Former Monitoring Well (removed, plugged and/or abondoned)
- Storm Water Outfall
- Surface Water Monitoring Location
- BLM Managed Land
- Earlier, Existing, and Approved Disturbance
- USFS Managed Land

No Action Alternative

- Earlier, Existing and Approved Disturbance at the Little Rock Mine
- Current Open Pit Configuration
- Existing Haul Road

Features of the Proposed Action and Connected Non-Federal Action

- Proposed Limit of Disturbance Expanding the Open Pit
- Proposed Conceptual Open Pit Configuration
- Proposed Dewatering Pipeline Alignment #2
- Proposed Power Line Alignment

Private Actions (Planned)

- Dewatering Pipeline Alignment #2
- Potential Power Line Route

0 800

SCALE IN FEET

COORDINATE SYSTEM
TYRONE LOCAL MINE

FIGURE 15
PROPOSED ACTION AREA MONITORING LOCATIONS LITTLE ROCK MINE

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3.2.1.2 Environmental Consequences

3.2.1.2.1 Proposed Action

SURFACE WATER HYDROLOGY

The current open pit configuration (under the no action alternative) would encompass approximately 197 acres. Under the proposed action and connected non-federal action, the conceptual open pit configuration would include an additional 131 acres, for a total of approximately 328 acres. The additional area encompassed by the open pit (west of the Deadman Canyon diversion) would no longer contribute storm water runoff to downgradient drainages. The loss of 131 acres represents less than a 0.1 percent change to the cumulative watershed of Mangas Creek at its confluence with the Gila River (Tierra EC, 2010). Tyrone holds surface water rights issued by the New Mexico Office of the State Engineer for the waters that would be temporarily and permanently collected or diverted under both the proposed action/connected non-federal action and the no action alternative.

In addition, the conceptual open pit configuration would include the current location of the Deadman Canyon diversion under the proposed action and connected non-federal action. The conceptual open pit configuration would also interrupt the small canyon on the south side of the mine which contributes storm water flows to Deadman Canyon. Storm water flows in Deadman Canyon and the canyon would be diverted along the eastern highwall of the open pit through a constructed channel, as depicted in Figure 3. The channel would be designed to carry the flows resulting from the 100-year, 24-hour storm event (approximately 4,400 cfs). The diversion would be designed to comply with applicable local, state, and Federal law and regulations. Flows greater than 4,400 cfs would overflow the inlet structure and be directed to the open pit. Given the rarity of this size storm event, which, by definition, has a 1 percent chance of occurrence in a given year, there would be no effect to water quantity from the reduction in peak flows from extreme storm events.

As described in Section 1.0, the construction, operation, and reclamation of the dewatering pipeline alignment #2 and rerouted power line would not impede or detain storm water flows.

Once mining is complete, storm water flows in California Gulch would continue to discharge into the reclaimed open pit (as permitted under the no action alternative) and storm water flows in Deadman Canyon would be routed around the open pit via the diversion. As with the no action alternative, pit dewatering would cease post-mining, allowing the formation of a pit lake. The pit lake is discussed in Section 3.2.2.2.1.

SURFACE WATER QUALITY

As a result of construction activities, erosion and sediment transport may increase slightly in the short-term, downgradient of the Deadman Canyon diversion. The diversion would be constructed with grade control structures to facilitate sediment deposition in the channel. An outlet structure would be designed to transition the hydraulic properties of the flow from the constructed channel to the existing location and flow condition in the natural channel. As added protection to control sedimentation, the depositional area upgradient of the existing 1X cross-cut channel would continue to serve as a sedimentation basin before storm waters are conveyed further downgradient. Given the existing, disturbed nature of the canyon walls

and channel bottom and the application of BMPs and design features to control erosion and sedimentation, a substantial change would not be expected to downgradient water quality.

As shown in cross section A-A' in Figure 12, the diversion would receive storm water runoff from the inert, unmineralized zone of the pit wall lying directly above the diversion. Tyrone would continue to comply with applicable state and Federal water pollution control regulations to prevent the degradation of water quality. Surface water quality would continue to be monitored through the post-closure period. The primary sampling and testing requirements would continue to be mandated by DP-1236 and the SWPPP under the MSGP.

Deadman Canyon is considered waters of the U.S. Tyrone is coordinating with the U.S. Army Corps of Engineers (Corps) to gain the appropriate permits and approvals for the potential placement of fill into waters of the U.S. along Deadman Canyon.

3.2.1.2.2 No Action

Under the no action alternative, Tyrone would continue activities previously authorized under existing permits and approvals. California Gulch would continue to be routed into the open pit. Deadman Canyon would remain in its current state. Similar to the proposed action, once mining is complete and dewatering of the open pit ceases, the open pit would begin to fill with groundwater, direct precipitation, and storm water from California Gulch creating one or more pit lakes. Discussion of the pit lake is presented in Section 3.2.2.2.2.

3.2.2 Groundwater

3.2.2.1 Affected Environment

REGIONAL HYDROGEOLOGY

Characterization of the aquifer systems in the regional area (generally, western Grant County) is documented in *Groundwater Model Technical Report* (Dames & Moore, 1995):

- The Gila Conglomerate contains the principal aquifer in Grant County. The Gila Conglomerate aquifer consists of two members. The upper member is less consolidated than the lower member, and can provide large yields in wells, up to 1,000 gallons per minute (gpm). The more consolidated, lower member is generally a very poor producer, with yields averaging less than 2 gpm. The Gila Conglomerate aquifer is generally found north of the Proposed Action Area.
- Alluvium is generally thin to nonexistent, except along surface water courses and inner valley areas. Yields from wells along perennial streams can be high, due to surface water recharge. However, wells completed in the alluvial valleys have wide seasonal fluctuations in water levels, and large yields cannot be sustained.
- In general, depths to groundwater are greater in the mountain areas than in the valleys. Groundwater tends to move from the upland areas towards major valleys, and then along the direction of major valleys. Perched water layers can be found within the alluvium of some tributaries, at least seasonally. Overall, the depth to groundwater in the region has been recorded at 20 to 320 feet below the ground surface (NMED, 2000).

- Recharge to the regional aquifer primarily comes from infiltration of snowmelt and rainfall events through bedrock fractures. Recharge to the perched alluvial aquifer is seasonal and comes primarily through infiltration from surface waters. It is believed that recharge occurs from the alluvial to the regional aquifer, at least on a seasonal basis.

LOCAL HYDROGEOLOGY

Groundwater in the vicinity of the Little Rock Mine exists primarily within the intrusive, igneous rocks present in the area, including Precambrian granite and Tertiary granodiorite. The lithology and structural setting of these units are described in Section 3.1.2. Groundwater occurrence and flow within the igneous rocks is controlled by secondary permeability (flow within joints, fractures, and faults). Geologic structures such as the Austin-Amazon Fault, Southern Star Fault, and the Tertiary quartz-monzonite porphyry dikes that are present in the area act as groundwater flow barriers due to their low permeability (DBSA, 2014). The Austin-Amazon and Southern Star faults are located to the northwest and north of the Little Rock Mine (respectively), and the Tertiary quartz-monzonite dikes trend southwest to northeast along the south side of the open pit (Figure 9).

The predominant groundwater flow direction is to the east-northeast, where groundwater flow is captured by the main pit at the Tyrone Mine. Groundwater that flows north across the Southern Star Fault enters saturated Gila Conglomerate (DBSA, 2014); however, this component of groundwater flow is expected to be small due to the low permeability of the Southern Star Fault. Recharge to the regional groundwater system occurs chiefly from infiltration of snowmelt and rainfall through bedrock fractures.

GROUNDWATER QUALITY

In accordance with DP-1236, groundwater quality monitoring data are collected from several wells in the vicinity of the Little Rock Mine (Figure 15).[1] The naturally occurring, deep and shallow groundwater quality upgradient of the Little Rock Mine can be summarized as generally meeting the standards reported in 20.6.2 NMAC Section 3103, with the exception of fluoride and manganese. BLM (1997a) reported elevated fluoride and manganese concentrations in wells in non-impacted areas upgradient of the Little Rock Mine ore body and elevated manganese in Sugarloaf Spring. Naturally occurring, elevated

[1] In accordance with DP-1236, existing groundwater monitoring wells are sampled quarterly. Seven monitoring wells were constructed in 1995, four of which are located within the current open pit configuration (refer to Figure 15). Wells LRW-2, LRW-3, and LRW-7, located within the footprint of the current configuration of the open pit, have been plugged and abandoned; LRW-1 has been inaccessible due to current mining activities and will be mined out and abandoned under existing operations. Well LRW-6, replaced by well 1236-2012-01, has been dry for several years and will also be abandoned under existing operations. Considering the anticipated drawdown of groundwater during active mining in the immediate vicinity of the open pit, Tyrone and NMED have jointly agreed to select locations for replacement monitoring wells later in the mining sequence of Little Rock. Replacement wells may be located within the proposed limit of disturbance; if replacement wells are proposed on lands managed by the BLM beyond the proposed limit of disturbance, then Tyrone would coordinate with BLM to obtain concurrence or the appropriate approval.

Existing wells outside of the conceptual open pit configuration that are expected to remain in place and continue to be sampled through post closure, include LRW-4 near the reclaimed p-plant; LRW-5 located upgradient of the open pit in California Gulch; and 1236-2012-01 located north and downgradient of the open pit (Figure 15).

background concentrations of fluoride and manganese have been confirmed in some groundwater wells in the vicinity of the Little Rock and Tyrone mines through ongoing monitoring (DBSA, 2014).

In general, natural fluoride is produced from volcanic rocks (Hem, 1985). In circum-neutral to alkaline waters, fluoride concentrations near host minerals (*e.g.*, fluorite) are elevated. Thus, fluoride tends to occur at higher concentrations very near volcanic rocks (source) in alkaline groundwater. As the groundwater and fluoride move from the source, fluoride may drop out due to geochemical equilibrium with host aquifer minerals (or lack thereof) or dilution, creating observable variability. This variability is common throughout the desert southwest, as shown by Robertson (1988).

Reflecting earlier operations, LRW-1 (in the northern lobe of the current open pit configuration and near the Ohio Mine area) and LRW-4 (near the now reclaimed leach stockpile and p-plant) have historically exhibited poorer water quality, with sample results exceeding Section 3103 standards for pH, several metals, fluoride, manganese, sulfate, and/or total dissolved solids (TDS). The source of impacted water observed at LRW-1 is likely associated with the earlier operations at the Ohio Mine; this area will be mined under both the proposed action and no action alternative.

The source of impacted water observed at LRW-4 is considered to be the reclaimed leach stockpile and p-plant. Reclamation of this area was completed in 2010 by regrading and construction of a vegetated soil cover. Shallow groundwater in this vicinity would continue to be captured under the proposed action. The water quality at LRW-5, which is completed in quartz-monzonite upgradient of the Little Rock Mine, has remained stable and continues to meet Section 3103 standards (DBSA, 2014).

Perched groundwater occurs in the shallow alluvium beneath the Deadman Canyon and California Gulch drainages. The groundwater occurring in the alluvium is limited to the alluvial sediments overlying the bedrock, and the intermittent saturation of the alluvium in these drainages primarily occurs during spring and summer runoff events. The shallow groundwater within the Deadman Canyon alluvium is currently impacted from upgradient mining activities, unrelated to the Little Rock Mine. As discussed in Section 4.0, Tyrone has described and addressed these impacts in the proposed *Tyrone Stage 2 Abatement Plan Proposal* (DBSA, 2012), submitted to the NMED under 20.6.2 NMAC Section 4106.

Springs, seeps, stock tanks, and other surface water features within a five-mile radius of the Little Rock Mine were investigated (Tierra EC, 2010). Hydrogeologic flow modeling indicated that a five-mile radius around the mine permit boundary encompassed the projected cone of depression due to groundwater withdrawal. The springs, seeps, stock tanks, and other surface water features observed were generally very small and produce a surface expression for small areas and/or only a short distance. A field reconnaissance survey (Tierra EC, 2010) allowed for an evaluation of the potential for the source water for the spring/seep to be connected to the regional groundwater table versus a more localized/ perched water source, including observation of the following:

- Elevation of the spring in relation to other surface features
- Source and flow rate of spring
- Lateral alignment of springs at similar elevations
- Vegetation in the vicinity of the spring/seep
- Likelihood for seasonal versus perennial flow based on vegetation

Seeps and springs do not contribute substantially to the surface flows in Whitewater Canyon, California Gulch, and Deadman Canyon. Further, these features coincide with the ephemeral washes and localized low points, providing evidence that seeps and springs in the project vicinity are associated with local, topographically driven flow systems rather than the regional aquifer (Tierra EC, 2010).

3.2.2.2 Environmental Consequences

Groundwater quantity and quality would continue to be monitored and protected under the proposed action and connected non-federal action or the no action alternative in accordance with the requirements of DP-1236 and other applicable Federal and state permits and regulations.

3.2.2.2.1 Proposed Action

To project the effects to groundwater quantity and quality from the proposed action and connected non-federal action, a predictive groundwater flow model was developed to simulate:

- Drawdown at the end of mining due to pit dewatering
- Estimated groundwater inflow rates to the pit lake
- Groundwater level elevations and flow directions
- Pit lake water levels, areas, and volumes
- Long-term pit lake water quality

The results of the predictive model are summarized herein; details of the groundwater modeling are presented in *Groundwater Flow and Geochemical Modeling, Little Rock Mine* (DBSA, 2014).

Under the proposed action and connected non-federal action, the open pit would expand primarily to the north and east, and the open pit would be advanced deeper than under the no action alternative. This expansion would excavate portions of the quartz-monzonite dikes at a depth below the regional water table. Removing portions of these low-permeability geologic structures would allow groundwater from the south to more readily flow to the Little Rock Mine open pit (DBSA, 2014). Similar to the no action alternative, the open pit would require dewatering efforts for the duration of mining operations. During mining, overburden material would be stockpiled in the northern and western portion of the conceptual open pit configuration. Once dewatering activities cease at the end of mining, a pit lake would form in the southeastern portion of the open pit (Figure 6). A pit lake would also form under the no action alternative.

As presented in *Groundwater Flow and Geochemical Modeling* (DBSA, 2014), the surface elevation of the pit lake is predicted to reach 5,700 feet once pit lake water levels stabilize, roughly 80 years after closure. Under the proposed action and connected non-federal action the pit lake would cover approximately 42 acres and hold an estimated 5,300 acre-feet of water. Due to the predicted area of the long-term pit lake surface, a substantial portion of the water flowing into the lake would evaporate; approximately 76 percent of the total inflow would be lost to evaporation at the 5,700-foot level. A smaller quantity of water is predicted to flow through the pit lake and discharge to groundwater along the northeast portion of the open pit. Groundwater derived from the pit lake is expected to flow toward the main pit at the Tyrone Mine, which would continue to be dewatered post-closure (Figure 16).

DRAWDOWN

During operations, the dewatering of the open pit would cause a groundwater cone of depression. In order to assess potential impacts to nearby residents, DBSA (2014) predicted the potential drawdown levels at the end of mining. As depicted in Figure 16, this assessment generally aligns with previous predictions (BLM, 1997a and Tierra EC, 2010; also refer to discussion under the no action alternative in Section 3.2.2.2.2). At the maximum depth of pit dewatering, the 1-foot drawdown (drop in groundwater elevation) is approximately 4,000 feet upgradient of the edge of the open pit in the direction of the Tarulli well and Red Rock subdivision. Given that the Tarulli well and Red Rock subdivision are more than approximately 9,000 and 16,000 feet from the edge of the pit, respectively, no measurable drawdown is anticipated at these locations. In the direction of the Burro Mountain Homestead, the 1-foot drawdown is approximately 6,500 feet from the edge of the open pit while the closest Burro Mountain Homestead well is over 12,000 feet removed. Thus, drawdown is not anticipated to be detected at the Burro Mountain Homestead wells.

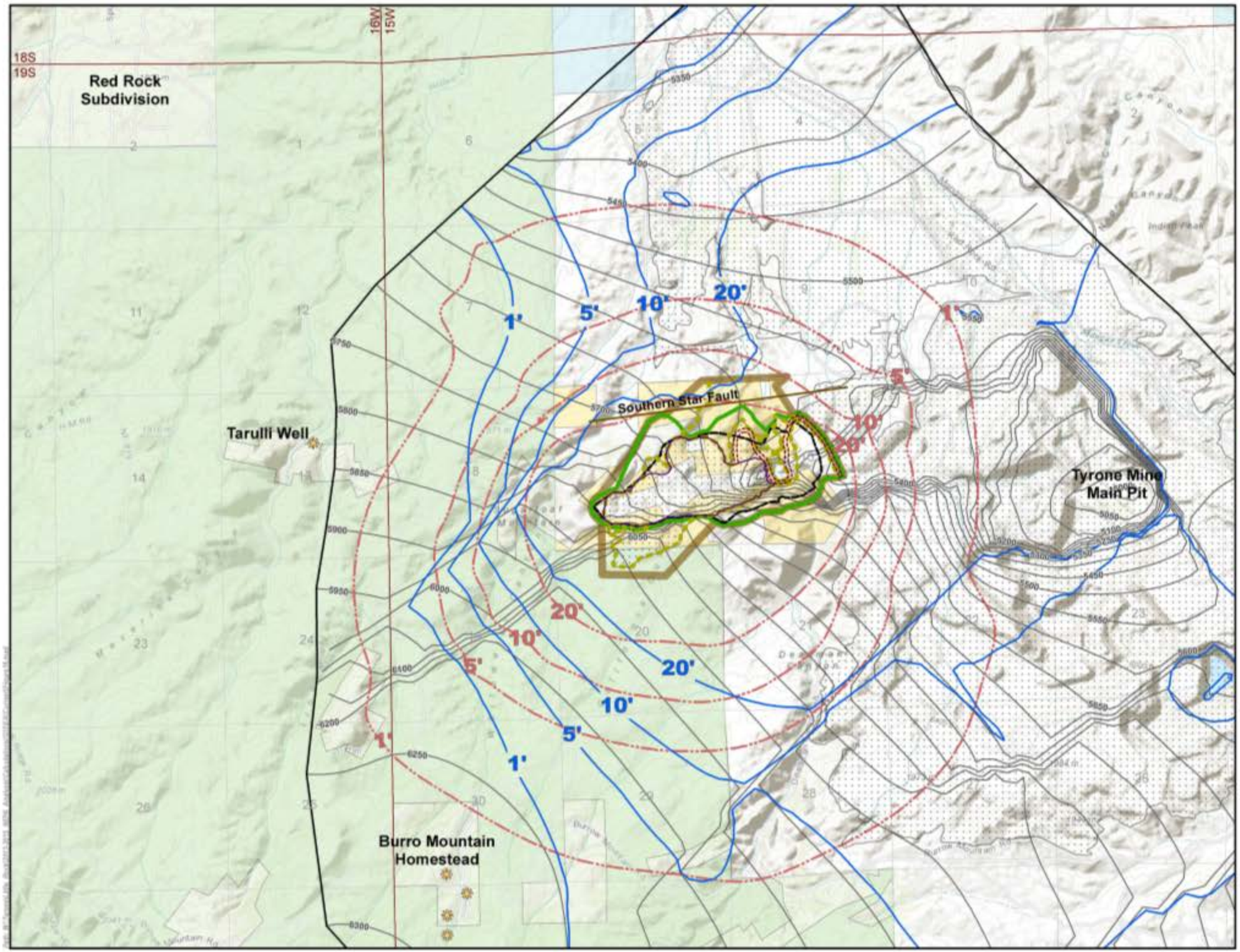
SEEPS AND SPRING

Hydrogeologic investigations indicate that the groundwater sources for the springs and seeps are not connected with the regional aquifer system; springs and seeps in the area are fed by perched groundwater, and would not be impacted by groundwater withdrawals to support mining activities under the proposed action and connected non-federal action and the no action alternative (Tierra EC, 2010).

WATER QUALITY

The *Groundwater Flow and Geochemical Modeling* report (DBSA, 2014) describes the approach to predicting the long-term water quality of the future pit lake which would develop within the open pit post-mining. The approach calculates the effects of mixing groundwater inflows, direct precipitation, and storm water runoff within the pit lake. Geochemical equilibrium and mass balance calculations predict the concentration of water quality constituents within the pit lake and groundwater outflow. Table 10 lists the predicted concentrations of selected constituents in comparison to the numerical 20.6.2 NMAC Section 3103 groundwater quality standards. The pH is predicted to be slightly alkaline, and the concentration of water quality constituents are projected to be similar to the non-impacted, inflowing groundwater quality exhibited by LRW-5 and storm water inflows from California Gulch. The predicted water quality would be below these standards, excepting fluoride, similar to the naturally elevated background concentration of fluoride observed in some monitoring wells in the vicinity.

Table 10 also shows an increase in concentration for some constituents between the 30- and 100-year predictions (*e.g.*, chloride). This is a result of the ongoing evaporative loss of water from the pit lake surface. The effect of this evapo-concentration does not change constituents that are in chemical equilibrium with the minerals in the pit walls and lake (*e.g.*, copper), and the effect of evapo-concentration would be similar to those predicted to occur under the no action alternative.



Legend

- Proposed Action Area
- Earlier, Existing, and Approved Disturbance
- 2014 Drawdown
- 2010 Drawdown
- Model Edge
- End of Mining Groundwater Contour
- Groundwater Well
- BLM Managed Land
- USFS Managed Land
- State Managed Land
- Private Land (No Color)

No Action Alternative

- Earlier, Existing and Approved Disturbance at the Little Rock Mine
- Current Open Pit Configuration
- Existing Haul Road

Features of the Proposed Action and Connected Non-Federal Action

- Proposed Limit of Disturbance Expanding the Open Pit
- Proposed Conceptual Open Pit Configuration
- Proposed Dewatering Pipeline Alignment #2
- Proposed Power Line Alignment

Goundwater modeling and results based on Groundwater Flow and Geochemical Modeling, Little Rock Mine (DBSA, 2014)

0 3,000

SCALE IN FEET

COORDINATE SYSTEM
TYRONE LOCAL MINE

FIGURE 16
SIMULATED GROUNDWATER DRAWDOWN AT LITTLE ROCK MINE

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Table 10 Predictive Geochemical Modeling Results for the Pit Lake

Constituent	Concentration (mg/L) [a]		
	20.6.2 NMAC Section 3103 Groundwater Quality Standard	**30 Years after Closure**	**100 Years after Closure**
pH (standard units)[c]	6 to 9	7.87	7.90
Aluminum	5.0	0.707	0.953
Arsenic	0.1	0.030	0.040
Boron	0.75	0.039	0.053
Bicarbonate	--	282	297
Cadmium	0.01	0.0035	0.0048
Calcium	--	69.3	65.8
Carbonate	--	1.02	1.15
Chloride	250	28.5	38.3
Chromium	0.05	0.0061	0.0082
Cobalt	0.05	0.0013	0.0013
Copper	1.0	0.12	0.12
Fluoride	**1.6**	**2.23**	**3.01**
Iron	1.0	0.00030	0.00030
Lead	0.05	0.0038	0.0055
Magnesium	--	24.5	32.9
Manganese	0.2	0.11	0.11
Nickel	0.2	0.021	0.028
Potassium	--	7.01	9.60
Sodium	--	47.4	63.6
Sulfate	600.0	95	128
Total dissolved solids	1,000.0	558	641
Zinc	10.0	0.22	0.30

(DBSA, 2014)

[a] Concentrations listed in mg/L unless otherwise noted.

Bold indicates values exceeding the 20.6.2 NMAC Section 3103 standard.

Groundwater sampling would continue through mining and reclamation, and then for 30 years following completion of final reclamation. Groundwater monitoring requirements are detailed in DP-1236. Monitoring wells would continue to be maintained, or would be replaced as needed, to facilitate monitoring through closure and post-closure. At least four productive groundwater monitoring wells are anticipated post-reclamation, which include two wells upgradient of the open pit and two downgradient. These may include the existing groundwater monitoring wells or targeted replacement wells. If needed, replacement wells would be designed to ensure that groundwater samples are collected at a depth representative of the pit lake and potential discharges to groundwater. The groundwater sampling frequency is anticipated to reduce gradually over time, from quarterly to semi-annual and then to annual. Post-closure groundwater monitoring would be performed in accordance with DP-1236 and 20 NMAC 6.2 Section 3107.

Tyrone holds water rights issued by the State Engineer, both for the use of these waters and for any respective impacts to recharge. There would be no increase of water use beyond those allocated amounts

permitted by the state under the proposed action and connected non-federal action and the no action alternative.

3.2.2.2.2 No Action

Similar to the proposed action and connected non-federal action, one or more pit lakes would form at the end of mining under the no action alternative. The 1997 Final EIS reports that the pit lake would reach an elevation of approximately 5,730 feet. The water entering the pit would evaporate or follow the predominant groundwater gradient toward the Tyrone Mine open pit. Water quality of the pit lake was estimated to exceed the Section 3103 standard of 1.6 mg/L for fluoride (BLM, 1997a). While the groundwater modeling methodology has been refined, no major differences in the projected water quality of the pit lake would be anticipated under the proposed action and connected non-federal action versus the no action alternative.

A groundwater drawdown analysis (Tierra EC, 2010) generally aligns with the results presented in the 1997 Final EIS (BLM). The projected groundwater drawdown would be similar under the proposed action and connected non-federal action and the no action alternative, as depicted in Figure 16. Under the no action alternative:

- Groundwater drawdown of up to 10 feet would be predicted to extend for distances of up to 7,000 feet from the pit due to mine dewatering.
- The 2010 groundwater flow model predicted that the dewatering drawdown would not extend from the mine pit as far as the new domestic groundwater well (Tarulli well).
- Well(s) at the Burro Mountain Homestead would not be affected by dewatering drawdown.
- Well(s) at the Red Rock subdivision, located northwest of the Proposed Action Area would also be beyond the area affected by dewatering drawdown.

As predicted in the 1997 Final EIS, groundwater levels would require over 50 years to rebound back to pre-mining conditions (BLM, 1997a). Tyrone holds water rights issued by the State Engineer, both for the use of these waters and for any respective impacts to recharge. There would be no increase of water use beyond those allocated amounts permitted by the state under the proposed action and connected non-federal action and the no action alternative.

3.3 BIOLOGICAL RESOURCES

This section describes the biological resources of the Proposed Action Area, including vegetation, general wildlife species, special status species, and migratory birds. As described in Section 1.1, an extensive project record documents the existing approvals and NEPA analyses associated with the Little Rock Mine. Collectively, the project record and associated approvals have established the baseline condition at the Little Rock Mine, and the current and ongoing operations, in accordance with the 1993 MPO, as modified, comprise the no action alternative against which potential effects resulting from the proposed action and connected non-federal action can be measured. The project record includes these investigations and conclusions of the baseline condition (the no action alternative):

- Surveys for potential Chiricahua leopard frog *(Rana chiricahuensis)* habitat and in-depth evaluation of the potential for effects (Tierra EC, 2010). The BLM concluded that the Little Rock Mine did not support Chiricahua leopard frog habitat and provided a determination of no effect to this species.
- A review of the list of special status species and critical habitat (including USFS sensitive species), the potential for occurrence in the project area, and definitive effects determinations with appropriate rationale. The BLM concluded no adverse effect would occur to special status species or critical habitat.
- A stand-alone effects determination for identified critical habitat in the project vicinity for southwestern willow flycatcher *(Empidonax traillii extimus)*, loach minnow *(Tiaroga cobitis)*, and spikedace *(Meda fulgida)*. The BLM concluded that there would be no effect on these species.
- An assessment of the potential impacts to water quality and flow regime in Mangas Creek and the Gila River and species that may occur there. The BLM concluded that downstream effects on water resources and in the Mangas Valley and Gila River would be insignificant.
- A review and analysis of the potential effects to Management Indicator Species for the Gila National Forest. The BLM and USFS concluded the baseline condition may affect, but would not be likely to adversely affect mule deer, representing Management Indicator Species.

An evaluation of the potential for special status species and critical habitat to occur in the project area was again updated in 2013 as part of the approval of a minor modification to the 1993 MPO (Tyrone, 2013a).

Given the extensive and recent analysis and documentation that exists in the project record to support the baseline condition which comprises the no action alternative presented in this EA, the description of biological resources presented herein summarizes this record and supplements and updates the data, investigations, and assessments to reflect new information or analyses where appropriate. Additionally, this section reports the potential environmental consequences related to the baseline condition/no action alternative and analyzes the potential environmental consequences of the activities associated with the proposed action/connected non-federal action presented in Section 2.0 of this EA.

Key issues related to biological resources in Section 1.6.1 identified during public and agency scoping include:

- What effect would the construction, operation, and reclamation of the Deadman Canyon diversion have on wildlife movement, habitat, and habitat connectivity?
- What effect would mine construction, operation, and reclamation have on vegetation?
- What effect would activities associated with mine construction, operation, and reclamation have on birds, wildlife, and sensitive species?

3.3.1 Vegetation

3.3.1.1 Affected Environment

The vegetation occurring in the Proposed Action Area consists of grassland/juniper grassland, piñon-juniper woodland/chaparral ecotone, ponderosa pine forest, and previously disturbed areas (Figure 17).[1] A sampling of species typically found in these vegetation communities in the Proposed Action Area include netleaf oak *(Quercus rugosa)*, shrub live oak *(Quercus turbinella)*, alligator juniper *(Juniperus deppeana)*, ponderosa pine *(Pinus ponderosa)*, and piñon pine (*Pinus edulis*). A number of other shrubby species are present including: rabbitbrush *(Chrysothamnus* spp.*)*, fairy duster *(Calliandra humilis)*, apache plume *(Fallugia paradoxa)*, desert willow (*Chilopsis linearis*), broom snakeweed *(Gutierrezia sarothrae)*, wolfberry *(Lycium pallidum)*, mesquite (*Prosopis* spp.), three-leaf sumac *(Rhus trilobata)*, and fourwing saltbush *(Atriplex canescens)*. Common grass species include spike muhly *(Muhlenbergia wrightii)*, sideoats grama *(Bouteloua curtipendula)*, black grama *(Bouteloua eriopoda)*, and blue grama *(Bouteloua gracilis)* (BLM, 1997a; Tierra EC, 2010).

As shown in Figure 1, the Proposed Action Area lies adjacent to the Burro Mountain Region of the Gila National Forest. The Burro Mountain Region includes roughly 165,000 acres of the same vegetation types which occur in the Proposed Action Area. Land cover classifications derived by the USGS National Gap Analysis Program (2004) within the approximately 204-square mile Mangas Creek Watershed (HUC10 1504000203) are depicted in Figure 13 and delineated in Table 11.[1]

[1] The previously disturbed areas have been updated to include the earlier, existing, and approved disturbance (refer to Section 1.5.1 and Table 7).

EXISTING 1X
CROSS-CUT CHANNEL

EXISTING DEWATERING
PIPELINE ALIGNMENT #1

DECLINING SHAFT

BLM

BLM

BLM

BLM

USFS

Surface topography dated Jan 2012.

Legend

- Proposed Action Area
- Earlier, Existing, and Approved Disturbance
- Grasslands/Juniper Grasslands
- Pinon-Juniper Woodland/Chaparral Ecotone
- Ponderosa Pine Forest
- Riparian (limited canopy development)
- BLM Managed Land
- USFS Managed Land

National Wetlands Inventory

- Freshwater Pond (PUB)
- Riverine (R4SBC)

No Action Alternative

- Earlier, Existing and Approved Disturbance at the Little Rock Mine
- Current Open Pit Configuration
- Existing Haul Road

Features of the Proposed Action and Connected Non-Federal Action

- Proposed Limit of Disturbance Expanding the Open Pit
- Proposed Conceptual Open Pit Configuration
- Proposed Dewatering Pipeline Alignment #2
- Proposed Power Line Alignment

Private Actions (Planned)

- Dewatering Pipeline Alignment #2
- Potential Power Line Route

0 1,000

SCALE IN FEET

COORDINATE SYSTEM
TYRONE LOCAL MINE

N

FIGURE 17
BIOTIC COMMUNITIES
LITTLE ROCK MINE

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FREEPORT-McMoRan

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Table 11 Vegetation Cover in the Mangas Creek Watershed

Land Cover Class[1]	Area by Land Ownership (square miles)					Total Area (sq mi)	Percent of Watershed Area
	BLM	USFS	State	FMI	Other Private		
Piñon-juniper woodland/ chaparral ecotone	5.3	20	48	21	35	129	63%
Ponderosa pine forest	0.9	1.6	29	2.0	4.0	37	18%
Grasslands/ juniper grasslands	0.2	5.0	2.5	9.3	6.0	23	11%
Recently mined or quarried	0.3	-	< 0.1	14	< 0.1	14	7%
Riparian and open water	< 0.1	0.3	< 0.1	0.3	0.5	1	< 1%
Grand Total	7	27	79	47	45	204	100%

(USGS, 2004)

Slight errors may exist in total values due to rounding.

"Recently mined or quarried" has been updated to include the earlier, existing, and approved disturbance (refer to Section 1.5.1 and Table 7).

[1] The following list identifies groupings of the USGS land cover classes in the watershed to align with the vegetation communities mapped in the Proposed Action Area and depicted in Figure 13.

Grasslands/ juniper grasslands

- Apacherian-Chihuahuan piedmont semi-desert grassland and steppe
- Chihuahuan creosotebush, mixed desert and thorn scrub
- Colorado plateau mixed bedrock canyon and tableland
- Inter-mountain basins semi-desert grassland
- Inter-mountain basins semi-desert shrub steppe
- Madrean juniper savanna
- North American warm desert wash
- Sonoran mid-elevation desert scrub

Riparian and open water

- North American warm desert lower montane riparian woodland and shrubland
- Open water

Piñon-juniper woodland/ chaparral ecotone

- Apacherian-Chihuahuan mesquite upland scrub
- Colorado Plateau pinyon-juniper woodland
- Inter-mountain basins juniper savanna
- Madrean encinal
- Madrean pinyon-juniper woodland
- Mogollon chaparral

Ponderosa pine forest

- Madrean pine-oak forest and woodland
- Rocky Mountain montane dry-mesic mixed conifer forest and woodland
- Rocky Mountain montane mesic mixed conifer forest and woodland
- Rocky Mountain ponderosa pine woodland

Recently mined or quarried

- Recently mined or quarried

Figure 17 also superimposes data from the National Wetlands Inventory (NWI; (USFWS, 2014)) over the vegetation mapping. Three segments of riverine systems are mapped within the Proposed Action Area, including Deadman Canyon, its tributary (on the north side of the open pit), and California Gulch. Based on the definition of riverine systems, multiple field observations, the vegetation mapping conducted for the 1997 Final EIS, and the existing Section 404 permit and related documentation, no wetlands or riparian vegetation occurs within the Proposed Action Area.[1]

Deadman Canyon runs parallel to existing disturbance associated with the Tyrone Mine for approximately two miles south of the Proposed Action Area (Figure 14). The functions of the existing vegetation and habitat along this reach of Deadman Canyon are constrained by the existing disturbance associated with the adjacent Tyrone Mine. As noted in Section 3.2.1 and depicted in Figure 17, a limited area of riparian vegetation was mapped for the 1997 Final EIS on private land south of the Proposed Action Area. This area is primarily characterized by individual or small strands of cottonwood trees (*Populus deltoids*). The NWI identifies this area as part of the riverine system.

Through the Proposed Action Area, earlier, existing, and approved disturbance encroach on Deadman Canyon, again limiting the habitat functions of the existing piñon-juniper woodland/chaparral ecotone and grassland/juniper grassland vegetation mapped along this reach (Figure 17). This reach of Deadman Canyon is a very steep and narrow canyon, and the existing haul road is carved into both sides, paralleling the canyon for approximately one-half mile. The existing spanning arch culvert comprises the existing haul road crossing over the ephemeral, Deadman Canyon channel.

North (upgradient) of the Proposed Action Area, the steep and narrow Deadman Canyon transitions to a distributary flow condition, which is the anthropogenic result of the construction of the existing 1X series tailings storage facility for the Tyrone Mine. A similar transition occurs where Whitewater Canyon, west of the Proposed Action Area, is intersected by the tailings facility. Two earthen dams have been constructed, one in each of the canyons, which have altered the topography, and man-made channels,

[1] While Deadman Canyon and California Gulch are considered "waters of the U.S.," it is important to note that no "wetlands," as defined under the Clean Water Act, occur within the Proposed Action Area, as determined by the Corps. Figure 17 depicts data from the NWI, which identifies Deadman Canyon as a riverine system within the Proposed Action Area. NWI mapping has recently been expanded to include depictions of riverine systems, which by definition in the Cowardin classification system, exclude "wetlands" (Cowardin, 1979). Therefore, the data from the NWI does not identify or locate "wetlands" defined under the Clean Water Act. The USFWS mapping standards acknowledge the same distinction, caution against relying on the data for regulatory purposes, clarify that the NWI is a high level representation of data, and stress the need for project specific review of the data. For these reasons, NWI data that incorrectly maps flow paths across the 1X tailings storage facility is not depicted. Similarly, NWI data for areas within the Tyrone Mine are not depicted; these areas would not be affected by the no action alternative or the proposed action/connected non-federal action. The NWI data does indicate the general locations of the man-made riparian areas north of the Proposed Action Area where Deadman and Whitewater canyons are intersected by the existing 1X series tailings storage facility for the Tyrone Mine. A permit from the Corps, pursuant to Section 404 of the Clean Water Act, has been issued for impacts to the waters of the U.S. that have or will occur under the no action alternative (Corps, 2010). For this reason, NWI data is not mapped within the area of the no action alternative in Figure 17. As stated in Section 3.2.1.2.1, Tyrone is coordinating with the Corps to gain the appropriate permits and approvals for the potential placement of fill into waters of the U.S. under the proposed action and connected non-federal action.

including the 1X cross-cut channel, divert the flow path around the tailings storage facility to the west. The earthen dams and man-made channels increase the retention time of storm water flows, reduce the storm water velocity, and cause sediment deposition upgradient of the dams, fostering the development of riparian vegetation. The man-made riparian vegetation areas (on private land) include cottonwood trees and desert willow. The NWI identifies these areas as freshwater ponds of the palustrine system. However, these areas are not inundated year-round; surface expression of water occurs seasonally, dependent on rainfall and in direct response to precipitation events. With the prior disturbance, these areas function as a part of the mining process, serving to reduce the sediment load carried downgradient and improving water quality.

3.3.1.2 Environmental Consequences

3.3.1.2.1 Proposed Action

As depicted in Figure 17 and identified in Table 12, the proposed action would result in direct impacts to approximately 109 acres of previously undisturbed, BLM-managed land, comprising approximately 18 acres of grassland/juniper grassland, approximately 91 acres of piñon-juniper woodland/chaparral ecotone, and less than one acre of ponderosa pine forest. Under the connected non-federal action, indirect impacts from new surface disturbance to approximately 91 acres of previously undisturbed, private land would include approximately two acres of grassland/juniper grassland and approximately 89 acres of piñon-juniper woodland/chaparral ecotone. By comparison, the no action alternative would include the continued surface disturbance to the approximately 320 acres of earlier, existing, and approved disturbance, as detailed in Table 7. The 2010 analysis of the baseline condition (the no action alternative) concluded:

> The amount of disturbance (up to 190 acres for the pit and approximately 40 acres for the haul road) is only a small fraction of the same [vegetation and] habitat types found in the region and surrounding the project area... Additionally, much of the project area has been previously disturbed, which minimizes the area of new impact. The project area is also covered under a permit with the New Mexico Mining and Minerals Division, which mandates that measures be taken after mining to restore wildlife habitat (Tierra EC, 2010).

Table 12 Proposed New Disturbance Area by Habitat Type

Habitat/ Vegetation Type	**Proposed Action** (BLM-managed land; acres)			**Connected Non-federal Action** (private land; acres)	**Total Area** (acres)
	Proposed Limit of Disturbance	**Dewatering Pipeline Alignment #2**	**Power Line Alignment**	**Proposed Limit of Disturbance**	
Grassland/ juniper grasslands	15	< 1	< 2	2	20
Piñon-juniper woodland/ chaparral ecotone	91	< 1	-	89	180
Ponderosa pine forest	< 1	-	-	-	< 1
Total	**106**	< 1	< 2	**91**	**200**

- Slight discrepancies may exist in subtotal and total values due to rounding.

These conclusions remain valid in light of the proposed action and connected non-federal action. The vegetation proposed for disturbance is adjacent to (or, in some cases, surrounded by) existing disturbance areas and ongoing mining operations. The same vegetation types are available in the Mangas Creek Watershed and adjacent Burro Mountain Region of the Gila National Forest. The approximately 200 acres of vegetation loss that would occur under the proposed action and connected non-federal action represents a negligible increase in the surface disturbance over the no action alternative.

Upon completion of the proposed action and connected non-federal action, disturbed areas would be reclaimed in accordance with the CCP. Reclamation would include seeding with a variety of native grasses, shrubs, and forbs to establish a self-sustaining native ecosystem that supports the desired post-mining land use (wildlife habitat) in accordance with MMD Permit GR007RE.

The natural riparian habitat lies approximately 0.5 mile south, and upgradient, of the Proposed Action Area. Therefore, the proposed action/connected non-federal action would not result in any direct and indirect impacts to the natural riparian habitat upgradient of the Proposed Action Area.

As noted in Section 3.2.1.2.1, erosion and sediment transport may increase slightly in the short-term, downgradient of the Deadman Canyon diversion. However, design features associated with the Deadman Canyon diversion channel would facilitate sediment deposition in the channel and minimize the potential for erosion through the engineered design of the channel outlet. The downgradient, man-made riparian vegetation (depositional area) would continue to serve as a sedimentation basin. Since this area would continue to function as a sedimentation basin under both the proposed action/connected non-federal action and the no action alternative, and because the sedimentation contributes to the development of the riparian vegetation occurring in this area, indirect impacts to the downgradient, man-made riparian area would be short-term and insubstantial.

The natural functions and values of the vegetation and habitat associated with Deadman Canyon has been minimized by earlier and existing mine operations. Under the proposed action/connected non-federal action, the existing and disturbed channel would be relocated to a constructed channel on a ramp on the eastern edge of the open pit. While the hydraulic and hydrologic functions associated with the channel

would continue to exist, the natural vegetation and habitat would be altered. However, given the amount of existing disturbance and proximity to ongoing mine operations, the loss of habitat associated with Deadman Canyon that would occur under the proposed action and connected non-federal action represents a negligible decrease in the function of the vegetation and canyon habitat compared to the no action alternative.

3.3.1.2.2 No Action

Under the no action alternative, there would be no impacts to vegetation beyond the 320 acres of surface disturbance that has been previously authorized.

3.3.2 General Wildlife Species

3.3.2.1 Affected Environment

Wildlife in the vicinity of the existing Little Rock Mine includes large and small mammals, diverse species of birds (both on a seasonal and residential basis), reptiles, and amphibians (BLM, 2009a), (BLM, 1997a), (Tierra EC, 2010). There are no perennial streams or rivers located within the Proposed Action Area. Drainages which traverse the site are ephemeral and flow only in response to storm events or spring snowmelt; thus, there are no fish located within the Proposed Action Area.

In general, water sources are limited within the Proposed Action Area and vicinity. Springs, seeps, stock tanks, and other surface water features in the project vicinity (beyond the Proposed Action Area) are generally small and produce a surface expression for small areas and/or short distances. Also, "the hydraulic time of concentration of watersheds within the Big Burro Mountains and surrounding region are short; canyon (drainage) slopes are steep (6 to 13 or more percent channel slope) and any appreciable rainfall rapidly discharges from mountainous drainages to lower elevations. Furthermore, channel beds are comprised of sands and gravels, which also preclude the development and persistence of short-term puddles and long-term surface water sources…" (Tierra EC, 2010).

BIRDS

The avifauna likely to be encountered at Little Rock Mine is diverse and likely to consist of at least 100 species. Surveys conducted to support the 1997 Final EIS documented the presence of 45 bird species, including Gambel's quail (*Callipepla gambelii*; characteristic of semidesert grassland), acorn woodpecker *(Melanerpes formicivorus)* and bridled titmouse (*Baeolophus wollweberi*; characteristic of oak woodlands), juniper titmouse (*Baeolophus ridgwayi*; characteristic of Great Basin conifer woodlands), spotted towhee (*Pipilo maculatus*; characteristic of interior chaparral), and Steller's jay (*Cyanocitta stelleri*; characteristic of ponderosa pine and mixed conifer forest). In general, birds likely to be in the vicinity of the Little Rock Mine site are representative of most North American orders of birds with the exception of marine and aquatic species. Most of the bird species occurring in the Proposed Action Area are small, insectivorous or granivorous species. Larger birds may include several species of hawks and owls that may forage on wildlife in habitats surrounding the Little Rock Mine; a turkey vulture *(Cathartes aura)* was observed in the project vicinity during field surveys in 2010 (Tierra EC), (BLM, 2009a), (BLM, 1997a). Lists of bird species which are likely to occur in the area have been presented in 1997 Final EIS (BLM, 1997a), the 2009 Stockpile EA (Tierra EC, 2009), and the 2010 analysis (Tierra EC).

MAMMALS

Mammals identified in the project record that have been observed in the Proposed Action Area or vicinity include smaller species such as chipmunk *(Eutamias* spp.*)*, Townsend's big-eared bat *(Corynorhinus townsendii)*, white-throated woodrat *(Neotoma albigula)*, rock squirrel *(Spermophilus variegatus)*, and desert cottontail *(Sylvilagus audubonii)*. Larger species that have been reported or observed include coyote *(Canis latrans)*, gray fox *(Urocyon cinereoargenteus)*, mountain lion *(Felis concolor)*, black bear *(Ursus americanus)*, black-tailed jack rabbit *(Lepus californicus)*, javelina *(Pecari tajacu)*, and mule deer *(Odocoileus hemionus)*, and white-tailed deer *(Odocoileus virginianus)*. Bats are discussed in in Section 3.3.3.

REPTILES AND AMPHIBIANS

The herpetofauna of the Little Rock Mine vicinity may include small species of lizards, small to medium-sized snakes, and toads (BLM, 1997a). Water sources are limited within the Proposed Action Area, and therefore, the potential for amphibians is minimal to nonexistent. In 2010, extensive surveys were conducted at seeps, springs, ponds, tanks, and other surface water features within a 5-mile radius of the Little Rock Mine for potential Chiricahua leopard frog habitat. During these surveys, herpetofauna encountered beyond the Proposed Action Area included bullfrogs *(Rana catesbeiana)* and crevice spiny lizard *(Sceloporus poinsettii)* (Tierra EC, 2010). The analysis resulted in the BLM concluding that the no action alternative presented in this EA would have no effect on the Chiricahua leopard frog, and suitable habitat and/or populations do not occur within a five-mile radius of the Little Rock Mine (BLM, 2010).

3.3.2.2 Environmental Consequences

3.3.2.2.1 Proposed Action

As delineated in Section 3.3.1.2.1, the proposed action/connected non-federal action would result in direct impacts to approximately 109 acres of previously undisturbed, BLM-managed land and approximately 91 acres of previously undisturbed, private land. The previously undisturbed land serves as potential wildlife habitat for wildlife species, although these areas are situated adjacent to existing and ongoing mining facilities and features that would continue under the no action alternative. The proposed action/connected non-federal action would represent an approximate 0.15 percent loss of the available habitat in the Mangas Creek Watershed. Undisturbed land is available beyond this watershed, including areas within the Burro Mountain Region of the Gila National Forest, which includes a total of approximately 165,000 acres of the same or similar habitat types. Given that much of southwestern New Mexico is largely undeveloped, additional expanses of undeveloped land and wildlife habitat are also available in the region. The loss of approximately 200 acres of habitat is not anticipated to produce long-term impacts on wildlife. Further, post-mining, successful reclamation and revegetation of the disturbed areas would restore wildlife habitat, in accordance with the CCP.[1]

Direct and indirect impacts resulting from the proposed action and connected non-federal action could include mortality of small mammals and reptiles due to collisions with haul trucks or light-duty vehicles and disturbance activities, and short-term avoidance of the Proposed Action Area during mine operations

[1] Species diversity and habitat type would be dependent upon plant establishment and may vary from pre-mining conditions.

due to increased noise levels and human presence. Noise and traffic could directly and indirectly affect wildlife activity in the immediate vicinity of the mining operation; however wildlife are commonly observed around the ongoing operations and at both the Little Rock Mine and adjacent Tyrone Mine. As discussed in Sections 3.2.1.1 and 3.3.1.1, Deadman Canyon has been disturbed directly from earlier operations, exploration activities, ore leaching operations, development of the current open pit configuration, and haul road construction; California Gulch has been bisected by the current open pit under the no action alternative. During reclamation, portions of the access road adjacent to the Deadman Canyon diversion that are not needed for long-term monitoring, sampling, and access would be reclaimed in accordance with the CCP. Utilization by wildlife may increase during closure and post-closure. The channel would be expected to remain ephemeral and would not support aquatic species. While the proposed action/connected non-federal action would extend operations onto an additional 200 acres of BLM-managed and private land, the amount of noise and traffic would be similar to the levels under the no action alternative, and potential impacts to wildlife, wildlife movement, and habitat connectivity would be minimal.

Sources of water are limited in the vicinity of the Little Rock Mine. Prior hydrogeologic modeling indicates that the groundwater sources for the springs and seeps are not connected with the regional aquifer system; springs and seeps in the project vicinity are fed by perched groundwater, and would not be impacted by groundwater withdrawals to support mining activities (Tierra EC, 2010). Similar levels of groundwater drawdown are predicted under the proposed action/connected non-federal action and the no action alternative (Section 3.2.2.2.1). In combination with the conclusions of the water resources evaluation, groundwater drawdown is not likely to impact seeps and springs in the project vicinity. In addition, the Deadman Canyon diversion channel would continue to convey storm water flows to the downgradient, man-made riparian area. Thus, there would be no effects to wildlife related to water due to the proposed action/connected non-federal action over the no action alternative.

3.3.2.2.2 No Action

Under the no action alternative, there would be no impacts to wildlife movement, habitat, and habitat connectivity beyond what has been previously authorized. Surface disturbances would continue to the approximately 320 acres of earlier, existing, and approved disturbance under the no action alternative.

3.3.3 Special Status Species

Collectively, “special status species” include those listed as endangered or threatened under either Federal or state law, candidate species for protection under Federal law, or other species of interest. For this analysis, the following regulations have been considered:

- **Endangered Species Act (ESA):** Provides for the conservation of threatened and endangered plants and animals, and the habitats in which they are found.
- **Migratory Bird Treaty Act:** As implemented by Executive Order 13186, directs Federal agencies to act in a way which contributes to the conservation and management of migratory birds and their habitats.
- **Bald and Golden Eagle Protection Act:** This act extends additional protection beyond the Migratory Bird Treaty Act to these species, including making *disturbance* unlawful. This rule

was considered in the compilation of this document, but is not discussed further, as these species are not present.

- **New Mexico Wildlife Conservation Act:** New Mexico does not explicitly adopt Federal endangered species lists, but creates a state-specific list based on "investigations concerning wildlife, other available scientific and commercial data and after consultation with wildlife agencies in other states, appropriate Federal agencies, local and tribal governments and other interested persons and organizations" (NMSA, 1978).

Species afforded protections under the Endangered Species Act of 1973 (ESA) and species considered sensitive or other special designations by the BLM and state agencies that may have some potential to occur in Grant County are considered special status species for this EA. An analysis of the state and Federal special status species – including range, habitat, and potential for occurrence in the Proposed Action Area – is presented in Appendix B. Appendix B assesses and lists the potential for special status species or their habitat to occur in the Proposed Action Area using the following summary descriptions:

- **None:** no suitable habitat is present or the species is not found within the elevation range of the Proposed Action Area
- **Unlikely:** no documentation of species occurrence; low or marginal habitat quality; outside currently known geographic distribution and/or elevation range of species occurrence; species may pass over or migrate through the Proposed Action Area
- **Possible:** no documentation of species occurrence, but suitable habitat may occur; within the geographic distribution and/or elevation range of species occurrence
- **Present:** species have been documented to occur within the Proposed Action Area

3.3.3.1 Affected Environment

3.3.3.1.1 Federally Listed, Threatened & Endangered Species and Critical Habitat

Special status species include those species which are afforded special protection under Federal guidelines in accordance with the ESA. A query of the U.S. Department of the Interior, Fish and Wildlife Service (USFWS) Information, Planning, and Conservation System (IPaC) online database was conducted to identify federally listed species that have the potential to occur at or near the Proposed Action Area (Appendix B). The IPaC was recently implemented by the USFWS to identify "Trust Resources" that may be affected by a project. These resources include threatened and endangered species, designated critical habitat areas, National Wildlife Refuges, migratory birds, wetlands conservation, and invasive species.

Table 13 presents the 19 species identified in the IPaC query for this project, including one amphibian, five birds, eight fish, three mammals, and two reptiles. These species are those which the USFWS considers to have a possible presence in the Proposed Action Area and are listed or candidates for listing under the ESA as threatened or endangered (USFWS, 2014b). Since similar evaluations for the potential for federally listed species to occur in the Little Rock Mine area were conducted recently for the 2013 minor modification, Table 13 also documents changes to the list of species or their status since this prior review. Details regarding the analysis of the potential to occur for each of the special status species is presented in Appendix B.

Critical habitat is an area designated for a threatened or endangered species under the ESA. A designation of critical habitat indicates that the particular area contains physical or biological features essential to the conservation of the species which may require special management considerations or protections. No designated or proposed critical habitat exists within a 10-mile radius of the Proposed Action Area.

Table 13 Federally Listed Threatened or Endangered Species Potentially Occurring in the Proposed Project Area

Species	**Taxon**	**Scientific Name**	**ESA Status/ Critical Habitat [a]**	**Updates or Changes since 2013 Evaluation for Little Rock Mine**	**Potential for Occurrence [b]**
Chiricahua leopard frog	Amphibian	*Lithobates [Rana] chiricahuensis*	T, DCH	None	**None**
Mexican spotted owl	Bird	*Strix occidentalis lucida*	T, DCH	None	**Unlikely**
Northern aplomado falcon	Bird	*Falco femoralis septentrionalis*	XPNE	None	**None**
Southwestern willow flycatcher	Bird	*Empidonax traillii extimus*	E, DCH	Revised designated critical habitat	**None**
Sprague's pipit	Bird	*Anthus spragueii*	C	Species granted candidate status	**None**
Yellow-billed cuckoo (western distinct pop.)	Bird	*Coccyzus americanus*	PT, PCH	Proposed rule for species status change; proposed critical habitat	**None**
Beautiful shiner	Fish	*Cyprinella formosa*	T, DCH	None	**None**
Chihuahua chub	Fish	*Gila nigrescens*	T	None	**None**
Gila chub	Fish	*Gila intermedia*	E, DCH	None	**None**
Gila topminnow	Fish	*Poeciliopsis occidentalis*	E	None	**None**
Gila trout	Fish	*Oncorhynchus gilae*	T	None	**None**
Loach minnow	Fish	*Tiaroga cobitis*	E, DCH	None	**None**
Roundtail chub	Fish	*Gila robusta*	C	None	**None**
Spikedace	Fish	*Meda fulgida*	E, DCH	None	**None**
Mexican wolf [c]	Mammal	*Canis lupus baileyi*	XPNE	Proposed revision proposed by USFWS	**Unlikely**
Lesser long-nosed bat	Mammal	*Leptonycteris curasoae yerbabuenae*	E	None	**None**

Species	Taxon	Scientific Name	ESA Status/ Critical Habitat [a]	Updates or Changes since 2013 Evaluation for Little Rock Mine	Potential for Occurrence [b]
Mexican long-nosed bat	Mammal	*Leptonycteris nivalis*	E	Species listed since 1988; recently added to Grant County list	**None**
Narrow-headed gartersnake	Reptile	*Thamnophis rufipunctatus*	T, PCH	Species status change; proposed critical habitat	**None**
Northern Mexican gartersnake	Reptile	*Thamnophis eques megalops*	T, PCH	Species status change; proposed critical habitat	**None**

Source: (USFWS, 2014b); (USFWS, 2014c)

[a] ESA status key:

- E Endangered
- T Threatened
- C Candidate
- XPNE Experimental population, non-essential
- PT Proposed threatened
- DCH Designated critical habitat
- PCH Proposed critical habitat

[b] Potential for occurrence listed presents the conclusion from the analysis documented in Appendix B.

[c] Parent species (*Canis lupus*) proposed for delisting due to recovery; sub-species listed as non-essential experimental population (USFWS, 2014a).

The analysis presented in Appendix B and summarized in Table 13 concludes that no federally listed species have more than an unlikely potential to occur in the Proposed Action Area. These conclusions are consistent with the prior analyses conducted for the 2013 minor modification (Westland) and the 2010 analysis (Tierra EC).

3.3.3.1.2 Other Special Status Species

In addition to species listed under the ESA, the BLM maintains a list of sensitive species and the New Mexico Department of Game and Fish (NMDGF) oversees a list of state threatened and endangered species. State listed species that may occur in Grant County are queried through the Biota Information System of New Mexico (BISON-M; (2014)) and the New Mexico Rare Plant Technical Council (NMRPTC; (2014)).

The analysis of the state and Federal special status species potential to occur in the Proposed Action Area is presented in Appendix B, including a summary of the range and habitat needs of listed species.

The lists of sensitive species were evaluated for the potential to occur in the Proposed Action Area in the 2013 analysis supporting Tyrone's request for a minor modification to the 1993 MPO (Westland, 2013). Appendix B reviews and updates this analysis including a detailed table of range and habitat needs and conclusions regarding the potential for occurrence for these species.

Table 14 presents five species (two birds and three bats [mammals]) which have been designated as special status species by these agencies and have a potential for occurrence in the Proposed Action Area.

Appendix B of this EA presents the summary of range and habitat needs, and conclusions regarding the potential for occurrence for the species that were not included in the prior approval in 2013. No additional species with a potential to occur in the Proposed Action Area were identified.

Table 14 Other Special Status Species with Possible Presence in Project Area

Species Common Name	Species Scientific Name	Taxon	Status		Potential for Occurrence
			NM	BLM	
Northern goshawk	*Accipiter gentilis atricapillus*	Bird		S	Possible
Piñon jay	*Gymnorhiinus cyanocephalus*	Bird		S	Possible
Allen's big eared bat (Allen's lappet browed bat)	*Idionycteris phyllotis*	Mammal		S	Possible
Spotted bat	*Euderma maculatum*	Mammal	T	S	Possible
Pale Townsend's big-eared bat	*Plecotus townsendii pallescens*	Mammal		S	Present

Status key:
T Threatened (NM)
S Sensitive (BLM)

BIRD SPECIES

The closest known northern goshawk nest site is located in the upper reach of California Gulch approximately 2 miles from the project site (Ybarra, 2010). Habitat attractive to goshawks and the piñon jay includes the woodland vegetation (piñon-juniper woodland, juniper grassland, and ponderosa pine forest) within the Proposed Action Area.

BAT SPECIES

The typical roosting habitat for the three species of bats listed in Table 14 includes caves and mine shafts and adits. For the Allen's big eared bat and spotted bat, potential habitat would also include rock outcroppings, crevices, and loose tree bark. Under the existing approvals, four adits and one shaft associated with Ohio Mine have been closed in accordance with the procedures provided by the New Mexico Abandoned Mines program, including bat habitat surveys and evaluations. Three of the adits did not include bat habitat, bats, or bat sign and were recommended to be closed. One adit may have provided some hibernation potential; however, no bats or bat sign were observed during an internal survey, and closure was recommended during warm months (April through September) to avoid potential disruption to hibernating bats. One bat, likely a Townsend's big-eared bat, was observed during a survey of the shaft at the Ohio Mine. Closure of the shaft included placing exclusion material over the opening during the cold season and allowing bats to leave the feature, but making it difficult to return. These measures were implemented, coupled with monitoring, prior to destruction of the shafts/adits in the Ohio Mine area (Ecosphere, 2011). The previously identified, known bat habitat has been eliminated from the Proposed Action Area.

The survey report, *Bat Habitat Evaluations for the Ohio Mine Claim Shaft and Adits* (Ecosphere, 2011), also discusses a prior field survey at the proximate Virtue Mine portal, a large adit located in the Little Burro Mountains about 2 miles northeast of the Proposed Action Area (Figure 13). The Virtue Mine portal has been closed with a bat compatible gate. Prior internal surveys conducted in the Virtue Mine indicate that this feature could adequately provide suitable habitat for bats that may be displaced by the closure of the Ohio Mine features. In addition, Tyrone has installed bat gates on two adits and one shaft at

the Jersey Lilly Mine (Figure 13), approximately 3 miles north-northeast of the Proposed Action Area (Tyrone, 2013b). These four features are located within an acceptable radius of the Proposed Action Area to provide suitable habitat for displaced bats.

One previously unidentified, abandoned mine feature was located during the course of field investigations in 2014; the feature is located on private land within the proposed limit of disturbance, south of the current open pit configuration, as indicated on Figure 17. Bat Conservation International (BCI) conducted an internal survey of the feature on October 24, 2014. The survey concluded that the feature is a decline shaft running approximately 90 feet in length at roughly 45 degrees to a few short drifts. Including the decline shaft, the workings totaled approximately 200 feet and contained a few remnants of prior mine workings (ladders, ore car tracks, supports, *etc.*). Mud covered the floor with damp ribs and a small trickle of flowing water. Biological remains included a few small to medium mammal skulls and leg bones scattered about. Five Townsend's big-eared bats (*Corynorhinus townsendii*) were found to be day roosting. The bat habitat was assessed and determined to be utilized as both a day and night roost with no indication of use as a maternity colony or hibernaculum (BCI, 2014). In accordance with recommendations by BCI and for mine safety purposes, the declining shaft will be closed utilizing appropriate bird and bat exclusion protocols detailed in *Managing Abandoned Mines for Bats* (Sherwin, 2009). The closure will be conducted under the New Mexico Abandoned Mines Program.

3.3.3.2 Environmental Consequences

3.3.3.2.1 Proposed Action

Analyses of impacts to special status species with a possible or known presence in the Proposed Action Area have been conducted for mining activities at the Little Rock Mine in 2013 (Westland), in 2010 (Tierra EC), in 2009 for the Stockpile EA (BLM, 2009a), and for the 1997 Final EIS (BLM, 1997a). The proposed action/connected non-federal action would have no effect to federally listed species or designated critical habitat.

The potential effects to the other special status species with a potential to occur in the Proposed Action Area are evaluated herein.

BIRD SPECIES

Under the proposed action/connected non-federal action, direct impacts to the northern goshawk and piñon jay would not be anticipated. Potential indirect impacts may include a loss of nesting, foraging, and breeding habitat as a result of vegetation removal and development of the proposed action and connected non-federal action; however, similar habitat surrounding the Proposed Action Area is available as discussed in Section 3.3.2.2.1, and these species would likely continue to nest, forage, and breed outside of the Proposed Action Area.

BAT SPECIES

The closure of the declining shaft, located on private land, is being conducted under the New Mexico Abandoned Mines Program for mine safety purposes, and is not a part of the proposed action or connected non-federal action. Bats that are excluded from this location would be expected to use other suitable habitat, including the four sites fitted with bat gates north of the Little Rock Mine.

3.3.3.2.2 No Action

Under the no action alternative, there would be no impacts to special status species beyond what has been previously authorized.

3.3.4 Migratory Birds

3.3.4.1 Affected Environment

Executive Order 13186 directs Federal agencies to take actions to implement the Migratory Bird Treaty Act and contribute to the conservation and management of migratory birds and their habitats. In 2010, the BLM and the USFWS entered into a Memorandum of Understanding to implement the Order. In the Memorandum of Understanding, the BLM agreed to evaluate at the project level, the effects of proposed actions on migratory birds focusing on species of concern, priority habitats, and key risk factors. If measurable negative effects to migratory bird populations are identified, the BLM is to implement measures to reduce take. The USFWS identified bird species of concern by Bird Conservation Region (BCR) in *Birds of Conservation Concern* (USFWS, 2008).

The Proposed Action Area is located within the Sierra Madre Occidental Bird Conservation Region (USFWS, 2008). The USFWS IPaC project review provides a list of 15 migratory birds of conservation concern that may occur in the Proposed Action Area, as listed in Table 15.

In addition, the National Audubon Society maintains a list of Important Bird Areas (IBAs), which include areas that provide essential habitat for breeding, wintering, and/or migrating birds. No IBAs are located proximate to the project area (Audubon, 2014). The nearest IBA is the Gila Bird Area IBA, located approximately 20 miles west of the project area. The Proposed Action Area is not within a major migratory pathway, either for diurnal or nocturnal migrants according to the USGS North American Breeding Birds Survey (BBS). The nearest avian migratory pathway, identified as Red Rock, occurs approximately 19 miles west of the Proposed Action Area.

Table 15 USFWS IPaC List of Migratory Birds with Potential to Occur in Project Area

Species Common Name	Scientific Name	Seasonal Occurrence in Project Area	Potential for Occurrence
Bald eagle	*Haliaeetus leucocephalus*	Wintering	None. No suitable habitat.
Bell's vireo	*Vireo bellii*	Breeding	None. No suitable habitat.
Black-chinned sparrow	*Spizella atrogularis*	Breeding	None. No suitable habitat.
Black-throated gray warbler	*Dendroica nigrescens*	Breeding (April – September)	Possible. Suitable habitat may be found in the Proposed Action Area.
Brewer's sparrow	*Spizella breweri*	Wintering	None. No suitable habitat.
Burrowing owl	*Athene cunicularia*	Breeding	Unlikely. Lack of suitable habitat; however, suitable habitat is present in the Mangas Valley near the Proposed Action Area.
Canyon towhee	*Pipilo fuscus*	Year-round	None. No suitable habitat.

Species Common Name	Scientific Name	Seasonal Occurrence in Project Area	Potential for Occurrence
Chestnut-collared longspur	*Calcarius ornatus*	Wintering	None. No suitable habitat.
Golden eagle	*Aquila chrysaetos*	Year-round	None. No suitable habitat.
Grace's warbler	*Dendroica graciae*	Breeding (April – September)	Possible. Species may disperse through the Proposed Action Area.
Gray vireo	*Vireo vicinior*	Breeding (April – August)	Unlikely. There is a small amount of low-quality foraging habitat for this species within the Proposed Action Area, and it is a rare summer resident of the Gila National Forest.
Lucy's warbler	*Vermivora luciae*	Breeding	None. No suitable habitat.
Red-faced warbler	*Cardellina rubrifrons*	Breeding (April – September)	Possible. Species may disperse through the Proposed Action Area.
Sonoran yellow warbler	*Dendroica petechia* ssp. *sonorana*	Breeding	None. No suitable habitat.
Williamson's sapsucker	*Sphyrapicus thyroideus*	Wintering	None. No suitable habitat.

3.3.4.2 Environmental Consequences

3.3.4.2.1 Proposed Action

Habitat attractive to migratory birds includes the woodland vegetation (piñon-juniper woodland, juniper grassland, and ponderosa pine forest) within the Proposed Action Area. Potential impacts may include a loss of nesting, foraging, and breeding habitat as a result of vegetation removal and development of the project. As listed in Table 12, the amount of surface disturbance represents a small fraction of the same habitat types found in the region surrounding the Proposed Action Area that that would continue to provide nesting, foraging, and breeding opportunities for migratory birds outside of the Proposed Action Area. Because birds are highly mobile, it is unlikely that non-nesting adult birds would be directly taken; however, limited direct loss of individual birds in nests may result from the proposed action/connected non-federal action. Although the proposed action/connected non-federal action may result in localized direct and indirect effects on individual birds and their habitat, these impacts would not contribute to a measurable decline in populations of birds of conservation concern or other migratory birds that may utilize the Proposed Action Area. Further, the Proposed Action Area has not been designated an important wintering area for birds. The proposed action/connected non-federal action is not expected to result in the loss of important wintering habitat or a trend toward the federal listing of migratory bird species.

The mining activities of the proposed action would not be expected to adversely affect migratory birds. Further, Tyrone would continue to implement the 2012 Migratory Bird Conservation Plan (Appendix C), which provides for hazing and engineering methods, in addition to monitoring and reporting, as conservation measures to protect migratory birds. The conservation plan utilizes multiple preventative strategies to minimize bird contact with mine operations. These strategies include both passive methods

(*e.g.*, construction and maintenance of offsite water bodies) and active methods (*e.g.*, bird hazing, barriers, bird balls, radar systems with alarms) to manage and minimize potential impacts to migratory birds.

3.3.4.2.2 No Action

Under the no action alternative, there would be no impacts to migratory birds or their habitat beyond the 320 acres of surface disturbance previously authorized.

3.4 LANDS AND REALTY

This section describes the range and recreation resources and existing utilities occurring in the Proposed Action Area. The description includes a summary of the data, investigations, and assessments presented in the 1997 Final EIS (BLM, 1997a), updated to reflect new information or analyses where appropriate. This section also analyzes the potential environmental consequences to lands and realty for the activities associated with the proposed action/connected non-federal action and no action alternative presented in Section 2.0 of this EA.

No issues related to lands and realty were identified during public and agency scoping (Section 1.6.1).

3.4.1 Range Resources

3.4.1.1 Affected Environment

Land jurisdiction and ownership in the vicinity of the Little Rock Mine is displayed in Figure 2. The vicinity of Little Rock includes BLM-managed land, USFS-managed land, and private land. The privately held lands in the vicinity of the Little Rock Mine are predominantly owned by Freeport-McMoRan or its subsidiary, Pacific Western Land Company. No new disturbances are proposed on USFS-managed land as part of the proposed action. The Little Rock Mine is currently permitted with the MMD as an existing, active mining operation.

A BLM livestock grazing lease, the Mangas Valley Lease, held by U-Bar Ranch extends into the Proposed Action Area. The existing U-Bar Ranch grazing lease encompasses over 60,000 acres of a combination of lands managed by the BLM and held by Pacific Western. The perimeter of the existing MMD permit boundary is fenced, and access roads are gated and locked to prevent livestock from accessing the Little Rock Mine.

3.4.1.2 Environmental Consequences

3.4.1.2.1 Proposed Action

The proposed action and connected non-federal action would extend the existing fence line to encompass the proposed limit of disturbance, precluding access to an additional, approximate 16 acres of land. Precluding grazing to this area during mine operations is a negligible reduction in the size of the grazing lease. The post mining land use of wildlife habitat, designated under the NMMA, does not preclude grazing following reclamation activities such as grading and reseeding with native plants as outlined in the 2014 CCP (Golder, 2014).

3.4.1.2.2 No Action

Grazing within the existing Little Rock Mine area is precluded by perimeter fencing; no additional impacts to livestock grazing would result from the no action alternative beyond what has been previously authorized.

3.4.2 Recreation Resources

3.4.2.1 Affected Environment

As discussed in the 1997 Final EIS (BLM, 1997a), the primary recreational activities in the area of the Little Rock Mine are hunting and dispersed recreation, which includes camping, picnicking, off-road vehicle use, hiking, horseback riding and bicycling.

The Continental Divide Trail is a designated recreational facility located in the general vicinity of the Little Rock Mine. The trail is located in the Gila National Forest, approximately 2.5 miles southeast of the Little Rock Mine at its closest point. The Continental Divide Trail diverts from the Continental Divide on the south side of the mine; the trail generally follows the ridge of the Big Burro Mountains to the northwest, and crosses Mangas Creek in the vicinity of Mangas Spring, roughly 15 linear miles from the Little Rock Mine.

Primitive roads exist in the vicinity of the Little Rock Mine, mainly originating on USFS-managed land south of the Little Rock Mine. Access to the mine site is precluded by fences and locked gates at the perimeter of the mine. Use of these roads for dispersed recreation is very low (BLM, 2009c).

3.4.2.2 Environmental Consequences

3.4.2.2.1 Proposed Action

The perimeter of the mining area is currently fenced; fencing would encompass an additional 16 acres as part of the proposed action to prevent the public from accessing mining areas. Considering the existing, approved mining and the dispersed and informal nature of recreation in the area, impacts to hunting and recreation are expected to be negligible. The Continental Divide Trail would not be impacted by the proposed action or connected non-federal action.

3.4.2.2.2 No Action

Under the no action alternative, no additional impacts to recreational resources would occur beyond those which have been previously authorized.

3.4.3 Utilities

3.4.3.1 Affected Environment

The existing power supply to the Little Rock Mine would be relocated from its current location spanning Deadman Canyon to the north of the conceptual open pit configuration under the proposed action. The power line occurring on private land north and east of the Proposed Action Area are owned and operated by Tyrone and are not subject to rights-of-way or easements.

At the western edge of the Proposed Action Area, the conceptual open pit configuration may incorporate a portion of an existing power line right-of-way help by the Public Utility of New Mexico (PNM). Recent and ongoing sampling and analysis of the ore body by Tyrone indicates that the open pit would not advance past this existing power line right-of-way under current programming. If necessary in the future, Tyrone would coordinate with PNM and the BLM, if required, to adjust the right-of-way and relocate the power line.

3.4.3.2 Environmental Consequences

3.4.3.2.1 Proposed Action

Under the proposed action and connected non-federal action, impacts to existing utility rights-of-way would not be anticipated. However, if necessitated by mine programming, Tyrone would coordinate with PNM and the BLM, if required, to adjust the right-of-way and relocate the power line.

3.4.3.2.2 No Action

Under the no action alternative, additional impacts to existing utility rights-of-way would not occur.

3.5 CULTURAL RESOURCES

This section describes the cultural resources of the Proposed Action Area and vicinities. Additionally, this section analyzes the potential environmental consequences for the activities associated with the proposed action/connected non-federal action and no action alternative presented in Section 2.0 of this EA.

Key issues related to cultural resources in Section 1.6.1 identified during public and agency scoping include:

- What effect would mine construction and operation have on cultural resources?

3.5.1 Affected Environment

Extensive Class III archeological surveys were performed as part of a 1997 Final EIS (BLM, 1997a) and Record of Decision (BLM, 2009b). In 2010, the BLM reaffirmed that the results and recommendations of the prior studies remained valid and recommended that mining at Little Rock be allowed to proceed, as documented in a letter from the BLM to the State Historic Preservation Office (SHPO). The prior surveys that have been conducted in the Proposed Action Area and vicinity, on both BLM-managed and private land, include:

- *A Supplemental Evaluation of Archaeological Sites Recorded by Surveys for the Proposed Little Rock Mine in Grant County, New Mexico* (Rogge and Shepard, 1996)
- *An Archaeological Survey of the Proposed Deadman Canyon Borrow Area, Tyrone Mine, Grant County, NM* (NMCRIS # 106928; (Ackerly, 2007)
- NMCRIS Activity No. 126381 – NMCRIS Investigation Abstract Form (NIAF) dated February 13, 2013, corresponding to the survey of dewatering pipeline alignment #1 (Ackerly)
- NMCRIS Activity No. 125791 – NIAF dated November 29, 2012, corresponding to the survey of a monitoring well (Ackerly)

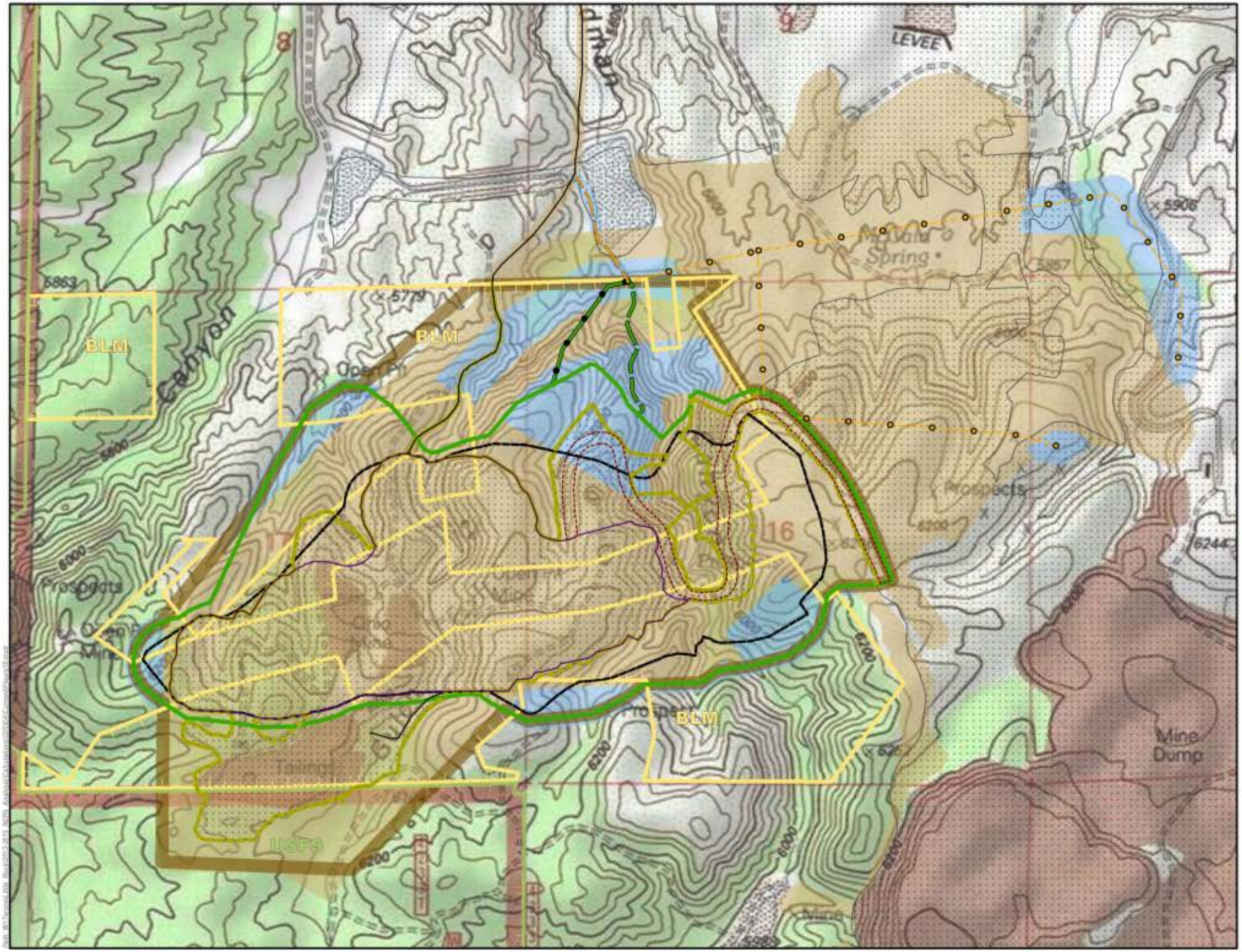
In addition, a Class III (100 percent) archeological survey was completed in 2014 (Ackerly) over approximately 173 acres (in eight, discontiguous parcels and including both BLM-managed and private land) in the Proposed Action Area and vicinity, beyond the acreage surveyed previously. The area of coverage by both the earlier and 2014 surveys is presented in Figure 18. The area surveyed extends approximately 100 feet outside of the proposed limit of disturbance under the proposed action and connected non-federal action and incorporates a minimum 50-foot buffer on either side of the width of the linear facilities under the proposed action. The survey area also included the planned route of the dewatering pipeline #2 and planned and potential power line routes that are private actions (refer to Section 1.5.3).

The Class III survey reported in *Supplemental Archeological Survey of the Little Rock Mine Expansion Area, Grant County, NM* (Ackerly, 2014) encountered three archaeological sites. Two prehistoric sites, LA178952 and LA178953 were identified, and one previously recorded, historic site, LA112576, was relocated.

- LA178952 is a small (approximately 1,400 square meters) prehistoric site, located on BLM-managed land, with a total of 22 surface artifacts. The artifact assemblage consists mostly of chipped stone artifacts; surface features are absent. Based on a single sherd, the site dates to ca. 400-900 A.D. The site has been impacted by earlier, existing, and approved disturbance; at least half the site has been destroyed or severely compromised, and the overall site integrity is minimal.
- LA178953 is a small prehistoric site located on private land, with a total of 49 surface artifacts and two hearths; structures are absent. The artifact assemblage consists of chipped and ground stone artifacts, as well as ceramics. Ceramics consist solely of utilitarian Mimbres corrugated wares nominally dating to ca. 800-1150 A.D. Prior construction activities have destroyed about half of the site; consequently, the overall site integrity is minimal.
- LA112576 is a historic site consisting of a very low-density surface scatter of historic artifacts, located on private land. Structures and other features are absent. This site has previously been determined not eligible for inclusion on the National Register of Historic Places (NRHP). A reevaluation of the site conducted during the survey does not change this recommendation and determination.

Based on report findings, and consistent with 36 CFR 63, the integrity of LA178952 and LA178953 are negligible. The report recommends that the three sites identified (or relocated) are not eligible for inclusion on the NRHP.

The 1997 Final EIS documents the status of previously recorded sites within and beyond the Proposed Action Area. Sites that have been determined eligible for inclusion in the NRHP in the project record are listed in Table 16, along with the land ownership and relative location to the within the Proposed Action Area and their current status. Mitigation has been completed for the only site identified on BLM-managed land, the Ohio Mine (LA102140), and this site has been destroyed under existing approvals/no action alternative. The other sites listed in Table 16 are located on private land, beyond the Proposed Action Area, and are listed here to consolidate and clarify the project record.



Legend

- Proposed Action Area
- Prior Class III Survey Area
- 2014 Class III Survey Area
- Earlier, Existing, and Approved Disturbance
- BLM Managed Land
- USFS Managed Land

No Action Alternative

- Earlier, Existing and Approved Disturbance at the Little Rock Mine
- Current Open Pit Configuration
- Existing Haul Road

Features of the Proposed Action and Connected Non-Federal Action

- Proposed Limit of Disturbance Expanding the Open Pit
- Proposed Conceptual Open Pit Configuration
- Proposed Dewatering Pipeline Alignment #2
- Proposed Power Line Alignment

Private Actions (Planned)

- Dewatering Pipeline Alignment #2
- Potential Power Line Route

0 1,000

SCALE IN FEET

COORDINATE SYSTEM
NM83-WF

FIGURE 18
CULTURAL RESOURCE SURVEY AREAS
LITTLE ROCK MINE

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FREEPORT-McMoRan

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Table 16 Previously Recorded Cultural Sites Eligible for Listing on the NRHP within the Proposed Action Area and Vicinity

Site No.	Description	Probable Function	National Register Eligibility (Criterion)	Land Ownership/ Relative Location	Status
LA102132	masonry pueblo (about 10 to 30 rooms) and artifact scatter	prehistoric Mimbres habitation	eligible (d)	private/ outside Proposed Action Area	beyond area proposed for disturbance under the private action
LA102135	scatter of ceramic and lithic artifacts; others may be buried	prehistoric Mimbres work station or camp	eligible (d)	private/ outside Proposed Action Area	proximate to planned power line route under the private action
LA102136	scatter of lithic artifacts; others may be buried	prehistoric Mimbres work station or camp	eligible (d)	private/ outside Proposed Action Area	proximate to planned power line route under the private action
LA102137	scatter of lithic artifacts; others may be buried	prehistoric lithic tool production or hunting	potentially eligible (d), would require testing	private/ outside Proposed Action Area	proximate to planned power line route under the private action
LA102138	scatter of lithic artifacts; others may be buried	prehistoric lithic tool production or hunting	eligible (d)	private/ outside Proposed Action Area	mitigation complete under prior approvals; site has been fenced/avoided and no new disturbance is proposed under the private action
LA102139	scatter of lithic artifacts; others may be buried	prehistoric lithic tool production or hunting	eligible (d)	private/ outside Proposed Action Area	mitigation complete under prior approvals; site destroyed
LA102140	historic Ohio mine; recent dam	historic mining and water control	eligible (d)	BLM-managed/ within current open pit configuration in the Proposed Action Area	mitigation complete under prior approvals; site destroyed under the no action alternative
LA109238 (redefined)	Azure Mining Company Claims (pits, adits, trenches, and a few artifacts)	historic prospecting	eligible (d)	private/ outside Proposed Action Area	mitigation complete under existing approvals; site destroyed

Sources: (Rogge and Shepard, 1996), (BLM, 1997a), (Tierra EC, 2010)

3.5.2 Environmental Consequences

3.5.2.1 Proposed Action

Under the proposed action and connected non-federal action, there would be no effect to cultural resource sites with a NRHP status of eligible, or recommend as eligible. Ackerly (2014) concludes that no adverse effects to cultural sites would occur from the proposed action or connected non-federal action.

3.5.2.2 No Action

Under the no action alternative, no disturbance to cultural resources would occur beyond what has been previously authorized.

3.6 AIR RESOURCES

This section describes the air resources of the project vicinity, including a summary of the data, investigations, and assessments presented in the 1997 Final EIS (BLM, 1997a) and 2010 analysis (Tierra EC), updated to reflect new analyses. Additionally, this section describes the environmental consequences for the activities associated with the proposed action, connected non-federal action, and no action alternative presented in Section 2.0 of this EA.

No issues related to air resources were identified during public and agency scoping (Section 1.6.1).

3.6.1 Ambient Air Quality

3.6.1.1 Affected Environment

The Tyrone Mine facilities, inclusive of the Little Rock Mine, have two active air quality permits: a state of New Mexico New Source Review (NSR) construction permit, as set forth in Section 20, Chapter 2, Part 72 of the NMAC, and an air quality operating permit under Title V of the Clean Air Act, as set forth in Section 20, Chapter 2, Part 70 of the NMAC (Title V).

Air quality standards include the National Ambient Air Quality Standards (NAAQS) and New Mexico Ambient Air Quality Standards (NMAAQS), established under the authority of Title I, Part A of the Clean Air Act, as well as Federal standards for limiting incremental degradation of air quality, known as Prevention of Significant Deterioration (PSD) "increment." The Federal NAAQS, state NMAAQS, and PSD increment were reviewed to determine applicability to an analysis of the proposed action and connected non-federal action.

The seven criteria pollutants for which Federal ambient air standards (NAAQS) exist are carbon monoxide (CO), lead, sulfur dioxide (SO_2), particulate matter less than 10 micrometers in size (PM_{10}), particulate matter less than 2.5 micrometers in size ($PM_{2.5}$), ozone, and nitrogen dioxide (NO_2). A review of the NMAAQS regulation indicates that in addition to the NAAQS criteria pollutants and standards, New Mexico has adopted ambient air standards for total suspended particulates (TSP), and in some cases, has established more protective ambient air standards than those established in the NAAQS.

The degree to which the air resource may be affected can be estimated through air dispersion modeling of pollutants. A screening of the seven Federal criteria pollutants allows the analysis to focus on pollutants which have a potential to affect local or regional air quality. Ozone is not emitted into the air directly, but can be a product of chemical interaction with volatile organic compounds (VOCs) and nitrogen dioxide. No changes are contemplated for Little Rock that would increase emissions of VOCs. Additionally, NMED monitors ambient ozone concentrations, making air dispersion modeling of VOC emissions unnecessary for determination of compliance with applicable ambient air quality standards. Potential lead emissions from Tyrone facilities are below applicable emission thresholds which would require modeling (NMAQB, 2014). Therefore, lead emissions are not analyzed further. Additionally, the 1997 Final EIS (BLM, 1997a) concludes that gaseous pollutant emissions (SO_2, CO, NO_2) were "of insignificant magnitude to warrant modeling." Further, gaseous emissions from mobile sources (such as haulage equipment) were analyzed and found to be protective of the NAAQS (Tierra EC, 2010). Given the low potential for sources at the Tyrone and Little Rock mines to contribute to an exceedance of the NAAQS for these constituents, the fact that mining rates at Little Rock are not anticipated to change above current levels, and the fact that Tyrone's air quality permits do not require inclusion of these mobile sources in air quality dispersion modeling, the air quality modeling did not include mobile sources of gaseous emissions (CEC, 2014). However, stationary sources of these criteria pollutants were included in the new air dispersion modeling.

In summary, air dispersion modeling includes the pollutants CO, SO_2, TSP, PM_{10}, $PM_{2.5}$, and NO_2. The pollutants for which PSD increments have been established are SO_2, PM_{10}, and NO_2. Table 17 lists these pollutants and the applicable regulatory standards.

Table 17 NAAQS, NMAAQS and PSD Regulatory Standards

Criteria Pollutant	**Applicable Regulation**	**Regulatory Standards**	
Carbon monoxide (CO)	NMAAQS	High 1-hour High 8-hour	13.1 ppm 8.7 ppm
Nitrogen dioxide (NO_2)	NMAAQS	High 24-hour Annual average	100 ppb 50 ppb
	PSD	Class I PSD Increment Class I PSD Increment	2.5 µg/m^3 25 µg/m^3
TSP	NMAAQS	24-hour average 30-day average Annual geometric mean	150 µg/m^3 90 µg/m^3 60 µg/m^3
$PM_{2.5}$	NAAQS	24-hour average Annual average	35 µg/m^3 12 µg/m^3
PM_{10}	NAAQS	24-hour average	150 µg/m^3
	PSD	24- hour Class I PSD Increment 24- hour Class II PSD Increment Annual Class I PSD Increment Annual Class II PSD Increment	8 µg/m^3 30 µg/m^3 4 µg/m^3 17 µg/m^3

Criteria Pollutant	**Applicable Regulation**	**Regulatory Standards**	
Sulfur dioxide (SO_2)	NAAQS	1-hour (99th percentile of maximum concentrations, averaged over 3 years)	75 ppb
		High 2nd high 3-hour	1,309 µg/m^3
	NMAAQS	High 2nd high 24-hour	0.100 ppm
		Annual average	0.020 ppm
	PSD	High 2nd high 3-hour Class I PSD Increment	25 µg/m^3
		High 2nd high 3-hour Class II PSD Increment	512 µg/m^3
		High 2nd high 24-hour Class I PSD Increment	5 µg/m^3
		High 2nd high 24-hour Class II PSD Increment	91 µg/m^3
		Annual Class I PSD Increment	2 µg/m^3
		Annual Class II PSD Increment	20 µg/m^3

ppm parts per million
ppb parts per billion
µg/m^3 micrograms per cubic meter

Air quality dispersion modeling has recently been completed in order to evaluate the potential impacts of changes to the Tyrone mining plan for the next 5 years (2014-2018). This modeling is required every five years under the terms of Tyrone's Title V permit, and is also required under Tyrone's NSR permit if changes to operations are proposed. The updated air quality dispersion modeling incorporates the features of the proposed action and additional, unrelated operational changes in mining and reclamation activities proposed at the Tyrone Mine (CEC, 2014). As opposed to prior air quality modeling efforts, a slightly different approach was taken in the current modeling effort. The current air dispersion modeling analysis determines the maximum material throughput (*i.e.*, mining and reclamation rates) for leach, waste rock, and overburden stockpiles and reclamation areas that would maintain compliance with the applicable air quality standards. The results of the modeling indicate (CEC, 2014):

- The overall mining rate at Tyrone facilities could increase from a maximum of approximately 230,000 tons per day to up to approximately 300,000 tons per day while maintaining compliance with air quality standards. Notably, an increase in the mining rate at the Little Rock Mine is not anticipated due to physical size and space constraints within the open pit.
- The use of blasting material at Tyrone facilities could increase from approximately 18,500 tons per year to approximately 73,000 tons per year. Similar to the above, an increase in the blasting rate at the Little Rock Mine is not anticipated.
- Haul roads can be located or relocated without exceeding ambient air quality standards at the fence line or beyond as long as they remain at least one-quarter mile from the fence line.
- Reclamation activities could be contemporaneously conducted at multiple locations around the Tyrone facility, up to a maximum material movement rate of approximately 20,000 tons per day, per project, with some exceptions set forth in Tyrone's air quality permits, based on proximity of the reclamation activity to the Tyrone fence line. Reclamation activities at the Little Rock Mine would not exceed the maximum rate of material movement. The dispersion modeling was used to optimize the reclamation activities at various locations without violating applicable ambient air quality standards.

The Tyrone Mine facilities are located in a Federal attainment area, in Air Quality Control Region 12, where the PSD minor source baseline dates for NO_2, SO_2 and PM_{10} have been established. The mine is located approximately 30 kilometers (km) south-southwest of the Gila Wilderness PSD Class I area (CEC, 2014). The existing Tyrone Mine, inclusive of the Little Rock Mine, operates in conformance with its two air quality permits; current operations are in compliance with applicable ambient air quality standards.

Figure 13 shows the approximate fence line boundary of the facility, outside of which Tyrone must demonstrate the attainment of Federal and state ambient air quality standards. This boundary is generally the Tyrone facility property line, within which access by the general public is restricted. The potentially affected environment for this EA therefore extends from the Tyrone fence line boundary (inclusive of the Little Rock Mine fence line), out to a distance of about 50 km from the facility; a 50-km radius surrounding the Proposed Action Area is depicted in Figure 1. This distance is considered to be adequate to include potentially substantial pollutant sources in an air dispersion model and to assure that areas potentially affected by the proposed action are evaluated.

3.6.1.2 Environmental Consequences

3.6.1.2.1 Proposed Action

The EPA approved air dispersion modeling computer program, AERMOD, was used to predict pollutant concentrations in ambient air based on modeled emission sources operating at Tyrone Mine facilities, inclusive of the Little Rock Mine. A full description of the air dispersion modeling, the pollutant source inventory, and the resulting ambient air concentrations of the modeled pollutants can be found in the modeling report, *Air Dispersion Modeling Summary Ambient Air Quality Impacts 2014-2018* (CEC, 2014). The environmental consequences were estimated by comparing the regulatory standards to the predicted concentrations of regulated pollutants in ambient air at potential receptor points.

The geometry, locations and magnitude of potential air emission sources associated with the proposed action were simulated within the AERMOD air dispersion model, and superimposed on other emissions from the Tyrone Mine and background air quality. Specific elements of the proposed action/connected non-federal action considered in the model include expansion of the open pit and the western haul road. The AERMOD model demonstrates that compliance with the ambient air quality standards would be maintained up to a maximum mining rate of 300,000 tons per day, with a maximum of 250,000 tons per day being derived from haulage of waste rock. However, an increase in the mining rate at the Little Rock Mine is not planned due to physical size and space constraints within the open pit. The expansion of the open pit and addition of the western haul road would not cause an exceedance of applicable ambient air quality standards.

Due to the proposed enlargement of the Little Rock Mine footprint and the resulting additional ore and waste rock materials that would be mined from it over time, the duration of mining at the Little Rock facility would be increased under the proposed action/connected non-federal action. Under the proposed action/connected non-federal action, although the total mass of pollutants (mainly TSP, PM_{10}, and $PM_{2.5}$) would be greater, the rate of release would not increase beyond levels permitted by Tyrone's air quality permits. These levels would be protective of applicable ambient air quality, in part through the use of

BMPs for dust control including haul road watering and the optional use of surfactants to achieve a dust control efficiency of at least 80 percent.

The results of the current air dispersion modeling demonstrate that the proposed action/connected non-federal action would comply with applicable air quality standards.

3.6.1.2.2 No Action

Under the no action alternative, Tyrone would continue activities previously authorized under existing permits and approvals.

3.6.2 Climate Change

Existing climate prediction models are global in nature and are not at the appropriate scale to estimate potential impacts of climate change within the Proposed Action Area. Further, no change to the anticipated number or type of equipment or processing facilities would occur under the proposed action/connected non-federal action. Due to the nature and scale of the project, effects on climate change are not further analyzed in this EA.

3.7 HUMAN RESOURCES

This section provides a summary of the visual resources, noise, socioeconomics, and environmental justice associated with the Little Rock Mine. This section also analyzes the potential environmental consequences to human resources for the activities associated with the proposed action/connected non-federal action and no action alternative presented in Section 2.0 of this EA.

No issues related to human resources were identified during public and agency scoping (Section 1.6.1).

3.7.1 Visual Resources

3.7.1.1 Affected Environment

The setting in the vicinity of the Little Rock Mine is dominated by lands that have previously been modified by mining activities. Both the Little Rock Mine and the adjacent Tyrone Mine are industrial in appearance. Jointly, these mines include such features as open pits; leach and waste rock stockpiles; tailings facilities; and other elements that contrast with the native landscape.

Portions of the Little Rock Mine occur within the jurisdiction of the BLM and are subject to the Visual Resource Management (VRM) classes outlined in the Mimbres Resource Management Plan (BLM, 1993). The management plan designates the area of the Little Rock Mine as VRM Class IV. The Class IV management objective is:

> Provide for management activities which require major modification of the existing character of the landscape. The level of change to the characteristic landscape can be high. These management activities can dominate the view and be the major focus of the viewer attention. However, every attempt should be made to minimize the impact of

these activities through careful location, minimal disturbance, and repeating the basic elements.

The landscape changes resulting from the existing Little Rock and Tyrone mines are most prominent from a local perspective within foreground views. However, due to the large scale of the Tyrone Mine and the position of the Little Rock Mine, there is limited potential for public visibility of the Little Rock Mine.

The Continental Divide Trail, described in Section 3.4.2.1, provides access to vantage points from which observant trail users may see the mine. The Little Rock Mine is visible in the middle ground from Jacks Peak and possibly (but unlikely) from Burro Peak looking north, approximately 4 miles south of the mine area. In visual comparison from these potential vantage points, however, the Little Rock Mine is far less prominent than the adjacent, and substantially larger Tyrone Mine.

The Little Rock Mine is not visible from the Burro Mountain Homestead (approximately 2 miles to the southwest) or other more distant, sparsely distributed residences (Figure 16); however, the mine is lit at night to allow for night-time operations. Under current operations, lighting is designed to minimize illumination of night skies.

3.7.1.2 Environmental Consequences

3.7.1.2.1 Proposed Action

The existing landscape within and adjacent to the Little Rock Mine has been extensively modified by previous mining activities. The existing mine has the appearance and characteristics of surface mines throughout the region and already contrasts strongly with the surrounding, characteristic landscape. The distance to and visibility to potential viewers of the Little Rock Mine expansion would not result in additional impacts to visual resources. Due to the isolated nature of the Proposed Action Area and the presence of past and current mining in vicinity of Little Rock, overall visual impacts from the proposed action and connected non-federal action would be minimal. The visual contrasts associated with the proposed action/connected non-federal action would meet the BLM VRM Class IV objectives and the Mimbres RMP guidance. No change to night-time lighting would be anticipated under the proposed action/connected non-federal action in comparison to the no action alternative.

3.7.1.2.2 No Action

There would be no impacts to visual resources under the no action alternative beyond what has already been approved.

3.7.2 Noise

3.7.2.1 Affected Environment

Sources of noise from current and proposed mining activities include diesel-powered earth-moving equipment, blasting, and short duration air blast warnings, typically lasting one second, once per day. Noise level criteria were developed as part of the analysis presented in the 1997 Final EIS (BLM, 1997a).

Noise is often described as "unwanted sound," and is commonly measured in terms of A-weighted decibels (dBA).[1] Per the 1997 Final EIS, noise levels predicted to be generated by mining activities at the Little Rock Mine were compared with a noise level of 55 dBA, which was developed based on EPA criteria and annoyance data of large populations. A level of 55 dBA would likely be considered intrusive and the potential audibility of noise from the mine could be considered an impact. In the 1997 Final EIS, noise levels from mining activities were considered at six receptor locations (five nearby residences and the community of Tyrone). Results showed that noise levels at the six receptor locations did not exceed the EPA's 55 dBA annoyance criterion; however for two nearby residences it could be distinctly audible and potentially annoying. One of the nearby residences (south of the Little Rock Mine) has since been purchased by Tyrone and removed.

Airblasts from mine blasting commonly only occur for short durations (approximately one second) and generally once per day on weekdays. Therefore, noise impacts from blasting typically do not result in the interference of activities such as speech. Damage and annoyance criteria developed by the U.S. Bureau of Mines were applied to the airblast levels predicted at receptors near the Little Rock Mine (Bureau of Mines, 1980). The Bureau of Mines criteria state that to minimize the possibility of damage, airblast levels should be limited to 134 dBL[2] (peak linear level) at receptor locations. To minimize the potential for annoyance, airblast levels are generally limited to 129 dBL.

3.7.2.2 Environmental Consequences

3.7.2.2.1 Proposed Action

Under the proposed action/connected non-federal action, there would be no changes in the sources generating noise in comparison to the no action alternative. The same equipment and blasting techniques would be used, and the rate of mining is not anticipated to change. The open pit would expand predominantly to the north and east, and towards existing mining activities and disturbances. The western haul road would shift some of the haul truck noise to the northwestern edge of the open pit, but the western haul road is approximately the same distance to the nearest potential receptor as the currently authorized, northern lobe of the open pit. It is anticipated that this change would be a negligible increase over the existing equipment noise levels at the nearest receptor.

In the 1997 Final EIS, no receptors were exposed to airblast impacts above either the 134 dBL damage level or the 129 dBL annoyance level. However, the two closest receptor locations identified earlier were predicted to incur airblast levels approaching the annoyance level. Under the proposed action, blasting operations would eventually shift further to the north and east. Expansion to the north is minimal, and does not move the blasting operations closer to potential receptors than is currently authorized. Expansion to the east would move the blasting operations further from either of the two closest receptors. If blasting

[1] The basic unit of noise measurement is the decibel (dB), which is equal to 20 times the logarithm (base 10) of sound pressure divided by the reference pressure of 0.00002 Newtons per square meter (N/m^2). A-weighted decibels have been frequency weighted in a manner representative of human hearing.

[2] L-weighted decibels measure loudness of all frequencies with the same sensitivity.

operations are needed for construction of the western haul road, noise impacts would be for a short duration and episodic, and would not be any closer to the nearest receptor than is currently authorized.

3.7.2.2.2 No Action

No changes to the potential for noise generation would occur under the no action alternative.

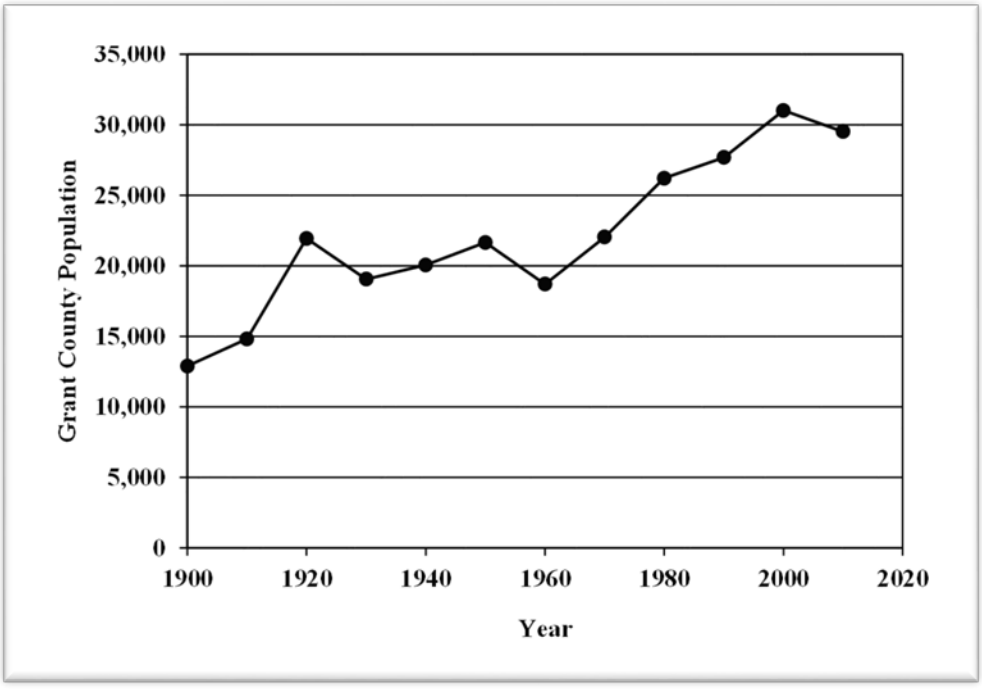
3.7.3 Socioeconomics

3.7.3.1 Affected Environment

3.7.3.1.1 Population

As shown in Inset 1, Grant County's population has been trending gradually upward over the past several decades, but has not changed substantially since the 1990s. The population in Grant County displayed a slight decrease (less than 5 percent) between the 2000 census (population of 31,002; (Tierra EC, 2010)) and the 2010 census (population of 29,514; (USCB, 2010b)).

Inset 1 Grant County Population Trend



Source: (Tierra EC, 2010); (USCB, 2010b)

3.7.3.1.2 Employment and Income

Mining represents approximately 10 percent of total employment in Grant County. As of 2011, Freeport-McMoRan continues to be the largest mining employer in Grant County, playing an important role in providing both personal income and tax revenues for the county (Tierra EC, 2010). Mining and manufacturing represents more than 12 percent of Grant County's 2012 gross receipts. Within Grant County and the broader region, the economy continues to grow, unevenly however, corresponding to the fluctuations of the mining industry and national economy.

Mining activities in Silver City and the surrounding area have varied with commodity prices since the early nineteenth century. Local growth trends due to mining and milling activities have also been cyclical, typically expanding or contracting with the demand for copper and other metals. However, as the Silver City area has grown, it has become more diversified, and is therefore less subject to large fluctuations in population from changes in the mining economy. While the role of the mining industry remains predominant, increased levels of tourism and interest in Silver City as a retirement community have contributed to population growth. Increases in the service sectors, government, and Western New Mexico University have also contributed to population growth (Tierra EC, 2010).

In 2013, Freeport-McMoRan operations (primarily the Tyrone, Chino, and Cobre mines) generated an estimated $178.1 million in economic benefits for Grant County (ASU, 2013), including a direct impact of $138.2 million (compensation, business taxes, and vendor purchases) and indirect impact of $39.9 million (spending by employees, spending from new tax revenues, spending from pension income, and vendor purchases). Comparatively, in 2008, Freeport-McMoRan operations generated an estimated $312.7 million in economic benefits for Grant County (WEAC, 2009), including direct impact of $197.1 million and indirect impact of $115.6 million.

3.7.3.2 Environmental Consequences

3.7.3.2.1 Proposed Action

The proposed action and connected non-federal action would enable and prolong the ongoing employment and wages, procurements from suppliers, and payments of taxes to state and local governments that have been generated under the no action alternative.

3.7.3.2.2 No Action

The no action alternative would result in direct and indirect negative effects resulting from the loss of economic benefits associated with the expansion of the continued mining of the Little Rock Mine ore body reserves.

3.7.4 Environmental Justice

3.7.4.1 Affected Environment

Race composition by Census Tract 9642, Grant County, and New Mexico is presented in Table 18. Census data from 2010 indicates a population of 29,514 people within Grant County, of which 84.9 percent self-identified as “White” and 48.3 percent self-identified as “Hispanic or Latino” (USCB, 2010c). As of the 2010 census, Hispanic, Latino or Spanish origin was not an option as a race identifier, instead being included as a stand-alone question for self-identified ethnicity. The composition of race in Census Tract 9642 (USCB, 2010a) predominantly self-identified as “White” (93.9 percent) and approximately 19.7 percent of the population identified as “Hispanic or Latino.” American Indian or Alaskan Native, Asian or Pacific Islander, and Black each represented one percent or less of the population in Census Tract 9642 (USCB, 2010a).

Poverty levels for Census Tract 9642, Grant County and New Mexico are presented in Table 19. The 2012 5-year estimate census indicates that income for 12.0 percent of the population of Census Tract 9642 was considered below the poverty level (USCB, 2012c), compared to 9.7 percent in 2000 (Tierra EC, 2010).

Table 18 Race Composition by Census Tract, County, and State

	Census Tract 9642[b]		**Grant County**		**New Mexico**	
Race[a]	**2000[c]**	**2010[d]**	**2000[c]**	**2010[e]**	**2000[c]**	**2010[f]**
Total Population	2,330	2,153	31,002	29,514	1,819,046	2,059,181
White	89.3%	93.9%	75.7%	84.9%	66.8%	68.4%
Hispanic or Latino[c]	18.5%	19.7%	48.8%	48.3%	42.1%	46.3%
Black or African American	0.5%	0.4%	0.5%	0.9%	1.9%	2.1%
American Indian and Alaska Native	0.9%	1.0%	1.4%	1.4%	9.5%	9.4%
Asian	0.2%	0.3%	0.3%	0.4%	1.1%	1.4%
Native Hawaiian and Other Pacific Islander	0%	0.0%	0%	0.1%	0.1%	0.1%

[a] Percentages do not add up to 100%; self-identification as Hispanic, Latino or Spanish origin is now a separate question from Race for census purposes.
[b] Census tract number has changed from 9842 to 9642 as of the 2010 Census.
[c] Source: (Tierra EC, 2010)
[d] Source: (USCB, 2010a)
[e] Source: (USCB, 2010c)
[f] Source: (USCB, 2010d)

Table 19 Poverty Levels

Population Category	Census Tract 9642 Poverty Level		Grant County Poverty Level		New Mexico Poverty Level	
	2000[a]	**2012[b]**	**2000[a]**	**2012[c]**	**2000[a]**	**2012[c]**
All ages	9.7%	12.0%	18.7%	18.4%	18.4%	19.5%
Related children under 18 years	11.1%	24.4%	25.9%	27.8%	24.6%	27.5%
65 years and older	5.4%	4.1%	9.5%	6.7%	12.8%	12.2%
Families	7.3%	11.7%	15.1%	13.7%	14.5%	14.9%

[a] Source: (Tierra EC, 2010)
[b] Source: (USCB, 2012c)
[c] Source: (USCB, 2012a)

3.7.4.2 Environmental Consequences

3.7.4.2.1 Proposed Action

Disproportionately high and adverse effects to minority populations as a result of the proposed action/connected non-federal action are unlikely, based on three factors:

- A lower percentage of minority populations in Census Tract 9642, which contains the proposed action area (19.7 percent Hispanic or Latino and one percent or less of each of the other minority races), compared with Grant County (approximately 48.3 percent Hispanic or Latino and 1.4 percent or less for each of the other minority races) and the State of New Mexico (approximately 46.3 percent Hispanic or Latino and 9.4 percent or less for each of the other minority races);
- A low population density (less than two persons per square mile in 2012 (ESRI, 2014)) within Census Tract 9642; and
- Overall low expected impacts from implementation of the proposed action and connected non-federal action. Potential impacts to minority residents, like any other resident, are expected to be less than significant.

Poverty levels for the population within Census Tract 9642 are lower than the poverty levels within Grant County and the State of New Mexico. As such the Proposed Action Area is not considered to represent a low-income population. In addition, implementation of the proposed action and connected non-federal action would generate positive economic benefits to the local economy, including opportunities for employment, increased earning potential for local individuals, and income to businesses and government. For the aforementioned reasons, the proposed action and connected non-federal action would not result in disproportionately high and adverse human health or environmental effects to low income or minority populations.

3.7.4.2.2 No Action

The no action alternative would not result in disproportionately high and adverse human health or environmental effects to low income or minority populations.

4.0 CUMULATIVE EFFECTS

4.1 METHODOLOGY

Cumulative impact, as defined by the Council on Environmental Quality (CEQ; 40 CFR 1508.7), is

> …the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.

The direct and indirect effects of the proposed action and connected non-federal action have been summarized in Section 3.0. The objective of the cumulative effects analysis is to estimate the resulting impact of the project on a resource when viewed within the context of other past, present, and reasonably foreseeable actions within the vicinity of the project. Five steps were taken to conduct this analysis:

- Identify cumulative effects issues
- Identify the temporal and spatial extent of the study area for each resource area
- Identify past, present and reasonably foreseeable future actions relevant to each issue
- Establish the baseline/trend for each resource considered
- Analyze cumulative effects

4.1.1 Identification of Cumulative Effect Issues

Project scoping facilitates focus on the important effects issues. As stated in the CEQ guidance, it allows the NEPA practitioner to "count what counts" (CEQ, 1997). Scoping was completed for the proposed project to identify key issues and define the scope of the project and environmental analysis. The identified issues are listed in Section 1.6.1. Section 3.0 describes the existing condition of the natural and human environment in the Proposed Action Area (the affected environment) and analyzes the potential direct and indirect effects that may result from the implementation of the proposed action/connected non-federal action and the no action alternative on environmental resource areas which are present and may be affected, regardless of their identification during the scoping process. This comprehensive analysis allows for the review of the issues identified during scoping and for the identification of other issues which may be important to consider within a cumulative effects analysis. The CEQ guidance also indicates that the cumulative effects analysis should focus on "important issues of national, regional, or local significance" (CEQ, 1997). Further, the CEQ guidance states that, "not all potential cumulative effects issues identified during scoping need to be included in an EA or EIS" if they are "irrelevant or inconsequential to decisions about the proposed action and alternatives" (CEQ, 1997).

The resources evaluated in Section 3.0 are listed in Table 20, along with a recommendation for retention in the cumulative effects analysis.

Table 20 Identification of Cumulative Effects Analysis Issues

Resource	Identified in Scoping?	Direct or Indirect Impacts[1]	Retained for Cumulative Effects Analysis?
Earth Resources			
Soils	No	No substantial impacts to soil	No
Geology/Mineral Resources	Yes	No substantial impacts to geology	No
Water Resources			
Surface Water and Groundwater Quantity	No	Insubstantial loss of contributing watershed area through the expansion of the open pit No change to groundwater withdrawals/ quantity	No
Surface Water Quality	Yes	No substantial change to surface water quality	No
Groundwater Quality	Yes	No substantial change to groundwater quality would be expected	No
Biological Resources			
Vegetation	Yes	• Approximately 200 acres of vegetation loss represents a negligible increase in surface disturbance; disturbed areas would be reclaimed in accordance with the CCP • No impacts to the upgradient, natural riparian habitat • Indirect impacts to the downgradient, man-made riparian area would be short-term and insubstantial • The Deadman Canyon diversion would cause a negligible decrease in the function of the vegetation and canyon habitat	Yes
General Wildlife Species	Yes	• Loss of approximately 200 acres of habitat is not anticipated to produce long-term impacts on wildlife, and successful reclamation and revegetation of the disturbed areas would restore wildlife habitat • Potential impacts to wildlife, wildlife movement, and habitat connectivity would be minimal • No effect to water availability for wildlife	Yes
Special Status Species	Yes	No effect to federally listed species or designated critical habitat; potential indirect impacts may include a loss of nesting, foraging, and breeding habitat for the northern goshawk and sensitive bat species	Yes
Migratory Birds	Yes	Potential impacts may include a loss of nesting, foraging, and breeding habitat as a result of vegetation removal and development of the project	Yes

Resource	Identified in Scoping?	Direct or Indirect Impacts[1]	Retained for Cumulative Effects Analysis?
Lands and Realty			
Range Resources	No	Negligible, short-term reduction in the size of an existing grazing lease	No
Recreation Resources	No	Impacts to hunting and recreation are expected to be negligible	No
Utilities	No	No substantial impact to existing utilities or rights-of-way	No
Cultural Resources			
Cultural Resources	Yes	No effect to cultural resources	No
Air Resources			
Ambient Air Quality	No	Compliance with applicable air quality standards; no impact to ambient air quality	No
Climate Change	No	No change to the anticipated number or type of equipment or processing facilities	No
Human Resources			
Visual Resources	No	Negligible overall visual impact	No
Noise	No	No change over the existing noise levels	No
Socioeconomics	No	Beneficial effect by enabling and prolonging the ongoing employment and wages, procurements from suppliers, and payments of taxes to state and local governments	No
Environmental Justice	No	No disproportionately high or adverse human health or environmental effects to low income or minority populations	No

[1] As identified in Section 3.0.

4.1.2 Geographic and Temporal Boundaries

Biological resource issues carried forward into cumulative effects analysis include vegetation, general wildlife species, special status species, and migratory birds. Impacts within and adjacent to the Proposed Action Area have been reviewed in Section 3.0. The cumulative effects analysis for biological resources evaluates past, present, and reasonably foreseeable future actions within the Mangas Creek Watershed (HUC10 1504000203). The Mangas Creek Watershed includes approximately 204 square miles, and is as the geographic boundary for this analysis, as shown in Figure 13 in relation to the Proposed Action Area.

Timeframes are also considered for the cumulative effects analysis. Under the proposed action and connected non-federal action, operations at the Little Rock Mine would be extended by approximately four years, creating a reasonably foreseeable future time frame beginning in approximately 2015 and ending in 2020. Reclamation would be conducted following operations, followed by post-closure monitoring, in accordance with the CCP.

By their nature, steps two and three of the cumulative effects analysis are interrelated and the completion of steps two, three, and four provides the framework and the context for consideration of cumulative effects. Table 21 lists past, present, and reasonably foreseeable future actions considered in this cumulative effects analysis and categorizes the geographic scope and timeframe of these activities.

Activities and their effects are listed in the first column. The second column is a summary of the cumulative effects on each resource associated with the key scoping issues (Section 1.6.1), based on distance from the proposed action and time frame.

In Table 21, the distance from the proposed action and connected non-federal action is categorized as follows:

- Zone A encompasses areas within 1 mile of Proposed Action Area
- Zone B is greater than 1 mile and less than or equal to 5 miles
- Zone C is greater than 5 miles and less than or equal to 10 miles
- Zone D is greater than 10 miles

The timeframe for these activities is listed as having occurred in the past, present (or ongoing), and/or reasonably foreseeable in the future.

Table 21 Past, Present, and Reasonably Foreseeable Future Actions*

Activity	Distance from Project Area	Timeframe			Potential Cumulative Effects			
					Biological Resources			
		Past	Present	Future	Vegetation	General Wildlife	Special Status Species	Migratory Birds
Earlier and existing mining and reclamation activities at the Little Rock Mine	A	•	•		•	•	•	•
Private action related to dewatering pipeline alignment #2	A			•	•	•	•	•
Private action related to the power line relocation	A			•	•	•	•	•
Tyrone Mine operations and reclamation activities	A-C	•	•	•	•	•	•	•
Tyrone 9AX stockpile extension	A, B			•				
Deadman Canyon Stage 2 Abatement	A			•				
Livestock grazing on BLM and USFS allotments	A-D	•	•	•	•	•		
Recreational uses of public land	B-D	•	•	•	•	•	•	•
Relocation of a portion of the PNM power line at the western edge of the Little Rock Mine	A			•	•	•	•	•
USFS Travel Management Plan	A-D			•	•	•	•	•
Land for agricultural, residential, commercial, and industrial development and transportation infrastructure	B-D	•	•	•	•	•	•	•

4.2 BIOLOGICAL RESOURCES

While a review of the project scoping issues and the Section 3.0 impact analyses does not indicate substantial direct impacts to biological resources, the potential for indirect impacts indicates that the

cumulative impacts to vegetation, general wildlife species, special status species, and migratory birds should be carried forward into the cumulative effects analysis. The potential cumulative effects of the proposed action/connected non-federal action and past, present, and reasonably foreseeable future actions on biological resources are discussed in this section. The analysis was conducted by superimposing the predicted direct and indirect impacts of the proposed action/connected non-federal action, as described in Section 3.3, on the surrounding biological habitats, in order to estimate the importance of the potential project impacts on the broader regional habitats and/or specific species. Characterization of the vegetation and habitat in the broader region was derived from the USGS for the Mangas Creek Watershed (USGS, 2004), as presented in Section 3.3.1.1, Table 11, and Figure 13. In addition, temporal impact trends to these resources were identified, where possible, in order to estimate the likelihood of additional impact to specific biological resources in the cumulative analysis area.

As discussed in Section 3.3.1.1, native landscapes and ground cover comprise approximately 93 percent of the land surface within the Mangas Creek Watershed; lands that have been modified for agricultural, urban, industrial, transportation, and mining purposes comprise about 7 percent of the land surface within the watershed. Approximately 55 percent of the land within the watershed is publicly owned and managed by state or Federal agencies. The USFS is the largest land manager in the watershed. As summarized in Section 3.3.1.2.1, the incremental increase in disturbed natural vegetation communities from development of the proposed action is 200 acres, as compared to the no action alternative. This represents an increase in the total disturbed area within the Mangas Creek Watershed of approximately 0.15 percent.

The biological resources depend on naturally vegetated habitats for their viability. The low level of existing disturbance to natural landscapes within the Mangas Creek Watershed, coupled with the fact that a high percentage of these lands are managed by public agencies, argues for a high level of habitat preservation within the watershed in the reasonably foreseeable future. Additionally, there is a low likelihood of substantial land development within the reasonably foreseeable future given the stagnant population growth in the vicinity. Each of the selected biological resources is discussed below, with these broader watershed trends in mind.

VEGETATION AND WILDLIFE HABITAT

As summarized in Section 3.3.1.2.1, approximately 200 acres of previously undisturbed BLM-managed and private lands would be directly impacted by the proposed action/connected non-federal action, as compared to the no action alternative. As listed in Table 11, vegetation and habitat types throughout the Mangas Creek Watershed indicates that they are common, with the occurrence within the watershed including 11 percent grasslands/juniper grasslands, 63 percent pinion-juniper woodland/chaparral ecotone, and 18 percent ponderosa pine forest. The area of vegetation lost from past and present development within the Mangas Creek Watershed comprises less than 7 percent of the total land area (USGS, 2004). As a reasonable foreseeable future action, reclamation activities associated with the Tyrone Mine would also restore a portion of the recently mined/disturbed lands in the watershed. The proposed action/connected non-federal action would result in a negligible reduction (approximately 0.15 percent) of the available native vegetation and habitat in the Mangas Valley Watershed. Cumulatively, ongoing and future reclamation activities would restore the vegetation and habitat available in the watershed.

GENERAL WILDLIFE SPECIES

Past, present, and reasonably foreseeable future actions, including implementation of the Gila National Forest Travel Management Plan would result in a net reduction on the amount of roads open to motor vehicles in the Mangas Valley Watershed. Correspondingly, road-related wildlife mortality may be reduced in the watershed.

The *Wildlife Report and Biological Evaluation* for the Gila National Forest Travel Management Project states (Telles, 2013):

> The Gila National Forest has had a long history of mining activities that have occurred, or are still occurring, on patented land within the Forest's boundaries. For the most part, mining activities have minimal, localized impacts where they occur.

Road use under either alternative would not be expected to have significant levels of wildlife mortality associated with project-related vehicle activities, nor would it be expected to result in adverse cumulative effects. Cumulative impacts from past, present, and reasonably foreseeable future actions in conjunction with the proposed action and connected non-federal action would be unlikely to adversely affect wildlife and wildlife habitat in the Mangas Valley Watershed.

SPECIAL STATUS SPECIES

Special status species were reviewed for their potential to occur in the project area. As outlined in Section 3.3.3, this includes special status species such as those listed as endangered or threatened under either Federal or state law, candidate species for protection under Federal law, or other species of interest. As demonstrated in Section 3.3.3, no federally listed threatened or endangered species are likely to occur in the project area. However, a review of sensitive species listed by the BLM and the NMDGF, five species were identified with a potential to occur in the project area (Table 14).

Of the five identified species, three of them are bats. Section 3.3.3 demonstrates that substantial past impact to bats has not occurred in the Proposed Action Area and that present or reasonably foreseeable future impacts are also minimal. Where possible, bat habitat associated with old mine workings can be preserved through the installation of bat gates, such as the efforts at the Virtue and Jersey Lilly mines in the Little Burro Mountains north of the Proposed Action Area. A brief review of USGS topographic maps of areas in the Mangas Creek Watershed indicates that additional old mine workings are scattered throughout the valley. Lands managed by state or Federal agencies have established programs to safeguard bat populations on public lands. The New Mexico Abandoned Mine Land Bureau has a robust program to coordinate safe closures of abandoned mines. This work is performed primarily for that same state or Federal agencies that are charged with the protection of sensitive species, therefore, it is done with preservation of bat populations in mind. Many abandoned mine closures takes place on public lands. Therefore, the cumulative risk to bat roosting habitat due to the proposed action/connected non-federal action is negligible. As illustrated for vegetation, the proposed action/connected non-federal action and other past, present, and reasonably foreseeable future actions do not pose a cumulative risk to vegetation, and therefore adverse effects to bats and bat colonies would not be anticipated due to loss of foraging habitat.

As discussed in Section 3.3.3, under the proposed action/connected non-federal action, direct impacts to the northern goshawk or piñon jay would not be anticipated. The closest known goshawk nest site is located in the upper reach of California Gulch approximately 2 miles from the Proposed Action Area

(Ybarra 2010). Habitat attractive to goshawks and piñon jays includes the woodland vegetation (piñon-juniper woodland, juniper grassland, and ponderosa pine forest). As illustrated in this section, these habitats are widely available within the Mangas Creek Watershed. The proposed action/connected non-federal action would impact only a small percentage of the habitat in the Mangas Creek Watershed that could be utilized by the northern goshawk and piñon jay for nesting, foraging, or breeding. Further, the implementation of the Gila National Forest Travel Management Plan would reduce potential impacts to these species (Telles, 2013). The proposed action/connected non-federal action and other past, present, and reasonably foreseeable future actions are unlikely to adversely affect the northern goshawk or piñon jay.

MIGRATORY BIRDS

As discussed in Section 3.3.4, no major migratory pathways for migrant species were identified in the project vicinity, and the amount of surface disturbance proposed is only a small fraction of the same habitat types found in the Mangas Creek Watershed that would continue to provide nesting, foraging, and breeding opportunities for migratory birds. Regional land development pressures are low and reclamation activities at the Little Rock and Tyrone mines would restore a portion of the disturbed lands, allowing the lands to regain ecologic functions that support migratory birds. In addition, implementation of the Gila National Forest Travel Management Plan would be expected to reduce potential impacts to migratory birds and supporting habitat. The proposed action/connected non-federal action and other past, present, and reasonably foreseeable future actions are unlikely to adversely affect migratory birds.

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5.0 CONSULTATION AND COORDINATION

The list of persons, groups and agencies contacted during the scoping period was compiled using a mailing list maintained by the BLM Las Cruces District Office and supplemented with additional interested parties. The full mailing list is provided in the administrative record and included 83 individuals, agencies, and groups.

LIST OF AGENCIES AND ORGANIZATIONS NOTIFIED

Allied-Signal Inc.
Burro Mountain Homestead
Coalition of Arizona / New Mexico Counties
Cordova Associates
EHV Investments LLC
Fort Sill Apache Tribe
Gila National Forest
Gila Resources Information Project
Grant County
Grant County Republican Party
Grant County Soil & Water Conservation District
Hopi Tribe, Cultural Preservation Office
Interstate Stream Commission
Mescalero Apache Tribe
Natural Resources Conservation Service
New Mexico Department of Game and Fish
New Mexico Department of Transportation
New Mexico Energy, Minerals & Natural Resources Department, Forestry Division
New Mexico Energy, Minerals & Natural Resources Department, Mining and Minerals Division
New Mexico Environment Department, Silver City Field Office
New Mexico Environment Department, Ground Water Quality Bureau
New Mexico Environment Department, Mining Environmental Compliance Section
New Mexico Environment Department, Surface Water Quality Bureau
New Mexico Environmental Law Center
New Mexico Historic Preservation Division, Department of Cultural Affairs
New Mexico Mining Association
New Mexico State Land Office
Piños Altos Land and Investment LLC
Pueblo of Acoma
Pueblo of Isleta
Rainbow Trust
Silver City/Grant County Economic Development Corp., Western New Mexico University
Southwest Council of Governments
The Center for Biological Diversity
The Nature Conservancy of New Mexico
The Navajo Nation

The New Mexico Wilderness Alliance
The Wilderness Society
U Bar Ranch
U.S. Army Corps of Engineers
U.S. Fish and Wildlife Service
White Mountain Apache Tribe, Office of Historic Preservation
Wild Earth Guardians

6.0 LIST OF PREPARERS

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APPENDIX A SUMMARY OF SCOPING COMMENTS

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Table A-1 Summary of Scoping Comments

Commenter	Resource Area	Comment Summary
White Mountain Apache Tribe (WMAT)	Cultural Resources	Proposed project will not have an impact on WMAT historic properties and/or traditional cultural properties. Regardless, any/all ground disturbing activities should be monitored if there are reasons to believe that there are human remains and/or funerary objects are present, and if such remains and/or objects are encountered they shall be treated with respect and handled accordingly until such remains are repatriated to the affiliated tribe.
Navajo Nation Historic Preservation Department-Traditional Culture Program (HPD-TCP)	Cultural Resources	After reviewing your consultation documents, the HPD-TCP has interest and questions regarding the proposed project. Our office would like to request additional maps of the proposed project area that show which areas of Grant County, New Mexico the mine is located. Until HPD-TCP has received the additional information requested we cannot make a formal decision. The Navajo Nation claims cultural affiliation to all Anasazi people (periods from Archaic to Pueblo IV) of the southwest. The Navajo Nation makes this claim through Navajo oral history and ceremonial history, which has been documented as early as 1880 and taught from generation to generations.
New Mexico State Historic Preservation Officer (SHPO)	Cultural Resources	Some portions of the project Area of Potential Effect (APE) have not been surveyed to identify and evaluate cultural resources that may be eligible for listing in the National Register of Historic Places (NRHP). Previously identified cultural resources are in or near the project APE. These resources need to be evaluated for NRHP eligibility. There will also need to be an assessment of the project's effects to historic properties. BLM needs to initiate and complete Section 106 consultation before the Finding of No Significant Impact (FONSI) can be signed.
New Mexico Department of Transportation (NMDOT)	Transportation	This expansion mainly remains within the Little Rock Mine permit boundary with only a few acres outside this Mine proper. There should be no impacts to NM highways.
Gila Resources Information Project (GRIP)	Water Resources; Financial Assurance	• Require monitoring of groundwater downgradient of the open pit • Evaluate potential water quality impacts from pit expansion • Fully assess and require adequate financial assurance

Commenter	Resource Area	Comment Summary
New Mexico Mining and Minerals Division (MMD)		Tyrone must submit an application to MMD to modify or revise Permit No. GR007RE, in part, for an expansion of the approved mine design limits and/or permit boundary, or changes to the approved mine closeout plan and/or the approved financial assurance for the Little Rock Mine.

New Mexico Department of Game and Fish (NMDGF)	Biological Resources	• Address impacts to Deadman Canyon related to likely use as a wildlife corridor by providing details on the diversion channel including:
		  • cross section and plan view figures
		  • construction materials and methods
		  • techniques to convey flow downstream in the canyon while mitigating effects on wildlife connectivity
		  • final reclamation should include reconstructing the channel and replacing vegetation structure similar to the surrounding habitat including woody plants
		• Suitability of the proposed leach cap material as reclamation cover/growth medium for large areas of the Little Rock pit may be the same material used on the Tyrone Mine 1C/7A Stockpile Unit and associated test plots. Three years after seeding, this material has completely failed to support vegetation on those features. The Environmental Assessment should include a provision for either amending the leach cap or using an alternative cover material, if necessary to improve vegetation establishment and reclamation success.
		• Design the power distribution line and substations to prevent wildlife electrocution by isolating the conductors using shielding and/or distance. Guidance is available from the Avian Power Line Interaction Committee at http://www.aplic.org/mission.php.
		• Communications towers should avoid avian collisions by using minimal or no lighting and guy line-free construction. If it is necessary to support the towers with guy lines, they should be marked to increase visibility and reduce collision risk.
		• To facilitate compliance with Federal Migratory Bird Treaty Act, clear vegetation outside of the general bird nesting season (September to March).
		• The perimeter fence should be designed in accordance with the provided specifications to minimize potential for injury to wildlife crossing over or under the fence.

Commenter	Resource Area	Comment Summary

		• Append to the EA a copy of the 2012 Tyrone Mine Migratory Bird Conservation Plan. The plan should protect wildlife from the potential chemical hazards of ingesting contaminated water, and the potential physical hazards of becoming trapped and drowning. Provide a list of tanks, ponds and other impoundments expected to be present in the permit area, both during mining operations and after the completion of final reclamation. For each tank, impoundment, or pit lake list:
		  • predicted water quality (will it meet or not meet the NM Water Quality Control Commission surface water and wildlife/livestock specifications)
		  • trapping hazard potential
		  • measures that will be taken to exclude wildlife or otherwise mitigate the hazard. Excluding or mitigating may include various combinations of exclusion fencing, escape ramps, netting or hazing, as appropriate to the particular feature being protected
		• The EA should address any expected impact to reclamation previously completed at the Little Rock Mine.
		• A list of sensitive, threatened and endangered species that occur in Grant County was provided. Additional species lists should be obtained, including:
		  • Biota Information System of New Mexico (BISON-M) species accounts, searches, and county lists at www.bison-m.org
		  • NMDGF Habitat Handbook Project guidelines at www.wildlife.state.nm.us/conservation/habitat_handbook/index.htm
		  • Custom, site-specific database searches on plants and wildlife at www.nhnm.unm.edu
		  • State-listed plants contact the New Mexico State Forestry Division at (505) 476-3334 or www.nmrareplants.unm.edu/index.html
		  • Current listing of federally listed species with the U.S. Fish and Wildlife Service at (505) 346-2525 or www.fws.gov/southwest/es/NewMexico/SBC.cfm

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APPENDIX B REVIEW OF SPECIAL STATUS SPECIES

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Species		Legal Protection Status			Preferred Habitat	Potential for Occurrence in the Project Area
Common Name	**Scientific Name**	**ESA[a]**	**New Mexico[b,c]**	**BLM[d]**		
Amphibians						
Arizona toad (Southwestern toad)	*Anaxyrus microscaphus*	Under Review	S	S	**Range:** Historic range includes Arizona, California, New Mexico, Nevada, Utah and Mexico. **Habitat:** Preference for lotic systems, including areas of shallow, small streams and rivers, and temporary woodland pools. Also associated with closed chaparral, mixed broadleaf riparian, cottonwood-willow riparian, and mesquite bosque (floodplain woodland) habitat types. **Elevation:** 6,200-8,900 feet	**Unlikely.** Lack of suitable habitat within the Proposed Action Area.
Chiricahua leopard frog	*Lithobates [Rana] chiricahuensis*	T	S		**Range:** U.S. range includes west-central and southwestern New Mexico, and central and southeastern Arizona. This species is highly mobile. **Habitat:** Variety of permanent or nearly permanent aquatic habitats, including springs, livestock tanks, ponds, lakes, marshes, and headwater streams into which nonnative predators either have yet to invade or habitats are marginal for them. **Elevation**: 3,200-8,900 feet	**None.** Lack of suitable habitat within the Proposed Action Area. The project area would not contribute to CLF dispersal or provide year-round suitable habitat for populations or metapopulations of CLF. Surveys found no water features within five-mile radius that could support this species. For more details on the potential for occurrence of this species in the project area, see the 2010 memo on the Little Rock Mine Biological Resources Analysis.
Lowland leopard frog	*Rana yavapaiensis*		E	S	**Range:** Historically this species ranged from southeastern California, extreme northwestern Arizona, and southwestern New Mexico to Sonora. The species is thought to be extremely rare and likely extirpated in the state of New Mexico. **Habitat:** Preference for lotic systems, including small to medium-sized streams and occasionally small ponds. This species will often concentrate near deep pools in association with root masses of large riparian trees. In New Mexico, this species is associated with riparian areas within grasslands, chaparral, and evergreen woodlands. **Elevation:** < 5,000 feet	**None.** Lack of suitable habitat within the Proposed Action Area. In addition, this species is thought to be extirpated from the state of New Mexico as only one observation (Guadalupe Canyon, Hidalgo County) has been reported in the last 20 years.

Species		Legal Protection Status			Preferred Habitat	Potential for Occurrence in the Project Area
Common Name	**Scientific Name**	**ESA[a]**	**New Mexico[b,c]**	**BLM[d]**		
8.0 Birds						
Abert's towhee	*Pipilo aberti aberti*		T		**Range:** Southeastern California, southern Nevada, southwestern Utah, central Arizona, and southwestern New Mexico, south to northeastern Baja California and northern Sonora. In New Mexico, this species is found along portions of the Gila River from the Arizona border to Mogollon Creek in Grant County, and at the San Simon Cienega in Hidalgo County. **Habitat:** Mesquite bosques and cottonwood-willow associations with an understory of dense shrubs, as well as adjacent shrublands. Also found in suburban yards and orchards. In its New Mexico range, this species uses thickets of seepwillow and other riparian habitats. **Elevation:** 2,800-5,500 feet	**None.** Lack of suitable riparian habitat within the Proposed Action Area. In addition, the project area is not within the current reported geographic range of this species.
American peregrine falcon	*Falco peregrinus anatum*	D	T		**Range:** Breeding range is from Canada and Alaska south into Baja California, the central Mexican highlands, and northwest Mexico, including the continental U.S. (except the southeast corner of the country). This species passes through New Mexico during migration from March-May. Historic records in both Big Burro and Little Burro Mountains. **Habitat:** Rocky, steep cliffs overlooking woodlands, riparian areas, or other habitats supporting an abundance of avian prey species. Nests on cliff ledges above or near water. Open landscapes surrounding these areas are critical for foraging. **Elevation:** 3,500-9,000 feet; (prefer 6,500-8,599 feet)	**Unlikely.** Lack of suitable breeding, nesting, and foraging habitat within the Proposed Action Area. Species could pass through the project area.
Arctic peregrine falcon	*Falco peregrinus tundrius*	D	T		**Range:** Breeding range is from Canada and Alaska south into Baja California, the central Mexican highlands, and northwest Mexico, including the continental U.S. (except the southeast corner of the country). This species passes through New Mexico during migration from March-May. **Habitat:** No breeding habitat is present in New Mexico. A variety of habitats may be used in winter and migration. **Elevation:** Seacoast to mountainous areas in winter and migration.	**Unlikely.** Lack of suitable breeding or nesting habitat within the Proposed Action Area. Species could pass through project area as a migrant, but this species is considered rare in New Mexico.

Species		Legal Protection Status			Preferred Habitat	Potential for Occurrence in the Project Area
Common Name	**Scientific Name**	**ESA[a]**	**New Mexico[b,c]**	**BLM[d]**		
Arizona grasshopper sparrow	*Ammodramus savannarum ammolegus*		E	S	**Range:** Breeds in parts of southeast Arizona, southwest New Mexico, and northern Sonora. In winter, some remain in the United States, while others migrate to central Mexico and possibly south into Central America. In New Mexico, this species is found only in the southern Animas Valley and western Playas Valley; both on the privately owned Gray Ranch in Hidalgo County. **Habitat:** Primary breeding habitat is Chihuahuan desert grasslands, in moderately open/short, dense grasslands with patchy bare ground. This species avoids areas with extensive shrub cover. In New Mexico, habitat is limited to well-developed grasslands (typically lacking woody vegetation), generally with blue grama. Habitat appears to coincide with that of the white-sided jackrabbit. **Elevation:** <6,500 feet	**None.** Lack of suitable habitat, and the project area is not within the known geographic range of this species.
Baird's sparrow	*Ammodramus bairdii*		T	S	**Range:** Nests in the Dakotas, Montana, and Minnesota, as well as the Canadian provinces of Alberta, Manitoba, and Saskatchewan. Winters primarily in northern Mexico, although some may be found in southern Texas, New Mexico, and Arizona. Species migrates in the eastern and extreme southern areas of New Mexico, where it is considered rare to uncommon. **Habitat:** Prairie habitat. Winters in areas of dense and expansive grasslands, with only a minor shrub component. In southern New Mexico, this species prefers areas with denser grass cover than surrounding areas. **Elevation:** < 11,800 feet	**None.** Lack of suitable habitat within the Proposed Action Area. In addition, this species is considered rare to uncommon in the state of New Mexico.

Species		Legal Protection Status			Preferred Habitat	Potential for Occurrence in the Project Area
Common Name	**Scientific Name**	**ESA[a]**	**New Mexico[b,c]**	**BLM[d]**		
Bald eagle	*Haliaeetus leucocephalus*	D	T	S	**Range:** Widespread across US and Canada, and into northwestern Mexico. In New Mexico, bald eagles are present casually to occasionally in summer, but they migrate and winter almost statewide. **Habitat:** Forested areas along coasts, large lakes, and rivers, but also other areas. Known to roost in large trees, and on ledges or cliffs near water (reservoirs, rivers, and streams) with abundant prey. They are found in coniferous forests, aspen, chaparral, and piñon-juniper forest types. In winter they forage widely and feed heavily on carrion. **Elevation:** 460-7,930 feet	**Unlikely.** Lack of suitable breeding or nesting habitat. Species may migrate through the Proposed Action Area.
Bell's vireo	*Vireo bellii arizonae*		T	S	**Range:** Breeding range includes southern California, Arizona, New Mexico, the central Great Plains and the Midwest southward to northern Mexico. This species occurs in southwestern New Mexico, with known populations in the lower Gila Box, San Simon Cienega, and Guadalupe Canyon. **Habitat:** In New Mexico, this species characteristically occurs near riparian habitat and dense shrubland or woodland along lowland stream courses. In the southeast and southwest parts of the state, most nests occur in willow, seepwillow, or hackberry. **Elevation:** Unknown	**None.** Lack of suitable breeding or nesting habitat within the Proposed Action Area. In addition, the project area is not within the reported geographic range of this species.
Bendire's thrasher	*Toxostoma bendiri*			S	**Range:** Breeds across the southwest, from southeastern California and southern Nevada to the eastern third of New Mexico, From southern Utah and Colorado south into Sonora and Chihuahua, and along the Pacific slope of Mexico to Sinaloa. In New Mexico, this species breeds in scattered locations throughout the central and western portions of the state. **Habitat:** In southern New Mexico, this species breeds in degraded desert grassland areas and desert scrub with various xerophytic shrub species, but little grass. In central New Mexico, this species is more commonly associated with cholla stands. This species is rare and very local in shrubland/woodland. **Elevation:** 2,800-5,500 feet	**None.** Lack of suitable habitat in the Proposed Action Area.

Species		Legal Protection Status			Preferred Habitat	Potential for Occurrence in the Project Area
Common Name	**Scientific Name**	**ESA[a]**	**New Mexico[b,c]**	**BLM[d]**		
Broad-billed hummingbird	*Cynanthus latirostris magicus*		T		**Range:** Mostly from Mexico with a northern distribution extending in southeastern Arizona and southwestern New Mexico. The New Mexico population is dependent on riparian habitat at a single known breeding location in Guadalupe Canyon in Hidalgo County. It occurs rarely in other canyons in the Peloncillo Mountains. **Habitat:** Found primarily in riparian woodlands at low to moderate elevations. In New Mexico this species is known to nest in hackberry thickets and similar vegetation. **Elevation:** 2,800-5,500 feet	**None.** Lack of suitable riparian habitat. The Proposed Action Area is not within reported geographic range of this species.
Brown pelican	*Pelecanus occidentalis carolinensis*	D	E		**Range:** Breeds on sea coasts from southern California and North Carolina southward through the Gulf and Caribbean areas to South America, occurring mainly as a vagrant inland in the United States. **Habitat:** Common along coasts and forages in shallow waters. Usually found in marine habitats in warmer waters in North America; except for the lower Colorado Basin and vicinity. Given the rarity of the species in New Mexico, next to nothing is known about its habits in the state. **Elevation:** Unknown	**None.** Lack of suitable breeding, nesting, and foraging habitat within the Proposed Action Area.
Buff-collared nightjar	*Caprimulgus ridgwayi*		E		**Range:** Occurs in summer from southeastern Arizona and extreme southwestern New Mexico southward to Honduras and Guatemala. This species was last reported in New Mexico in 1985; they were not found on regular surveys in Guadalupe Canyon during the period 1987-93. **Habitat:** Arid shrublands and woodlands; generally in canyons and washes. Areas supporting open stands of mesquite (*Prosopis glandulosa)* and other small trees and large shrubs. In New Mexico, this species prefers rocky, shrubby desert canyons. **Elevation:** Sea level-5,000 feet	**None.** Lack of suitable habitat, and Proposed Action Area is not within reported geographic range of this species. In addition, this species was last reported in New Mexico in 1985.

Species		Legal Protection Status			Preferred Habitat	Potential for Occurrence in the Project Area
Common Name	**Scientific Name**	**ESA[a]**	**New Mexico[b,c]**	**BLM[d]**		
Common black-hawk	*Buteogallus anthracinus*		T		**Range:** This species occurs from Arizona to southern Texas and southward to Peru and Paraguay. In New Mexico, this species is found along the Gila, San Francisco, and Mimbres Rivers in the southwest quadrant of the state, as well as along the Rio Hondo in the southeast. It occasionally nests along the Rio Grande as far north as Albuquerque, and in the Canadian River and Upper Pecos drainages. **Habitat:** Riparian nester. In the Southwest, this species is characteristically found in cottonwood (*Populus* spp.) and other woodlands along perennial streams with riffles and shallow water depth. It may less commonly occur on intermittent streams if pools remain present. Breeding individuals require mature, well developed riparian forest stands (*e.g.*, cottonwood bosques) that are located near flowing streams. **Elevation:** 2,800-5,500 feet	**None.** Lack of suitable breeding, nesting, and foraging habitat. There are no perennial water sources within the Proposed Action Area. In addition, the project area is outside the reported geographic range of this species in New Mexico.
Common ground-dove	*Columbina passerina pallescens*		E		**Range:** Range extends south across the Pacific and Atlantic slopes of Mexico, much of Central America, and northern portions of South America. In New Mexico, this species occurs most frequently in the lower Gila Valley (from Cliff south) and in Hidalgo County, especially in Guadalupe Canyon. They also occur rarely in the Rio Grande Valley from Socorro south, and in Eddy County. **Habitat:** In the western and southwestern U.S., habitat includes mesquite flats and river bottom woodlands, desert scrub and washes, and xeric riparian areas. In New Mexico, this species prefers shrubby riparian habitat or edges of riparian woodlands. It also occurs in open stands of creosote bush and large succulents, and in abandoned agricultural fields with tall weeds. **Elevation:** <5,400 feet	**None.** Lack of suitable habitat. The Proposed Action Area is not within the reported geographic range of this species.

Species		Legal Protection Status			Preferred Habitat	Potential for Occurrence in the Project Area
Common Name	**Scientific Name**	**ESA[a]**	**New Mexico[b,c]**	**BLM[d]**		
Costa's hummingbird	*Calypte costae*		T		**Range:** Resident in much of southern California, all of Baja California, and portions of southwest Arizona and northwest Sonora. Breeding populations extend farther north and east to southern Nevada and southwest Utah, central Arizona, and southwest New Mexico. In New Mexico, this species is an uncommon and sporadic breeder in the southwest and south-central mountains. It occurs most regularly in Guadalupe Canyon and in side canyons along the lower Gila River from Cliff south. **Habitat:** Desert scrub of the Sonoran and Mojave deserts, particularly along washes, canyons and rocky slopes. Where riparian and desert shrub habitats interface, it often remains in the more xeric areas. In New Mexico, this species occupies more characteristic Chihuahuan Desert Shrub and foothill/montane shrub habitats. **Elevation:** 2,800-5,500 feet	**None.** Lack of suitable habitat within the Proposed Action Area. In addition, the project area is located outside of this species reported geographic range.
Elegant trogon	*Trogon elegans canescens*		E		**Range:** Primarily Mexico, with a limited breeding population in several mountain ranges of southeast Arizona, and rare in the Peloncillo and Animas Mountains of New Mexico. In New Mexico, vagrant birds have been seen in Grant, Catron, Sierra, and Otero counties. **Habitat:** High-elevation riparian deciduous woodlands and marshes, arid scrublands, and temperate upland coniferous forests. In New Mexico, sycamores, pines, and oaks are considered critical habitat components. In both riparian and pine-oak habitat, this species prefers dense vegetation with plenty of undergrowth. **Elevation:** 4,000 and 7,000 feet	**None.** Lack of suitable riparian habitat within the Proposed Action Area. In addition, this species is considered rare in the state of New Mexico.

Species		Legal Protection Status			Preferred Habitat	Potential for Occurrence in the Project Area
Common Name	**Scientific Name**	**ESA[a]**	**New Mexico[b,c]**	**BLM[d]**		
Gila woodpecker	*Melanerpes uropygialis uropygialis*		T		**Range:** U.S. range includes much of the southern half of Arizona, with small extensions into southeast California, southern Nevada, and southwest New Mexico. In New Mexico this species is found in the lower Gila Valley in Hidalgo and Grant counties, Guadalupe Canyon, San Simon Cienega, drainages of the Animas and Peloncillo Mountains, and Bitter Creek in western Grant County. **Habitat:** In New Mexico, this species is confined to lower elevation woodlands, especially those dominated by mature cottonwoods or sycamores, along stream courses. **Elevation**: 3,700-4,900 feet	**Unlikely.** Lack of suitable habitat within the Proposed Action Area. Species may pass through project area as a vagrant.
Gray vireo	*Vireo vicinior*		T		**Range:** Widespread species of the Four Corners states, southern California, and west Texas. It winters in Latin America. In New Mexico, this species is locally distributed across the western two-thirds of the state. May be found within suitable habitat in the Guadalupe and southern Sacramento mountains; the Organ and San Andres mountains; the southern Peloncillo mountains; the Silver City area; in the foothills of the Magdalena, Manzanita, and Sandia mountains; western Santa Fe County; a few canyons in the western Zuni Mountains; and in San Juan and Rio Arriba counties. **Habitat:** Rare summer residents of the Gila National Forest, this species occurs in New Mexico only in the warmer months. In southern parts of New Mexico, the species uses juniper-oak woodlands and desert riparian communities. Forages in thickets. Breeding habitat is generally open woodlands and shrublands, featuring evergreen trees and various shrubs. **Elevation:** 4,300-6,600 feet	**Unlikely.** Although there is a small amount of low-quality foraging habitat for this species within the Proposed Action Area, it is a rare summer resident of the Gila National Forest.

Species		Legal Protection Status			Preferred Habitat	Potential for Occurrence in the Project Area
Common Name	**Scientific Name**	**ESA[a]**	**New Mexico[b,c]**	**BLM[d]**		
Lucifer hummingbird	*Calothorax lucifer*		T		**Range:** In the U.S., this species is most common in the Big Bend and Chisos Mountains region of Texas. It is also present in southern New Mexico, and more rarely in Arizona. In New Mexico, a small breeding population has been documented in the Peloncillo Mountains (Clanton, Skeleton, and Post Office canyons). **Habitat:** Rocky slopes and adjacent canyons in arid montane areas. Chihuahuan Desert vegetation, especially where there are flowering species such as agaves, ocotillo, and other chaparral-type plants. More common on talus slopes and rocky hillsides than in lower-elevation desert scrub habitat. Nest sites are selected on slopes above rocky or wooded washes. **Elevation:** Unknown	**None.** Lack of suitable habitat. In addition, the Proposed Action Area lies outside of this species reported geographic range.
Mexican spotted owl	*Strix occidentalis lucida*	T	S		**Range:** Patchily distributed from southern Utah and central Colorado south through Arizona, New Mexico, and western Texas to the mountains of central Mexico. In New Mexico, this species occurs in summer and winter throughout the state, except for in the eastern plains. They are more abundant in the south. **Habitat:** Dense old growth mixed-conifer forests and canyons. Preferred nesting and breeding habitat includes high canopy closure, high stand density, a multilayered canopy, uneven-aged stands, numerous snags, and downed woody matter. Diverse dispersal habitat. Nearly all isolated patches of mixed conifer or ponderosa pine in New Mexico and the southwest could be reached by dispersing owls. **Elevation:** 4,100-9,000 feet	**Unlikely.** It is possible that these owls may infrequently pass through the action area; may use upper elevations in the Big Burro Mountains for hunting or winter habitat. However, given the lack of mature forest habitat and the on-going levels of disturbance, it is unlikely that a spotted owl would remain in this area for an extended period of time. The closest area of designated critical habitat is north of Silver City, about 20 miles from the Proposed Action Area.

Species		Legal Protection Status			Preferred Habitat	Potential for Occurrence in the Project Area
Common Name	**Scientific Name**	**ESA[a]**	**New Mexico[b,c]**	**BLM[d]**		
Neotropic cormorant	*Phalacrocorax brasilianus*		T		**Range:** Southern New Mexico to southern Louisiana, southward through Central America and parts of the Caribbean region to southern South America. Vagrants occur elsewhere, including further north in the United States. In New Mexico, this species breeds and is variably resident in the Rio Grande Valley. **Habitat:** Species occupies wetlands in fresh, brackish, or salt water, both in coastal and inland areas. Prefer areas with deep water for diving and elevated perches for nesting, roosting, etc. In New Mexico, nesting cormorants require stands of trees or shrubs, in or near water, that are free from human disturbance. **Elevation:** Unknown	**None.** Lack of suitable habitat within the Proposed Action Area.
Northern aplomado falcon	*Falco femoralis septentrionalis*	EXPN	E		**Range**: Species ranges from southwestern United States through Mexico and Central America to Argentina and Chile. Before reintroductions in Texas, the last known breeding of this species in the U.S. occurred in New Mexico in 1952. In 1995 breeding pairs became reestablished in Texas as a result of reintroduction efforts. Current populations are primarily in Mexico, with isolated populations in southern Texas and from northern Chihuahua to southern New Mexico. **Habitat:** In the U.S., this species prefers open Chihuahuan Desert grassland areas with relatively low ground cover and scattered trees suitable for nesting platforms. Habitat suitability declines rapidly with an increase in woody vegetation. Historic range in Grant County. **Elevation:** 3,500-9,000 feet	**None**. Lack of suitable habitat within the Proposed Action Area. In addition, this species is considered very rare in New Mexico, and the probability of their use of less than optimal habitats is very low.
Northern beardless tyrannulet	*Camptostoma imberbe ridgwayi*		E		**Range:** Species occurs from southwestern Arizona to southernmost Texas, southward through Mexico to Costa Rica. In New Mexico, this species is known to breed only in Guadalupe Canyon (Hidalgo County). **Habitat:** Generally found in semi-open brushy woodlands, scrubby riparian thickets, and edges of gallery or secondary forests. In New Mexico, habitat is typically cottonwood-dominated riparian woodland with adjacent scrub. **Elevation:** <6,000 feet	**None.** Lack of suitable habitat within the Proposed Action Area. In addition, the project area is located outside of this species reported geographic range.

Species		Legal Protection Status			Preferred Habitat	Potential for Occurrence in the Project Area
Common Name	**Scientific Name**	**ESA[a]**	**New Mexico[b,c]**	**BLM[d]**		
Northern goshawk	*Accipiter gentilis atricapillus*		S		**Range:** This species breeds and winters extensively in North America, with some populations wintering south of the U.S. border. **Habitat:** Concentrations of large, mature trees that offer medium to high canopy cover. The small New Mexico population occurs locally in mature, closed canopied coniferous forests of mountains and high mesas. **Elevation:** 3,000-9,000 feet	**Possible**. The Proposed Action Area is within the currently known geographic range, and vegetation communities resemble those known to be used by the species. A nest site has been reported within about two miles of the Little Rock Mine boundary. For more details on the potential for occurrence of this species in the project area, see the 2010 memo on the Little Rock Mine Biological Resources Analysis.
Painted bunting	*Passerina ciris*			S	**Range:** Breeds in south-central and southeast United States and northeast Mexico. The species also breeds, less commonly, in the Rio Grande valley south of Hatch. Winters in south Florida, Mexico, and Central America. In New Mexico, this species occurs primarily in the southeast. Locations include Rattlesnake Springs and other areas along the lower Pecos River valley in Eddy County and near Jal in Lea County. A small but possibly expanding population exists along the Canadian River valley from Tucumcari to Conchas Lake. **Habitat:** Open riparian areas and surrounding desert scrub habitats. In southeast New Mexico, this species is common in and around pockets of riparian vegetation and surrounding grass and shrub habitats. Often nests in open mesquite shrublands. **Elevation:** 2,800-7,500 feet	**None.** Lack of suitable habitat within the Proposed Action Area. In addition, the project area is located outside of this species reported geographic range of this species.
Piñon jay	*Gymnorhiinus cyanocephalus*			S	**Range:** Range extends across much of the intermountain west and southwest. **Habitat:** Often found on dry mountain slopes and foothills. Predominantly associated with piñon-juniper habitat. In New Mexico, this species is associated primarily with Colorado piñon (*Pinus edulis*). **Elevation:** 4,000-11,000 feet	**Possible**. Habitat characteristics suitable for this species are present in the Proposed Action Area.

Species		Legal Protection Status			Preferred Habitat	Potential for Occurrence in the Project Area
Common Name	**Scientific Name**	**ESA[a]**	**New Mexico[b,c]**	**BLM[d]**		
Southwestern willow flycatcher	*Empidonax traillii extimus*	E	E		**Range:** A neotropical migrant that winters in Mexico and Central America. Known to breed throughout the southwest United States. In New Mexico, this species breeds along the Gila River, Rio Grande, and from one site along the San Francisco River. Historical breeding records are also known from the Canadian, Chama, San Francisco, San Juan and Zuni River drainages. Species occurs widely throughout the state during migration. **Habitat:** Patchy to dense riparian areas along rivers, streams, and other wetlands. Areas in close proximity to surface water with dense under- and mid-story vegetation including cottonwood, willow, tamarisk, and other riparian plant species. These riparian communities provide nesting and foraging habitat. Willows are the preferred nesting substrate in New Mexico, with the exception of the Gila River where they mostly nest in boxelders. **Elevation:** Sea level- >8,500 feet	**None.** Vegetation found within the Proposed Action Area has none of the documented and required habitat elements for this species. Lack of suitable riparian habitat necessary for breeding and foraging. For more details on the potential for occurrence of this species in the project area, see the 2010 memo on the Little Rock Mine Biological Resources Analysis.
Sprague's pipit	*Anthus spragueii*	C		S	**Range:** Breeds in the northern Great Plains, winters in the southern Great Plains and Mexico. In New Mexico, this species occurs sporadically during winter in southern desert grasslands, primarily in the lower Pecos River Valley, Otero Mesa and the Animas Valley. **Habitat:** This species prefers dry, open grasslands with mid-height vegetation. Areas with shrubs, even at low densities, are avoided for breeding. Upland mixed-grass prairies and meadows often near lakes. **Elevation:** 2,800-5,500 feet	**None.** Lack of suitable habitat, and the Proposed Action Area is not within the reported geographic range of this species.

Species		Legal Protection Status			Preferred Habitat	Potential for Occurrence in the Project Area
Common Name	**Scientific Name**	**ESA[a]**	**New Mexico[b,c]**	**BLM[d]**		
Thick-billed kingbird	*Tyrannus crassirostris*		E		**Range:** Southeastern Arizona and extreme southwestern New Mexico, southward through western Mexico to northern Guatemala. In New Mexico, this species summers in Guadalupe Canyon (Hidalgo County). Vagrants have also been observed in other portions of Hidalgo County (near Antelope Wells and in the foothills of the Animas Mountains). **Habitat:** In the southwest, this species occupies riparian canyons with cottonwood and Arizona sycamore. Breed in riparian woodlands, especially near running water. Often forage on adjacent slopes of desert scrub. **Elevation:** Unknown	**None.** Lack of suitable riparian habitat, and Proposed Action Area is not within the reported geographic range of this species.
Varied bunting	*Passerina versicolor versicolor*		T		**Range:** Most of interior Mexico south to Guatemala. Breeding range extends north into extreme southern Texas, southeast and southwest New Mexico, and southern Arizona. In New Mexico, this species occurs in Guadalupe Canyon (Hidalgo County), in canyons of Carlsbad Caverns National Park (Eddy County), and also less regularly in Doña Ana County. Reports of vagrants in Luna, Sierra, and Otero counties. **Habitat:** Brushy desert canyons, along washes and riparian edges, and less commonly in open desert with dense vegetation. Primary breeding habitat in New Mexico is Chihuahuan desert scrub. **Elevation:** 2,800-7,500 feet	**None.** Lack of suitable habitat, and Proposed Action Area is not within reported geographic range of this species.
Western burrowing owl	*Athene cunicularia hypugaea*			S	**Range:** Species breeds in North America and winters primarily south of the U.S.-Mexico border. In New Mexico, this species summers and variably winters statewide. **Habitat:** Breed in grasslands, prairies, or open areas near human habitation. Commonly found in agricultural fields and along canals. Utilize abandoned rodent burrows and other ground depressions for shelter and nesting. **Elevation:** 2,800-7,500 feet	**Unlikely:** Lack of suitable habitat; however, suitable habitat is present in the Mangas Valley near the Proposed Action Area.

Species		Legal Protection Status			Preferred Habitat	Potential for Occurrence in the Project Area
Common Name	**Scientific Name**	**ESA[a]**	**New Mexico[b,c]**	**BLM[d]**		
Yellow-billed cuckoo (western distinct population)	*Coccyzus americanus occidentalis*	PT	S	S	**Range**: A late spring migrant from South America, cuckoos breed throughout the western United States. In New Mexico this species is known to occur within several counties, including Grant County. **Habitat:** Typically associated with rivers and streams supporting dense, humid, riparian woodlands (e.g., cottonwood, willow, tamarisk galleries, and mesquite bosques). In New Mexico they are most common in the south and along major drainages. **Elevation:** 3,000-7,500 feet	**None.** Lack of suitable riparian habitat. Vegetation found within the Proposed Action Area has none of the documented and required habitat elements for this species.
White-eared hummingbird	*Hylocharis leucotis borealis*		T		**Range:** Resident from the northern Mexico mountains southward to Nicaragua. Occurs in small numbers and very locally during summer in the border region of the southwestern United States. Verified only as migrants in New Mexico, this species was found summering in the Animas Mountains in the mid-1970s. Subsequently, it was reported from two sites in the Peloncillo Mountains. In 1993, at least four individuals were at two sites in the Piños Altos Mountains, and individuals were reported from two sites in the Sangre de Cristo Mountains. **Habitat:** Moist montane canyons. In New Mexico, this species is found most commonly in the pine and pine-oak zones, but is accidentally transient in areas of desert scrub/rocky slopes, juniper savannah, piñon/juniper woodland, and ponderosa/oak forests near montane regions. **Elevation:** 5,000-7,500 feet	**Unlikely.** The Proposed Action Area is not within the known geographic range of this species in New Mexico. Although there is an extremely low likelihood of occurrence, a small amount of low-quality foraging habitat for this species occurs within the project area.
Yellow-eyed junco	*Junco phaeonotus palliatus*		T		**Range:** Mountains of southwestern U.S. and Mexico. In New Mexico, this species occurs in high-elevation forests in the Animas Mountains, in Hidalgo County, and in the Big Burro Mountains, Grant County. Records also exist for the Big Hatchet and Piños Altos Mountains. In winter, it is sometimes found in the Peloncillo Mountains. **Habitat:** High-elevation, mixed-coniferous and ponderosa pine forests. Nests consist of a scraped hollow in the ground, typically concealed by a rock, log or grass tuft and lined with grass and pine needles. **Elevation:** <7,000 feet	**Unlikely:** Lack of suitable habitat; however, there is suitable habitat nearby in the Big Burro Mountains.

Species		Legal Protection Status			Preferred Habitat	Potential for Occurrence in the Project Area
Common Name	**Scientific Name**	**ESA[a]**	**New Mexico[b,c]**	**BLM[d]**		
Crustaceans						
Lynch's tadpole shrimp	*Lepidurus lemmoni*	SC	S	S	**Range:** Laguna Chapala, Baja California, and Norte, Mexico; Alberta, Canada; Arizona, California, Oregon, Nevada, New Mexico, and Washington. State records only for Wyoming and Montana. No distribution data available for New Mexico. **Habitat:** Found in diverse ecoregions such as the Apache highlands, Shortgrass prairie, and Chihuahuan desert. Warm to cool, temporary pools or manmade catchments at low to moderate elevations. Obligate aquatic species whose persistence across the landscape is wholly dependent on geographically isolated ephemeral wetlands. Does not occur in perennial waters. **Elevation:** Unknown	**None.** Lack of suitable aquatic habitat.
Moore's fairy shrimp	*Streptocephalus moorei*		S	S	**Range:** Widely separated populations in New Mexico and Chihuahua. Four populations have been found in New Mexico; one each from stock tanks in Luna and Sierra counties, one from Isaack Lake (Doña Ana County), and one from a roadside playa in Doña Ana County. **Habitat:** Aquatic. Ephemeral manmade and natural catchments. This species can be considered a resident of the Chihuahuan Desert where it occurs in warm-water depressional basins, pit tanks dug into alkali playas, dirt stock tanks, and temporary ponds and pools. They are not found in flowing waters. Most often do not occur in the presence of fish. **Elevation:** 3,000-5,000 feet	**None.** Lack of suitable aquatic habitat, and the project area is not within the reported geographic range of this species.
Sublette's fairy shrimp	*Phallocryptus branchinella sublettei*			S	**Range:** New Mexico and Texas. In New Mexico, this species has been documented at Crow Flats, Otero County. **Habitat:** Shallow, freshwater temporary pools/naturally occurring ephemeral catchments. This species does not occur in perennial waters. **Elevation:** Unknown	**None.** Lack of suitable aquatic habitat. The project area is not within the reported geographic range of this species.

Species		Legal Protection Status			Preferred Habitat	Potential for Occurrence in the Project Area
Common Name	**Scientific Name**	**ESA[a]**	**New Mexico[b,c]**	**BLM[d]**		
Fish						
Beautiful shiner	*Cyprinella formosa*	T			**Range:** Extirpated from the U.S. in 1968, but still found in much of its historical range in Mexico. Breeding stock were collected from Mexico in 1989 and placed at Dexter National Fish Hatchery in New Mexico. In 1990, several individuals were taken from the hatchery and were reintroduced on San Bernardino National Wildlife Refuge in southeastern Arizona (Cochise County). **Habitat:** Riffles of small to medium streams with sand, gravel, and rock bottoms. **Elevation:** < 4,500 feet	**None**. Lack of suitable aquatic habitat in the Proposed Action Area.
Chihuahua chub	*Gila nigrescens*	T	E		**Range:** Historic range included the Mimbres River, New Mexico and streams within the Guzman and Laguna Bustillos basins of Chihuahua, Mexico. In the U.S., populations are currently known to exist only within reaches of the Mimbres River. Some of these populations were reintroduced by the Dexter National Fish Hatchery & Technology Center. **Habitat:** Adults are typically found in deep pools, beneath undercut banks in small to medium-sized streams. Habitats containing extensive cover (downed trees, vegetation, organic debris, etc.) are preferred. Juveniles are often found in shallower water with or without cover. **Elevation:** 4,900-6,500 feet	**None**. Lack of suitable aquatic habitat in the Proposed Action Area.
Desert sucker	*Catostomus clarkii*		S	S	**Range:** Historic range includes Arizona, New Mexico, Nevada, Utah, and Mexico. Current range within the Lower Colorado River drainage and the Gila River Basin in Arizona-New Mexico, including Aravaipa Creek. **Habitat:** Rapids and flowing pools of streams, primarily over bottoms of gravel-rubble with sandy silt in the interstices. **Elevation:** Unknown	**None.** Lack of suitable aquatic habitat in the Proposed Action Area.

Species		Legal Protection Status			Preferred Habitat	Potential for Occurrence in the Project Area
Common Name	**Scientific Name**	**ESA[a]**	**New Mexico[b,c]**	**BLM[d]**		
Gila chub	*Gila intermedia*	E	E	S	**Range:** Historically, populations have been recorded throughout the Gila River basin in northern Sonora, Mexico, central and southeastern Arizona, and western New Mexico. In New Mexico, all historically documented populations have been extirpated except in Turkey Creek, in northwestern Grant County. **Habitat**: Pools in small streams, springs, and cienegas. Adults prefer deeper waters with cover including terrestrial vegetation, fallen logs, and boulders, while young prefer shallower waters. **Elevation**: 2,000-5,500 feet	**None**. Lack of suitable aquatic habitat in the Proposed Action Area.
Gila topminnow	*Poeciliopsis occidentalis occidentalis*	E	T		**Range:** Historically occupied the Gila River drainage in New Mexico, Arizona, and Mexico. The Gila topminnow has been eliminated from almost all of its historic range. It currently persists in scattered locations throughout Arizona, whereas the New Mexico population was extirpated in the 1950s. In 1989, the Gila topminnow was stocked in a pond on the New Mexico Department of Game and Fish (NMDGF) Red Rock Wildlife Management Area; however, the effort was unsuccessful. **Habitat**: Springs, cienegas, vegetated margins and backwater areas of intermittent and perennial streams, and margins of large rivers. Topminnows prefer areas containing emergent or aquatic vegetation and shallow warm water, but can withstand a wide range of temperatures. **Elevation**: <5,000 feet	**None**. Lack of suitable aquatic habitat in the Proposed Action Area. Believed to be extirpated in New Mexico. Attempted reintroductions on the Red Rock Wildlife Management Area in 1989 were unsuccessful.

Species		Legal Protection Status			Preferred Habitat	Potential for Occurrence in the Project Area
Common Name	**Scientific Name**	**ESA[a]**	**New Mexico[b,c]**	**BLM[d]**		
Gila trout	*Oncorhynchus gilae*	T	T		**Range**: In New Mexico, this species historically occurred in the headwater streams of the Gila and San Francisco rivers. As of 2001, there were documented populations in Grant, Catron, and Sierra counties, New Mexico. Three streams within Grant County were known to contain populations of the Gila trout (McKnight Creek, Sheep Corral Canyon, and Black Canyon). **Habitat:** Moderate- to high-gradient perennial mountain streams with clean gravel substrates for spawning. This species requires water temperatures below 77 degrees F and cover such as undercut banks, woody debris, and overhanging vegetation. **Elevation**: 5,000-10,000 feet	**None**. Lack of suitable aquatic habitat in the Proposed Action Area.
Headwater chub	*Gila nigra*	C	E		**Range:** Gila River basin of Arizona and New Mexico. In New Mexico, this species is generally distributed in warm water reaches of the Gila River forks (East, West, and Middle). **Habitat:** Middle and headwater reaches of middle-sized streams. They are associated with deep, near-shore pools adjacent to swift riffles and runs, and near obstructions. Cover consists of root wads, boulders, undercut banks, submerged organic debris, or deep water. **Elevation:** 3,000-6,700 feet	**None**. Lack of suitable aquatic habitat in the Proposed Action Area.
Loach minnow	*Tiaroga cobitis*	E	E		**Range**: Range includes Arizona and New Mexico rivers and their tributaries. In New Mexico, the species is found in the Gila River and its tributaries including the West, Middle, and East forks of the Gila River, and Mangas and Bear creeks (Catron, Grant, and Hidalgo counties), as well as the San Francisco and Blue Rivers and some of their tributaries. **Habitat**: Small to large perennial creeks and rivers, typically shallow with cobble substrate and swift currents. **Elevation**: <8,200 feet	**None.** Lack of suitable aquatic habitat. There are no perennial streams or rivers within the Proposed Action Area. For more details on the potential for occurrence of this species in the project area, see the 2010 memo on the Little Rock Mine Biological Resources Analysis.

Species		Legal Protection Status			Preferred Habitat	Potential for Occurrence in the Project Area
Common Name	**Scientific Name**	**ESA[a]**	**New Mexico[b,c]**	**BLM[d]**		
Roundtail chub	*Gila robusta*	C	E	S	**Range:** Mainstem Colorado River and its larger tributaries in the upper Colorado River basin in Wyoming, Utah and Colorado; and in the lower Colorado River basin in approximately 31 localities in tributaries of the Little Colorado and Bill Williams rivers, and in the mainstem and tributaries of the Gila, Salt, and Verde rivers. Species is thought to be extirpated from the Gila River drainage in New Mexico. **Habitat:** Cool to warm water over a wide range of elevations in rivers and streams. Cover is usually present and consists of large boulders, tree rootwads, submerged large trees and branches, undercut cliff walls, or deep water. Smaller chubs generally occupy shallower, low velocity water adjacent to overhead bank cover. **Elevation:** 1,000-6,000 feet	**None**. Lack of suitable aquatic habitat in the Proposed Action Area.
Sonora sucker	*Catostomus insignis*		S	S	**Range:** Historic range includes Arizona, New Mexico and Mexico. In New Mexico, this species is native to the Gila and San Francisco drainages (except in extreme headwaters). It was introduced unsuccessfully into the Rio Hondo drainage during the 1960s. In New Mexico, this species is currently known from Gila River drainage. **Habitat:** Lentic and pool habitats and are found in a variety of habitats from warm water rivers to trout streams. **Elevation:** Unknown	**None**. Lack of suitable aquatic habitat in the Proposed Action Area.
Spikedace	*Meda fulgida*	E	E		**Range**: Arizona and New Mexico rivers and their tributaries. In New Mexico, this species is found in the mainstem Gila River, as well as in the lower end of the West, Middle, and East forks of the Gila River, and Mangas Creek within Hidalgo, Grant, and Catron counties. **Habitat**: Shallow riffles of moderate to large perennial streams, with sand, gravel, and rubble substrates. **Elevation**: < 6,890 feet	**None**. Lack of suitable aquatic habitat. There are no perennial streams or rivers within the Proposed Action Area. For more details on the potential for occurrence of this species in the project area, see the 2010 memo on the Little Rock Mine Biological Resources Analysis.

Species		Legal Protection Status			Preferred Habitat	Potential for Occurrence in the Project Area
Common Name	**Scientific Name**	**ESA[a]**	**New Mexico[b,c]**	**BLM[d]**		
Reptiles						
Big Bend slider	*Trachemys gaigeae gaigeae*			S	**Range**: Occurs in the Rio Grande drainage from south-central New Mexico downstream to western Texas and northwestern Coahuila, the Rio Conchos in Mexico from southern Chihuahua downstream to the confluence with the Rio Grande, and the Rio Nazas closed basin of Durango and Coahuila, Mexico **Habitat:** Perennial rivers and higher order streams within the Chihuahuan Desert that are subject to extreme fluctuations in flow. In New Mexico, this species may also use ponds, marshes, and canals up to a mile from a river. **Elevation:** 4,100-5,000 feet	**None**. Lack of suitable aquatic habitat. There are no perennial streams or rivers within the Proposed Action Area.
Northern Mexican gartersnake	*Thamnophis eques megalops*	T	E		**Range**: Current range includes fragmented populations within the middle and upper Verde River drainage, middle and lower Tonto Creek, and the upper Santa Cruz River, as well as in a small number of isolated wetland habitats in southeastern Arizona. Its status in New Mexico is uncertain; however, it is likely extirpated. **Habitat**: Associated with a variety of habitats, but most of the range is centered on the lower parts of highland areas and adjacent basins. Dense vegetation along the banks or in the shallows of ponds and cienegas, lowland river riparian forests and woodlands, and upland stream gallery forests. **Elevation**: 3,000-5,000 feet; may reach 8,500 feet.	**None.** Lack of suitable habitat within the Proposed Action Area. In addition, this species is likely extirpated from New Mexico.
Narrow-headed garter snake	*Thamnophis rufipunctatus rufipunctatus*	T	T	S	**Range:** Perennial drainages across the Mogollon Rim from northern and eastern Arizona, southeast into southwestern New Mexico. **Habitat:** Highly aquatic species. Strongly associated with clear, rocky streams, using predominantly pool and riffle habitat that includes cobbles and boulders, but has also been observed using lake shoreline habitat in New Mexico. **Elevation:** 2,300-8,200 feet	**None.** Lack of suitable aquatic habitat within the Proposed Action Area.

Species		Legal Protection Status			Preferred Habitat	Potential for Occurrence in the Project Area
Common Name	**Scientific Name**	**ESA[a]**	**New Mexico[b,c]**	**BLM[d]**		
Reticulate Gila monster	*Heloderma suspectum*		E	*S	**Range:** Peripheral in New Mexico, reaching the eastern edge of its range in the southwest, where it is known from Hidalgo, Grant, Luna and perhaps Doña Ana counties. Most common at the Redrock Wildlife Area on the Gila River west of the Big Burro Mountains. **Habitat:** Desert and mesquite-grassland, but also pine-oak forest, tropical deciduous forest, and thorn forest. It is usually found in rocky foothill regions and avoids open flats. It typically inhabits the lower slopes of mountains and nearby outwash plains, especially in canyons and arroyos where water is at least periodically present. In some areas, they also frequent irrigated farmlands that adjoin those habitat types. Cover in such areas often includes boulders, rock crevices, downed vegetation, and litter. **Elevation:** 3,800-6,400 feet	**Unlikely.** Suitable habitat is present within the Proposed Action Area, but is near the eastern limit of its known geographic range.
Insects						
Anthony blister beetle	*Lytta mirifica*			S	**Range:** Endemic to New Mexico. This species has been verified in Sierra, Doña Ana and Otero counties. Geographical features include part of the Gila National Forest, the Black Range, San Andres, Organ, and Sacramento mountains, the Jornada Experimental Range, White Sands National Monument, and Dripping Springs Natural Area. **Habitat:** Chihuahuan semi-desert grasslands and Western Great Plains sandhill sagebrush shrubland. Commonly found on flowering plants, particularly in agricultural areas. Feeds on various plants. **Elevation:** Unknown	**None.** Lack of suitable riparian habitat within the Proposed Action Area. In addition, the project area is not within the reported geographic range of this species.

Species		Legal Protection Status			Preferred Habitat	Potential for Occurrence in the Project Area
Common Name	**Scientific Name**	**ESA[a]**	**New Mexico[b,c]**	**BLM[d]**		
Mammals						
Allen's big-eared bat (Allen's lappet-browed bat)	*Idionycteris phyllotis*		S	S	**Range:** In the United States, this species is known from Arizona, Nevada, Utah, and southwestern New Mexico. In New Mexico, this species has been documented from Catron, Socorro, Grant, and Sierra counties. In 2006, this species was observed in Grant County at the following locations: Saddle Rock (Big Burro Mountains), Mimbres River (Cooney Place), and at Black Canyon Campground (Santa Fe). **Habitat:** In New Mexico, this species is found in ponderosa pine forest, oak-piñon-juniper-pine transition, and riparian cottonwood-sycamore forest. Often associated with water. Roosts in caves, mines, boulder piles, cliff ledges, and beneath loose bark of large ponderosa pine snags. **Elevation:** 1,320-9,800 feet (mostly 3,500-7,500 feet)	**Possible.** Suitable roosting habitat may be present in abandoned mines in the Big Burro and Little Burro Mountains. Species may forage in the Proposed Action Area.
Black-tailed prairie dog	*Cynomys ludovicianus*	SC	S	S	**Range:** Great Plains from southern Canada to northern Mexico. In New Mexico, the historic range was in the eastern and southwestern two-thirds of the state. Current New Mexico distribution appears to be scattered in remnant populations in 54 percent of the counties that had historical records. **Habitat:** Inhabitants of shortgrass plains, Sacaton grassland, sycamore, cottonwood, and rabbitbrush riparian habitats. Colonies have often been reported in marginal habitat, such as open woodland and in the southwestern part of New Mexico in semidesert conditions. **Elevation:** 2,300-7,200 feet	**None.** Lack of suitable habitat, within the Proposed Action Area.
Cebolleta pocket gopher	*Thomomys umbrinus paguatae*			S	**Range:** Endemic to a small area near Cebolleta, Cibola County, New Mexico. **Habitat:** Sycamore, cottonwood, and rabbitbrush riparian habitats, floodplain areas with sandy clay alluvium. **Elevation:** 6,000-7,000 feet	**Unlikely.** No documentation and low/poor habitat quality. This species is found only occasionally in the southern and eastern portions of the state along the Texas border.

Species		Legal Protection Status			Preferred Habitat	Potential for Occurrence in the Project Area
Common Name	**Scientific Name**	**ESA[a]**	**New Mexico[b,c]**	**BLM[d]**		
Lesser long-nosed bat	*Leptonycteris curasoae yerbabuenae*	E	T		**Range:** Central Arizona and southwest New Mexico through much of Mexico to El Salvador. Records exist for occurrences in the southern Peloncillo Mountains of New Mexico. Foraging habitat includes saguaro cacti and Palmer or Parry agave. **Habitat**: Mainly desert scrub habitat in the U.S. portion of its range. Roosting is in caves, abandoned mines, and unoccupied buildings at the base of mountains where agave, saguaro, and organ pipe cacti are present **Elevation**: 1,600-11,500 feet	**None.** Although there have been incidental reports of this species in the general vicinity of the mine, and there is a known roost site in the Bootheel mountain ranges of southwestern New Mexico region, the Proposed Action Area is outside the reported geographic range for this species. Furthermore, the Proposed Action Area lacks roosting sites and suitable foraging habitat for this species. An internal survey of a decline shaft on October 24, 2014 by Bat Conservation International (BCI) concluded that this species does not occur.
Meadow (New Mexico) jumping mouse	*Zapus hudsonius luteus*	E		S	**Range:** Endemic to New Mexico, Arizona, and a small area of southern Colorado. In New Mexico, this species is known from Bernalillo, Colfax, Lincoln, Los Alamos, Mora, Otero, Rio Arriba, San Miguel, Sandoval, Santa Fe, Socorro, Taos, and Valencia counties. **Habitat:** Moist grasslands; avoids heavily wooded areas. Nests in dry soils, but uses moist, streamside, dense riparian/wetland vegetation. Generally associated with montane meadow systems and open grassy fields with streams, ponds, or marshes nearby. Appears to only utilize two riparian community types: 1) persistent emergent herbaceous wetlands; and 2) scrub-shrub wetlands (i.e., riparian areas along perennial streams that are composed of willows and alders). **Elevation:** <8,000 feet	**None.** Lack of suitable habitat within the Proposed Action Area. In addition, the project area is not within this species reported geographic range.

Species		Legal Protection Status			Preferred Habitat	Potential for Occurrence in the Project Area
Common Name	**Scientific Name**	**ESA[a]**	**New Mexico[b,c]**	**BLM[d]**		
Mexican wolf	*Canis lupus baileyi*	EXPN	E		**Range:** Historically, the Mexican gray wolf (*Canis lupus baileyi*) occupied portions of Arizona, New Mexico, Texas, and Mexico. By the mid-1900s, this species had been eliminated from the U.S., and populations in Mexico were severely reduced. This species has since been reintroduced into the mountains of the Apache National Forest in Arizona and translocated into the Gila National Forest in New Mexico. **Habitat**: Habitat generalists, this species occupies mountain forests (most often pine, oak, or piñon-juniper), grasslands, and shrublands where ungulates (their main prey source) are numerous. **Elevation**: >4,500 feet	**Unlikely.** While the Project site occurs within the secondary recovery zone of the Blue Range Recovery Area, and suitable habitat for the wolf exists in areas surrounding the site, no wolves have been documented on the Little Rock Mine site or in the vicinity. However, due to the high mobility of this species, it is possible that an occasional single wolf could disperse through the area.
Mexican long-nosed bat	*Leptonycteris nivalis*	E	E		**Range:** The Mexican long-nosed bat has been found in extreme southwestern New Mexico, the Big Bend area of Texas, the Chinati Mountains of Presidio County, Texas and southward to central Mexico. Foraging habitat includes columnar cacti and succulents such as saguaro cactus and Palmer or Parry agave. **Habitat**: A colonial cave dweller that usually inhabits deep caverns, but also can be found in mines, culverts, hollow trees, and unoccupied buildings. This bat occupies a variety of habitats from high-elevation pine oak woodlands to sparsely vegetated deserts. **Elevation**: 3,700-7,800 feet (for local vegetation types)	**None.** Although there have been incidental reports of this species in the general vicinity of the mine, and there is a known roost site in the Bootheel mountain ranges of southwestern New Mexico region, the Proposed Action Area is outside the reported geographic range for this species. Furthermore, the Proposed Action Area lacks potential roosting sites and suitable foraging habitat for this species. An internal survey of a decline shaft on October 24, 2014 by Bat Conservation International (BCI) concluded that this species does not occur.

Species		Legal Protection Status			Preferred Habitat	Potential for Occurrence in the Project Area
Common Name	**Scientific Name**	**ESA[a]**	**New Mexico[b,c]**	**BLM[d]**		
Mexican long-tongued bat	*Choeronycteris mexicana*		S	S	**Range**: New Mexico, California, Texas, Arizona. Species is known from Honduras and El Salvador to south CA, NV, AZ, and NM. In NM, found in Peloncillo & Guadalupe mountains, Hidalgo County, often in shallow caves in hilly country with piñon-juniper woodlands. In NM from July through late August, early September. **Habitat:** Cottonwood-willow, western live oak, and piñon-juniper woodlands; sycamore, cottonwood, and rabbitbrush riparian habitats; and lowlands consisting primarily of desert canyons. Day roosts include deep canyons and caves, mine tunnels, or rock fissures. This species has also been found in buildings. **Elevation:** 4,000-9,000 feet	**Unlikely.** Lack of suitable habitat. In addition, the Proposed Action Area is located outside of the reported geographic range (Hidalgo County).
Spotted bat	*Euderma maculatum*		T	S	**Range:** This species has a wide geographic range, from southern British Columbia to southern Mexico, but is not common anywhere. In New Mexico, this species has been documented from Bernalillo, Catron, Cibola, Doña Ana, Grant, Otero, Rio Arriba, Sandoval, San Juan, and Socorro counties. In 2006, this species was observed in Grant County at the following locations: Lichty Farm (Gila River), near Buckhorn (Gila River), Big Burro Mountains (Gila River), and at Black Canyon Campground (Santa Fe). **Habitat:** Rocky outcrops of riparian, piñon juniper, ponderosa pine and spruce-fir forests usually near bodies of water. In New Mexico, this species prefers meadows in Subalpine Coniferous Forest. Often roost in crevices in cliffs or under loose rocks, but are occasionally found in caves and buildings. This species is known to fly long distances to forage and drink. **Elevation:** 3,300-10,900 feet	**Possible.** Suitable roosting habitat may be present in abandoned mines in the Big Burro and Little Burro Mountains, and there may be suitable foraging habitat located within the Proposed Action Area.

Species		Legal Protection Status			Preferred Habitat	Potential for Occurrence in the Project Area
Common Name	**Scientific Name**	**ESA[a]**	**New Mexico[b,c]**	**BLM[d]**		
Pale Townsend's big-eared bat	*Plecotus townsendii pallescens*		S	S	**Range:** Found throughout western Canada, the western United States to southern Mexico; a few isolated populations exist in the eastern United States. **Habitat:** Semidesert shrublands, piñon-juniper woodlands, and open montane forests. This species is frequently associated with spacious cavern-like structures for day roosts and hibernacula, including caves and abandoned mines, but will also use abandoned buildings and crevices on rock cliffs for refuge. Forages over vegetation and within tree canopies. Species does not move or forage far from their day roosts. Very sensitive to disturbance in roost sites, hibernacula, and maternity sites. **Elevation:** 4,000-9,000 feet	**Possible.** Suitable roost sites may be available in abandoned mines in the Big Burro and Little Burro Mountains, and there may be suitable foraging habitat located within the Proposed Action Area.
Western red bat	*Lasiurus blossevillii*		S		**Range**: Western Canada, western United States and western Mexico to Central America. New Mexico range includes Catron, Doña Ana, Grant, Hidalgo, and Luna counties. **Habitat:** In New Mexico this species prefers riparian associations of deciduous trees including sycamore, cottonwood, oak, and willow riparian habitats. It is rarely found in desert habitats. It is typically solitary, roosting primarily in the foliage of trees or large shrubs. Roosting habitat is found in woodland borders, rivers, agricultural areas, urban areas with mature trees, and occasionally caves. **Elevation**: 1,900-7,200 feet	**None.** Lack of suitable riparian habitat within the Proposed Action Area.

Species		Legal Protection Status			Preferred Habitat	Potential for Occurrence in the Project Area
Common Name	**Scientific Name**	**ESA[a]**	**New Mexico[b,c]**	**BLM[d]**		
Western yellow bat	*Lasiurus xanthinus*		T	S	**Range:** Southwestern United States (California, Arizona, and New Mexico) to southern Mexico. New Mexico range is from southern Hidalgo County, where it has been recorded in Guadalupe Canyon and in the Animas Mountains at Double Adobe Creek and Gibson Tank. **Habitat:** Sycamore, rabbitbrush, and cottonwood riparian areas. Most commonly associated near water features in open grassy areas and scrub, as well as canyon and riparian situations. Typically associated with wooded areas. Most captures in New Mexico have been over water in riparian areas. In Guadalupe Canyon, associated vegetation includes Fremont cottonwoods (*Populus fremontii*), Arizona sycamores (*Platanus wrightii*), and Arizona white oaks. Roost in trees and other vegetation. **Elevation:** 5,000-7,000 feet	**Unlikely.** Lack of suitable habitat within the Proposed Action Area. In addition, the project area is not within this species reported New Mexico range (Hidalgo County).
White-nosed coati	*Nasua narica*		S	S	**Range:** Southwestern United States, south across Mexico and Central America to Colombia. In New Mexico, most records are from the Peloncillo Mountains (Hidalgo County), but there are also reports from as far north as the Gila Valley, and the Burro Mountains (Grant County), and from the San Francisco Valley County. **Habitat:** Steep, rocky canyons (oak-sycamore-walnut, oak-pine, or shrub-grass dominated) near creeks or some other water source, but can also be found in oak and piñon-juniper woodlands and riparian areas. Dens can be found in rock crevices, under tree roots, hollow trees, and caves or mines. **Elevation:** 4,500-4,700 feet	**Unlikely.** Possible suitable foraging habitat and denning sites may be present in the Big Burro and Little Burro Mountains near the Proposed Action Area.
White-sided jack rabbit	*Lepus callotis*		T	S	**Range:** Extreme southwestern New Mexico southward on the Mexican Plateau to Jalisco. In New Mexico, this species is present only in extreme southern Hidalgo County, where confirmed only from the Animas and South Playas valleys. **Habitat:** In New Mexico, this species is an obligate of grasslands. Typical of plains-mesa grasslands. Dependent on well-developed, pure grasslands that have low shrub density and level terrain. **Elevation**: 4,000-6,000 feet	**None.** Lack of suitable habitat, and the Proposed Action Area is outside the reported geographic range of this species.

Species		Legal Protection Status			Preferred Habitat	Potential for Occurrence in the Project Area
Common Name	**Scientific Name**	**ESA[a]**	**New Mexico[b,c]**	**BLM[d]**		
Mollusks						
Gila springsnail	*Pyrgulopsis gilae*		T		**Range:** Endemic and limited to a series of thermal springs along the Gila River in Grant County, (four in a 2.9 mile stretch of the lower East Fork and a fifth on the mainstem, 1.4 miles below the confluence of the East and West forks). **Habitat:** Aquatic species. Habitat of the major population is a cool spring and its brook, but a few of these animals have also been found in a nearby thermal spring, occurring in association with the New Mexico hot spring snail. The Gila springsnail occurs in mud, debris, and vegetation. Typical habitat is a rivulet about 1 m wide and grown up with watercress (*Nasturtium officinale*). **Elevation:** Unknown	**None**. Lack of suitable habitat within the Proposed Action Area. In addition, the project area is not within the reported geographic range of this species.
New Mexico hot springsnail	*Pyrgulopsis thermalis*		T		**Range:** Endemic to southwest New Mexico where it is restricted to a series of thermal springs along the Gila River in Grant County (four in a 2.9 mile stretch of the lower East Fork and a fifth on the mainstem, 1.4 miles below the confluence of the East and West forks). **Habitat:** Aquatic species. Areas of steep, vertical rock covered with thin sheets of water represent the typical substrate occupied by this species. This species also inhabits minor spring flows on algal film and crusts of lime-depositing algae. May also use dense grasses and sedges bordering the springs. **Elevation:** Unknown	**None**. Lack of suitable habitat within the Proposed Action Area. In addition, the project area is not within the reported geographic range of this species.
Plants						
Alamo beardtongue	*Penstemon alamosensis*			S	**Range:** New Mexico, from Doña Ana, Lincoln, and Otero counties, the west escarpment of the Sacramento Mountains and east side of San Andres Mountains. Also known from El Paso County, and the Hueco Mountains in Texas. **Habitat:** Sheltered rocky areas/ crevices; canyon sides and bottoms; on limestone. **Elevation:** 4,300-5,300 feet	**None.** Lack of suitable habitat within the Proposed Action Area. In addition, this species reported New Mexico range is limited to Doña Ana, Lincoln, and Otero counties.

Species		Legal Protection Status			Preferred Habitat	Potential for Occurrence in the Project Area
Common Name	**Scientific Name**	**ESA[a]**	**New Mexico[b,c]**	**BLM[d]**		
Chapline's columbine	*Aquilegia chrysantha var. chaplinei*			S	**Range**: New Mexico, from Eddy and Otero counties, the Guadalupe and southern Sacramento mountains, and adjacent Texas. **Habitat:** Remote canyons with limestone seeps and springs in the montane scrub or riparian canyon bottoms. **Elevation:** 4,700-5,500 feet	**None.** Lack of suitable habitat within the Proposed Action Area. In addition, this species reported New Mexico range is limited to Eddy and Otero counties.
Chihuahua scurfpea	*Pediomelum pentaphyllum*	Under review		S	**Range**: Range includes New Mexico (Hidalgo County); adjacent Arizona (Cochise and Graham counties); possibly Texas (Presidio County); and Mexico (Chihuahua), south to about Ciudad Chihuahua. **Habitat**: Desert grassland or desertscrub among creosote bush or mesquite in sandy or gravelly loam soils. **Elevation**: 4,400-6,600 feet	**None.** Lack of suitable habitat. In addition, this species reported New Mexico range is limited to Hidalgo County.
Coppermine milkvetch	*Astragalus cobrensis var. maguirei*			S	**Range:** New Mexico, from the Peloncillo Mountains (Hidalgo County); and Arizona, from the Chiricahua and Peloncillo mountains (Cochise County). **Habitat:** Dry creek beds, banks, canyon sides, generally dry, open slopes with oaks, juniper, and pine. **Elevation:** 5,500-7,000 feet	**None.** The Proposed Action Area is not within the reported geographic range of this species.
Davidson's cliff carrot	*Cymopterus davidsonii*		RARE		**Range:** In New Mexico, this species is known from Catron and Grant counties, in the Mogollon Mountains and Piños Altos Range. Also known from adjacent eastern Arizona. **Habitat:** Cool, moist, rocky places in piñon-juniper woodland and lower montane coniferous forest. This species has been documented on sheer cliffs, in rocky, damp, drainages, mountain sides, and in wet areas (including springs, seeps, wetlands, and riparian areas). **Elevation:**; 6,500-8,000 feet	**None.** The Proposed Action Area is not within the reported geographic range of this species.

Species		Legal Protection Status			Preferred Habitat	Potential for Occurrence in the Project Area
Common Name	**Scientific Name**	**ESA[a]**	**New Mexico[b,c]**	**BLM[d]**		
Desert night-blooming cereus	*Peniocereus greggii var. greggii*		RARE	S	**Range:** New Mexico, from Doña Ana, Grant, Hidalgo, and Luna counties; Texas (mostly in the Big Bend Region); and Mexico (Chihuahua). Grant County records from the Little Hatchet Mountains (at the extreme south end of county). **Habitat:** Mostly in sandy to silty gravelly soils in gently broken to level terrain in desert grassland or Chihuahuan desert scrub. Typically found growing up through and supported by shrubs, especially *Larrea tridentata* and *Prosopis glandulosa*. **Elevation:** 3,000-5,000 feet.	**None.** Lack of suitable habitat within the Proposed Action Area.
Duncan's pincushion cactus	*Escobaria duncanii*	SC		S	**Range:** New Mexico, from central Sierra County; Texas, from Brewster and Presidio counties; and adjacent Mexico, from Coahuila and Chihuahua. **Habitat:** Cracks in limestone and limy shale in broken terrain in Chihuahuan desert scrub. Can be found on almost barren rocky slopes. **Elevation**: 5,100 feet	**None.** Lack of suitable habitat within the Proposed Action Area. In addition, the project area is not within the reported geographic range of this species.
Gila brickellbush	*Brickellia chenopodina*		RARE		**Range:** Endemic to New Mexico, from the Gila River Valley (Grant County). **Habitat:** Restricted to alluvial soils along the Gila River. **Elevation:** 4,500 feet	**None.** Lack of suitable habitat within the Proposed Action Area. In addition, this species has only been reported at elevations lower than in the project area. **Note:** May not be a valid taxon. Only specimens are over 100 years old from a single location on the Gila River.
Grama grass cactus	*Pediocactus papyracantha*			S	**Range:** Southern portion of Navajo County, Arizona, and from southeast Rio Arriba County and McKinley County to Grant and Doña Ana counties, New Mexico. Additional populations have been located in Hudspeth County, Texas **Habitat:** Piñon-juniper woodlands, desert grasslands, and Chihuahuan desert scrub. Almost always associated with grama (*Bouteloua* spp.), especially blue grama (*B. gracilis*). **Elevation**: 4,900-7,200 feet	**None.** Lack of suitable habitat within the Proposed Action Area.

Species		Legal Protection Status			Preferred Habitat	Potential for Occurrence in the Project Area
Common Name	**Scientific Name**	**ESA[a]**	**New Mexico[b,c]**	**BLM[d]**		
Gray sibara (Texas thelypody)	*Sibara grisea*			S	**Range:** New Mexico, from Chaves, Eddy, and Otero counties. Also known from adjacent Texas. **Habitat:** In crevices and at the bases of limestone cliffs in interior chaparral and piñon-juniper woodland communities. **Elevation:** 4,500-6,000 feet	**None.** Lack of suitable limestone habitat within the Proposed Action Area. In addition, this species known New Mexico range is limited to Chaves, Eddy, and Otero counties.
Grayish-white giant hyssop	*Agastache cana*		RARE		**Range:** New Mexico, from Doña Ana, Grant, Luna, and Sierra counties. Texas, from El Paso and Hudspeth counties. **Habitat:** Crevices and bases of granite cliffs or in canyons with small-leaved oaks at the upper edge of the desert and lower edge of the piñon-juniper zone. **Elevation:** 4,600-5,900 feet	**Unlikely.** Suitable habitat may be present within the Proposed Action Area. Granitic substrates are widespread in the Big Burro Mountains.
Guadalupe mescalbean	*Sophora gypsophila* var. *guadalupensis*			S	**Range:** New Mexico range includes the Brokeoff Mountains (Otero County) and Upper Dog Canyon area of the Guadalupe Mountains (Eddy County). Species is also known from adjacent Culberson County, Texas. **Habitat:** Outcrops of pink, limy, slightly gypseous, fine-grained sandstone in Chihuahuan desert scrub and juniper savanna. **Elevation**: 5,200-6,700 feet	**None.** Lack of suitable habitat within the Proposed Action Area. In addition, the reported New Mexico range is limited to Otero and Eddy counties.
Guadalupe stickleaf	*Mentzelia humilis var. guadalupensis*			S	**Range**: New Mexico endemic, from west slope of the Guadalupe Mountains (southeastern Otero County). **Habitat**: Open gypsum outcrops of the Yeso Formation, with limestone cobble. **Elevation**: 4,400-5,100 feet	**None**. Lack of suitable habitat within the Proposed Action Area. In addition, the project area is not within the reported geographic range of this species (southeastern Otero County).
Gypsum scalebroom	*Lepidospartum burgessii*			S	**Range:** New Mexico endemic, from Alkali Lakes (southern Otero County), and adjacent Texas (Hudspeth County). **Habitat**: Stabilized gypsum dunes with Chihuahuan desert scrub and arid grassland. **Elevation**: 3,500-3,700 feet	**None.** Lack of suitable habitat within the Proposed Action Area. In addition, this species is a very narrow endemic of the Alkali Lakes area west of the Guadalupe Mountains (New Mexico).
Howard's gyp ringstem	*Anulocaulis leiosolenus var. howardii*			S	**Range**: New Mexico endemic, from west slope of the Guadalupe Mountains (southeastern Otero County). **Habitat**: Open gypsum outcrops of the Yeso Formation, with limestone cobble. **Elevation**: 4,400-4,800 feet	**None**. Lack of suitable habitat within the Proposed Action Area. In addition, the project area is not within the reported geographic range of this species (southeastern Otero County).

Species		Legal Protection Status			Preferred Habitat	Potential for Occurrence in the Project Area
Common Name	**Scientific Name**	**ESA[a]**	**New Mexico[b,c]**	**BLM[d]**		
Maguire's beardtongue	*Penstemon linarioides* ssp. *maguirei*		RARE		**Range**: In and near the Gila River valley in both Arizona and New Mexico. New Mexico, from Grant County. Arizona, from Greenlee County. **Habitat**: Limestone cliffs in piñon-juniper woodland. **Elevation**: 6,000-6,500 feet	**None.** There is low/ poor habitat quality for this species within the Proposed Action Area, and there is no available limestone substrate. In addition this species has not been documented in New Mexico in over 100 years.
Metcalfe's tick-trefoil	*Desmodium metcalfei*		RARE		**Range:** Historically, this species occurred in Grant and Sierra counties in the Caballo Watershed. However, there are no recent occurrence records . Arizona, from Cochise, Coconino, Gila, Pinal, Santa Cruz, and Yavapai counties. Mexico, from Sinaloa. **Habitat**: Rocky slopes, canyons, and ditches in grasslands and oak/piñon-juniper woodlands. **Elevation**: 4,000-6,500 feet	**Unlikely.** There is poor habitat quality for this species within the Proposed Action Area. In addition, there have been no recent occurrence records for this species in New Mexico.
Mimbres figwort	*Scrophularia macrantha*		RARE	S	**Range**: New Mexico endemic, from the Mimbres Mountains, Kneeling Nun, Cook's Peak, and Railroad, Noonday, and Upper Gallinas canyons (Grant and Luna counties). **Habitat:** Piñon-juniper woodland and lower montane coniferous forest. Steep, rocky, usually north-facing igneous cliffs and talus slopes, occasionally in canyon bottoms. **Elevation:** 6,500-8,200 feet	**Unlikely.** Potential habitat for this species is present at higher elevations in the Big Burro Mountains.
Mogollon whitlowgrass	*Draba mogollonica*		RARE		**Range:** New Mexico, from Catron, Grant, Sierra, and Socorro counties. Also present in Arizona. **Habitat:** Cool, moist northern slopes of mountains, ravines and canyons on volcanic rocks and soil in montane forests. **Elevation:** 5,000-9,000 feet	**None.** Lack of suitable habitat within the Proposed Action Area.
New Mexico gumweed	*Grindelia arizonica var neomexicana*		RARE		**Range**: Subspecies is New Mexico endemic, from the Piños Altos Range, Black Range, and Mimbres Mountains (Grant and Sierra counties). Species range includes Arizona, Colorado, and Texas. **Habitat**: Rocky slopes and ledges in piñon-juniper woodland and lower montane coniferous forest. **Elevation**: 6,500-7,500 feet	**Unlikely.** Although there is no documentation for this species in the area, there is potentially suitable habitat in the Big Burro Mountains.

Species		Legal Protection Status			Preferred Habitat	Potential for Occurrence in the Project Area
Common Name	**Scientific Name**	**ESA[a]**	**New Mexico[b,c]**	**BLM[d]**		
Nodding rock daisy	*Perityle cernua*			S	**Range:** New Mexico endemic, from the Organ Mountains (Doña Ana County). **Habitat:** Igneous cliffs, primarily on rhyolite, occasionally on andesite. **Elevation:** 5,000-8,800 feet	**None.** Lack of suitable habitat within the Proposed Action Area. In addition, this species known New Mexico range is limited to the Organ Mountains (Doña Ana County).
Parish's alkali grass	*Puccinellia parishii*		RARE	S	**Range:** New Mexico, from Catron, Cibola, Grant, Hidalgo, McKinley, Sandoval, and San Juan counties. Also from California, Arizona, and Colorado. **Habitat**: Alkaline springs, seeps, and seasonally wet areas that occur at the heads of drainages or on gentle slopes. This species requires continuously damp soils during its late winter to spring growing period. **Elevation**: 2,600-7,200 feet	**None.** Lack of suitable habitat within the Proposed Action Area.
Piños Altos fame flower	*Phemeranthus humilis*		RARE		**Range:** New Mexico, from Grant and Hidalgo counties; Arizona, from Cochise County; Mexico, from western Chihuahua and northeastern Sonora. **Habitat:** Shallow, rocky/gravelly, usually clayey soils overlying rhyolite. Usually on south-facing rocky slopes; rock benches in sloping terrain or in soil pockets overlying bedrock in nearly level areas. Madrean grassland, chaparral habitat, pine-oak woodland, or piñon-juniper woodland. **Elevation**: 6,000-8,000 feet	**None.** Although the original range of this species included Grant County, this species has not been found in New Mexico since the 1880's.
Porsild's starwort	*Stellaria porsildii*		RARE		**Range:** New Mexico, from the Piños Altos Mountains (Grant County). Arizona, from the Chiricahua Mountains (Cochise County). **Habitat:** In shade and partially open understory of mixed-conifer and aspen forests, and occasionally scattered on roadsides with steep, loamy and rocky embankments. **Elevation:** 7,900-8,200 feet	**None.** The Proposed Action Area lacks suitable habitat and is below the typical elevation range of this species.
Ray Turner’s spurge	*Euphorbia rayturneri*		RARE		**Range:** Very specific and limited areas of Grant, Hidalgo, and Luna counties in New Mexico. **Habitat:** Defined only as desert grassland. **Elevation:** 4,590-5,580 feet	**None.** Lack of suitable habitat within the Proposed Action Area.

Species		Legal Protection Status			Preferred Habitat	Potential for Occurrence in the Project Area
Common Name	**Scientific Name**	**ESA[a]**	**New Mexico[b,c]**	**BLM[d]**		
Roetter's hedgehog cactus	*Echinocereus x roetteri var. roetteri*			S	**Range:** Trans-Pecos Texas; Eddy County, New Mexico, and north of El Paso in Doña Ana and Otero counties. Also known from adjacent Mexico. **Habitat:** Mesquite and desertscrub of degraded grasslands. **Elevation:** 2,500-4,500 feet	**None.** Lack of suitable habitat. In addition, the Proposed Action Area is above the typical elevation range of this species. **Note:** The "x" in the species name signifies that it is a hybrid.
Sand pricklypear	*Opuntia arenaria*			S	**Range:** New Mexico, from southern Doña Ana, Luna, and Socorro counties; adjacent Texas, from El Paso County; Mexico, from Chihuahua, south to near Samalayuca. **Habitat:** Sandy areas, particularly semi-stabilized sand dunes among open Chihuahuan desert scrub; often with honey mesquite and a sparse cover of grasses. **Elevation:** 3,800-4,300 feet	**None**. The Proposed Action Area has no suitable habitat and lies outside the reported elevation and geographic range of this species.
Slender spiderflower	*Peritoma multicaulis*		RARE		**Range:** From Grant and Hidalgo counties, New Mexico. Also found in Wyoming, south-central Colorado, southeastern Arizona, western Texas, and Mexico. **Habitat:** Wet, saline or alkaline soils; often in and around alkali sinks, saline meadows, or old lake beds. **Elevation:** 3,600-4,200 feet.	**None.** The Proposed Action Area is above the typical elevation range of this species. In addition, the project area does not contain suitable alkaline habitat for this species.
Thurber's campion	*Silene thurberi*		RARE		**Range:** New Mexico, from eastern Grant, western Sierra and Hidalgo counties. Arizona, from Cochise County. Adjacent Mexico, from Chihuahua and Sonora. **Habitat:** Protected locations on rocky areas and slopes; arroyos and mountains. **Elevation:** 5,000-7,000 feet	**Unlikely.** Marginal habitat for this species may be present in the project vicinity, but this species has not been reported from this area.
Villard's pincushion cactus	*Escobaria villardii*			S	**Range**: New Mexico endemic, from Otero and Doña Ana counties; west slope of the Sacramento Mountains and northern Franklin Mountains. **Habitat**: Loamy soils of desert grassland with Chihuahuan desert scrub on broad limestone benches in mountainous terrain. **Elevation**: 4,500-6,500 feet	**None**. Lack of suitable habitat within the Proposed Action Area. In addition, the project area is not within the reported geographic range of this species (Otero and Doña Ana counties).

Species		Legal Protection Status			Preferred Habitat	Potential for Occurrence in the Project Area
Common Name	**Scientific Name**	**ESA[a]**	**New Mexico[b,c]**	**BLM[d]**		
Wooton's hawthorn	*Crataegus wootoniana*		RARE		**Range:** New Mexico endemic, from Piños Altos Mountains (Catron and Grant counties), and from the Sacramento mountains (Lincoln County). **Habitat:** Canyon bottoms and forest understory in lower montane coniferous forest. **Elevation:** 6,500-8,000 feet	**None.** Lack of suitable habitat within the Proposed Action Area.
Wright's campion	*Silene wrightii*		RARE		**Range:** New Mexico endemic in Catron, Grant, Luna, Sierra, and Socorro counties. **Habitat:** Cliffs and rocky outcrops in Rocky Mountain montane and subalpine conifer forests. Historic collections made near Santa Rita del Cobre copper mines in eastern Grant County. **Elevation:** 6,800-8,000 feet	**None.** Lack of suitable habitat within the Proposed Action Area.

Guide for Potential for Occurrence:

None: no suitable habitat is present or the species is not found within the elevation range of the Project site
Unlikely: no documentation; low or marginal habitat quality; outside, but close to, currently known geographic or elevational distribution; species may pass/migrate through Project site
Possible: no documentation but suitable habitat within range occurs
Present: species have been documented to occur

Guide for Legal Protection Status:

Endangered Species Act

Special status plant and wildlife species are subject to regulations under the authority of Federal and state agencies. Federal special status species (indicated under the "ESA" column) include threatened and endangered species protected pursuant to Section 4 of the ESA of 1973, as amended (or this rule's predecessor, the Endangered Species Preservation Act of 1966). The ESA status is designated by the USFWS and includes:

E Endangered species are those species in danger of extinction throughout all or a significant portion of their range.
T Threatened species are those species likely to become endangered in the foreseeable future.
PT Proposed threatened species.
EXPN Experimental, Nonessential Population designations imply the experimental population is not essential for the continued existence of the species.
C Candidate species are those species for which USFWS has sufficient information on their biological status and threats to propose them as endangered or threatened under the ESA, but for which development of a proposed listing regulation is precluded by other higher priority listing activities. Candidate species are not protected under the ESA.
D Delisted due to recovery.

New Mexico

Biota Information System of New Mexico

E As used in the Wildlife Conservation Act [17-2-37 to 17-2-46 NMSA (New Mexico Statutes Annotated) 1978]: "ENDANGERED SPECIES, formerly called 'Group 1'" means any species of fish or wildlife whose prospects of survival or recruitment within the state are in jeopardy due to any of the following factors: 1) the present or threatened destruction, modification or curtailment of its habitat; 2) overutilization for scientific, commercial or sporting purposes; 3) the effect of disease or predation; 4) other natural or man-made factors affecting its prospects of survival or recruitment within the state; or 5) any combination of the foregoing factors.

T As defined in the Wildlife Conservation Act, "THREATENED SPECIES, formerly called 'Group 2'" means any species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range in New Mexico; the term may also include any species of fish and wildlife appearing on the United States list of endangered native and foreign fish and wildlife as set forth in Section 4 of the ESA of 1973 as threatened species, provided that the commission adopts the list in whole or in part.

S Taxa which, in the opinion of a qualified NMDGF biologist, deserve special consideration in management and planning, and are NOT listed threatened or endangered by the state of New Mexico. These may include taxa that are listed threatened, endangered or sensitive by other agencies; taxa with limited protection; and taxa without any legal protection. The intent of this category is to alert land managers to the need for caution in management where these taxa may be affected. Where the Department lacks in house expertise, the opinion of a recognized authority for the taxa will be used.

New Mexico Rare Plant Technical Council

RARE As defined by the New Mexico Rare Plant Technical Council (NMRPTC), rare indicates "a taxon that is narrowly endemic to a specific geographic feature (*e.g.*, mountain range; geologic outcrop) or subset area of a phytogeographic region (*e.g.*, southern Rocky Mountains, northern Chihuahuan desert). It can be locally abundant within its narrow range, but typically will not extend more than 100 miles in length of range; OR A taxon that is more widespread, but is numerically rare – never locally common – throughout its range (*e.g.*, *Peniocereus greggii*) or is numerically abundant only in a few small, widely scattered habitats (*e.g.*, *Puccinellia parishii, Helianthus paradoxus*).

BLM

The BLM has designated some species:

S BLM Sensitive are those taxa occurring on BLM-managed land in New Mexico, which are considered sensitive by the New Mexico State Office.

Sources:

[a] USFWS. (2014b). *Official Species List, Consultation Tracking Number: 02ENNM00-2014-SLI-0239.* Albuquerque, New Mexico: New Mexico Ecological Services Field Office. Retrieved April 24, 2014.

[a] USFWS. (2014c). Trust Resources List. Retrieved September 3, 2014, from Information, Planning, and Conservation System: http://ecos.fws.gov/ipac/wizard/trustResourceList!prepare.action.

[b] BISON-M. (2014). *Report County TES Table for Grant County.* Retrieved September 4, 2014, from New Mexico Wildlife of Concern: http://www.bison-m.org/speciesreports.aspx.

[c] NMRPTC. (2014). Results of County Search - Grant County. Retrieved April 3, 2014, from New Mexico Rare Plants: http://nmrareplants.unm.edu/county_result.php?output=html.

[d] BLM. 2010. Las Cruces District. Sensitive Species List. Amphibians-Reptiles Update. Revised August 2011.

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_____. 2011. Las Cruces District. Sensitive Species List. Mollusks, Crustaceans, and Other Arthropods. Revised August 2011.

_____. 2011. Las Cruces District. Sensitive Species List. Sensitive Mammals Update. Revised August 2011.

_____. 2011. Las Cruces District. Sensitive Species List. Sensitive Plants List. September 2011.

_____. 2015. Las Cruces District. Sensitive Species Final Summary List.

APPENDIX C TYRONE MINE MIGRATORY BIRD CONSERVATION PLAN

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FREEPORT-MCMORAN TYRONE, INC.
MIGRATORY BIRD CONSERVATION PLAN
FOR THE
TYRONE MINE

October 2002
Revised through June 2004
Revised December 1, 2004
Revised April 26, 2005
Revised July 14, 2008
Revised January 20, 2010
Revised May 6, 2010
Revised November 10, 2010
Revised June, 2011
Reviewed July 2012
Revised November, 2012

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Prepared By:

ENVIRONMENT, LAND AND WATER DEPARTMENT
TYRONE OPERATIONS

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GENERAL INFORMATION

In September 2000, bird mortalities were discovered in the vicinity of inactive tailing impoundments and tailing impoundment storm water ponds. In 2009, FMTI completed reclamation of all tailing dams and associated water bodies and thus removed all threats to wildlife at the tailing impoundments. The U.S. Fish and Wildlife Service (USFWS) investigated the incidents and, in 2005, FMTI entered into a Plea Agreement with the United States which includes a Corrective Action Plan (CAP) to prevent bird mortalities. This document supplements the CAP and provides detailed procedures for implementation of migratory bird conservation measures by FMTI.

At this time, FMTI continues to operate under the CAP whereby mine and or contract personnel monitor, document and if needed haze and or rescue birds and wildlife from the mine facility. The components of the CAP have been, and will be modified from time to time to address the ever changing conditions and threats to birds and other wildlife. It is company policy to incorporate wildlife and threats to such in our planning of new or changes in our operations.

As a preventative measure, and in accordance with the CAP, from 2004 to 2009, FMTI reclaimed the tailing impoundments by regrading the impoundments to facilitate drainage and installing a soil cover at least two feet thick over the tailing material. As a result, water no longer comes into direct contact with tailing material and water no longer ponds on top of the tailing impoundments. Consequently a full-time, seven-days-per-week bird hazing crew will be employed as needed, to be determined by management if it is determined that birds and other wildlife are frequenting unsafe water bodies. This decision will be based upon review of inspections that are conducted by mine personnel at all water bodies in and around the mine that are either low in pH or otherwise known to be potentially hazardous to birds and other wildlife. FMTI has built three safe water bodies near the mine that were designed to provide a safe area for birds to locate. These water bodies will be maintained as long as considered practical.

Currently poor quality water bodies that pose a risk as determined by observance of birds or other wildlife will be managed by hazing, bird barriers, bird balls, radar systems with alarms or other methods to limit the risk and exposure to these ponds. Mine design will to the extent practical design pits and water bodies to limit exposure as well.

This report summarizes FMTI's activities to conserve migratory birds and documents the current activities and procedures used.

HANDLING AND REPORTING PROCEDURES

Freeport McMoRan Tyrone Inc.
Bird Reporting Procedures and Protocol

If an injured or dead bird(s) of any type is encountered at FMTI facilities, do not handle, disturb, or collect the bird(s) (except as noted below for rehabilitation).

Immediately report all dead or injured birds to one of the following Tyrone representatives until positive verbal notification is completed. The bird should be reported as soon as possible on the same day.

If a bird is found using any of the Tyrone ponds, immediately call one of the contacts below in descending order below. Notify them of the location and bird activity. If one of the contacts below cannot be reached, report the incident to your supervisor immediately.

For the hazing crew, if a bird will not leave a FMTI facility and it appears feasible and safe to capture for rehabilitation, call Dennis Miller at the numbers below before capture and follow his instructions. If a bird is captured for rehabilitation, report it as outlined above.

Ty Bays-Tyrone Representative
Wk 912-5757 (Tyrone)
Cell 313-0913 or 590-7587

Grant Kronberg-Tyrone Representative
Wk 912-5399 (Tyrone)
Cell 956-5284

Tim Eastep- Tyrone Representative
Wk 912-5237
Cell 313-6056

Dennis Miller – Licensed Wildlife Rehabilitation (Only for capture and rehabilitation)
Cell 590-0118
Home 538-6227

If none of these people answer, go to the front gate and ask them to call the environmental person on call, and notify that person. Ask that person to notify one of the Tyrone representatives above.

BIRD HAZING

The following procedures were developed for site specific implementation at FMTI after consultation with US Fish and Wildlife Service, NM Department of Game and Fish, Geomarine, Animal Damage Control and The World Bird Sanctuary.

A crew of FMTI personnel employees and a part time crew of contractor's during migration periods have been retained to conduct non-lethal hazing methods. Geomarine conducted training for the original hazing crew in 2001.

Current Hazing Procedures

Hazing methods have been implemented, and are in place to minimize migratory bird presence at low pH process ponds on FMTI property. In no way shall these procedures be deemed or intended as harassment of wildlife except for the safety of the wildlife. Further, it is intended that these procedures will discourage migratory birds from using various water bodies at FMTI for resting/foraging and thus minimize potential accidental bird mortality. All birds, regardless of species, shall be hazed away from low pH or dangerous FMTI water bodies including, but not limited to, storm water reservoirs and pregnant leach solution (PLS) collection ponds. These procedures shall continue until it is deemed that hazing is no longer necessary to minimize contact with the relevant water bodies.

FMTI employees shall check priority water bodies daily throughout the year (See Appendix A for a list of ponds and frequency of hazing visits). The number of personnel/hazers will vary throughout the year depending upon the season and the number of birds observed.

Additional personnel may be added to the hazing crew typically about the middle of August through May 1st. This time period covers both the fall and spring migration with the highest number of bird sightings being in September and October. Hazing hours will be dictated by the number of, frequency and time of presence on FMTI property. Hazing will occur as long as needed to protect birds and other wildlife.

The following measures have been implemented to reduce contact by migratory birds with process waters at FMTI facilities:

HAZING ACTIVITY AND FIELD LOG PROCEDURE
FREEPORT MCMORAN HAZING STAFF

1. The following protocol and attached hazing log hereby replaces any previous method of documenting hazing activities on Freeport McMoRan properties and mine sites. The hazing log will be filled out as completely as possible or appropriate notes provided to explain specific circumstances and conditions that necessitated an incomplete or modified data recording effort.
2. Lead Hazer will allocate all resources to efficiently cover all appropriate ponds or areas to be surveyed for birds. In some circumstances (e.g., when birds are observed arriving at a specific location), it may be appropriate to modify a standard survey route in order to prevent birds from landing.
3. Every effort should be made to minimize the presence of birds within the facility. We recognize that some sites contain fresh water, and serve as a convenient location for migratory birds to rest and to which hazed birds may fly. Field judgment should be employed, but in general the freshwater areas should probably not be hazed when water is present in other areas of the facility. However, when there is no water elsewhere on the facility (i.e., to where birds may be hazed) then the freshwater areas may also be hazed.
4. If a group of birds are observed, it is best to make several counts to ensure the accuracy of the estimated bird number. When more than one staff member is present, it is recommended that each person provides an independent estimate of the number of birds and that an agreed number is entered onto the Hazing Log Field Sheet.
5. Hazers should strive to minimize double or multi-counting of the same birds. For example, if a group of birds are observed or thought to be, moving from one location to another the hazing effort should be recorded. However, appropriate notation (in the comments) should indicate that these were the same birds.
6. The Hazing Log Field Sheet for each day's activity should be completed as follows.
    a. Date (mm/dd/yy)
    b. Time (24 hour clock or military time). This is the time of arrival of the Hazers at a site/location
    c. Pond Location – the unique designator assigned to each pond
    d. Number of birds. This refers to the number of birds located at less desirable areas and which need to be hazed. (See comment # 4 above).
    e. Bird Type. If you are able to identify the birds to species, enter this in the comments section. Otherwise, group the birds into the following categories
        i. DU= ducks
        ii. GR= Grebes
        iii. WF= Waterfowl that cannot be assigned to one of the previous categories
        iv. GL= Gulls
        v. SH= Shorebirds
        vi. O/U= Other or Unknown i.e., any species that cannot be assigned to one of the previous categories.
        vii. The observed total is the total of all birds observed i.e., the sum of each bird category.

f. Hazing Technique Employed. Note the hazing technique. For example:
    i. H= human
    ii. V= vehicle approach (this might include vehicle door banging/closing)
    iii. PS= pistol launched screamer shell
    iv. PB= pistol launched banger shell
    v. SB= shotgun launched banger launched

g. The number of birds hazed – record all birds that were successfully hazed. Successfully hazed is defined as birds flown away and assumed to, or known to, have moved off the hazing area. If successful hazing has taken place, the total number of observed birds should be the same as the total number of hazed birds. Note that categories for hazed birds are the same as the observed birds, thus;
    i. DU= ducks
    ii. GR= Grebes
    iii. WF= Waterfowl that cannot be assigned to one of the previous categories
    iv. GL= Gulls
    v. SH= Shorebirds
    vi. O/U= Other or Unknown i.e., any species that cannot be assigned to one of the previous categories.
    vii. The hazed total is the total of all birds hazed i.e., the sum of each bird category.

h. Time to Clear – The time difference (in minutes) between the arrival time of the hazer and the successful hazing of the birds.

i. Comments: Comments might include an indication of the number of times a hazing activity was performed. For example the number of shells used, the location of the bird within the pond (i.e., edge, middle), or other observations that characterize the event and more fully represent the hazing or bird activity.

j. Completed Hazing Logs should be submitted to the appropriate Freeport-McMoRan representative on a regular (daily) basis.

Propane Cannons: Where practical and effective, propane cannons with adjustable firing intervals have been located at areas of open water on a temporary basis. To ensure that birds do not become accustomed to these devices, they will be moved and the frequency of the blast shall be changed regularly. Regular checks are made to ensure they are operating properly. An operating and maintenance manual for the propane cannons used at Tyrone is included in Appendix E of this Plan.

Qualified members of ELWD and contractor personnel may train other employees in the proper use and maintenance of hazing devices. Hazing devices are pyrotechnics, and should be handled with extreme care. Instructions for the care and use of the 15 mm launchers and the hazing projectiles are included in Appendix F of this Plan.

Reporting and Documentation

- Birds that will not leave the pond after hazing will be reported to ELWD personnel. ELWD personnel may contact Wildlife rehabilitation expert, Dennis Miller if it appears that it is safe and feasible to attempt to rescue a bird from potential adverse conditions. Mr. Miller may retrieve birds for rehabilitation.
- Bird mortalities shall be reported as outlined in Section 1 of this manual.
- A FMTI Bird Hazing Program Log (see Appendix G) shall be filled out on wildlife activity, specifically birds. The number of birds, species if possible and location where found and the action taken to haze birds from FMTI property shall be documented.
- Weather events appear to cause bird movement especially during the fall migration. Thus, FMTI personnel shall monitor weather events specifically in northern New Mexico as well as local events. If deemed appropriate, additional personnel may be placed on duty in anticipation of increased bird activity.

Hazing records have been in use since at least June 2000. These records indicate a cyclic rise and fall in the number of birds based on seasons. This is to be expected because of spring and fall migrations. The chart in Appendix J shows that the months of September, October, November, March, and April all have an increase in bird hazing; again, this is to be expected because of Fall and Spring migrations.

Other Hazing Methods Tested

The following measures were implemented in the past in order to reduce contact by migratory birds with process waters and water collecting on tailing ponds at FMTI facilities. Some were discontinued because it was found that these measures were ineffective in reducing contact by migratory birds with relevant water bodies at FMTI facilities. Some of these measures were discontinued because the method was not practically functional in the mine area environment.

#	Measure	Material Description	Intended Use	Results
1	Flash Tape	Foil tape	Scare birds	Little observable affect
2	Owls	OWL decoy	Scare birds	Somewhat effective
3	Propane Cannons	Propane cannon and tank	Scare birds away	Somewhat effective
4	Monofilament Barrier	A series of fishing lines attached to posts at 1.5-2.5 foot intervals	Impede birds from landing	Effective
5	Snake	Snake decoy	Scare birds	Ineffective
6	Remote Controlled Boat	Toy remote controlled boat	Haze birds that were uncooperative in leaving	Somewhat effective; maintenance problems
7	Bird avert	Electronic birds that move and propane canons and noise form birds	Scare birds for ponds	Effective
8	Bird balls	Plastic balls	This is used to fill bottom of pond to keep birds away.	Effective
9	Netting	Small holed Poly netting	This to keep birds out of water areas	Keeps birds from entering tanks

ENGINEERING MEASURES

Numerous engineering measures have been evaluated to improve water management at FMTI and to enhance the ability to reduce the risk of bird mortalities. A number of engineering measures have been implemented successfully as summarized below.

Timing	Project	Purpose
2005	North Racket	Monofilament barrier was placed over pond.
2007	3 PLS & 3PLS Over Flow 1 B Over Flow Upper Oak Grove Pond DC 2-1 Lined Overflow @AST Tank Tailing Dam 3 series	Bird Balls were placed on these ponds. These areas have been reclaimed and seeded for better storm water control and ground water control from storm events and to keep water from ponding on the tops and catchments
2008	Tailing Dams 1 & 2	All 1 & 2 Series ponds were reclaimed and seeded for better storm water control and ground water control from storm events and to keep water from ponding on the tops and catchments.
2009	1 A Over Flow 1X1	Monofilament barrier was placed over the pond.
2009	2 PLS Over Flow Pond Raffinate Overflow Pond	Installed monofilament barrier over the ponds.
2010	North Racket 1A PLS over flow Pond	Installed monofilament barrier over the ponds. Improved design and durability.

APPENDIX A
FMTI List of Ponds

This table was developed to list the FMTI inventory of tailing impoundments, catchment basins and relevant process ponds.

The primary prevention methods at these water bodies are neutralization, hazing and monitoring using FMTI and contract personnel. These methods are used at all higher priority mine area sites (no neutralization at mine area) listed below except as noted. In addition to these methods, hazing cannons are located at most of the sites as rotation requirements dictate. Please refer to Engineering Measures table for other conservation measures at specific ponds included below.

Pond Designation	Monitored By
NEUTRAL WATER PONDS IN TAILING AREA	**Neutral Water Ponds in Tailing Area**
CB 1XE1	Reclaimed
MINE AREA PONDS	**Low pH Process water ponds-high priority**
No. 2 PLS Pond	SXEW
No. 3 PLS	SXEW
no. 3 PLS Overflow	SXEW
No. 3 (b)	SXEW
No. 3 (c)	SXEW
No. 3 (d)	SXEW
No. 3 (e)	Gone
No. 3 (f)	Gone
No. 3 (h)	Gone
PLS Feed Pond	SXEW
2 A West PLS	SXEW
2 A East PLS Overflow	SXEW
2 A (b) (surge pond)	Gone
North Racket Sump	SXEW
East Main Booster	SXEW
7 B PLS Pond	SXEW
1 A PLS Overflow (1 A OF)	SXEW
1 B Overflow Pond	SXEW
1 PLS Pond (4 Sump)	Reclaimed
PIT BOTTOMS & MINE STORMWATER	**Moderate to Low pH Water**
Main Pit	O6
Valencia Pit	O6
Copper Mtn Pit	SXEW
Savanna Pit	SXEW
Gettysburg Pit (a)	SXEW
Gettysburg Pit	SXEW
San Salvador Hill Pit	ELWD
South Rim Pit	ELWD
Savanna Pit Seepage Sump	SXEW
Niagara Storm water	ELWD

Pond Designation	Monitored By
Cu Mtn a (DC 2-1)	SXEW
Cu Mtn b (4 seep)	SXEW
Cu Mtn c (3 seep)	SXEW
Cu Mtn d (Concrete Headwall)	SXEW
Cu Mtn Pit (e)	SXEW
8 Seep	Reclaimed
7 C Seep	Reclaimed
Oakgrove Pond	ELWD
1 C Stockpile Pond	ELWD
2 a (a)	Gone
Precipitation Plant Launders	SXEW
Lube Shop Pond	O6
2 B Storm water	Reclaimed
5 E Pond	SXEW
1 A Storm water Pond	SXEW
BMCC 2 b (1 PLS OF)	Reclaimed
Ohio Dam	ELWD
Little Rock South Pond	Gone
Little Rock North Pond	Gone
No. 3 (g)	Gone
STORM WATER PONDS & PLANT PONDS NEUTRAL PH	
Plant Oxidation Pond a	ELWD
Plant Oxidation Pond b	ELWD
Land Farm & Stage Pond	ELWD
5 Other Thickeners	ELWD
SPCC Pond	ELWD
Crusher Pond	ELWD
No. 3 (a)	SXEW
1X1 “liner”	ELWD
FRESH WATER PONDS	
CB 1xm	ELWD
Fleming Pond	ELWD
Oakgrove Tank	ELWD
Mangas Valley Pond	ELWD

APPENDIX B
PROPANE CANNON OPERATION MANUAL

The following information is taken from the manufacturer's (Reed-Joseph International Company) manual of operation of the "SCARE AWAY M-8 Multi Bang Cannon." This manual is on file at FMTI.

- The SCARE AWAY should be operated outdoors and under no circumstances in an enclosed place. Always wear ear protection when within 50 feet of the SCARE AWAY.
- After removing the SCARE AWAY from the shipping box, attach the barrel extension with the welded seam down so water will drain from the weep hole to the barrel of the combustion chamber and tighten the three bolts with a wrench. These three bolts must be tight or explosion pressure will damage the bolt connections on the combustion chamber.
- With a full tank of LP gas, open the valve and allow a small amount of LP gas to escape; close the valve at once.
- Connect the pressure reducer valve to the LP gas tank with the bull nose connector and tighten nut #107 with a wrench. Caution: connector #103 and threads must be clean.
- The frequency of firing is adjustable. The time between a series of multi bangs can be adjusted from approximately 30 seconds to approximately 30 minutes by use of the needle valve on the left side of the SCARE AWAY frame. To increase the frequency turn handle #12 counterclockwise in the direction of the arrow on dial #139. To decrease the frequency, turn the handle clockwise. Adjust the frequency to your requirements.
- To start the SCARE AWAY, slowly open the valve of the LP gas tank. The SCARE AWAY will fire at the same frequency as previously set without further adjustment.
- To stop the SCARE AWAY, close the valve of the LP gas tank.
- To start the SCARE AWAY again, open the valve of the LP gas tank. The SCARE AWAY will fire at the same frequency as previously set without further adjustment.
- The SCARE AWAY is equipped with a piezo-electric ignition system that will produce at least 200,000 ignitions.

APPENDIX C
OPERATING AND MAINTENANCE INSTRUCTIONS FOR SINGLE SHOT LAUNCHER AND AMMUNITION

MOQAP-XX-XXXX

Revision Date: July 18, 2006 **Issued By:** Mike Painter

Title: **Launcher/ 15mm pistols/12 gauge**

1.0 Policy

1.1 Freeport-McMoRan Tyrone, Inc. provides safe procedures and work instructions to maintain the operation of the 15mm pistols which fire bird scaring devices and 12 gauge shotguns used to fire shell crackers for bird hazing heron referred to as launchers.

2.0 Scope

2.1 This procedure describes the safe and efficient manner in which to operate and provide routine maintenance of launchers. This includes regular inspections and cleaning of launchers.

3.0 Personal Protective Equipment (PPE)

3.1 The launcher operation is not considered a firearm but personnel protective equipment (PPE) are required to ensure that the individual has the basic level of protection from the identified hazards.

3.2 The prescribed PPE must be worn properly at all times when performing the following tasks as well as the minimum required PPE.

3.3 Firing of launchers

- 3.3.1 Safety Glasses
- 3.3.2 Hard Hat
- 3.3.3 Steel toed Boots
- 3.3.4 Hearing protection
- 3.3.5 Gloves

4.0 Firing Precautions

4.1 Always keep muzzle of a launcher pointed in a safe direction, (away from humans and facilities).
4.2 Never load launcher until ready to fire.
4.3 Treat all launchers as if loaded.
4.4 Use safety until ready to fire.
4.5 Unload launcher immediately after firing.
4.6 Only use ammunition approved and provided by FMTI.
4.7 Review launchers operating manual.
4.8 Be certain of target before firing
4.9 All 15 mm launchers will be inspected daily and replaced with new launchers if needed.
4.10 If a misfire occurs wait 30 seconds until unloading launcher.
4.11 Storage of launchers and ammunition should be in separate compartments.

4.12 Never transport a loaded launcher.
4.13 Clean launchers on a weekly basis or more often if launcher has been heavily used.
4.14 Check launchers for obstructions before each shot.

Safety Precautions:

1. Inspect all equipment for obvious defects before operation use. 1. Check launchers for buildup and obstructions in the barrels and clean if necessary. 2. Check hammers and firing pins to ensure they are working properly and DO NOT FIRE WITHOUT PULLING THE TRIGGER. 3. Check barrels for cracks or damage. 4. If equipment is defective in any way or appears to have excessive wear, it should be marked as BO and delivered to the supervisor immediately for disposal. Equipment includes a 15mm launcher, .22 caliber blank firing caps, and either Bird Bombs or Bird Whistlers.
2. Make sure when firing the 15mm launcher that the path is clear and that the launched Bird Bomb or Bird Whistler is not deflected back towards the shooter.
3. Never fire ammunition from vehicle, vessel, building, or other enclosed area.
4. Always wear ear and eye protection when firing 12 gauge shotguns or 15mm launchers.
5. Never use launcher or 12 gauge near buildings, dry fields, or any flammable material.
6. Keep launcher empty of all cartridges until ready to fire.
7. Keep Bird Bombs or Bird Whistlers away from heat and moisture when storing or using.
8. Keep launcher, 12 gauge shotgun and ammunition out of the reach of children. Not authorized for use by persons under the age of 18.
9. The record Launcher is not classified as a "firearm" by the U.S. Bureau of Alcohol, Tobacco, and Firearms because it cannot fire a bullet. However, exercise the same precautions for their use and storage.

Instruction:

When firing Bird Whistlers or Bird Bombs, use only a Record launcher with a 15mm adapter. 1. Insert the Bird Bombs with the black concave end in the barrel and the plastic cap end facing out. 2. Load the Bird Whistlers with the hollow end in the barrel and the colored plug end facing out. 3. Pull hammer back and place a .22 blank cap, crimped end down, snugly in the cavity against the tension clip. The cap should be under the spring clip and held down by it. 4. It is important to keep hands away from the Bomb or Whistler at this time while pointing the launcher in a safe direction. This process should be followed exactly in this order to prevent a premature firing of the Bomb or Whistler. Never place the primer in first or leave a primer in the launcher. NEVER PLACE A BOMB OR WHISTLER IN A LAUNCHER WITH A FIRING CAP IN THE LAUNCHER. The pistol could accidentally go off and cause serious burns to your hands. Hold launcher at arm length at a 45-degree angle above head. Holding the launcher in this position is very important because the .22 caps automatically eject in a backward direction. If the launcher is held too low (at shoulder height), the cap may strike the user in the face. Always use eye and ear protection and gloves when firing. Be sure of a clear firing line and sufficient distance from flammable objects (approximately 150 feet).

5.0 Certification

5.1 Green card certification is required for both the 12 gauge shotgun and 15 mm launchers.

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APPENDIX D
FMTI BIRD HAZING PROGRAM LOG

FMI 2009				HAZING LOG FIELD SHEET															Sheet___ of ____	
			Field	Number Observed						Observed	Hazing	Number of Birds Hazed						Hazed		
Date	Observer(s)	Time	Location	DU	GR	WF	GL	SH	O/U	Total	Method	DU	GR	WF	GL	SH	O/U	Total	Time to Clear	Comments
			1 C STOCKPILE																	
			Precipitation Launders																	
			Oakgrove Pond																	
			Niagara Stormwater																	
			Ohio Dam																	
			Oxidation Pond A																	
			Oxidation Pond B																	
			Thickeners																	
			Crusher Pond																	
			1 Stockpile Pond																	
			CB 1XM																	
			Fleming Pond																	
			Oakgrove Tank																	
			Mangas Valley Pond																	
			1 x Liner																	
			SPCC Pond																	
			South Rim Pit																	
			San Salvador Pit																	
			Decant 1,2,3																	

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APPENDIX E
PAST HAZING RECORDS

Date	Total Number of Ducks	Total Number of Other Fowl	Total Number of Fowl
Oct-00	1622	0	1622
Nov-00	1859	313	2172
Dec-00	91	12	103
Jan-01	33	7	40
Feb-01	39	10	49
Mar-01	108	176	284
Apr-01	102	110	212
May-01	41	9	50
Jun-01	12	0	12
Jul-01	57	9	66
Aug-01	140	16	156
Sep-01	559	11	570
Oct-01	164	3	167
Nov-01	299	15	314
Dec-01	151	0	151
Jan-02	6	1	7
Feb-02	52	0	52
Mar-02	432	17	449
Apr-02	256	129	385
May-02	45	51	96
Jun-02	37	1	38
Jul-02	66	9	75
Aug-02	238	22	260
Sep-02	1025	47	1072
Nov-02	411	105	516
Dec-02	66	9	75
Jan-03	12	14	26
Feb-03	29	1	30
Mar-03	123	25	148
Apr-03	49	83	132
May-03	21	121	142
Jun-03	27	30	57
Jul-03	89	46	135
Aug-03	439	143	582
Sep-03	1039	205	1244
Oct-03	453	405	858
Nov-03	354	166	520
Dec-03	40	24	64
Jan-04	40	21	61
Feb-04	201	24	225
Mar-04	1066	961	2027
Apr-04	479	904	1383
May-04	216	235	451
Jun-04	182	63	245
Jul-04	167	45	212
Aug-04	179	79	258
Sep-04	575	157	732
Oct-04	646	62	708
Nov-04	321	122	443
Dec-04	19	37	56
Jan-05	69	8	77
Feb-05	46	4	50
Mar-05	90	74	164
Apr-05	125	209	334
May-05	40	125	165
Jun-05	30	15	45

Date	Total Number of Ducks	Total Number of Other Fowl	Total Number of Fowl
Jul-05	5	10	15
Aug-05	101	64	165
Sep-05	443	108	551
Oct-05	160	75	235
Nov-05	38	7	45
Dec-05	26	2	28
Jan-06	0	0	0
Feb-06	33	0	33
Mar-06	114	18	132
Apr-06	13	2	15
May-06	4	15	19
Jun-06	9	7	16
Jul-06	11	6	17
Aug-06	66	53	119
Sep-06	162	61	223
Oct-06	71	25	96
Nov-06	41	9	50
Dec-06	8	1	9
Jan-07	14	0	14
Feb-07	7	0	7
Mar-07	14	5	19
Apr-07	54	19	73
May-07	32	80	112
Jun-07	11	1	12
Jul-07	2	4	6
Aug-07	21	4	25
Sep-07	29	16	45
Oct-07	54	16	70
Nov-07	22	0	22
Dec-07	9	2	11
Jan-08	17	0	17
Feb-08	96	0	96
Mar-08	95	42	137
Apr-08	63	3	66
May-08	22	9	31
Jun-08	21	3	24
Jul-08	5	0	5
Aug-08	63	15	78
Sep-08	72	0	72
Oct-08	24	27	51
Nov-08	4	2	6
Dec-08	16	0	16
Jan-09	2	0	2
Feb-09	35	0	35
Mar-09	60	1	61
Apr-09	93	0	93
May-09	45	0	45
Jun-09	33	0	33
Jul-09	37	0	37
Aug-09	43	0	43
Sep-09	31	0	31
Oct-09	39	0	39
Nov-09	67	0	67
Dec-09	22	0	22

APPENDIX F
MIGRATORY BIRD AND WILDLIFE POLICY

Background: In 2005 Phelps Dodge Tyrone, Inc. entered a plea agreement with the Department of Justice to settle Migratory Bird mortalities at the Tyrone Mine. Under the Corrective Action Plan (CAP) Tyrone agreed to a number of measures until the final settlement was made.

Policy: Though not mandated because final settlement has not been made FMTI will continue all of the preventive measures in place during the 2005 plea agreement.

This policy will include engineering measures to prevent or limit migratory bird and other wildlife exposure to FMTI facilities. Further, continuous monitoring of potentially hazardous ponds and other facilities will be conducted and updated as needed. If migratory birds or wildlife occupy FMTI facilities despite our preventive measures the FMTI has personnel available at all times to haze and if needed rescue wildlife. Reporting of migratory bird deaths will continue to be reported as agreed to in the 2005 CAP agreement. Records will be kept of all migratory birds found dead or hazed off mine facilities as agreed to in the 2005 CAP agreement.

The company previously constructed three ponds strategically located to provide alternative resting areas for migrating birds. FMTI is committed to retain these ponds at this time as they appear to be beneficial in providing an alternative site for migrating birds.

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