DRAFT
ENVIRONMENTAL IMPACT STATEMENT

EMIGRANT PROJECT

Newmont Mining Corporation

NOVEMBER 2008

BLM

Elko District Office - Nevada

U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

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

BLM/NV/EK/ES-GI-09/02+1793

United States Department of the Interior

BUREAU OF LAND MANAGEMENT
Elko District Office
3900 East Idaho Street
Elko, Nevada 89801
http://www.nv.blm.gov

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In Reply Refer To:
1793.8/3809 (NV013)
NVN 78123

Dear Reader:

Enclosed for your review and comment is the Draft Environmental Impact Statement (DEIS) for Newmont Mining Corporation's (Newmont's) proposed Emigrant Mine Project. A DEIS for this project was originally issued March 25, 2005. Substantive comments were received on that DEIS. This new DEIS, which incorporates revisions made in response to those comments, is being issued to replace the 2005 DEIS.

This Draft Environmental Impact Statement (DEIS) analyzes potential impacts associated with Newmont Mining Corporation's (Newmont's) proposal to develop the Emigrant Project (Proposed Action), a proposed open pit gold mine located approximately 10 miles south of Carlin, Nevada. Newmont submitted a Plan of Operations for development of the Emigrant Project in February 2004, revised May 2004, and re-submitted with further revision in March 2007. Modifications to the proposed plan have been made based upon new information pertinent to the proposed action and its effects.

The revised Proposed Action provides for development and operation of an open pit mine; construction of a waste rock disposal facility, run-of-mine heap leach pad, permanent engineered stream channel, ancillary support facilities; and concurrent reclamation of surface disturbances in the Emigrant Project Area. Approximately 1,418 acres would be disturbed by mine-related facilities, including 248 acres of private land and 1,170 acres of public land (including 442 acres of split estate). The Emigrant Project would have a 14-year operational mine life and produce approximately 92 million tons of ore and 83 million tons of waste rock. Closure activities may continue for a period of up to 30 years after mining activity is completed. The Agency Preferred Alternative is the Proposed Action with mitigation.

Public comments on the DEIS will be accepted during a 45 day comment period ending January 7, 2009. Comments on the DEIS should be submitted to:

Bureau of Land Management
Elko District Office
Attention: Tom Schmidt
Emigrant Project EIS Coordinator
3900 East Idaho Street
Elko, NV 89801

The Final EIS may be published in an abbreviated format so please retain this draft document for future reference. Your interest in the management of public land is appreciated. If you have questions, please contact Tom Schmidt, Emigrant Project EIS Coordinator at (775) 753-0200.

Sincerely,

Kenneth E. Miller
District Manager

DRAFT
ENVIRONMENTAL IMPACT STATEMENT
NEWMONT MINING CORPORATION
EMIGRANT PROJECT

LEAD AGENCY:	U.S. Department of the Interior Bureau of Land Management Elko District Office Elko, Nevada
COOPERATING AGENCIES:	Nevada Department of Wildlife Nevada Division of Environmental Protection
PROJECT LOCATION:	Elko County, Nevada
COMMENTS ON THIS DRAFT EIS SHOULD BE DIRECTED TO:	Mr. Tom Schmidt EIS Project Coordinator Bureau of Land Management Elko District Office 3900 East Idaho Street Elko, NV 89801
DATE DRAFT EIS FILED WITH EPA:	November 21, 2008
DATE BY WHICH COMMENTS MUST BE POSTMARKED TO BLM:	January 7, 2009

ABSTRACT

This Draft Environmental Impact Statement (DEIS) analyzes potential impacts associated with Newmont Mining Corporation's (Newmont's) proposal to develop the Emigrant Project (Proposed Action), a proposed open pit gold mine located approximately 10 miles south of Carlin, Nevada. Newmont submitted a Plan of Operations for development of the Emigrant Project in February 2004, revised May 2004, and re-submitted with further revision in March 2007. The Proposed Action provides for development and operation of an open pit mine; construction of a waste rock disposal facility, run-of-mine heap leach pad, permanent engineered stream channel, ancillary support facilities; and reclamation of surface disturbances in the Emigrant Project Area. Approximately 1,418 acres would be disturbed by mine-related facilities, including 248 acres of private land and 1,170 acres of public land (including 442 acres of split estate). The Emigrant Project would have a 14-year operational mine life and produce approximately 92 million tons of ore and 83 million tons of waste rock. Closure activities may continue for a period of up to 30 years after mining activity is completed. The Agency Preferred Alternative is the Proposed Action with mitigation.

Responsible Official for DEIS: Kenneth E. Miller
Manager, Elko District Office
Bureau of Land Management

SUMMARY

Newmont Mining Corporation (Newmont) proposes to develop and operate an open pit mine with associated surface support facilities at the Emigrant Project in Elko County, Nevada. The Project would result in development of an open pit mine, construction of a waste rock disposal facility, heap leach facility, excavation of borrow material areas, construction of haul roads and ancillary facilities, and continued exploration activities. Development of the Emigrant Project is described in a Plan of Operations submitted in February 2004, revised in May 2004, and re-submitted with further revision in March 2007 to the Elko Field Office of the Bureau of Land Management (BLM). The Emigrant Project is located on public and private land in Elko County, Nevada approximately 10 miles south of Carlin, Nevada.

This Draft Environmental Impact Statement (EIS) describes Newmont's Proposed Action, No Action Alternative, and environmental consequences that could result from implementation of these actions. Potential direct, indirect, and cumulative effects on the environment are analyzed in this Draft EIS. Impacts described herein will form the basis for a BLM decision regarding the Proposed Action, No Action Alternative, and selection of appropriate mitigation measures. No distinction is made in this Draft EIS between potential impacts on public versus private land that would result from possible authorizations by BLM.

SUMMARY OF PROPOSED ACTION

Implementation of Newmont's Proposed Action would result in removal of ore and waste rock from multiple phases of an open pit mine. Approximately 83 million tons (Mt) of waste rock would be removed to extract and leach 92 Mt of ore over a 14-year operational life. Development of the Emigrant Project would disturb approximately 1,418 acres, of which 1,170 acres are public land (including 442 acres of public surface and private mineral estate) and 248 acres of private land.

The proposed open pit mine would be approximately 615 acres. Mining would progress in a series of phases beginning at lower elevations of the southern mine pit area. Dewatering would not be necessary because the mine pit would not extend below the groundwater table.

A waste rock disposal facility would be constructed during the first three phases of mine development. Potentially acid generating (PAG) waste rock would not be placed in the waste rock disposal facility. The non-PAG waste rock disposal facility would cover an area of 78 acres extending 190 feet above existing topography with a capacity of 12 Mt. Waste rock generated from subsequent mining phases would be placed in mined-out portions of the pit.

PAG waste rock encountered during mine development would be segregated and placed on limestone benches in mined-out portions of the pit, and encapsulated with a minimum of 10 feet of neutralizing waste rock. Based on the current mine plan, approximately 5 percent (4 Mt) of total waste rock to be excavated (83 Mt) would be managed as PAG waste rock.

Low-grade oxide ore would be placed on a heap leach facility constructed south of the mine pit. The heap leach facility would be constructed in three phases on approximately 288 acres rising to an ultimate height of 300 feet above existing ground surface. The heap leach would be a run-of-mine facility so that crushing of ore would not be necessary at this time. In the future, if crushing becomes necessary, Newmont would obtain necessary permits from the Nevada Division of Environmental Protection (NDEP).

Ore and waste rock would be drilled and blasted in sequential benches to facilitate loading and hauling. Blasted ore and waste rock would be loaded into off-road, end-dump haul trucks using shovels and front-end loaders. Benches would be established at approximately 20-ft vertical intervals with bench widths varying to include safety berms and haul roads. Haul trucks would move within the pit using roads on the surface of benches with ramps extending between two or more benches.

Two tributary drainages to Dixie Creek exhibit perennial flow immediately west of the proposed mine area. These two channels combine to form a single channel at the west side of the proposed mine pit. Below the confluence of these channels, flow is ephemeral and intermittent and occurs in response to spring snow-melt and major rain storms. A permanent engineered stream channel for this drainage would be constructed across the southern part of the proposed mine pit area during the first two phases of mining.

PHASE I MINING

Mining would begin at the south end of the deposit above the existing streambed elevation and extend eastward to establish a highwall. The next sequence would involve mining down to the streambed and constructing the engineered stream channel to the east of the existing streambed. Flow would continue in the existing channel until this section of the diversion is completed. Once the new engineered stream channel is established, flow would be diverted into the new channel, which would allow mining to progress below the level of the original streambed. Non-PAG waste rock generated during this phase of mine development would be placed in the non-PAG waste rock disposal facility. PAG waste rock would be segregated and placed in a mined-out portion of the pit on benches of Devils Gate limestone, and encapsulated with a minimum of 10 feet of neutralizing waste rock.

PHASE II MINING

This phase of mine development would be similar to Phase I, but would occur on the north or upper section of the drainage. Excavation would progress eastward above the existing elevation of the streambed allowing flow to remain in the existing channel. Portions of non-PAG waste rock generated during this phase would be placed in the non-PAG waste rock disposal facility and some would be used as backfill in mined-out portions of the Phase I sequence. Upon completion, surface flow would be redirected into the engineered stream channel and mining below the streambed would occur. The permanent engineered stream channel would be completed at the end of Phase II mining sequence. The new engineered stream channel would be constructed at the same grade as the original streambed (4%) and would be located entirely on Devils Gate limestone.

PHASE III THROUGH PHASE VIII MINING

Once Phase I and Phase II mining are complete, and the permanent stream channel established, mining would proceed from lower elevations of the deposit toward higher elevations. A portion of non-PAG waste rock generated during Phase III of mining would be placed in the non-PAG waste rock disposal facility. Subsequent waste rock generated through Phase VIII would be placed as backfill within mined-out portions of the pit. PAG waste rock encountered during these phases of mining would be encapsulated in the same manner as described above.

ANCILLARY FACILITIES

Ancillary facilities would include an operations office, processing facility, and septic leach field constructed near the south end of the heap leach facility. Existing shops at the Rain Mine facility would be used for equipment and vehicle maintenance. A lime silo would be installed at the northern end of the heap leach facility. Above ground diesel storage tanks would be located in the equipment fueling area near the non-PAG waste rock disposal facility. A prill silo would be located adjacent to the road from the Rain Mine to the Project area. Other ancillary facilities associated with the Project include explosives magazines, water fill stations, and growth medium stockpiles. Growth medium stockpiles would be located throughout the Project area.

Berms and ditches would be constructed as appropriate to preclude meteoric water from flowing into mine pits, or onto the non-PAG waste rock disposal facility. Sediment control measures would be implemented, as necessary to reduce soil movement within the site and to minimize off-site effects. These structures would be designed and constructed to allow access for maintenance throughout the life of the Project. Soil collected in these structures would be periodically removed and placed in the soil stockpile or on reclaimed areas. Sediment control structures would be removed once vegetation has stabilized on reclaimed areas.

RECLAMATION

Reclamation activities would include regrading the non-PAG waste rock disposal facility and heap leach pad, removing structures after cessation of operations, regrading disturbed areas (including roads), establishing drainage control, removing and regrading stockpile areas, replacing salvaged growth media, revegetation, and reclamation monitoring. The reclamation schedule would encompass the period between cessation of mining through revegetation. Reclamation would take place concurrent with operations, where possible.

SUMMARY OF IMPACTS

Analysis of potential impacts and mitigations associated with Newmont's proposed Emigrant Project is presented in Chapter 3 - *Affected Environment and Environmental Consequences*. The following is a summary of potential impacts, by resource, resulting from the Proposed Action and No Action Alternative.

GEOLOGY AND MINERALS

Proposed Action

Direct impacts to the geologic resource associated with implementation of the Proposed Action include relocation of approximately 83 Mt of waste rock and 92 Mt of ore. No known important paleontological resources (e.g., vertebrate fossils or fossil quarries) are located in the area to be disturbed by the Proposed Action. Seismic risk is acceptable with respect to the stability of proposed waste rock and heap leach facilities resulting from earthquakes that may affect the Emigrant Project site.

The Proposed Action involves excavation and exposure of waste rock and ore to oxygen and precipitation, which could result in formation of acidic water. Acidic water contact with minerals in the waste rock and ore could result in release of trace elements into groundwater and surface water at concentrations above background levels and/or water quality standards. In order to characterize the potential for the primary rock types at the Emigrant Mine site to generate acid and/or mobilize metals, several static and kinetic tests were performed.

Initial static Acid-Base Accounting tests conducted by Newmont generally show that the unoxidized Chainman/Fresh Webb siltstone (1% of waste rock and 3% of ore) is PAG; whereas the Devils Gate limestone (32% of waste rock and 21% of ore) is non-PAG. A small portion of the remaining primary rock type (oxidized Webb siltstone – 67% of waste rock and 76% of ore) was determined to have a potential to generate acid.

Initial static testing to determine potential for acid generation of rock was conducted by Newmont in 2002 for 1,272 samples of waste rock and ore. As a result of some uncertainty in the oxidized Webb siltstone, supplemental testing was conducted by Newmont in 2005-2006 using 36 representative composite samples. Supplemental testing included both static and kinetic tests. Results of the supplemental static tests in 2005-2006 generally confirmed initial static test results for the Chainman/Fresh Webb siltstone and Devils Gate limestone samples. Supplemental kinetic tests show that some of the oxidized Webb siltstone has potential to generate acid. Newmont conducted another set of tests in 2008 that evaluated Paste pH and Net Carbonate Value (static tests) for 1,271 composite samples of oxidized waste rock and ore.

Based on the static and kinetic testing results, and a comparison of the Paste pH tests with the kinetic Humidity Cell tests, a recommendation has been made to revise the criteria for classifying rock as potentially acid producing in the field using Net Carbonate Value (NCV) and Paste pH: PAG rock = [NCV $< 0\%$ CO_2] or [NCV $\geq 0\%$ CO_2 and Paste pH < 6]. Using the revised criteria, potentially acid generating rock at the Emigrant Mine would total approximately 4 Mt or 5 percent of total waste rock to be removed during mining. Newmont's mine plan is designed to manage this tonnage of rock as PAG.

Potential for mobilizing metals from waste rock and ore at the Emigrant site was evaluated using analysis of leachate collected during Meteoric Water Mobility Procedure tests and Humidity Cell tests. In general, metal mobility was higher for PAG rock. Constituents for which NDEP Profile I reference values were most commonly exceeded in waste rock and ore tests include aluminum, arsenic, manganese, nickel, thallium, fluoride, and sulfate.

Isolation and encapsulation of PAG waste rock with neutralizing rock would provide some buffering material around potentially acid generating rock, and would limit exposure of this rock to oxygen and direct meteoric water; thereby reducing potential for acid generation. In addition, PAG waste rock would be placed onto limestone benches in the Emigrant mine pit. Acidic seepage that may be generated by waste rock would be neutralized by the underlying limestone. PAG rock may be exposed during mining in the west pit highwalls. These exposures would be reclaimed during pit backfilling with limestone waste rock. The reclaimed surface of all backfilled mine pit areas would include a store-and-release soil or growth media cover which would minimize infiltration of water into the PAG cell.

Thickness of the unsaturated zone beneath the mine pit (approximately 450 feet) would result in slow dispersed movement of unsaturated flow. Unsaturated seepage from backfilled pits into the Devils Gate limestone would move primarily within interconnected fractures. Slow downward advancement of unsaturated flow in the limestone provides increased opportunity for attenuation and precipitation of metals in the limestone. Results of unsaturated flow modeling are summarized in the *Water Quantity and Quality* section.

Waste rock at the Emigrant site would be regraded, covered with growth media, and revegetated. The proposed store-and-release cover is effective in reducing infiltration rates into the underlying waste rock, especially in climatic conditions characteristic of the Emigrant Project area.

Acidity potentially produced by ore on the leach pad would be neutralized by the leaching solution which is maintained at basic pH values. This potentially acid producing ore (mined during early phases) represents approximately 3 percent of the ore placed on the heap leach pad. In addition, a soil water balance cover would be placed on the heap leach pad at closure. For these reasons, it is unlikely that acid generation would occur from ore at the Emigrant Project site.

No Action

The No Action alternative would avoid potential direct and indirect impacts of the Proposed Action. It would also eliminate recovery of approximately 92 Mt of ore from the geologic resource, and the gold reserve intended to be mined would remain in-place. Paleontological resources, if present, would not be affected.

AIR QUALITY

Proposed Action

Mining-related activities at the Emigrant Project would be a source of particulate and gaseous air pollutants. Fugitive dust emissions would be generated by mining, loading, hauling, and placing ore on the heap leach facility, and disposal of waste rock. Particulate emissions would be mitigated by minimization of drop heights during loading, dust suppression and implementation of best management practices. Gaseous pollutant emissions would result from blasting, construction and mining equipment, and vehicle exhaust. These emissions would be minimized by proper equipment maintenance and operation.

Mercury emissions are associated with the carbon handling and refinery services that would process Emigrant ore. These services would be performed at Newmont's South Operations Area located approximately 15 miles north of the Emigrant Project. The mercury content of the Emigrant ore falls within the range of concentrations for ore currently processed at the South Operations Area. As such, mercury emissions would not increase over historic emission levels with the processing of material from the Emigrant Project. Ore production from Emigrant with processing at the South Operations Area is projected to extend beyond ore production and processing from the South Operations Area.

Newmont has obtained a Class II Air Quality Operating Permit from the Nevada Bureau of Air Pollution Control for the Emigrant Project. Air quality in the vicinity of the Emigrant Project would continue to be better than National Ambient Air Quality Standards. Emigrant Project emissions would not affect air quality or visibility in any Class I areas.

No Action

The No Action alternative would avoid potential direct and indirect impacts of the Proposed Action to air resources.

WATER QUANTITY AND QUALITY

Proposed Action

The Proposed Action would have direct impacts on some water resources in the Project area. Impacts to surface water would be associated primarily with diversion and replacement of a natural intermittent stream with an engineered stream channel through the operational and reclaimed mine pit area. The engineered stream channel would allow continued natural surface water flow to move through the Emigrant Project site. Backfilling and reclamation of the mine pit also would allow natural runoff conditions to occur after completion of post-mining activities.

Areas to be disturbed by mine-related activities (*e.g.*, roads, mine pit, waste rock disposal area, and heap leach facility) would result in increased erosion and sedimentation until reclaimed vegetation has been sufficiently established. Best Management Practices would be implemented, as part of storm water permit requirements, for disturbed areas to prevent or minimize sediment movement to off-site areas. A monitoring program would be implemented to verify on-site control of erosion and sedimentation. If on-site increases in sediment load to surface water did occur from the Emigrant Project, these increases could extend to Dixie Creek and possibly South Fork Humboldt River.

Short-term impacts to groundwater levels would result due to removal of water by production wells in the central part of Dixie Creek Valley. These wells and conveyance systems would transport water from the valley bottom to proposed mine facilities located farther upland on the west side of Dixie Creek Valley. This groundwater pumping, however, has been occurring since 1988 for the nearby Rain Mine. Groundwater withdrawal from the production wells for the proposed Emigrant Project (130 to 140 million gal/yr) would be similar to full water production for the Rain Mine (138 million gal/yr peak production). Water production for the Rain Mine has been reduced to about 2 to 3 million gal/yr.

The Emigrant Project ore body is shallow and would be mined above the groundwater table in bedrock. Therefore, impacts to groundwater levels and discharge from springs are not expected as a result of the mine pit.

Potential release of trace elements into groundwater or surface water at concentrations above water quality standards could result from the backfilled mine pit and/or non-PAG waste rock disposal facility. Excavation and exposure of waste rock and ore associated with the Proposed Action to oxygen and precipitation could result in formation of acidic water and resultant release of metals to groundwater and/or surface water. Testing performed to characterize the potential for the primary rock types at the Emigrant Mine site to generate acid and/or mobilize metals is described in the *Geology and Minerals* section.

Ore placed on the lined leach pad would be neutralized by the leaching solution. At closure, a store-and-release cover comprised of growth media and vegetation would be constructed over the leach pad. Residual drain-down of leachate from the heap would be managed in an evapotranspiration cell, to be operated until leachate no longer drains from the heap, or the water quality is acceptable for discharge.

Thickness of the unsaturated zone beneath the mine pit (approximately 450 feet) would result in slow dispersed movement of seepage from the pit bottom, unless preferential pathways of water movement develop. Any fractures created in the underlying Devils Gate limestone as a result of blasting at the mine would not propagate to depth. The slow downward advancement of any seepage also provides greater opportunity for attenuation and precipitation of any metals from seepage water to the Devils Gate limestone. Results of unsaturated zone seepage modeling show that seepage would discharge from the base of the PAG cell at a rate in the range of 0.021 to 0.223 acre-feet/acre/year, which is equivalent to 1 to 14 gal/min for a 100-acre PAG cell. This flux of unsaturated water flow would move down through about 450 feet of limestone before reaching the groundwater table.

Waste rock at the Emigrant site would be regraded, covered with growth media, and revegetated. This type of store-and-release cover is effective in reducing infiltration rates into the underlying waste rock, especially in climatic conditions characteristic of the Emigrant Project area.

No Action

The No Action alternative would result in no change to natural stream channels in the Project area, no make-up water pumping from wells in Dixie Creek Valley, and no potential quality impacts to groundwater and/or surface water from the mine pit and waste rock disposal area. Impacts to surface water resources associated with other ground disturbing activities (*i.e.*, grazing) in the area would continue.

SOIL RESOURCES

Proposed Action

The proposed Emigrant Project would result in approximately 1,418 acres of surface disturbance including the mine pit area, haul roads, non-PAG waste rock disposal facility, heap leach pad, process ponds, borrow areas, access roads, and continued exploration activities. Potential impacts to soil resources include loss of soil during salvage and replacement, soil loss in stockpiles due to wind and water erosion, reduced biological activity, and loss of soil structure. These impacts would be reduced by direct hauling stripped growth media from active mine pits for placement over backfilled portions of previously mined areas; whenever practical. Newmont would initiate reclamation activities concurrent with ongoing mining operations. As mining operations progress, backfilled portions of the pit would be concurrently regraded, growth media placed, and seeded.

The last mine pit panel (98 acres) would be partially backfilled and would have exposed rock faces at the end of mining. Interruption of soil processes and functions during operation of the proposed Project would be reversed by returning soil to disturbed areas through reclamation and allowing natural soil development to become reinstated.

No Action

Implementation of the No Action alternative would preclude potential impacts of the Proposed Action on soil resources.

UPLAND VEGETATION

Proposed Action

Implementing the Proposed Action would result in disturbance to plant communities, consisting of 11 vegetation types. Reclamation would occur on disturbed areas after mining activities cease. Establishment of big sagebrush communities on reclaimed areas may take decades, and would require special reclamation measures that favor sagebrush over grasses and other herbaceous species.

Special-Status Plant Species

The Proposed Action would not affect special-status plant species. No special-status plants are known to be present in the Project area.

Invasive, Non-Native Species

Disturbed areas would be susceptible to invasion by undesirable, non-native species (weeds). Noxious weeds would be controlled by implementation of a weed control plan during and after mining operations. Adjacent areas would continue to be a source of noxious weeds.

No Action

Vegetation resources in the Study Area would not be impacted by implementation of the No Action alternative since no ground disturbance associated with mining activities would occur. Since there are no known special-status plants in the Project area, the No Action alternative would be similar to the Proposed Action. Effects of invasive, non-native species would not occur from the No Action alternative because there would be no new ground disturbance. Impacts to vegetation associated with other ground disturbing activities in the area, including livestock grazing and wildfire, would continue.

WETLANDS/RIPARIAN AREAS

Proposed Action

The Proposed Action would result in removing or filling approximately 0.15 acre (2,381 lineal feet) of wetlands and 0.88 acre (13,142 lineal feet) of non-wetland Waters of the U.S. associated with the mine pit, waste rock facility, heap leach facility, borrow area, and sediment ponds. Wetland mitigation and enhancement would compensate for lost or degraded wetland functions and values that would result from the Proposed Action. The new engineered stream channel segment that would be constructed through the reclaimed mine pit area to replace the existing stream reach would support wetland and riparian vegetation. Riparian areas adjacent to proposed mine facilities would be fenced to protect against livestock grazing and trampling.

No Action

Implementation of the No Action alternative would result in no additional impacts to wetland/riparian areas in the Study Area. Impacts to wetland/riparian areas associated with other ground disturbing activities in the area would continue.

FISHERIES AND AQUATIC RESOURCES

Proposed Action

Approximately 0.15 acre (2,381 lineal feet) of aquatic habitat could eliminate a small population of Lahontan speckled dace, Lahontan redside shiner, and aquatic macroinvertebrates. These populations may reestablish and increase based on the design of the new engineered channel to increase surface water flow and provide habitat features including step pools and riparian plant communities.

No Action

Potential impacts to fisheries and aquatic resources that would result from development of the Emigrant Project would not occur under the No Action alternative. Impacts to fisheries and aquatic resources associated with other ground disturbing activities (*i.e.*, grazing) in the area would continue.

TERRESTRIAL WILDLIFE

Proposed Action

Direct impacts to wildlife resulting from the Proposed Action would be loss of habitat and subsequent displacement or loss of wildlife. Direct loss of wildlife habitat would eliminate cover (nesting, hiding, and thermal), breeding sites, and forage. Most of the affected habitat within the Study Area consists of sagebrush / bunchgrass communities.

Construction of new haul roads, ancillary facilities, and mine development would result in 1,418 acres of habitat loss, most of which is dominated by sagebrush. Reclamation of disturbed land would eventually restore habitat for some species; however, species dependent on plant communities with a large component of big sagebrush, and trees would experience a net loss in habitat quality as a result of the Proposed Action.

Special Status Wildlife Species

The threatened Lahontan cutthroat trout would not be affected by the Proposed Action. Removal of upland and wetland vegetation would reduce bat foraging opportunities until reclamation is successful. Bat roosting habitat (cliffs, rock crevices, and juniper trees) in the mine pit area would be removed. Habitat for Preble's shrew, pygmy rabbit, and burrowing owl may be affected by the Proposed Action; however, these species have not been confirmed to occur in the Study Area. Foraging habitat for Swainson's and ferruginous hawks would be reduced; however, no nests have been identified in the Project area.

The Proposed Action would likely result in the long-term reduction of habitat quality for sage grouse. Reclamation of sagebrush on the post mine area and mitigation involving sagebrush enhancement within and adjacent to the proposed mine disturbance area would improve sage grouse habitat and offset the reduced sagebrush density in other areas. Increased sediment could adversely affect white-faced ibis and California floater in South Fork Humboldt River; however, erosion and sedimentation would be controlled through use of best management practices.

No Action

Under the No Action alternative, Newmont would not be authorized to develop defined ore reserves or undertake any of the previously described associated activities. Potential impacts to terrestrial wildlife and special status wildlife species from development of the Project would not be realized. Impacts from previously authorized activities would continue under the No Action alternative.

RECREATION

Proposed Action

The Emigrant Project would result in up to approximately 3,900 fewer acres available for recreational activities during operation and after cessation of mining until reclamation is complete. The Project would bisect the Tonka Creek road precluding travel through the area during active mining operations. Upon completion of reclamation, the road segment would be reconstructed and relocated to connect with the existing route and re-establish travel through the area. Most of the work force for facility construction and mining would be drawn from the local labor pool; consequently, impacts to existing campgrounds and other area recreational opportunities are expected to be minimal relative to existing conditions.

No Action

Under the No Action alternative, no additional disturbance to private or public land or direct impacts to recreation resources would occur. Impacts from previously authorized activities would continue under the No Action alternative.

GRAZING MANAGEMENT

Proposed Action

Implementation of the Emigrant Project would result in the loss of 306 Animal Unit Months (AUMs) in Emigrant Springs Allotment No. 5417. Carrying capacity of the allotment would be reduced until reclamation of disturbed areas is complete and vegetation established. Alternative water sources would be developed to compensate for losses incurred from mining activity. There would be no reduction of AUMs in Tonka Allotment No. 5468.

No Action

Implementation of the No Action alternative would not affect current grazing practices or range resources in the Project area. No additional disturbance to soil or vegetation would occur and current stocking rates would continue as permitted. Impacts from previously authorized activities would continue under the No Action alternative.

ACCESS AND LAND USE

Proposed Action

The Emigrant Project would bisect the Tonka Creek road precluding travel through the area during active mining operations. Upon completion of mining the road segment would be reconstructed and relocated to connect with the existing route and re-establish travel through the area.

Land use in the Project area would be modified from grazing, wildlife habitat, and recreation to mining.

No Action

The No Action alternative would result in no additional impacts to land use and access. Impacts from previously authorized activities would continue under the No Action alternative.

VISUAL RESOURCES

Proposed Action

Visual impacts of the Proposed Action were analyzed using procedures set forth in the Visual Resource Contrast Rating Handbook (BLM 1986). Terraced, flat-topped waste rock piles and rock faces would present moderate to strong contrasts with the existing landform and line of steep canyons and gentle slopes. The moderate to strong form contrasts would impact visual resources in a localized manner. Views of the majority of mining activities would be hidden from view by canyon walls and higher ridge land forms to the south and east. The color and texture of the reclaimed area would be a moderate contrast to the existing landscape. Reclamation of disturbed areas would meet Class IV VRM objectives.

No Action

Under the No Action alternative, no visual impacts would occur at the Emigrant Project beyond those already present.

CULTURAL RESOURCES

Proposed Action

Forty-three cultural resources are located within the Area of Potential Effect (APE). Of these, three prehistoric period resources (CrNV-12-13259, -13261, and -13272) have been determined eligible to the National Register based on Criterion D. These sites are located within the proposed oxide heap leach facility and would be impacted during construction of that facility. Because avoidance was not possible, a data recovery plan was prepared and approved by BLM in consultation with the Nevada State Historic Preservation Office.

No Action

There would be no effect on cultural resources under the No Action alternative.

NATIVE AMERICAN CONCERNS

Proposed Action

Implementation of the Proposed Action would have no direct or indirect impacts on Western Shoshone traditional cultural values, practices, properties, or human remains. Compliance with all applicable state and federal design parameters is expected to reduce impacts resulting from the Proposed Action.

No Action

The No Action alternative would result in no further direct or indirect impacts on Native American religious or traditional values, practices, properties, human remains, or cultural items.

SOCIAL AND ECONOMIC RESOURCES

Proposed Action

The Emigrant Project would employ approximately 180 people. Most of the work force for the Project would be from existing mine-related work forces in the Carlin Trend. The initial construction work force for the Emigrant Project would be approximately 100 people decreasing to about five employees at the end of construction. Construction and development are expected to require approximately 12 months.

The Proposed Action would create positive impacts through continued employment in the mining industry and indirect employment in the retail and service sectors. Property and net proceeds of mining taxes paid by Newmont for the Emigrant Project collected by local and state jurisdictions would also continue. Negative impacts would be minimal because employees from existing and nearby facilities likely would be used for construction and operation of the facility, thereby extending their work rather than bringing in new workers.

No Action

Under the No Action alternative, the Emigrant Project would not be approved. Since most of the work force for the Project would come from the existing mine-related work force in the Carlin Trend, negative impacts under the No Action alternative would include increased unemployment, reduced wages spent in the local economy, decreased revenue to local and state jurisdictions, increased stress on public assistance programs, and decreased quality-of-life for some residents.

ENVIRONMENTAL JUSTICE

There would be no disproportionate direct or indirect impacts to minority or low-income populations resulting from implementation of the Proposed Action and No Action alternative.

SUMMARY OF POTENTIAL IMPACTS AND MITIGATIONS

Potential impacts resulting from implementation of the Proposed Action, along with mitigation and monitoring measures to reduce or eliminate impacts, are summarized in **Table S-1**.

PROJECT ALTERNATIVES

Primary issues identified during review and scoping of the Emigrant Project include: 1) permanent relocation of a drainage that would be impacted by mine development; and 2) potential for mined rock to become acidic and release trace metals to the environment. Newmont has committed to construct a permanent engineered stream channel that would convey surface water along the reclaimed mine pit area on Devils Gate limestone. This engineered stream channel has been designed to incorporate step-pools, native riparian grasses (graminoides), shrubs, and rock weirs to create a drainage that appears and functions as a natural channel providing both aquatic and riparian habitat.

Newmont has sampled, tested, and classified waste rock in accordance with NDEP Waste Rock and Overburden Evaluation Guidelines to determine acid generating potential of mined waste rock. Classification of waste rock was determined through use of static and kinetic testing to determine acid generation potential. Results of these tests indicate that about 5 percent of the overall waste rock volume (4 Mt of the total 83 Mt waste rock) to be excavated would be managed as PAG. PAG rock would be placed on Devils Gate limestone benches in mined-out portions of the pit. PAG material would be encapsulated with a minimum 10-ft thick layer of acid neutralizing waste rock to effectively isolate the PAG rock from atmospheric oxygen and water. Any seepage from PAG waste rock would move downward through a 450-ft thick unsaturated zone in Devils Gate limestone.

No other component of the Proposed Action was determined to have potentially adverse impacts requiring an alternative to eliminate or reduce impacts. Therefore, the only alternative discussed in detail in this Draft EIS is the No Action Alternative. Minor issues and potential impacts identified in Chapter 3 (*Affected Environment and Environmental Consequences*) are addressed with specific mitigation measures.

NO ACTION ALTERNATIVE

Under the No Action alternative, the Proposed Action would not be approved. Newmont would not be authorized to develop the defined ore reserves, construct ancillary mine facilities, place waste rock in the disposal facility, or construct the oxide heap leach facility on public land. Potential impacts predicted to result from development of the Project would not occur.

ALTERNATIVES CONSIDERED BUT ELIMINATED FROM DETAILED ANALYSIS

This section describes alternatives to the Proposed Action that were eliminated from further review in the EIS. These alternatives were identified during the public scoping process or by BLM during review and analysis of the Proposed Action. These alternatives were considered technically infeasible, unreasonable, provided no advantage over the Proposed Action, or would not meet the purpose and need of the Proposed Action.

USE EXISTING HEAP LEACH FACILITY AT RAIN MINE

This alternative would include all components of the Proposed Action, but would require Newmont to haul ore approximately 2.5 miles from the Emigrant Project to the existing heap leach facility at the Rain Mine. This alternative could eliminate the need to construct the proposed heap leach facility at the Emigrant Project site.

RATIONALE FOR DISMISSAL

The Rain Mine heap leach facility is no longer active and drain-down of process solution is ongoing. The existing heap leach facility at the Rain Mine encompasses approximately 40 acres and expansion of this facility to accommodate approximately 92 Mt of ore from the Emigrant Project would require an additional 320 acres of leach area. Such an expansion at the Rain Mine was determined to not have an advantage over the Proposed Action.

AGENCY PREFERRED ALTERNATIVE

The agency preferred alternative is the Proposed Action with mitigation.

TABLE S-1
Summary Comparison of Potential Direct and Indirect Impacts of Alternatives

Resource	Potential Impacts Proposed Action	Proposed Environmental Protection Measures	Potential Impacts No Action	Monitoring and Mitigation Recommendations
Geology and Minerals	Relocation of approximately 83 Mt of waste rock and 92 Mt of ore.	PAG waste rock generated during all phases of mining would be placed on limestone benches in mined out portions of the pit. Isolation and encapsulation of PAG waste rock with compacted Devils Gate limestone and neutralizing waste rock would limit exposure of this rock to oxygen and direct meteoric water, thereby reducing potential for acid generation.	Eliminate recovery of approximately 92 Mt of ore from the geologic resource	No additional monitoring or mitigation measures have been identified by BLM or NDEP.
	Excavation and exposure of waste rock to oxygen and precipitation could result in formation of acidic water and potential release of trace elements into groundwater and surface water at concentrations above background levels and/or exceed water quality standards.			A waste rock management report that summarizes mining progress and disposition of waste rock would be submitted to BLM and NDEP annually.
Air Quality	Fugitive dust emissions would be generated by mining, loading, hauling, and placing ore on the heap leach facility, and disposal of waste rock.	Minimize drop heights during loading, dust suppression (*e.g.*, road watering, application of magnesium chloride) and procedures outlined in the Handbook of Best Management Practices	Air quality in the Study Area would remain within ambient levels.	No additional monitoring or mitigation measures have been identified by BLM or NDEP.

TABLE S-1
Summary Comparison of Potential Direct and Indirect Impacts of Alternatives

Resource	Potential Impacts Proposed Action	Proposed Environmental Protection Measures	Potential Impacts No Action	Monitoring and Mitigation Recommendations
Air Quality (cont.)	Gaseous pollutant emissions would result from blasting, construction and mining equipment, vehicle exhaust, and carbon handling.	Emissions would be minimized by equipment maintenance and operation.	Air quality in the Study Area would remain within ambient levels.	No additional monitoring or mitigation measures have been identified by BLM or NDEP.
	Processing of gold-bearing carbon from Emigrant at Gold Quarry facilities would extend emissions of mercury at levels commensurate with existing permitted operations by about 4 years.	Newmont has installed Maximum Achievable Control Technology on carbon handling and refinery services that emit mercury. These controls are in accordance with Mercury Reduction Program (2002) and are listed in NAC 445B.3651 as constituting presumptive Nevada Maximum Achievable Control Technology for mercury.	Mercury emissions associated with ore processing at Gold Quarry would continue to be controlled and monitored in accordance with NDEP permit.	Increased monitoring of mercury emissions is being developed by NDEP.
Water Quantity	Water for mine operations would be supplied from existing Dixie Creek Valley wells at rates similar to amounts pumped for Rain Mine operations (130-140 million gal/yr). Pumping for about 14 additional years is not expected to affect flow in Dixie Creek.	Continue to monitor and report pumping of groundwater in Dixie Creek Valley to BLM, NDEP, and Nevada Division of Water Resources.	Groundwater withdrawal would continue at current levels (2 to 3 million gal/yr) to support closure of the Rain Mine.	Newmont would continue to monitor flow and groundwater levels.

TABLE S-1 Summary Comparison of Potential Direct and Indirect Impacts of Alternatives				
Resource	**Potential Impacts Proposed Action**	**Proposed Environmental Protection Measures**	**Potential Impacts No Action**	**Monitoring and Mitigation Recommendations**
Water Quality (cont'd)	Diversion and replacement of a natural intermittent stream with an engineered stream channel through the operational and reclaimed mine pit area.	Prior to construction Newmont would obtain BLM approval of the engineered stream channel design. The channel would incorporate sediment control and vegetation components to function as a natural channel.	Functioning of the natural stream channel would not change from existing and reasonably foreseeable future conditions.	Newmont, BLM, and NDEP cooperatively develop a mitigation and monitoring plan to verify the replacement channel is functioning as designed.
	Increased erosion and sedimentation from mine pit, roads, waste rock disposal area, and heap leach facility.	BMPs implemented to prevent or minimize sediment movement to off-site areas. Implementation of monitoring program to verify on-site control of erosion and sedimentation.		Monitor total suspended solids (TSS) levels in surface water flow in drainages upstream and downstream of Project area and in natural stream channels located in Dixie Creek drainage but outside the influence of the proposed Project. If monitoring identifies sediment contribution from the proposed Project site, BLM and NDEP personnel would review the sediment control system with Newmont to identify the source of sediment contribution and implement corrective actions as necessary.

TABLE S-1
Summary Comparison of Potential Direct and Indirect Impacts of Alternatives

Resource	Potential Impacts Proposed Action	Proposed Environmental Protection Measures	Potential Impacts No Action	Monitoring and Mitigation Recommendations
Water Quality (cont'd)	Potential release of trace elements into groundwater and/or surface water at concentrations above water quality standards from the backfilled mine pit and/or non-PAG waste rock disposal facility.	Slow advancement of unsaturated flow down 450 feet to groundwater in limestone bedrock beneath the mine pits provides for attenuation and precipitation of trace metals in the limestone.		Additional monitoring wells may be required by NDEP prior to issuing a mine permit as part implementing the plan.
Soil Resources	Potential impacts from disturbance of about 1,400 acres include loss of soil during salvage and replacement, soil loss in stockpiles due to wind and water erosion, and reduced biological activities and soil structure.	Direct hauling stripped growth media from active mine pits for placement over backfilled portions of previously mined areas.	Soil conditions would remain similar to current conditions.	No additional monitoring or mitigation measures have been identified by BLM or NDEP.
		Installation of sediment control structures (ditches, sediment pond) would arrest soil movement – soil returned to reclaimed areas or stockpile.		
		Initiate reclamation activities concurrent with ongoing mining operations. As mining operations progress, backfilled portions of the pit would be concurrently regraded, growth media placed, and seeded.		

TABLE S-1
Summary Comparison of Potential Direct and Indirect Impacts of Alternatives

Resource	Potential Impacts Proposed Action	Proposed Environmental Protection Measures	Potential Impacts No Action	Monitoring and Mitigation Recommendations
Vegetation	Disturbance to 11 vegetation community types over approximately 1,600 acres	Reclamation in accordance with approved plan would occur on disturbed areas after mining activities cease.	Vegetation resources would remain in the current condition.	Reclamation measures would be implemented that favor establishment of big sagebrush on portions of the site. Planting small patches of sagebrush among areas seeded with rapidly growing forbs and grasses would be coordinated with BLM and NDOW to control soil loss associated with slow establishment of big sagebrush after planting.
	Disturbed areas would be susceptible to invasion by undesirable, non-native species (weeds).	Newmont would continue to conduct annual weed surveys to direct weed control efforts for the life-of-mine and reclamation period to reduce potential impacts of new infestations. Certified weed free straw bales would be used for sediment control. Newmont would eradicate Scotch thistle in and adjacent to Project area prior to commencing construction.	Detection and control of weed invasion from other related ground disturbing activities including livestock grazing, would continue.	Additional measures could include application of mulch, inoculation with arbusucular mychorrizae, reduced competition with herbaceous species (lower seeding rate of grasses and forbs).
	Removal of vegetation during site construction and operation would result in soil movement from the site (see *Soil Resources* above).			

TABLE S-1
Summary Comparison of Potential Direct and Indirect Impacts of Alternatives

Resource	Potential Impacts Proposed Action	Proposed Environmental Protection Measures	Potential Impacts No Action	Monitoring and Mitigation Recommendations
Vegetation (cont'd)	Potential off-site impacts to vegetation from use of enhanced evaporation system during heap leach decommissioning.			Atomizers used to disperse heap leach drain-down fluids would not be used during periods of high wind in order to keep solutions within areas designed for containment to avoid affecting surrounding vegetation.
Wetland and Riparian Areas	Loss of 0.15 acres of wetlands and 0.88 acres of non-wetland waters of U.S.	Construct a low permeability transition between alluvial-valley fill material in ephemeral drainage upstream of the open pit mine, and the surface water diversion channel downstream that would cause water in the alluvium to the surface and flow into the engineered stream channel. The low permeability transition would 1) serve to elevate water levels in the alluvium upstream of the engineered stream channel, and 2) prevent dewatering of the alluvium and wetland areas upstream of the mine pit, thereby maintaining an environment suitable for aquatic life and riparian vegetation.	Impacts to wetland/riparian areas associated with existing land uses in the area would continue.	Fence wetland, riparian areas, and springs adjacent to proposed mine-disturbance areas to reduce effects of livestock on vegetation and stream banks. These sites include springs at the following locations: • NE¼Section 28, Township 32 North, Range 53 East • SW¼NW¼, Section 27, Township 32 North, Range 53 East • SW¼NW¼, Section 27, Township 32 North, Range 53 East. Emigrant Spring exclosure would be reconstructed and maintained using pipe rail fencing.

TABLE S-1 Summary Comparison of Potential Direct and Indirect Impacts of Alternatives				
Resource	**Potential Impacts Proposed Action**	**Proposed Environmental Protection Measures**	**Potential Impacts No Action**	**Monitoring and Mitigation Recommendations**
Wetland and Riparian (cont'd)				Weed control currently being conducted in the Emigrant Spring exclosure would continue.
Fisheries and Aquatic Resources	Approximately 0.15 acre (2,381 lineal feet) of aquatic habitat would be removed by the proposed mine pit, which would eliminate a small population of Lahontan speckled dace, Lahontan redside shiner, and aquatic macroinvertebrates.	The engineered stream channel is designed to allow fish passage during periods of low velocity stream flow. The channel configuration would support wetland and riparian vegetation to support resident fish populations.	Impacts to fisheries and aquatic resources associated with other ground disturbing activities (*i.e.*, grazing) in the area would continue.	Review status of native fish and macroinvertebrate populations in Emigrant drainage and reconstructed diversion channel every 5 years. Re-establish fish and macroinvertebrate populations into the channel as necessary or warranted. (See Water Quality)
	Sediment control ponds constructed in the drainage channel would preclude fish from migrating through the Project area during life-of-mine operations.	Once reclamation is completed and sediment control ponds have been removed, fish could migrate through the area depending on flow conditions.		
Terrestrial Wildlife	Loss of approximately 1,400 acres of wildlife habitat would eliminate cover (nesting, hiding, and thermal), breeding sites, forage, and subsequent displacement or loss of wildlife.	Reclamation in accordance with approved plan would eventually restore habitat for some species.	Effects of current land uses and natural phenomena (wildfire) in the Project Area would continue.	Construct spring exclosures described for Wetland/Riparian areas to benefit wildlife use. Scope, frequency and intensity of wildlife mitigation and monitoring will be identified in the plan developed by BLM in consultation with NDOW for inclusion in the Mitigation and Monitoring section of the FEIS.
	Species dependent on plant communities with a large component of sagebrush and trees would experience a net loss in habitat quality.			

TABLE S-1
Summary Comparison of Potential Direct and Indirect Impacts of Alternatives

Resource	Potential Impacts Proposed Action	Proposed Environmental Protection Measures	Potential Impacts No Action	Monitoring and Mitigation Recommendations
Terrestrial Wildlife (cont'd)	Bat roosting habitat (cliffs, rock crevices, and juniper trees) in the mine pit area would be removed.	Post mine highwall would offer potential bat roosting habitat.		
	Long-term reduction of habitat quality for sage grouse.	Reclamation including establishment of sagebrush on the mine area and mitigation involving sagebrush enhancement within and adjacent to the proposed mine disturbance area would improve sage grouse habitat and off set the reduced sagebrush density in other areas		
Recreation	Approximately 3,800 fewer acres would be available for recreational activities during operation and after cessation of mining until reclamation is complete.	Upon completion of reclamation fences would be removed and the road segment would be reconstructed and relocated to connect with the existing route re-establishing travel through the area. Newmont would provide funding for interpretive signs to be placed at the South Fork Special Recreation Management Area.	Recreational use of the area would likely continue at existing levels.	No additional monitoring or mitigation measures have been identified by BLM or NDEP.
	Interrupt travel on Tonka Creek road.			

TABLE S-1
Summary Comparison of Potential Direct and Indirect Impacts of Alternatives

Resource	Potential Impacts Proposed Action	Proposed Environmental Protection Measures	Potential Impacts No Action	Monitoring and Mitigation Recommendations
Grazing Management	Loss of 306 AUMs in Emigrant Springs Allotment No. 5417.	Reclamation of disturbed areas would restore carrying capacity of the allotment.	No affect on current grazing practices or range resources in the Project area. Current stocking rates would continue as permitted. Previously authorized land use activities would continue.	Develop two springs within the Project Area and pipe the water outside enclosure fence.
	Loss of grazing land until reclamation is successful.			Construct trough and pipeline system on east side; and, maintain east side cattle corridor.
Access and Land Use	Bisect the Tonka Creek road precluding travel through the area during active mining operations.	Upon completion of mining the road segment would be reconstructed and relocated to connect with the existing route and re-establish travel through the area.	Travel on Tonka Creek road would not be interrupted.	No monitoring or mitigation measures have been identified by BLM and NDEP.
Solid and Hazardous Waste and Hazardous Materials	Impacts to soil, water, and vegetation from accidents occurring during transport, storage, and use of solid and hazardous wastes and hazardous materials.	Solid waste would be disposed of in a Class III waivered landfill. Hazardous waste would be stored in 55-gallon drums and periodically transported to an approved treatment, storage, and disposal facility in accordance with applicable federal and state regulations.	No effect on resources from solid and hazardous waste and hazardous materials would occur.	No monitoring or mitigation measures have been identified by BLM and NDEP.
		USDOT approved containers would be used for on-site storage of hazardous materials, and spill containment structures provided.		

TABLE S-1
Summary Comparison of Potential Direct and Indirect Impacts of Alternatives

Resource	Potential Impacts Proposed Action	Proposed Environmental Protection Measures	Potential Impacts No Action	Monitoring and Mitigation Recommendations
Visual Resources	Terraced, flat-topped waste rock piles and rock faces would present moderate to strong contrasts with the existing landform and line of steep canyons and gentle slopes.	Where practicable, grading would blend disturbed areas with the surrounding terrain. Angular features, including tops and edges of waste rock disposal facilities, would be rounded. Reclamation of disturbed areas would meet Class IV VRM objectives.	No visual impacts would occur at the Emigrant Project beyond those already present.	No monitoring or mitigation measures for visual resources have been identified by BLM.
Cultural Resources	Three prehistoric period resources located within the proposed disturbance boundary for the heap leach facility have been determined eligible to the National Register.		No effect on cultural resources from mining related activities in the proposed Project area.	Because avoidance of eligible sites would not be possible, a data recovery plan was prepared and approved by BLM in consultation with the Nevada State Historic Preservation Office.
Native American Concerns	No impacts on Western Shoshone traditional cultural values, practices, properties, or human remains have been identified.		Same as Proposed Action	No monitoring or mitigation measures have been identified by BLM or NDEP.

TABLE S-1
Summary Comparison of Potential Direct and Indirect Impacts of Alternatives

Resource	Potential Impacts Proposed Action	Proposed Environmental Protection Measures	Potential Impacts No Action	Monitoring and Mitigation Recommendations
Social and Economic Resources	Emigrant Project would employ approximately 180 people.		Potential for increased unemployment, reduced wages spent in the local economy, decreased revenue to local and state jurisdictions, increased stress on public assistance programs, and decreased quality-of-life for some residents.	No monitoring or mitigation measures have been identified by BLM or NDEP.
	Continued employment in the mining industry and indirect employment in the retail and service sectors.			
	Property and net proceeds of mining taxes collected by local and state jurisdictions would continue.		Various taxes associated with the mine development would not be paid under this Alternative.	
	Newmont's existing workforce would be used for operation of the facility, thereby extending employment in lieu of bringing in new workers.			
Environmental Justice	No disproportionate direct or indirect impacts to minority or low-income populations		Same as Proposed Action	No monitoring and mitigation measures f have been identified by BLM or NDEP.

DRAFT
ENVIRONMENTAL IMPACT STATEMENT
EMIGRANT PROJECT

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CHAPTER 1
INTRODUCTION

The Elko Field Office of the United States Department of the Interior (USDI) Bureau of Land Management (BLM) received a revised Plan of Operations from Newmont Mining Corporation (Newmont) in March 2007, proposing development and operation of an open pit mine and associated support facilities in the Emigrant Project (Project) area. The original Plan of Operations for the Emigrant Project was submitted to BLM in February 2004. The Project is located on public and private land in Elko County, Nevada, approximately 10 miles southeast of Carlin, Nevada (**Figure 1-1** and **Figure 1-2**).

Proposed facilities in the Project area would be located in part on public land administered by BLM; consequently, review and approval of Newmont's Plan of Operations is required by BLM pursuant to Title 43, Code of Federal Regulations, Part 3809 (43 CFR 3809) Surface Management Regulations. BLM's decision regarding the proposed Project must also conform to requirements of the National Environmental Policy Act of 1969 (NEPA). Due to the potential for the proposed Project to result in significant environmental impacts, BLM determined that an Environmental Impact Statement (EIS) would be necessary under NEPA. A Notice of Intent to publish an EIS appeared in the Federal Register on May 25, 2004 (Vol. 69, No. 101, Page 29744-29745).

In May 2005, a Draft EIS was released for public review. In April 2007, BLM determined that results of additional geochemical testing completed by Newmont constituted new information relevant to the environmental concerns and bearing on the Proposed Action requiring re-issue of a Draft EIS and associated public comment period. This revised Draft EIS replaces (in its entirety) the previous Draft EIS issued in 2005.

The revised Plan of Operations (Newmont 2007a) supersedes earlier plans and incorporates changes to the proposed Project based on comments received for the 2005 Draft EIS. Changes include modifications to the design of an in-pit engineered stream channel and revisions to the mining sequence to encapsulate a larger volume of potentially acid generating (PAG) rock encountered during mining. The 2007 Plan of Operations is described as the *Proposed Action* in Chapter 2.

BLM is serving as lead agency in preparing this Draft EIS in conjunction with the following cooperating agencies:

- Nevada Division of Environmental Protection (NDEP); and
- Nevada Department of Wildlife (NDOW).

DOCUMENT ORGANIZATION

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

This Draft EIS describes environmental consequences of mining and waste rock disposal operations in the proposed Emigrant Project area. Chapter 1 describes the purpose of and need for action, the role of BLM, and identifies issues raised through public scoping. Chapter 2 provides a description of mineral exploration operations, the Proposed Action, and alternatives to the Proposed Action. Chapter 3 describes the affected environment in the Project area; environmental consequences including potential direct and indirect impacts associated with the Proposed Action and the No Action alternative; and mitigation measures that may be selected to reduce or minimize impacts. Chapter 4 summarizes past, present, and reasonably foreseeable future activities in the Emigrant Project area and forms the basis for assessment of potential cumulative effects. Chapter 5 identifies the consultation and coordination with public, state, and federal agencies that occurred during preparation of this Draft EIS and a list of preparers. Chapter 6 contains references cited throughout the Draft EIS.

PURPOSE OF AND NEED FOR THE PROJECT

The purpose of Newmont's proposal is to use its existing mining work force to conduct open pit mining on unpatented mining claims and fee land within the Project area to produce gold from ore reserves. The need for the proposed Project is to produce gold, which is an established commodity with international markets and demand. Uses include jewelry, investments, as a standard for monetary systems, electronics, and other industrial applications.

BLM is responsible for managing mineral rights access on certain federal land as authorized under the General Mining Law of 1872, as amended. Under the law, persons are entitled to reasonable access to explore for and develop mineral deposits on public domain land that has not been withdrawn from mineral entry.

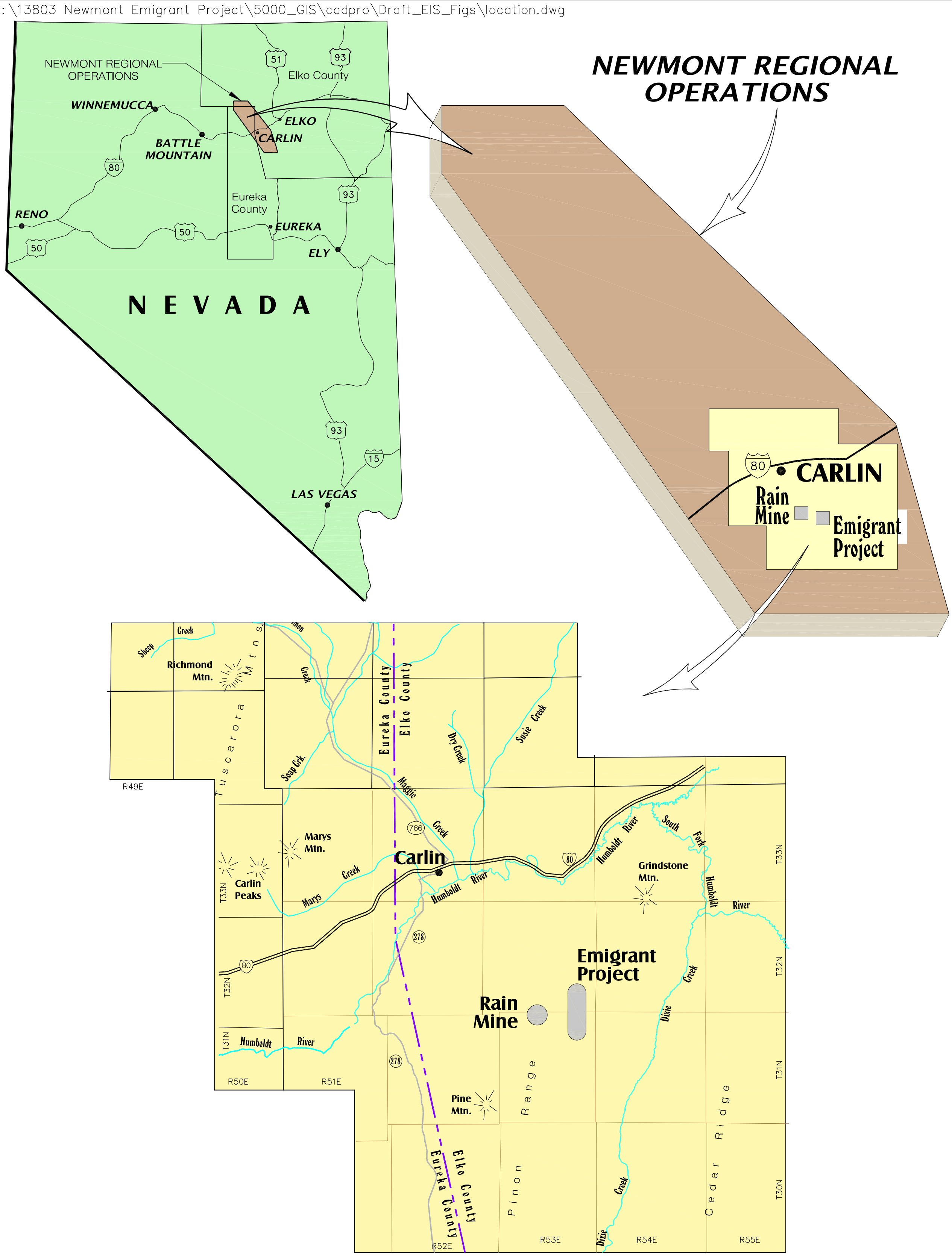
In order to use public land managed by the BLM Elko District Office, Newmont must comply with BLM Surface Management Regulations (43 CFR 3809) and other applicable statutes, including the Mining and Mineral Policy Act of 1970 (as amended) and Federal Land Policy and Management Act of 1976. BLM must review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

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

AUTHORIZING ACTIONS

A proposal submitted to BLM may be approved only after an environmental analysis is completed and disclosed to the public as required by NEPA. BLM decision options include approving Newmont's Plan of Operations for the Emigrant Project as submitted, approve an alternative(s) to the Plan of Operations to mitigate environmental impacts, approve the Plan of Operations with stipulations to mitigate environmental impacts, or deny the Plan of Operations (No Action). If BLM denies the Plan of Operations, the applicant may modify and resubmit the Plan of Operations to address issues or concerns identified by BLM on the original Plan of Operations.

A portion of Newmont's proposed Emigrant Project facilities would be located on public land administered by BLM; such operations must comply with BLM regulations for mining on public land (43 CFR 3809, Surface Management Regulations); Use and Occupancy under the Mining Laws (43 CFR 3715); the Mining and Mineral Policy Act of 1970; and the Federal Land Policy and Management Act of 1976. These laws recognize the statutory right of mining claim holders to develop federal mineral resources under the General Mining Law of h:\13803 Newmont Emigrant Project\5000_GIS\cadpro\Draft_EIS_Figs\location.dwg



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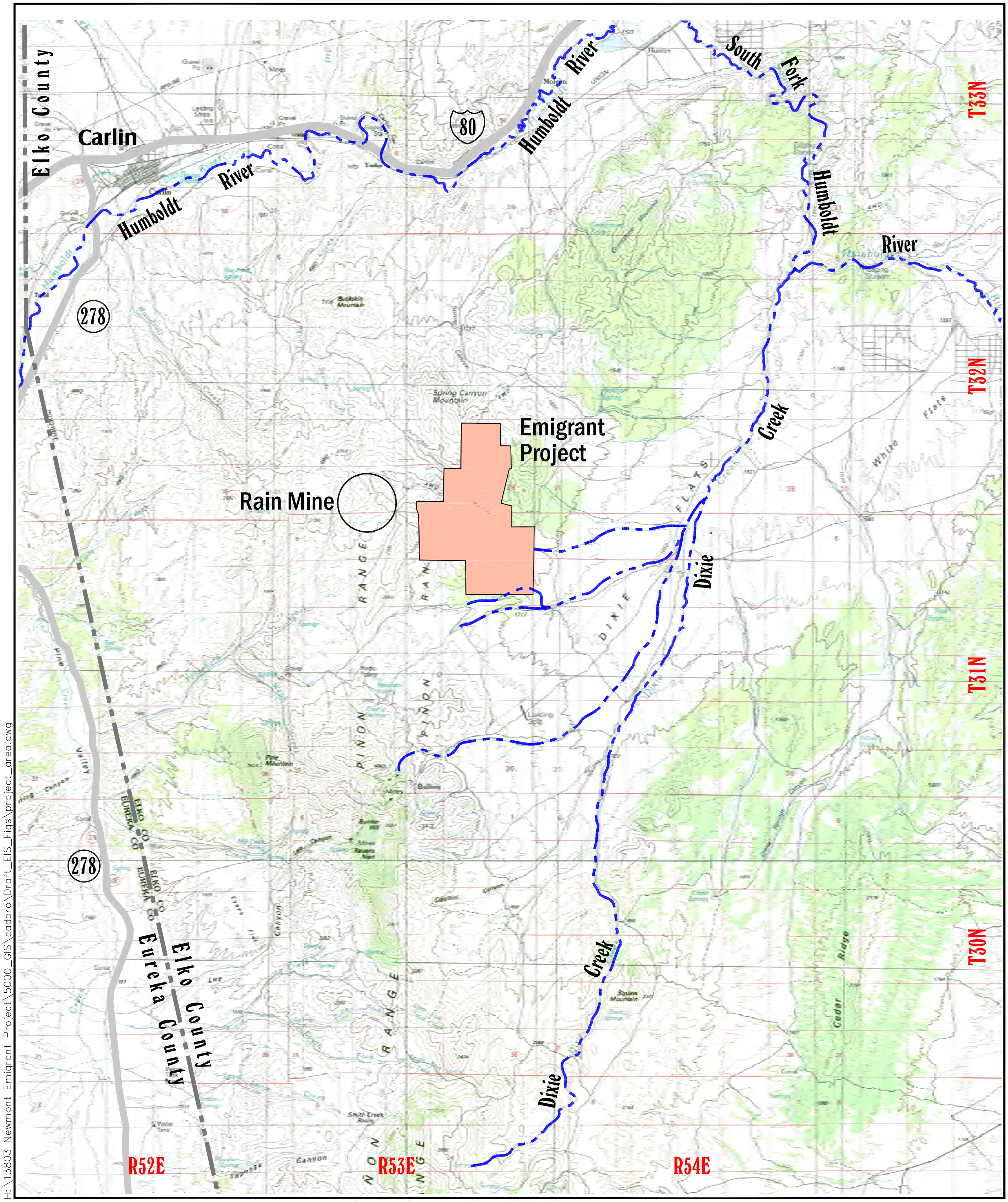
U.S. Department of the Interior
Bureau of Land Management
Elko District Office
Elko, Nevada

General Location Map
Emigrant Project
Elko County, Nevada
FIGURE 1-1



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U.S. Department of the Interior
Bureau of Land Management
Elko District Office
Elko, Nevada

Project Area
Emigrant Project
Elko County, Nevada
FIGURE 1-2

1872. These laws, in combination with other BLM policies (i.e., the Resource Management Plan), also require BLM to analyze proposed mining operations to ensure: 1) adequate provisions are included to prevent undue or unnecessary degradation of public land; 2) measures are included to provide reasonable reclamation of disturbed areas; 3) use and occupancy of public land for development of locatable mineral deposits are limited to that which is incident; and 4) proposed operations would comply with other applicable federal, state, and local statutes and regulations.

The BLM will prevent abuse of public land while recognizing valid rights and uses under the Mining Law of 1872 (30 U.S.C. 22 *et seq.*) and related laws governing public land. BLM has determined that the use and occupancy of public land identified in the Proposed Action is reasonably incident to the Project in accordance with 43 CFR 3715 – Use and Occupancy under the Mining Laws. The mining and reclamation plans are designed to minimize the amount of land that would be disturbed to develop mine pits, dispose of overburden, process ore, and construct haul roads and other ancillary facilities to meet Project requirements and ensure that applicable safety standards are met.

In addition to BLM, other federal, state, and local agencies have jurisdiction over certain aspects of the Proposed Action. A list of agencies and their respective permitting/authorizing responsibilities is shown in **Table 1-1**. In addition to securing authorization from BLM, the primary permits to be obtained by Newmont include a reclamation permit, water pollution control permit, industrial artificial pond permit, air quality operating permit, and a storm water discharge permit.

The Nevada Division of Environmental Protection (NDEP) bonding requirements for mine reclamation in Nevada are outlined in Nevada Administrative Code (NAC) / Nevada Revised Statute (NRS) 519A Regulations. Surface Management Regulations (43 CFR 3809) establish BLM's bonding policy relating to mining and mineral development. In 2002, BLM and NDEP updated an existing Memorandum of Understanding (MOU) to coordinate evaluation and approval of reclamation plans, and determine bond amounts for mining and exploration operations. The MOU allows submittal of one bond by an operator to satisfy reclamation bond requirements for both agencies.

Operators must provide a reclamation cost estimate when submitting a Plan of Operations to BLM. The reclamation cost estimate must be calculated as if third party contractors would perform reclamation after the site has been vacated by the operator. The bond amount must be sufficient to cover 100 percent of the cost of reclaiming the proposed disturbance.

RELATIONSHIP TO BLM POLICIES, PLANS, AND PROGRAMS

The Emigrant Project Plan of Operations (Newmont 2007a) has been reviewed for compliance with BLM policies, plans, and programs. The proposal is in conformance with the minerals decisions in the Record of Decision, Elko Resource Area - Resource Management Plan, approved in March 1987.

SUMMARY OF ISSUES ADDRESSED

Public and agency scoping comments concerning the Proposed Action and comments received on the 2005 Draft EIS are shown in **Table 1-2**. This table also provides references to sections of this Draft EIS in which responses to each issue raised in the comments are provided.

TABLE 1-1
Regulatory Responsibilities

Authorizing Action	Regulatory Agency
Plan of Operations/Rights of Way	Bureau of Land Management (BLM)
National Environmental Policy Act	BLM
National Historic Preservation Act	BLM; Nevada Division of Historic Preservation & Archaeology
Native American Graves Protection & Repatriation Act	BLM
American Indian Religious Freedom Act	BLM
Clean Water Act (Section 404)	United States Army Corps of Engineers (USACE)
High Explosive License/Permit	United States Bureau of Alcohol, Tobacco, & Firearms
Hydrocarbon Permit	Nevada Division of Environmental Protection (NDEP). Bureau of Mining Regulation and Reclamation
Storm Water Permit	NDEP, Bureau of Water Pollution Control
Air Quality Permit	NDEP, Bureau of Air Pollution Control
Water Pollution Control Permit	NDEP, Bureau of Mining Regulation & Reclamation
Industrial Artificial Pond Permit	Nevada Department of Wildlife (NDOW)
Mine Reclamation Permit/Bonding	NDEP, Bureau of Mining Regulation & Reclamation/BLM
Solid Waste Disposal Permit	NDEP, Bureau of Waste Management
Potable Water	Nevada Division of Health (NDH), Department of Human Resources
Sewer System Approvals	NDH, NDEP, Bureau of Water Pollution Control
Safety Plan	Mine Safety & Health Administration (MSHA)
Water Rights	Nevada Division of Water Resources
Water Appropriation Permit	Nevada State Engineer
Endangered Species Act of 1973	United States Fish & Wildlife Service (USFWS)

TABLE 1-2
Scoping Summary
Emigrant Mine Project

Issue	Response
Mining and Reclamation	
Discuss proposed topsoil salvage efforts in the EIS.	Chapter 2 – Proposed Action Chapter 3 - Soil Resources
Describe reclamation plans with regard to erosion control and proposed post mine vegetation communities in the EIS.	Chapter 2 – Proposed Action
Reclamation seed mixes should include species that will provide forage and cover attributes similar to pre-mine condition.	Chapter 2 – Proposed Action
Backfill mine pits to blend with surrounding topography.	Chapter 2 – Proposed Action
Discuss proposed seedbed preparation activities in the EIS.	Chapter 2 – Proposed Action
Describe post mine topography of backfilled material in pits and establishment of vegetation with regard to livestock and wildlife habitat in the EIS	Chapter 2 – Proposed Action
The operation should be properly bonded.	Chapter 1– Introduction
The EIS must follow U.S. mining law and BLM is mandated to follow the Mining and Minerals Policy Act of 1970.	Chapter 1 – Introduction
Discuss potential for acid generation from waste rock.	Chapter 2 – Proposed Action Chapter 3 – Geology and Minerals
Water Quantity and Quality	
Describe impacts to livestock and wildlife water sources and mitigation measures.	Chapter 3 - Water Quantity and Quality
Describe impacts to Emigrant Spring, Cherry Spring, and springs and water sources on west side of Corfett Mountain Range and Upper Scott Ranch and mitigation measures.	Chapter 3 - Water Quantity and Quality
Stock water developments have to be installed and operating before any rangeland is closed for mining to mitigate for stock water losses.	Chapter 3 - Water Quantity and Quality
Existing water rights permits should be examined to ensure the Emigrant operation is encompassed within the existing permitted place of use and the diversion points are appropriately located.	Chapter 3 - Water Quantity and Quality
Notification of the Nevada Division of Water Resources must be done in the case of installation of any new water management or storage structures.	Chapter 3 - Water Quantity and Quality
Wildlife and Vegetation	
Effect of Project on wetland and riparian habitat in general and Emigrant Springs area in particular should be evaluated in the EIS	Chapter 3 - Fisheries and Aquatic Resources Chapter 3 - Water Quantity and Quality
Potential impacts from the Emigrant Project on destruction or alteration of breeding, nesting, cover, and foraging habitat for bats and non-game birds should be described.	Chapter 3 – Terrestrial Wildlife

TABLE 1-2 Scoping Summary Emigrant Mine Project	
Issue	**Response**
Potential impacts resulting from mine development to raptor nest sites, migration routes, winter and summer range for deer and antelope, roosting habitat for bats, and sage grouse habitat including leks, and other sensitive habitat should be evaluated in the EIS.	Chapter 3 – Terrestrial Wildlife
Occurrence of Lahontan cutthroat trout in Dixie Creek above the Project Area should be evaluated in the EIS.	Chapter 3 - Fisheries and Aquatic Resources
All land clearing activities should occur outside of the avian breeding season to protect nests.	Chapter 3 – Terrestrial Wildlife
Impacts to federally listed species and species of concern should be evaluated.	Chapter 3 – Terrestrial Wildlife
Land Use and Access	
Describe fencing, gates, and cattleguard types, materials, and maintenance responsibility and mitigation plans to deal with reduced public access, livestock crossing, recreational access from the Carlin side of Project, and grazing access as a result of closing roads in Project Area.	Chapter 2 – Proposed Action Chapter 3 – Access and Land Use
Fences should enclose only the minimum area required for operations, expanding as necessary as the footprint increases, minimizing impact to grazing land.	Chapter 2 – Proposed Action
Discuss potential mitigation of livestock forage losses by improvement of forage in areas not impacted by mine development.	Chapter 3 – Access and Land Use
Social and Economic Resources	
Alternatives should have economic impacts quantified so that public can evaluate potential economic effects of each on the community.	Chapter 3 - Social and Economic Resources
Discuss mitigation of economic losses to ranchers for livestock forage reduction due to mine development.	Chapter 3 - Social and Economic Resources
South Fork Band Environmental Department Issues*	
Will pit intersect groundwater?	Chapter 3 - Water Quantity and Quality
Is diversion channel sufficient size to accommodate a 24-hour/ 100- year storm event?	Chapter 2 – Proposed Action (Diversion Channel)
Will operator be required to follow all laws and regulations?	Chapter 1 - Introduction
Will waste rock be tested to determine if it will mobilize contaminants?	Chapter 3 – Geology and Minerals
What parameters are used to measure success of reclamation?	Chapter 2 – Proposed Action
Waste rock and ore need to be characterized by meteoric water mobility tests and acid base accounting for potential to generate acid and mobilize metals.	Chapter 3 – Geology and Minerals
Cultural artifacts must be protected under Archaeological Resources Protection Act (16 USC 1701), Native American Graves Protection and Repatriation Act, section (3)(d)(1).	Chapter 1 – Introduction Chapter 3 - Cultural Resources Chapter 3 - Native American Concerns

* These comments were received by BLM staff from the South Fork Band Environmental Department during Native American coordination and communication efforts.

CHAPTER 2
DESCRIPTION OF PROPOSED ACTION AND ALTERNATIVES

INTRODUCTION

This chapter describes Newmont's previous activities in the Emigrant Project area, Newmont's Proposed Action to develop the Emigrant Project, reasonable alternatives to the Proposed Action, alternatives eliminated from further analysis, and the agency's preferred alternative. The proposal to develop ore reserves at Emigrant is referred to as the Emigrant Project (Project) or the Proposed Action in this document.

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

The Emigrant Project is located on the eastern slopes of the Piñon Range in the Dixie Creek Basin, and includes Sections 25, 26, 34, 35, and 36, Township 32 North, Range 53 East and Sections 1, 2, 3, 4, 11, and 12, Township 31 North, Range 53 East, Mount Diablo Baseline and Meridian. Surface and mineral ownership are shown on **Figure 2-1**.

The Emigrant deposit is a large, shallow, low-grade, oxide ore body exposed along the side of a hill. Geologic investigations have identified mineralization extending 12,000 feet along a north-south trend, and 3,000 feet east of the Emigrant Fault. The deposit extends from the bottom to the top of the hill, which would facilitate mining in phases up the hillside and allow waste rock to be placed into previously mined-out portions of the pit.

One small intermittent drainage flows through the proposed mine pit area. A new engineered stream channel for this drainage would be constructed during the first two phases of mining to form a permanent stream channel through the mine pit area.

CURRENT ACTIVITY

Exploration activities at the Emigrant Project area were authorized under the Decision Letter for the Emigrant Springs Exploration Plan of Operations (BLS-1 N16-93-001P) issued in December 1994. Exploration activities included road construction, drill pad construction, drilling, trenching, and rock sampling.

In February 2004 (revised May 2004), Newmont submitted a Plan of Operations for the Emigrant Project, which was analyzed in a Draft EIS that was published and released for public comment in March 2005. At the time the 2005 Draft EIS was issued for public review, additional waste rock characterization, including humidity cell testing, was being conducted by Newmont to provide data to augment previous test results. Specifically, the geochemical testing was designed to evaluate potential for acid mine drainage formation and metal contaminant release from waste rock that would be produced during mining. Results of this testing are included in the *Geology and Minerals* section of Chapter 3.

With development of the additional geochemistry data, BLM decided to re-issue a Draft EIS that incorporates the data and updates the Plan of Operation for the Emigrant Project. Information regarding BLM's action for the Draft EIS is included in Chapter 1.

PROPOSED ACTION

The Proposed Action referred to throughout this Draft EIS is Newmont's 2007 Plan of Operations for the Emigrant Project. The Plan of Operations for the Project (Newmont 2007a) submitted to the BLM and evaluated in this Draft EIS includes descriptions of the following components:

- Life-of-Mine Schedule
- Permit Boundary
- Geologic Evaluations
- Mine Development
- Mining Operations
- Engineered Stream Channel
- Waste Rock Management
- Heap Leach Facility
- Process Ponds
- Surface Water and Sediment Controls
- Haul and Access Roads
- Ancillary Facilities
- Wildlife Protection Measures
- Resource Monitoring
- Solid and Hazardous Waste
- Human Health and Safety
- Employment
- Reclamation
- Monitoring/Evaluation of Reclamation

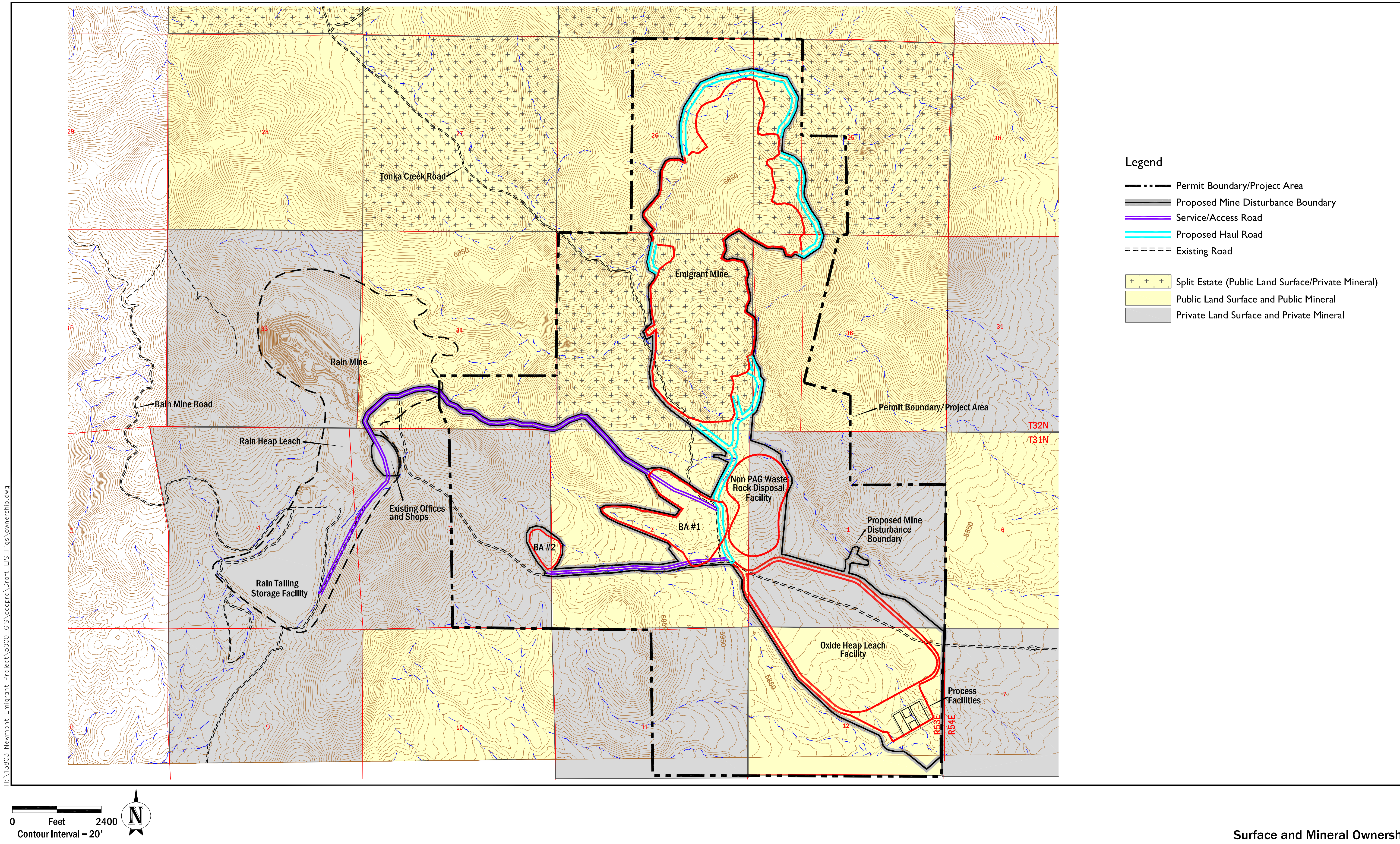
LIFE-OF-MINE SCHEDULE

Under current operating plans and projections, Newmont anticipates the Project would have an operational life of 10 years of mining and 14 years of active leaching. Reclamation, closure, and monitoring activities could extend up to 30 years. The proposed schedule for the Emigrant Project is shown in **Table 2-1**.

TABLE 2-1
Proposed Emigrant Mine Schedule

Activity	Estimated Time-Frame
Permitting	1 Year
Construction	1 Year
o Phase I leach Pad	1 Year
o Diversion Channel	3 Years
Mining & In-Pit Backfill	10 Years
o Phase I	1 Year
o Phase II - III	2 Years
o Phase IV – V	2 Years
o Phase VI	1 Year
o Phase VII	2 Years
o Phase VIII	2 Years
Heap Leaching	14 Years
Construction (Phase II Pad) (continued heap leaching)	12 Years
Construction (Phase III Pad) (continued heap leaching)	10 Years
Phased Capping of Heap	3 Years
Solution Evaporation	7 Years
Closure Monitoring	30 Years

Source: Newmont 2007a.



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Surface and Mineral Ownership
Emigrant Project
Elko County, Nevada
FIGURE 2-1

PERMIT BOUNDARY

The proposed permit boundary would encompass 3,883 acres, of which 2,761 acres are public (including 880 acres of split estate) and 1,122 acres are private. The proposed mine disturbance boundary (within the permit boundary) shown on **Figure 2-2** includes buffer zones around proposed surface disturbances. Total area of proposed surface disturbance within the mine permit boundary would be approximately 1,418 acres, which includes 1,170 acres of public land (including 442 acres of split estate) and 248 acres of private land. Approximately 22 acres in the existing Rain Mine complex located 3 miles west of the Emigrant Project site would be used to support the Emigrant Project. Acreage associated with the Rain Mine is permitted under a separate authorization. Proposed disturbance areas and mine components are shown on **Figure 2-2** and summarized in **Table 2-2.**

A standard BLM fence would be constructed around the permit boundary to prevent livestock from entering active mine areas. The northern extension of the fence would be advanced to coincide with mining operations to allow continued livestock grazing as long as possible in each area. Once the mine is fully developed, the fence would enclose the entire permit area and remain in place until reclamation is complete.

GEOLOGIC EVALUATIONS

Newmont proposes to continue geologic evaluations (exploration) within the Project area under the previously approved Emigrant Springs Exploration Project Plan of Operations (N-071065). Geologic evaluation activities would include exploration and development drilling, geochemical sampling, excavation of test pits, trenching, and application of various geophysical methods.

TABLE 2-2
Proposed Surface Disturbance Areas
Emigrant Mine Project

Disturbance Areas	Proposed Disturbance (Acres)		
	Public	Private	Total
Mine Pits	615	0	615
Non-PAG Waste Rock Disposal Facility	26	52	78
Heap Leach and Processing Facility	214	130	344
Haul/Access Roads[1]	37	0	37
Ancillary Facilities[2]	278	66	344
Total	**1,170[3]**	**248**	**1,418**

Source: Newmont 2007a.
1 Does not include 13.6 acres of public access road.
2 Includes buildings, storage yards, growth medium stockpiles, barrow sources, and buffer zones.
3 Includes 442 acres of split estate (public surface, private mineral).

Surface disturbance created by drilling operations would consist of constructing roads, drill pads, and sumps. A surface disturbance of 50 acres would occur with exploration activities. These activities were reviewed under the Environmental Assessment, Finding of No Significant Impact (April 9, 2003), and Decision Record issued for Modification of the Emigrant Springs Exploration Plan of Operations No. BLM/EK/PL-2003/018.

MINE DEVELOPMENT

Prior to commencing mining and ore processing operations, various construction and development activities would occur sequentially or in some cases concurrently. These activities are described below and discussed in respective sections of this chapter. Mine development would include the following construction activities:

- Access roads into the Project area from the Rain Mine;
- Phase I of the heap leach facility;
- Surface and storm water controls (ponds and ditches);
- Ancillary facilities (*e.g.*, operations office, maintenance shop, plant facilities, powder magazines, prill silo, water fill station, and septic leach field);
- Perimeter fence;
- Upgrade and reroute electrical service from Rain Mine; and
- Relocate water supply line.

Where possible, land clearing and surface disturbance would be timed to prevent destruction of active bird nests or disturbance of young birds during the avian breeding season (May 1 to July 15, annually) to comply with the Migratory Bird Treaty Act. If surface disturbing activities are unavoidable, Newmont would have a qualified biologist survey areas proposed for immediate disturbance to identify active nests. If active nests are located, or if other evidence of nesting is observed (mating pairs, territorial defense, carrying nesting material, transporting of food), the area would be avoided to prevent destruction or disturbance of nests until the birds are no longer present.

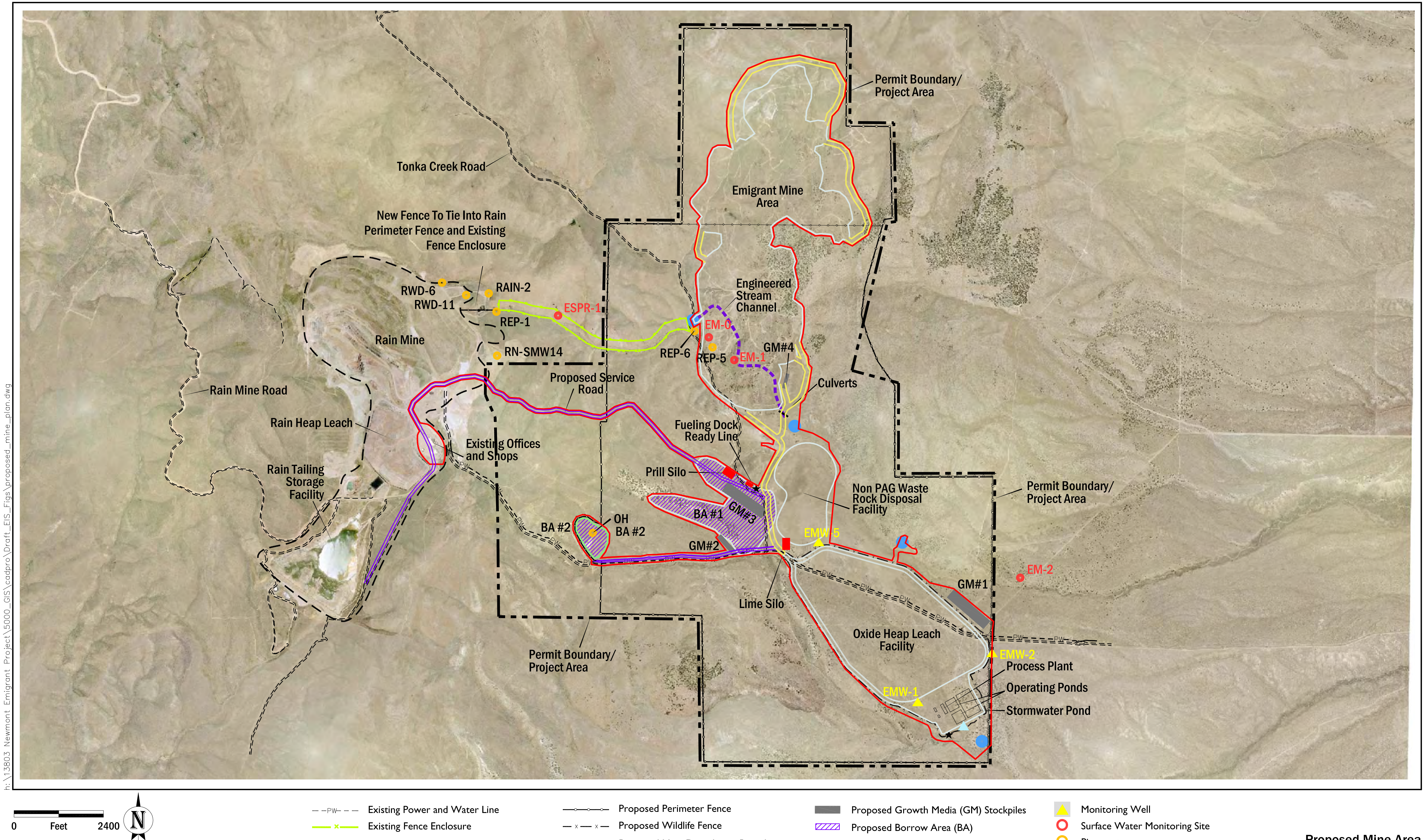
Avian surveys would be conducted only during the breeding season and immediately prior to Newmont's activities that would result in disturbance. After such surveys are performed, and disturbance created (*i.e.*, road construction and drill pad development), Newmont would not disturb additional land during the avian breeding season without first conducting another avian survey. After July 15, new land clearing activities would continue, and no further avian surveys would be conducted until the following year, in compliance with Migratory Bird Treaty Act (Newmont 2007a).

MINING OPERATIONS

Newmont proposes to mine 92 million (M) tons (t) of ore and 83 Mt of waste rock from the Emigrant ore deposit (**Figure 2-2**). Low-grade run-of-mine oxide ore would be placed on a heap leach facility constructed south of the open pit mine. Lime would be added to the ore prior to placement on the heap leach facility to maintain the proper pH of the ore for leaching (Newmont 2007a).

The proposed open pit would disturb approximately 615 acres of public land. Mining would progress in phases, beginning at the lower elevation near the southern end of the pit. A non-PAG waste rock disposal facility would be constructed during the first phases of mine development. The non-PAG waste rock disposal facility would disturb approximately 78 acres, extend about 190 feet above existing topography, and would have a capacity of approximately 12 Mt. Waste rock from subsequent phases would be placed as backfilled overburden in mined-out portions of the pit.

PAG waste rock encountered during mining would be segregated and placed on limestone benches in mined-out portions of the pit against exposed limestone highwalls and encapsulated with a minimum of 10 feet of neutralizing waste rock as described in the *Encapsulation Cell* section of this chapter. Based on the current mine plan, approximately 5 percent (4 Mt) of the total waste rock to be excavated (83 Mt) would be managed as PAG waste rock.



- Existing Power and Water Line
- Existing Fence Enclosure
- Existing Road
- Rain Mine Area
- Permit Boundary/Project Area
- Proposed Perimeter Fence
- Proposed Wildlife Fence
- Proposed Mine Disturbance Boundary
- Service/Access Road
- Proposed Haul Road
- Proposed Growth Media (GM) Stockpiles
- Proposed Borrow Area (BA)
- Electric Substation
- Sediment Pond
- Monitoring Well
- Surface Water Monitoring Site
- Piezometer
- Proposed Monitoring Well

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Proposed Mine Area
Emigrant Project
Elko County, Nevada
FIGURE 2-2

Ore and waste rock would be drilled and blasted in sequential benches to facilitate loading and hauling. Blasted ore and waste rock would be loaded into end-dump haul trucks using shovels and front-end loaders. Benches would be established at approximately 20-ft vertical intervals with bench widths varying to include safety berms and haul roads. Haul trucks would move within the pit using roads on the surface of benches with ramps extending between two or more benches.

Drill cuttings would be collected during blast-hole drilling and analyzed to determine gold content and metallurgical and waste rock characteristics. Blasted rock material would be loaded into haul trucks for transportation to the non-PAG waste rock disposal facility, heap leach facility, or placed as backfill into mined-out portions of the pit.

Phase I Mining

Mining would begin at the topographically lower south end of the deposit above the existing streambed elevation and extend eastward. The next sequence would involve mining down to the streambed and constructing an engineered stream channel to the east of the existing streambed. Flow would continue in the existing channel until this section of the engineered stream channel is completed (**Figure 2-3**). Once the new engineered stream channel is established, flow would be diverted into the channel, which would allow mining to progress below the level of the original streambed. Non-PAG waste rock generated during this phase of mine development would be placed in the non-PAG waste rock disposal facility. PAG waste rock would be segregated and placed in a designated encapsulation cell and managed as described in the *Encapsulation Cell* section of this chapter.

Phase II Mining

This phase of mine development would be similar to Phase I, but would occur in the northwestern or upper section of the drainage. Excavation would progress eastward above the existing elevation of the streambed allowing flow to remain in the existing channel. A portion of waste rock generated during this phase would be placed in the non-PAG waste rock disposal facility, with the remainder used as backfill in mined-out portions of the Phase I pit sequence. PAG waste rock generated during Phase II would be placed in an encapsulation cell and managed in the same fashion as described in the *Encapsulation Cell* section of this chapter.

Upon completion of the engineered stream channel, surface flow would be redirected into the channel and mining below the streambed elevation would occur. The permanent engineered stream channel would be completed at the end of the Phase II mining sequence. The new engineered stream channel would be constructed at the same grade as the original streambed (4%) and would be located primarily in Devils Gate limestone. Detailed information on construction and design of the engineered stream channel is discussed in the *Engineered Stream Channel* section of this chapter.

Phase III Through Phase VIII Mining

Once Phase I and Phase II mining are completed and the permanent engineered stream channel is established, mining would proceed from the lower elevations of the deposit toward the higher elevations. Phase III through Phase VIII mining sequences are depicted on **Figures 2-3, 2-4,** and **2-5**.

During mining of the Phase III pit, PAG waste rock may be exposed in the western highwall. Non-PAG neutralizing waste rock from Phase IV mining would be used to completely backfill the Phase III pit. PAG rock exposed in the

Phase III highwall would be backfilled at a 3H:1V (horizontal to vertical) slope angle. Selective handling and placement of PAG waste rock generated during Phase III through Phase VIII would be managed as described in the *Encapsulation Cell* section of this chapter.

Engineered Stream Channel

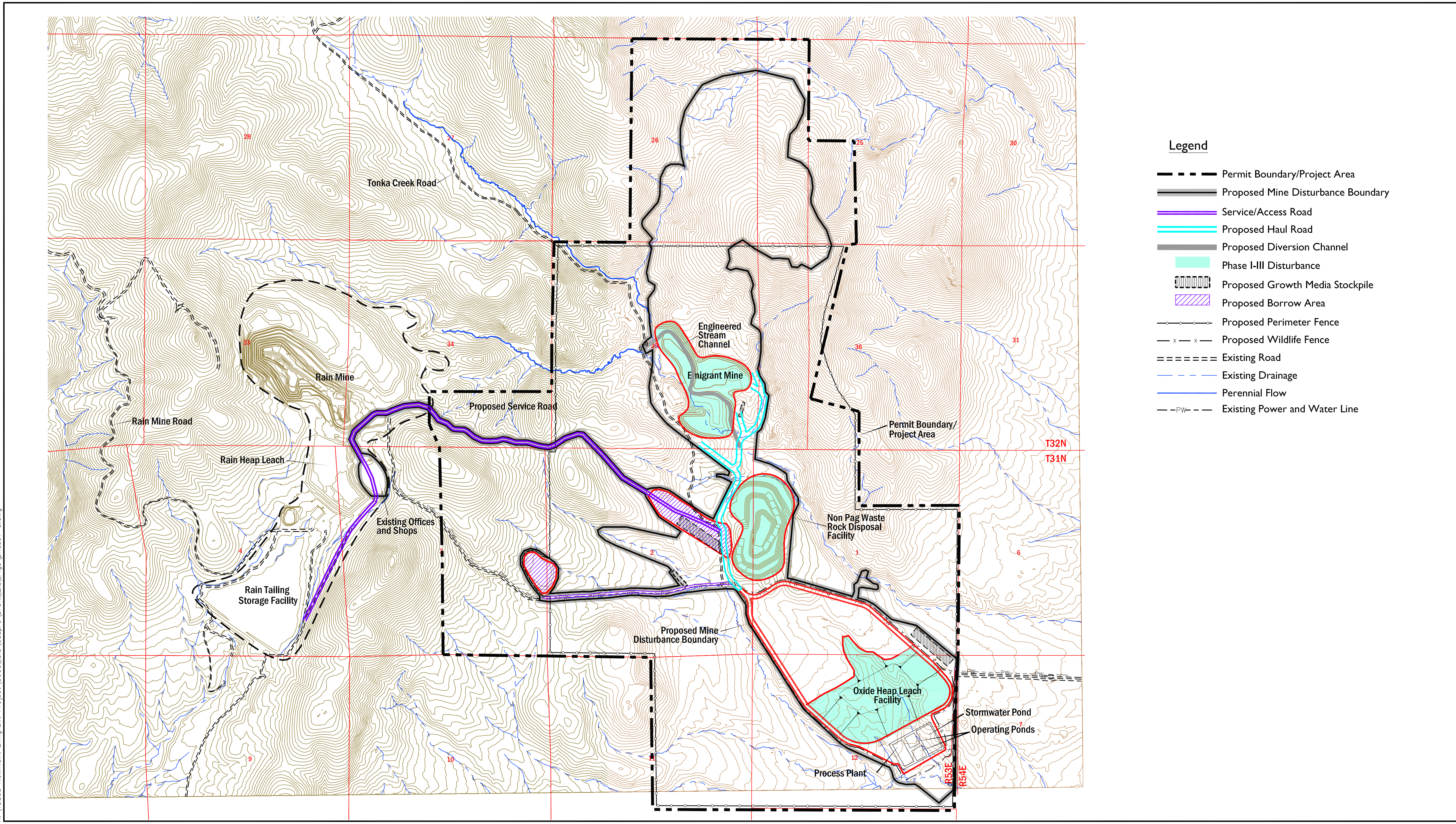
The intermittent stream that extends through the southern portion of the proposed mine pit would be permanently diverted (**Figure 2-2**). Phased construction of the new engineered stream channel is described in the *Mining Operations* section of this chapter. The engineered stream channel would be relocated along a pit bench at or near the bottom of the drainage and would require reconstruction as a result of mining operations.

To control and limit flow of alluvial groundwater into backfilled mine pits adjacent to the engineered stream channel, a slurry cutoff wall would be installed in the natural channel above the inlet to the engineered stream channel (**Figure 2-6**). Alluvial groundwater encountering the cutoff wall would pool on the upstream side of the cutoff wall. Once the pool fills to a level commensurate with the inlet to the engineered stream channel, water would flow into the channel.

The engineered stream channel would be lined with a geosynthetic clay liner and follow a constructed meandering pathway along the pit bench to replicate the natural drainage course. The channel design would incorporate step-pools, native riparian grasses (graminoides), shrubs, and rock weirs to create a drainage that appears and functions as a natural channel providing both aquatic and riparian habitat (**Photos 1** and **2**). This design is intended to restore the natural form and function of the stream channel. Final design of the engineered stream channel would be contingent upon BLM review and approval. Post closure reclamation of the sediment pond and slurry cutoff wall would include revegetation to establish riparian habitat as shown on **Figure 2-7**.

The pit bench upon which the diversion would be constructed would be about 50 feet wide and slope at a continuous grade of approximately 4 percent from the upgradient channel transition area to a point where the channel is returned to its natural course. The upgradient channel transition would be constructed on a 0.5 percent grade from the upstream transition between the natural drainage channel and the engineered stream channel. The engineered stream channel would be approximately 5,000 feet long. Flow from the engineered stream channel would be directed into the existing natural drainage at the southeastern edge of the pit.

Debris and large sediment catch basins would be constructed at the base of the pit highwall along the east side of the engineered stream channel to collect surface water run-off and rock debris dislodged upslope during mining. A levee with 3.0H/1.0V slopes would be constructed along the western edge of the engineered stream channel to provide protection during periods of high flow. Sediment control structures would be constructed behind the levee to capture and retain sediment. Both the catch basins and sediment control structures would be accessible with equipment and maintained on an as needed basis. A typical cross-section and features of the engineered stream channel are shown on **Figure 2-6**.



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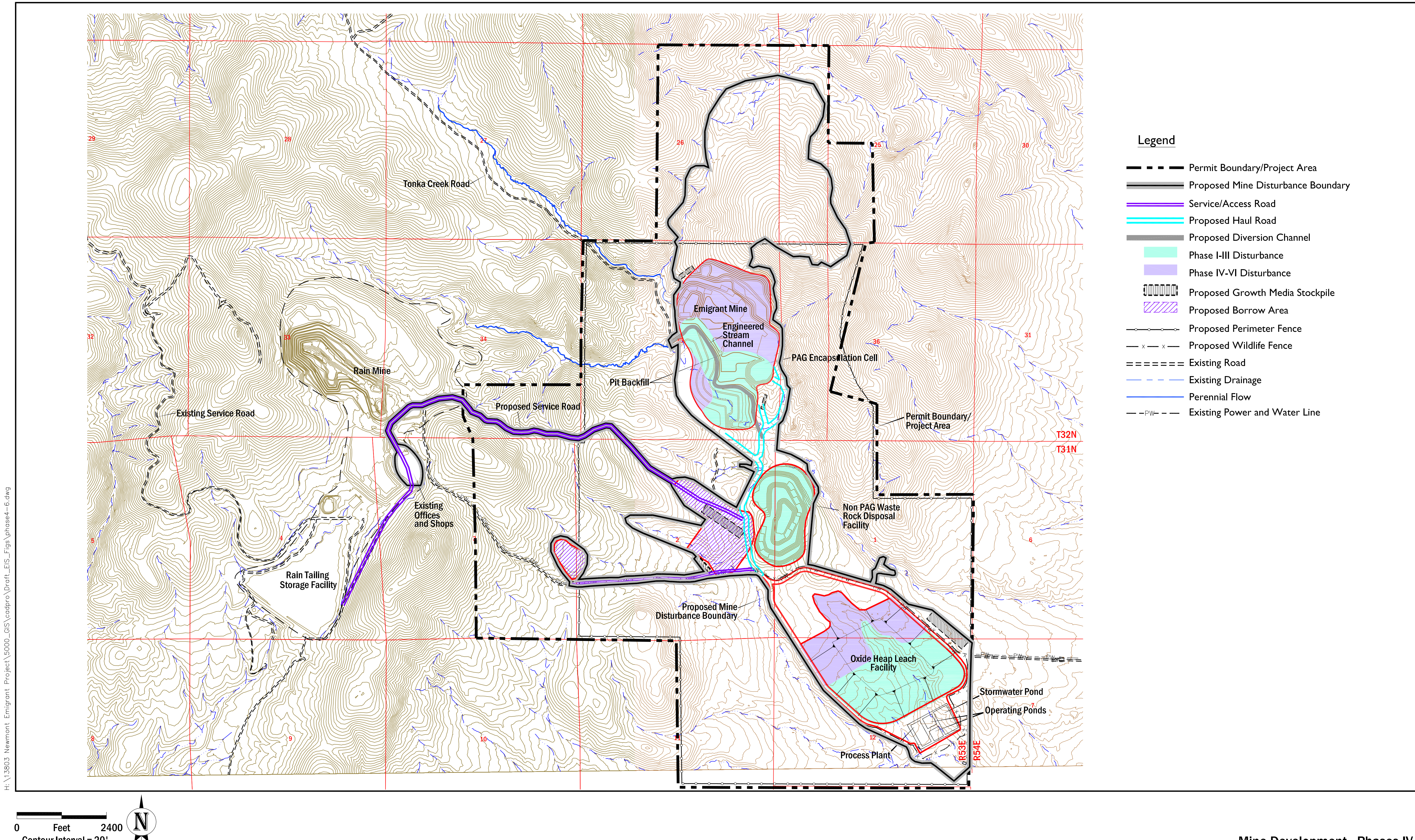
Elko, Nevada

Mine Development - Phases I-III
Emigrant Project
Elko County, Nevada
FIGURE 2-3



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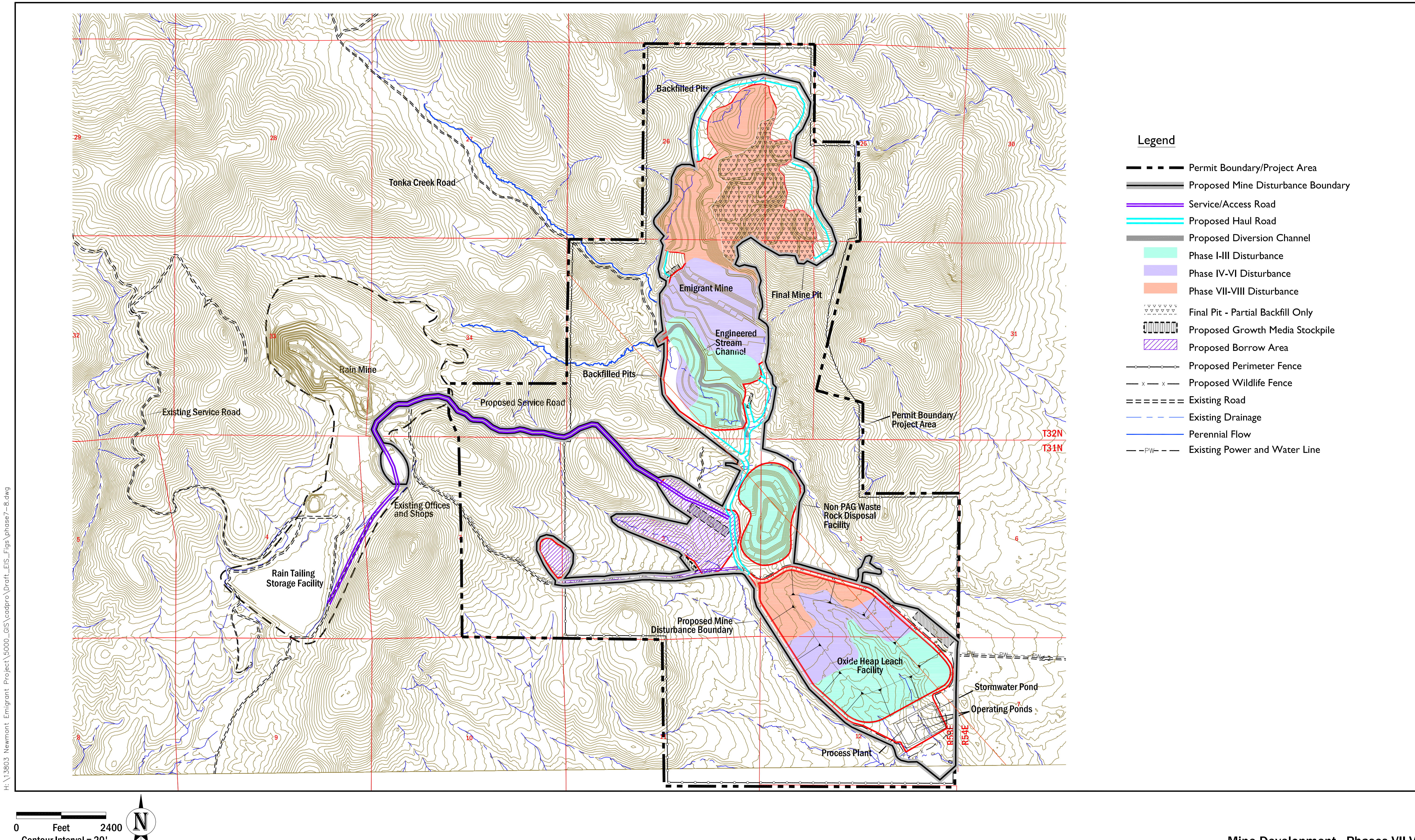
Mine Development - Phases IV-VI
Emigrant Project
Elko County, Nevada
FIGURE 2-4



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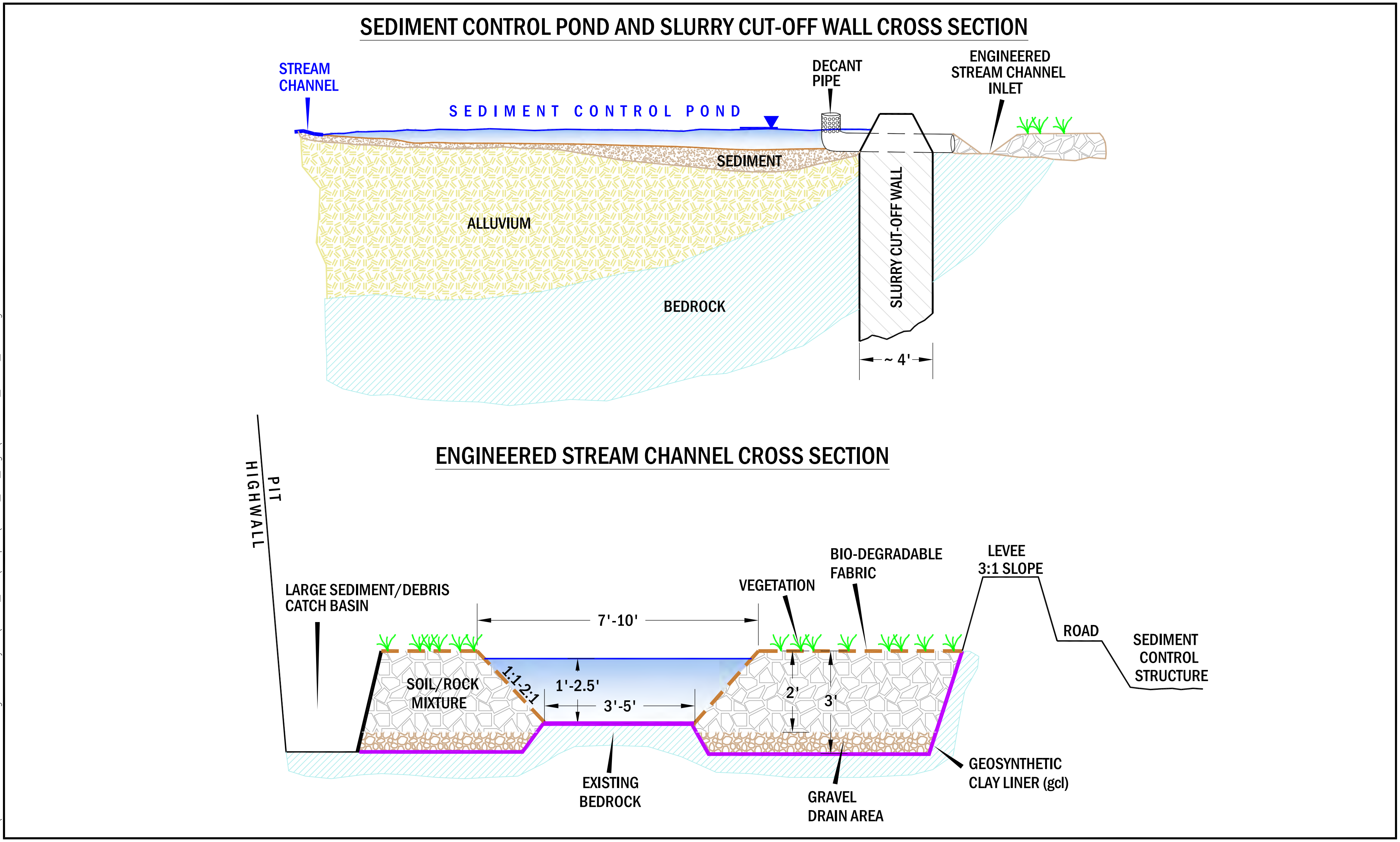
Mine Development - Phases VII-VIII
Emigrant Project
Elko County, Nevada
FIGURE 2-5



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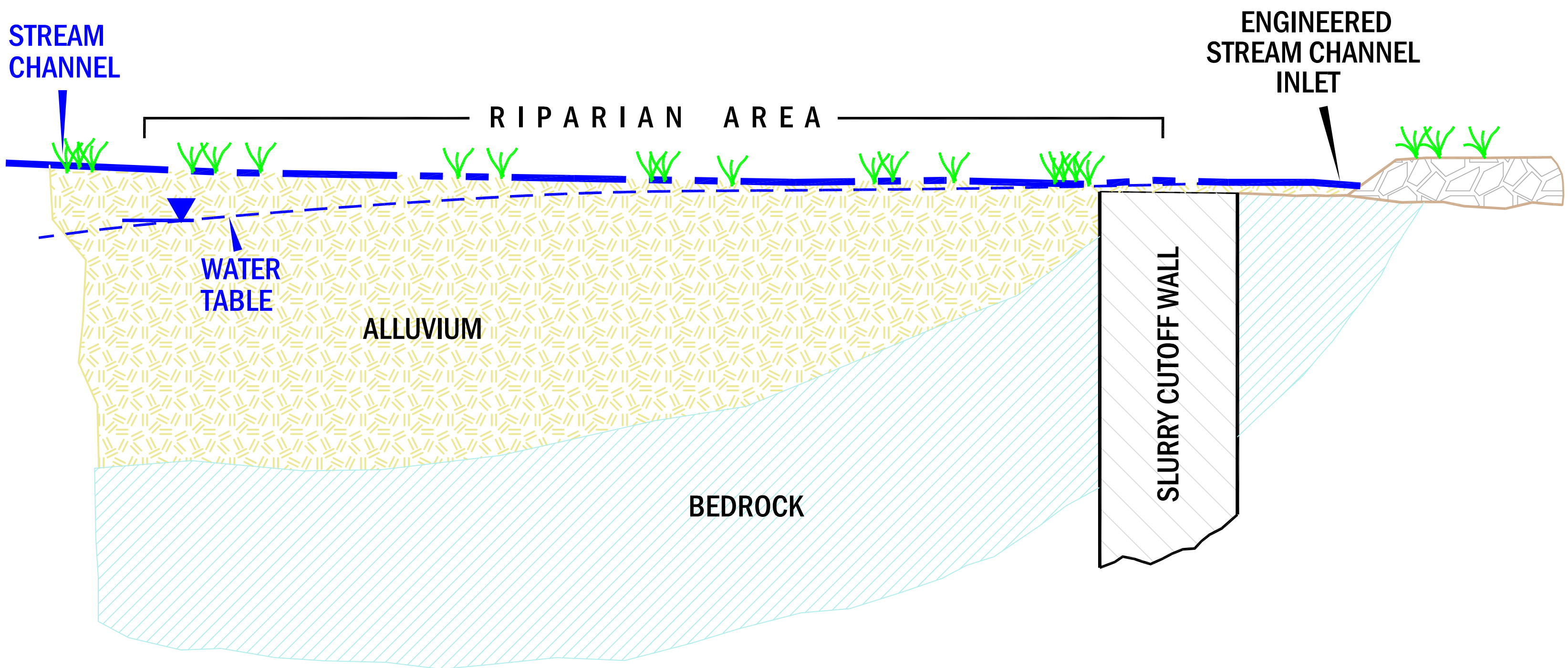
Engineered Stream Channel Details
Emigrant Project
Elko County, Nevada
FIGURE 2-6



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Elko, Nevada

Post Closure Sediment Pond and Slurry
Cutoff Wall Cross Section
Emigrant Project
Elko County, Nevada
FIGURE 2-7

Photo No. 1: Relocation of tributary to Bell Creek northwest of Carlin, Nevada, illustrates conceptual design for construction of engineered stream channel in the Emigrant drainage. Relocated channel includes sinuous meandering channel cobble bed, rock weirs, and riparian vegetation including willows, sedges, and rushes.

Photo No. 2: Relocated Bell Creek tributary has perennial flow in some stretches resulting in growth and establishment of wetland riparian vegetation supporting terrestrial and aquatic wildlife species.

The new engineered stream channel would be constructed to accommodate a 500-year storm event (3.9 inches). Culverts with reinforced concrete or non-PAG rip-rap headwalls would be installed where haul roads cross the channel. Culverts would be capable of conveying 100-year peak flow and installed in a manner to allow passage of aquatic life within engineering constraints. Flow in excess of culvert capacity would pass over the roadway. Non-PAG rip-rap would be incorporated into the diversion and at the discharge point to reduce potential coarse sediment effects. Applicable Clean Water Act (Section 404) permits would be obtained from the U.S. Army Corps of Engineers.

WASTE ROCK MANAGEMENT

In order to characterize the potential to generate acid and/or mobilize metals, various static and kinetic tests were performed on the primary rock types at the Emigrant Mine. Initial static testing was performed by Newmont in 2002, and due to the uncertainty of unoxidized rock to generate acid, Newmont performed supplemental testing in 2005 and 2006. Testing included static tests [Acid-Base Accounting; Peroxide Acid Generation (Net Acid Generating); and Meteoric Water Mobility Procedure], and kinetic tests (Humidity Cell and Biological Acid Production Potential tests). Paste pH measurements were also taken on samples undergoing humidity cell testing. A summary of test results is contained in *NCV and Paste pH Emigrant Project Waste Rock Characterization and a Proposed Method for Field Identification* (Newmont 2008a) on file at the BLM Elko District Office.

Non-PAG Waste Rock Disposal Facility

Development of the Emigrant Project would require construction of a non-PAG waste rock disposal facility to be located in portions of Sections 1 and 2, Township 31 North, Range 53 East. A portion of the non-PAG waste rock generated during the first three phases of mining would be placed in the non-PAG waste rock disposal facility. Subsequent waste rock generated during Phases IV through VIII would be placed as backfill within mined-out portions of the pit. The non-PAG waste rock disposal facility would be engineered for stability and designed, where practicable, with boundaries to blend with surrounding topography. The proposed non-PAG waste rock disposal facility would disturb approximately 78 acres (26 public and 52 private acres) and have a capacity of approximately 12 Mt. Remaining waste rock would be used for in-pit backfill.

Non-PAG waste rock would be placed by end-dumping down an advancing face in successive horizontal lifts of 20 to 60 feet, depending on topography. Approximate dimensions of the waste rock disposal facility are 2,750 feet long north to south, and 1,650 feet wide east to west. The waste rock disposal facility would be constructed to an overall height of 190 feet above ground surface with an operating slope of 1.4H:1.0V, and reclaimed at an overall average slope of 3.0H:1.0V.

Based on regional seismicity, a magnitude 7.0 earthquake on the Richter scale was used for design of the waste rock disposal facility. Since epicenters are not closely associated with identified faults in this region, the epicenter of a maximum credible earthquake could occur anywhere within the area (Ryall 1977). Consistent with standard and accepted design practices, the value of 0.13 gravity (g) is taken as two-thirds of the maximum horizontal ground acceleration of 0.2g expected to occur as a result of the design seismic event of 7.0 on the Richter scale. Newmont has designed the waste rock disposal facility with a horizontal coefficient of acceleration of 0.13g used to simulate earthquake loading for a pseudostatic case (Newmont 2007a).

Waste Rock Handling

Newmont would sample, test, and classify waste rock in accordance with NDEP Waste Rock and Overburden Evaluation Guidelines (NDEP 1994). Acid generating potential of mined waste rock would be determined in accordance with BLM acid rock drainage policy for activities authorized under 43 CFR 3802/3809 (BLM 1996). Classification is by net acid generation potential according to Acid-base Accounting (ABA) procedures and the Net Carbonate Value (NCV) system. Visual sulfide classification of waste rock is conducted by Newmont geologists from in-pit samples or blast-hole drill cuttings. The visual classification scheme is verified through laboratory analysis of blast-hole cuttings.

A summary of the classification procedure includes the following steps:

- Establish PAG identification from core logs and analyses from exploration holes (NCV [ASTM E1915-05]; Biological Acid Production Potential [Newmot 2004a]; X-ray diffraction/X-ray florescence; kinetic [ASTM D5744-96]; and Meteoric Water Mobility Procedure test work [Appendix B of Information Bulletin No. NV-96-97]).

- Computer modeling of known PAG zones to locate areas of concern.

- Blast-hole analyses, including NCV determination, visual geology and field hydrochloric acid neutralizing test.

- Engineers/geologists establish polygons for mining and special handling of PAG waste rock to encapsulation cells.

- Tracking PAG handling through Newmont's dispatch system.

- Monitoring PAG cells to ensure compliance with respective guidelines.

- Compliance sampling, analyses, and reporting. Compliance samples are collected for every 200 ktons of waste rock. A composite sample is sent to an independent state certified laboratory for analyses (Newmont 2003).

Approximately 83 Mt of waste rock would be mined from proposed mine pit areas. Of this total, about 5 percent (4 Mt) is projected to be PAG (carbon sulfur rock type). The remainder of waste rock would be either net neutralizing (oxide carbonate) or oxide siliceous, which is inert, slightly basic, or basic. During the first phases of mining (Phases I through III), 12 Mt (14% of total waste rock) of non-PAG oxide waste rock would be placed in the non-PAG waste rock disposal facility located south of the pit area. Most waste rock (86%) generated at Emigrant would be placed as backfill in mined-out portions of the pit. Pit floors are composed predominantly of Devils Gate limestone. Waste rock produced during each proposed mining phase is shown in **Table 2-3**.

Encapsulation Cell

Encapsulation cells would be constructed in the following manner:

- PAG waste rock would be placed on Devils Gate limestone in mined-out portions of the pit.

- PAG waste rock would be encapsulated with a minimum 10-ft thick layer of non-PAG acid-neutralizing waste rock.

- The surface of the PAG cell and backfill surface material would be sloped to eliminate pooling and minimize infiltration of meteoric water.

TABLE 2-3
Proposed Waste Rock Production and Classification
Emigrant Mine Project

Mining Phase	Total Waste Rock (tons)	Non-Potentially Acid Generating Waste Rock (tons)	Potentially Acid Generating Waste Rock (tons)	Potentially Acid Generating Waste Rock as % of Total
1	10,082,637	9,885,366	197,271	0.24
2	3,920,835	2,917,463	1,003,372	1.2
3	4,937,138	4,846,050	91,088	0.1
4	21,748,659	21,188,549	560,110	0.68
5	4,584,876	4,060,863	524,013	0.64
6	15,557,583	14,248,075	1,309,508	1.6
7	12,022,729	11,854,152	168,577	0.20
8	9,578,032	9,429,909	148,123	0.18
Total	**82,432,489**	**78,430,427**	**4,002,062**	**4.9**

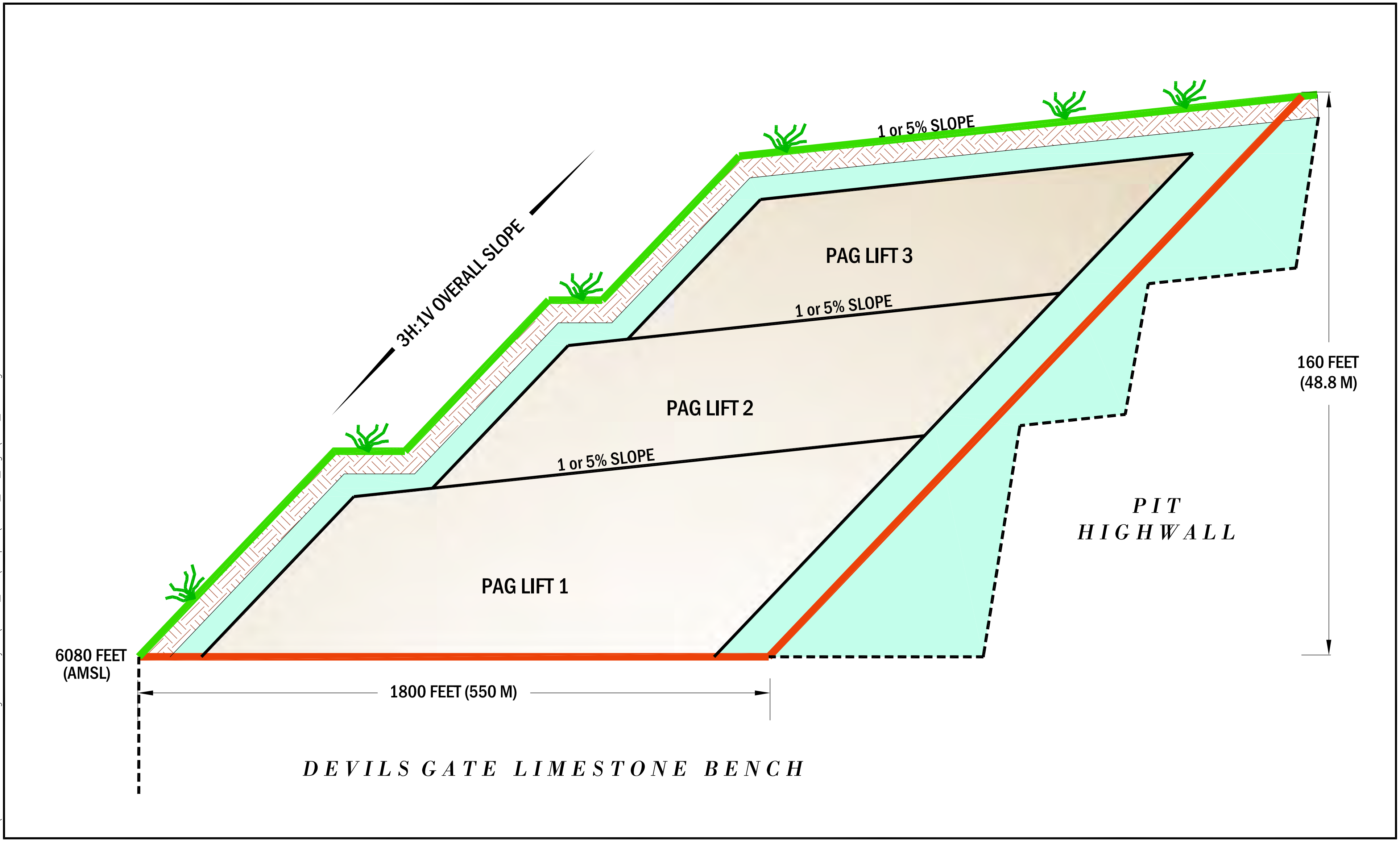
Note: NCV = Net Carbonate Value (%CO_2). Revised NCV criteria for classification of potentially acid generating rock are [NCV < 0% CO_2] or [NCV > 0% CO_2 and Paste pH <6].
Source: Newmont 2008a.

The ratio of non-PAG to PAG waste rock averages greater than 30:1 across all phases of mining. Based on current mine design, adequate quantities of non-PAG waste rock would be available for use in construction of the 10-ft thick encapsulation layer. Encapsulation cells are designed to minimize exposure of PAG waste rock to atmospheric oxygen and water from precipitation and snowmelt. Typical placement and encapsulation of PAG material is shown on **Figure 2-8** (Newmont 2007a).

HEAP LEACH FACILITY

Ore produced at the Emigrant Mine would be processed using run-of-mine oxide heap leach techniques. Lime would be added to the ore at the lime silo as it is transported to the heap leach facility. Coarse lime (minimum 1/8-inch diameter) would be added to the ore in order to maintain a consistent pH level of the cyanide solution used in the heap leach facility. The proposed location of the lime silo is shown on **Figure 2-2**.

The zero discharge heap leach facility would be constructed in three phases (**Figure 2-5**) on approximately 344 acres (214 acres public land and 130 acres private land) in portions of Sections 1 and 12, Township 31 North, Range 53 East (**Figure 2-2**). The ultimate leach pad would be approximately 2,800 feet wide and 5,000 feet long, and designed to contain 92 Mt of ore. Loaded to its ultimate configuration, the maximum height would be approximately 300 feet above ground surface. Temporary surface water control ditches would be constructed around each of the three successive phases of heap leach pad development. The heap leach pad would be developed in six construction stages: 1) remove and stockpile growth media; 2) blend and compact remaining subsoil and selected borrow materials to attain a low-permeability (12 inches of 1×10^{-6} centimeters per second [cm/sec]) subgrade; 3) install an 80-mil (0.080-inch) double-textured, high density polyethylene (HDPE) liner; 4) place 12 inches of



Free Drainage Boundary
Atmospheric Boundary

Soil Cover (0.5 ft or 2 ft Minimum Thickness)
PAG Material
Non-PAG Material (10 ft Minimum Thickness)

Not To Scale

U.S. Department of the Interior
Bureau of Land Management
Elko District Office
Elko, Nevada

Typical Encapsulation Cell
Emigrant Project
Elko County, Nevada
FIGURE 2-8

fine-grained (100 percent passing a #4 sieve) gravel material over the liner as a protective layer; 5) place an 18-inch thick coarse rock layer over the lateral collector and header pipes to enhance drainage through the pad and minimize hydraulic head on the liner system; and 6) place ore in successive lifts on the prepared base and liner (Newmont 2005a). A cross-section of the leach pad liner system proposed for the Emigrant Project heap leach facility is shown on **Figure 2-9**. Final design would require NDEP approval.

A leak detection system would be installed under areas of concentrated flow such as solution collection headers, to monitor potential seepage through the liner system. Perforated pipe would be installed in 80-mil HDPE-lined trenches cut into subgrade material beneath key areas in the leach pad liner system (**Figure 2-9**). The leak detection system piping would flow to a collection sump which would be monitored by site personnel (Newmont 2005a).

Three types of material would be used during construction of the heap leach facility: 1) prepared subgrade; 2) protective layer; and 3) drainage layer. Borrow sources (**Figure 2-2**) would be developed to provide material for construction. Borrow areas are described in detail later in this chapter. During construction of the heap leach facility, fine-grained material would be excavated and hauled for use as the over-liner protective layer placed on the synthetic liner (construction stage 4 above).

Solution exiting the leach pad drainage system would pass through a launder box designed to direct flow of pregnant solution to the process ponds or directly to the processing plant. Solution would be conveyed from the launder to its destination via HDPE piping installed in HDPE-lined conveyance channels. Channels would be designed to contain maximum potential flow volume, plus the flow resulting from a 100-year, 24-hour storm event, plus the maximum capacity of the piping, and serve as secondary containment in case of a release.

Loading the heap facility would progress from the lower southeast end of the facility to the northwest in phases. Loading of Phases 1, 2, and 3 (ultimate loading) is shown on **Figure 2-5.** Ore would be placed on the heap leach pad in lifts ranging from 15 to 60 feet depending on topography and processing needs. Benches approximately 30 feet wide would separate each lift. The surface of each lift would be ripped to facilitate percolation of process solutions. A weak barren cyanide solution (barren of metals) would be applied to the surface using drip tubes or sprinklers.

The cyanide solution would migrate through the ore; dissolve the gold and silver contained in the ore, and drain to a central collection point at the base of the ore pile. Leach solution containing dissolved gold and silver would then be pumped from the collection point to a series of carbon columns, where the gold and silver would be adsorbed onto the carbon (Carbon-in-Column recovery system). Process solution would then be recycled back to the leach pad for reuse. About once a week, loaded carbon (carbon containing metal) would be transported to Newmont's Gold Quarry processing facility (about 7 miles north of Carlin) for treatment.

Solution flow rates would be designed for 9,000 gallons per minute (gal/min) to allow for surge capacity, but would operate at 7,000 gal/min. Makeup water required for the heap leach facility would average about 200 gal/min (approximately 100 million gal/year for about 14 years) with most losses attributable to evaporation and moisture retention of the ore. Makeup water requirements would be reduced in subsequent years. Makeup water would be supplied from existing groundwater wells located in the Dixie Creek Valley, currently used to supply water to the Rain Mine.

PROCESS PONDS

Three process ponds including two operational ponds measuring approximately 325 by 350 feet, each with a capacity of 10 million gallons, and a storm water (event) pond approximately 410 by 700 feet with a capacity of 30 million gallons, would be constructed approximately 800 feet southeast of the heap leach facility (**Figures 2-2**). The ponds would be designed with side-slopes of 2.5H:1.0V and depths ranging from 20 to 25 feet. Pond liner systems would be constructed in the following manner from bottom to top: 12 inches of prepared subgrade; secondary 80-mil HDPE geomembrane; leak detection system consisting of a geonet; and a primary 80-mil HDPE geomembrane.

The geonet layer between the geomembrane layers would allow for collection of fluids that may seep through the primary geomembrane. A cross-section showing construction of the ponds is on **Figure 2-9**. The ponds would be connected by spillways such that flow would be contained within the two operational ponds before spilling to the storm water pond.

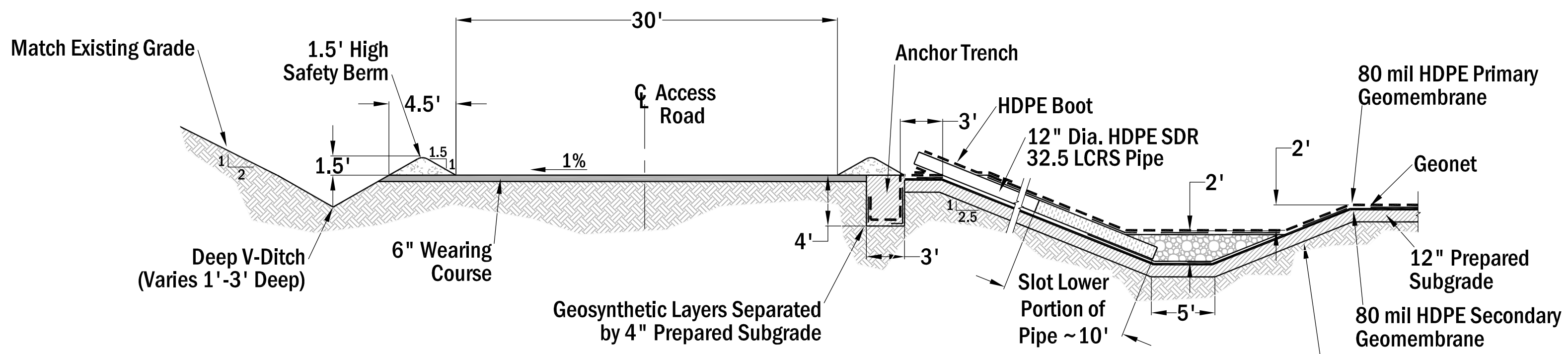
The heap leach facility and processing ponds would be fenced to preclude access by wildlife in accordance with NRS 502.390 (Newmont 2005a). Process ponds containing chemicals in solution at concentrations lethal to wildlife (*e.g.*, barren and pregnant solution ponds) would be covered or contained to preclude access by birds and bats for as long as the pond contains solution. NDOW representatives would periodically check on the status of the protective measures. Newmont has obtained an Industrial Artificial Pond permit from NDOW in accordance with NRS 501.181, 502.390, and NAC 502.

SURFACE WATER AND SEDIMENT CONTROLS

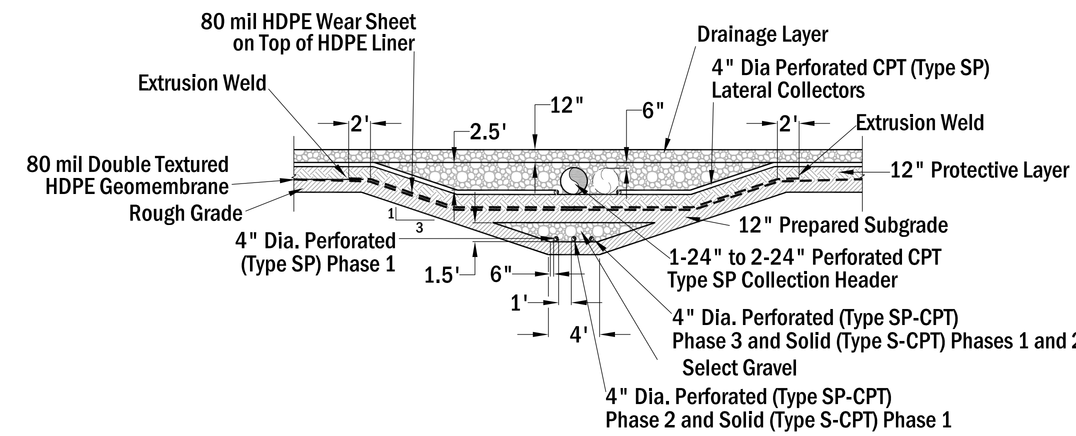
Surface water run-off would be controlled within the mine site by construction of diversion ditches, berms, and sediment and water retention structures. Surface water control ditches would be constructed as necessary around the heap leach facility and non-PAG waste rock disposal facility to control storm water run-on to these sites. Surface water control ditches and sediment retention ponds would be designed and constructed in accordance with Best Management Practices (BMPs) as outlined in the Handbook of Best Management Practices (Nevada State Conservation Commission 1994) and a Storm Water Pollution Prevention Plan (Newmont 2005a). Sediment ponds and diversion ditches would be sized to contain a 100-year, 24-hour precipitation event of 2.8 inches. Locations of sediment control ponds are shown on **Figure 2-2**.

Sediment control structures would be constructed as needed in response to advancing mine operations. Specific sediment control structures would include:

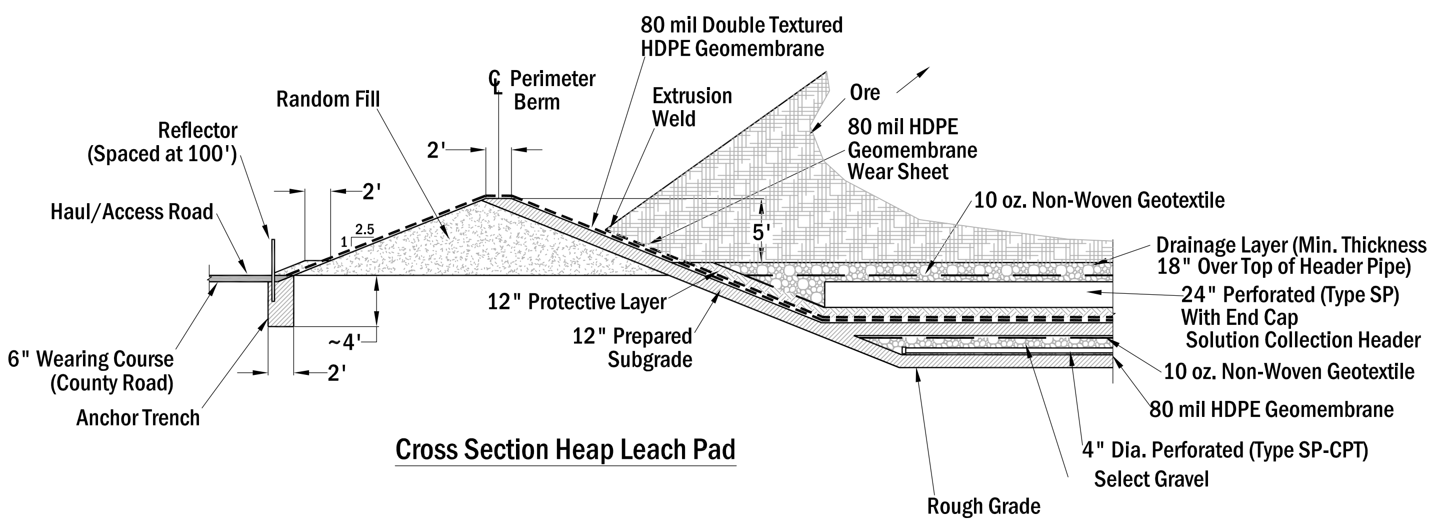
- Permanent and temporary surface water diversion channels around the heap leach pad to direct water flow away from the facility into natural drainage channels down stream.
  - Diversion channels around the east side of the leach pad would parallel the county road right-of-way.
  - A diversion channel along the west side of the heap leach pad to divert water run-off from the haul road away from the pad and into natural drainages downstream of the process ponds.



Proposed Pond Liner



Internal Solution Channels



Cross Section Heap Leach Pad

H:\13803 Newmont Emigrant Project\5000_GIS\cadpro\Draft_EIS_Figs\leachxsec.dwg

0 Feet 15

U.S. Department of the Interior
Bureau of Land Management
Elko District Office
Elko, Nevada

Proposed Leach Pad and Process Liner Systems
Emigrant Project
Elko County, Nevada
FIGURE 2-9

A large sediment/debris catch basin at the toe of the high wall adjacent to the engineered stream channel with additional check structures within the channel proper (see discussion under *Engineered Stream Channel* in this chapter).

- Long-term control of soil movement from the heap leach pad would be accomplished by establishing vegetation on the slopes. Short-term control would use BMPs such as dozer tracking and sediment filter barriers at the toe of the fill slopes.
- Run-off from the non-PAG waste rock disposal facility would be directed toward Borrow Area #1 and into sediment collection basins where topography permits. Sediment filters would also be used at the toe of the non-PAG waste rock disposal facility.

Newmont has obtained a storm water discharge permit from NDEP which includes design criteria, monitoring program, and a Storm Water Pollution Prevention Plan (Newmont 2005a). Storm water would be controlled using BMPs as defined by Nevada State Conservation Commission (1994). These BMPs address material handling procedures that minimize exposure of materials to storm water; define spill prevention and response measures; identify sediment and erosion control measures; and describe physical storm water controls.

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

Berms and ditches would be constructed as appropriate to preclude meteoric water from flowing into mine pits, or onto the non-PAG waste rock disposal facility. Sediment control structures would include silt traps and fences using certified weed free straw, hay bales, or geotextile fabric, and sediment ponds. Sediment ponds would be constructed at the upstream and downstream end of the engineered stream channel to capture sediment released from mining and related disturbances. Sediment ponds would be removed once vegetation has stabilized on reclaimed areas.

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

HAUL AND ACCESS ROADS

Development and operation of the Emigrant Project would require approximately 37 acres of disturbance on public land for construction of haul, access, and service roads (**Figure 2-2**). Proposed haul roads would be 100 to 120 feet wide (running width) to safely accommodate haul truck traffic with a maximum gradient of 10 percent. Haul roads would be maintained on a continuous basis to ensure safe, efficient haulage operations and to minimize fugitive dust emissions in accordance with the NDEP Bureau of Air Pollution Control Class II Air Quality Operating Permit, No. AP1041-2085. Haul roads would be constructed using non-PAG in-situ or oxide waste rock as necessary, for construction or routine maintenance. Access and service roads would be constructed to an average width of 70 feet using in-situ materials and non-PAG waste rock similar to haul roads. Berms (approximately 5 to 6 feet in height) would be constructed along each side of access and haul roads. Breaks in the berms would be constructed to allow wildlife passage through the area. The service road from the Rain Mine shop complex to the Emigrant Mine is shown on **Figure 2-2**. An existing county road right-of-way would be relocated around the heap leach facility.

ANCILLARY FACILITIES

Ancillary facilities would be constructed at the Emigrant Mine including: operations office, septic leach field, truck ready-line and equipment fueling facility, electrical substation, lime silo, prill silo, explosive magazine, water fill stations for water trucks, and growth media stockpiles. The operations office and septic leach field would be located south of the heap leach pad next to the processing plant (**Figure 2-2**). Equipment and vehicle maintenance would be performed at existing shops located at the Rain Mine.

Equipment Fueling Facility

The equipment fueling facility and ready line would be constructed near the prill silo and consist of above ground storage tanks with a total capacity of approximately 30,000 gallons of diesel fuel. A lined spill containment basin would be constructed around bulk storage tanks to contain 110 percent of the volume of the largest tank.

Spill Prevention and Response

In accordance with Newmont's Spill Prevention, Control, and Countermeasure (SPCC) Plan (Newmont 1997), all maintenance facilities would be equipped with spill response materials. Earth moving equipment would be available from the mining operation for constructing dikes. Above-ground tanks and associated piping would be visually inspected for leaks on a daily basis. Bulk storage tanks would be constructed with secondary containment to accommodate 110 percent of volume of the largest tank.

Newmont personnel would be instructed in operation and maintenance of equipment to prevent discharge of oil. Spill response training would be provided through the Environmental Compliance Awareness Program outlined in Newmont's Emergency Response Plan (Newmont 2006). Supervisors would schedule and conduct spill prevention briefings for appropriate personnel to include a review of the SPCC Plan, spills, malfunctioning components, and precautionary measures. Emergency response procedures and clean-up would be conducted in accordance with Newmont's Emergency Response Plan (Newmont 2006a).

Growth Media Stockpiles

Prior to commencing mining activities, growth media would be salvaged and stockpiled for future use in reclaiming disturbed areas. Proposed growth media stockpile areas for material salvaged from Phase I of the heap leach facility, non-PAG waste rock disposal facility, and initial pit development are shown on **Figure 2-2**. Growth media salvaged during construction of Phases II and III of the heap leach facility would be stockpiled in the north end of Borrow Area #1 (GM #3 on **Figure 2-2**). The following estimates of growth media volumes are for the initial development stage only, and do not include additional growth media available for reclamation that would be salvaged during phased development of the heap leach facility and borrow areas.

Growth media stockpile #1 (GM#1) would contain approximately 318,000 cubic yards (yd^3) of material stripped from Phase I construction of the heap leach facility. Growth media stockpile #2 (GM#2) would contain approximately 50,000 yd^3 of material salvaged from Borrow Area #1 (BA#1). Growth media stockpile #3 (GM#3) would contain material salvaged from the base of the non-PAG waste rock disposal facility (approximately 186,000 yd^3) and Phases II and III of the heap leach facility (approximately 414,000 yd^3). Growth media stockpile #4 (GM#4) would contain approximately 10,000 yd^3 of material stripped from the initial mine pit during Phases 1 and II. In addition, several small stockpiles would be created adjacent to the new haul road during construction of the road.

Borrow Areas

Three borrow areas would be developed to provide material for construction of the heap leach facility and growth media for use in reclamation. Locations of borrow sources are shown on **Figure 2-2**.

Borrow Area #1 (BA#1) would be located adjacent to the non-PAG waste rock disposal facility and would disturb approximately 83 acres of public land. This source would provide approximately 1.3 million yd^3 of borrow material. Borrow Area #2 (BA#2) is an existing source and would be expanded to produce approximately 475,000 yd^3 within an existing surface disturbance of 16 acres (13 private and 3 public acres). An existing road would be widened and used to access and transport material from Borrow Area #2.

Approximately 165,000 yd^3 of material would be excavated from within the proposed disturbance boundary of the heap leach facility for use as a protective layer over the synthetic liner during construction of the heap leach facility.

Growth media would be salvaged and stockpiled from Borrow Areas #1 and #2 for use in reclamation. Final slopes would be regraded to an overall average of 3.0H:1.0V, and final stage pit floors that are not backfilled would be shaped and graded with growth media to facilitate drainage and prevent ponding.

Energy

Electrical energy would be provided by accessing an existing 25-kilovolt (kV) line that currently services the Rain Mine. An existing line supplying power to water wells in Dixie Valley would be rerouted around the heap leach facility. A new 3000-kV electrical substation would be constructed near the southeast corner of the heap leach facility. An additional 1000-kV substation would be constructed near the ready line.

Water Supply Wells and Water Use

Two water supply wells were installed by Newmont in 1988 along Dixie Creek to provide water for the Rain Mine. Well logs indicate that the production wells (RPW-1 and RPW-2) were completed to depths ranging from 700 to 860 feet below ground surface and collectively produce up to 1,500 gal/min. Water from these production wells is transported 6 miles to the Rain Mine by a 12-inch diameter buried pipeline within right-of-way (N-47282) issued by BLM to Newmont. The right-of-way also includes an overhead powerline and access road.

Water use at the Rain Mine would continue for about 5 years at an expected rate of 2 to 3 million gal/year, which has been the pumping volume for the Rain Mine since 2005 (Newmont 2008b). The proposed volume to be pumped from the Dixie Creek Valley production wells for the Emigrant Project would total about 130 million gal/year (105 million gal/year as make-up water for the heap leach facility and 25 million gal/year for dust suppression, equipment wash bay, potable, and sanitary use). The combined pumping volumes for the Emigrant Mine and

Rain Mine, therefore, would be approximately 133 million gal/year, but usage would decrease after 5 years as the Rain Mine is decommissioned.

WILDLIFE PROTECTION MEASURES

Fencing

The heap leach facility and process ponds would be fenced to preclude access by terrestrial animals. The fence would be 8 feet high, the bottom 4 feet of which would be composed of woven or mesh wire with not greater than 2-inch mesh on the bottom 2 feet and a maximum of 8-inch mesh on the top. The bottom would be placed tight to the ground level to prevent animals from gaining access under the fence. The remainder of the fence above the woven or mesh wire would be smooth or barbed wire with a spacing of 10, 12, and 14 inches beginning from the top of the woven or mesh wire. If cyclone or chain-link fence is used, the only applicable conditions would be the 8-foot height and tight-to-ground requirement.

Covering/Containment

Bird balls or netting would be placed on or over process ponds containing chemicals in solution at concentrations lethal to wildlife (e.g., barren and pregnant solution ponds) to preclude access by birds and bats for as long as the ponds contain solution. NDOW representatives would periodically check on the status of the protective measures.

RESOURCE MONITORING

Air Quality

Emissions from the lime silo would be monitored in accordance with requirements imposed by an NDEP Air Quality Operating Permit. Fugitive emissions would be controlled using BMPs as defined by the Nevada State Conservation Commission (1994). Dust emissions would be controlled through use of water, approved chemical binders or wetting agents, dust collection devices, water sprays, and revegetation of disturbed areas concurrent with operations.

Water Resources

Water resources in the Project area would be monitored within the Dixie Creek hydrographic basin as part of Newmont's Plan of Operations (Newmont 2007a). The monitoring program would be developed in conjunction with NDEP to address groundwater, springs/seeps, and streams/rivers. The purpose of water monitoring is to establish baseline data and report changing conditions as mining and ore processing operations are conducted in the area. Three groundwater monitoring wells have been installed to date on the Project site. One is located down-gradient of the waste rock storage facility, and two others, a shallow alluvial well and deeper bedrock well, have been installed down-gradient of the proposed heap leach facility. These wells would be sampled quarterly and results reported to NDEP and BLM in accordance with State Water Pollution Control Permit requirements.

Other monitoring wells may be required by the State prior to issuing a mine permit. Location of additional monitoring wells would be approved by NDEP and BLM and incorporated into Newmont's Water Monitoring Program. Water quality, groundwater levels, and surface water flow would be measured as required at designated monitoring wells, springs and seeps, and surface water stations. Monitoring reports would be prepared by Newmont to summarize water resource monitoring data collected in accordance with State Water Pollution Control Permit requirements.

Cultural Resources

Cultural resource inventories have been completed for the Emigrant Project area. Three cultural resource sites were mitigated due to proposed disturbance by various mine facilities. No sites eligible for listing on the National Register of Historic Places would be affected. New sites that may be discovered during proposed surface disturbing activities or by future cultural inventories would either be avoided or mitigated by Newmont in accordance with Section 106 of the National Historic Preservation Act (see Chapter 3 - *Cultural Resources*).

Paleontological Resources

Paleontological resources have not been identified within the Emigrant Project area. In the event vertebrate fossils are discovered within the Project area during mining operations, Newmont would notify the BLM Authorized Officer. Actions that could occur after notification include cessation of mining activities in the area of discovery; verification and preliminary inspection of the discovery; and development/ implementation of plans to avoid or recover the fossils.

Wildlife

Newmont has obtained an Industrial Artificial Pond permit from NDOW in accordance with NRS 501.181, 502.390, and NAC 502. Measures would be implemented to prevent wildlife mortality occurring as a result of contact with the heap leach facility and associated process ponds. Newmont would inspect these facilities daily and maintain a record of wildlife mortalities associated with them. Reports would be submitted to NDOW on forms provided by the agency.

SOLID AND HAZARDOUS WASTE

Solid Waste

All non-hazardous solid waste generated at the Emigrant Mine would be disposed in an NDEP approved Class III waivered landfill established at the mine site or in an existing landfill at the Rain Mine. Typical solid waste generated at the Emigrant Project would include paper, plastic packaging, and household type refuse.

Hazardous Waste

Hazardous waste is defined as any solid waste that meets criteria in 40 CFR 261.10 through 261.35. Under the Resource Conservation and Recovery Act (RCRA), solid waste from the "extraction, beneficiation, and processing of ores and minerals" are excluded from hazardous wastes designation as a result of the Beville Exclusion (40 CFR 261.4(b)(7). The Emigrant Mine would operate as a Conditionally Exempt Small Quantity Generator of hazardous waste as defined by RCRA because the facility would generate less than 220 pounds (100 kilograms) per month of RCRA-regulated hazardous waste (40 CFR Part 260-270) under EPA Identification No. NVD 982-486-300. Hazardous wastes would be stored in covered 55-gallon drums and periodically transported to an approved treatment, storage, and disposal facility. When practicable, wastes would be sent to recycling facilities. All hazardous wastes would be stored, packaged, and manifested in compliance with applicable federal and state regulations.

Hazardous Materials

Quantities Greater Than Reportable Quantities

The term "hazardous materials" is defined in 49 CFR 172.101. Hazardous substances are defined in 40 CFR 302.4 and the Superfund Amendments and Reauthorization Act Title III. Hazardous materials and hazardous substances that would be transported, stored, or used in quantities greater than the Threshold Planning Quantity designated by Title III for emergency planning are summarized in **Table 2-4**.

Hazardous materials are transported to the Rochester Mine via Highway 278 south of Carlin, then approximately 10 miles south on the Rain Mine road to the Rain Mine, and then via mine access roads to the site.

U.S. Department of Transportation (USDOT) regulated transporters would be used for shipment. U.S. Department of Transportation approved containers would be used for on-site storage (Newmont 2007a), and spill containment structures would be provided. Hazardous materials would be stored in designated areas on private and public land.

Quantities Less Than Reportable Quantities

Small quantities of hazardous materials less than the Threshold Planning Quantity not included in **Table 2-4** would also be managed at the Emigrant Project. These include vehicle and equipment maintenance products, office products, paint, and batteries.

TABLE 2-4
Hazardous Materials Management
Emigrant Mine Project

Substance	Area Used/Stored	Rate of Use (per year)	Quantity Stored On-site	Storage Method	Waste Management
Diesel Fuel	Mine/truck shop	5,300,000 gal.	35,000 gal.	Bulk tank	No waste
Hydraulic Fluid	Mine/truck shop	-	5,000 gal.	Bulk tank totes, drums	Recycled
Motor Oil	Mine/truck shop	-	5,000 gal.	Bulk tank totes, drums	Recycled
Antifreeze	Mine/truck shop	-	5,000 gal.	Bulk tank totes, drums	Recycled
Explosives	Prill Silo	8,000,000 lbs.	370,000 lbs.	Silo	No waste
	Explosive (powder) magazine	50 tons	2,500 lbs.	Magazine	No waste
Gasoline	Mine/truck shop	-	5,000 gal.	Bulk tank	No waste
Propane	Mine/surface	-	5,000 gal.	Bulk tank	No waste
Grease	Mine/truck shop	-	1,000 gal	Totes, drums	Recycled
Cyanide	Leach Pad	8,200,000 lbs.	7,000 gal	Bulk tank	No waste
Lime	Heap Leach Facility/Lime silo	26,000 tons	250 tons	Silo	No waste

gal = gallons; lbs. = pounds
Source: Newmont 2007a.

Emergency Response

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

Newmont would implement an Emergency Contingency Hazardous Waste Plan (Newmont 2007b) and an Emergency Response Plan (Newmont 2006a) to address accidental spills or releases of hazardous materials to minimize health risk and environmental effects. The plans include procedures for evacuating personnel, maintaining safety, cleanup and neutralization activities, emergency contacts, internal and external notifications to regulatory authorities, and incident documentation. Proper implementation of the Emergency Contingency Hazardous Waste Plan and Emergency Response Plan is expected to minimize the potential for impacts associated with potential releases of hazardous materials.

Toxic Release Inventory

Under Emergency Planning and Community Right-To-Know Act Section 313 guidance, Newmont would be required to report the amount of toxic release inventory chemicals that would be placed in disposal facilities as a "release amount." Waste rock is exempt from reporting under the Toxic Release Inventory regulations.

HUMAN HEALTH AND SAFETY

Human health and safety at the Emigrant Project would be regulated under the federal Mine Safety and Health Act of 1977, which sets mandatory safety and health standards for metal mines, including open pit mines. The purpose of these health and safety standards is the protection of life, promotion of health and safety, and prevention of accidents. Mine Safety and Health Act regulations are codified under 30 CFR Subchapter N, Part 56. Employees at the Emigrant Project would be required by Newmont to receive training as outlined in **Table 2-5**.

Noise

Noise levels are quantified using units of decibels (dB). Humans typically have reduced hearing sensitivity at low frequencies compared with their response at high frequencies. The "A-weighting" of noise levels, or A-weighted decibels (dBA), closely correlates to the frequency response of normal human hearing (250 to 4,000 hertz). By using A-weighted noise levels in an environmental study, a person's response to noise can typically be assessed. Because decibels are logarithmic values, the combined noise level of two 50 dBA noise sources would be 53 dBA, not 100 dBA.

Many different A-weighted metrics can be used to describe and quantify noise levels. The equivalent noise levels, L_{eq}, during a certain time period uses a single number to describe the constantly fluctuating instantaneous ambient noise levels at a receptor location during a period of time, and accounts for all noises and quiet periods that occur during that time period.

Noise levels at the Emigrant Project would vary during construction, mining, and reclamation activities. No residences, campgrounds, or recreation facilities are located within a 5-mile radius of the Project area. Noise sources within a 5-mile radius include the Rain Mine heap-leach processing and reclamation activities, wind-generated noise through grass and trees, flowing water in creeks, wildlife, aircraft flying overhead, and vehicles traveling on roads.

TABLE 2-5
Emigrant Project Health and Safety Training Programs

Course	Personnel	Frequency	Duration	Instruction
New-hire Training	All new hires exposed to mine hazards	Once	24 hours	Employee rights Supervisor responsibilities Self-rescue Respiratory devices Transportation controls Communication systems Escape and emergency evacuation Ground control hazards Occupational health hazards Electrical hazards First aid Explosives Toxic materials
Task Training	Employees assigned to new work tasks	Before new assignments	Variable	Task-specific health and safety procedures Supervised practice in assigned work tasks in nonproductive duty
Refresher Training	All employees who received new-hire training	Yearly	8 hours	Required health and safety standards Transportation controls Communication systems Escape ways, emergency evacuations Fire warning Ground control hazards First aid Electrical hazards Accident prevention Explosives Respirator devices
Hazard Training	All employees exposed to mine hazards	Once	Variable	Hazard recognition and avoidance Emergency evacuation procedures Health standards Safety rules Respiratory devices

Equipment proposed for use during construction, mining, and/or reclamation activities would include drill rigs, down-hole blasting, end-dump trucks, front-end loaders, shovels, and other standard construction and earthmoving equipment. Each individual piece of construction and earthmoving equipment can typically generate intermittent noise levels up to 90 dBA at a distance of 50 feet from the equipment (USDOT 1995). However, equipment noise can vary considerably depending on age, condition, manufacturer, use, and changing distance from the equipment to receptor location. **Table 2-6** indicates the estimated noise levels per activity at varying distances from the source(s).

Short-term noise levels during construction and reclamation activities would meet EPA L_{dn} levels of L_{dn} 55 dBA at 0.25 mile from the Project area (**Table 2-6**). Long-term noise levels during mining operations, including work at the open pit, waste rock disposal, and heap leaching facilities, would meet the EPA L_{dn} level of 55 dBA at approximately 0.6 mile beyond the Project area.

TABLE 2-6
Estimated Noise Levels at Various Distances from Source(s)
Emigrant Mine Project

Activity	Equipment / Noise Source(s)	Noise Level at Receiver		
		¼ mile	½ mile	1 mile
Construction — Heap leaching facility Diversion channel Haul and access roads Ancillary facilities	Three pieces of earth moving equipment operating simultaneously, such as end-dump trucks, bulldozers, scrapers, front-end loaders, or graders.	L_{dn} 55 dBA	L_{dn} 49 dBA	L_{dn} 46 dBA
Operations- Open pit mine Waste rock disposal Heap leaching facility	Sixteen pieces of earth moving equipment operating simultaneously, including end-dump trucks, front-end loaders, or shovels	L_{dn} 62 dBA	L_{dn} 56 dBA	L_{dn} 50 dBA
Operations — Open pit mine	Blasting – 10 charges of 375 lb explosives detonated simultaneously.	120 dBA (peak)	114 dBA (peak)	108 dBA[1] (peak)
Reclamation — All areas	Three pieces of earth moving equipment operating simultaneously, e.g., end-dump trucks, bulldozers, scrapers, front-end loaders, or graders,	L_{dn} 55 dBA	L_{dn} 49 dBA	L_{dn} 46 dBA

[1] Blast noise potentially audible for several miles; L_{dn} = day-night average noise level – a single number descriptor that represents the constantly varying sound level during a continuous 24-hour period. dBA = A-weighted decibels.
Source: USDOT 1995; Greene and Greene 1997.

Personal Protective Equipment

Personal protective equipment would be mandatory under Newmont policy for all activities based upon job risk assessment in accordance with MSHA regulations. At a minimum, all employees would be required to wear hard-hats and steel toed boots in designated work areas. Rubber gloves, rubber arm protectors, rain suit coveralls, face shields, splash goggles, safety belts and lanyards, dust respirators, hearing protectors, welding hoods and goggles, and high voltage insulated gloves would be available and required where appropriate. Safety showers would be provided at the processing plant.

EMPLOYMENT

The Emigrant Project would employ approximately 180 people. Most of the work force for the Project would come from existing mine-related work forces in the Carlin area.

The construction work force would be approximately 100 people during initial construction phases, decreasing to approximately five employees during final phases of construction. Construction and development are expected to require approximately 12 months.

RECLAMATION

Newmont submitted a Reclamation Plan for the Emigrant Mine site to both the BLM and NDEP in March 2007 (Newmont 2007a). Reclamation activities for the Emigrant Project are designed to achieve post-mining land uses consistent with the Elko District Office Resource Management Plan (BLM 1987). Reclamation is designed to return disturbed land to a level of productivity comparable to pre-mining levels associated with adjacent land. Post-mining land uses include wildlife habitat, livestock grazing, dispersed recreation, mineral exploration and development. Certain mine components (*e.g.*, last phase of the mine pit) may have restrictive post-mine land uses.

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

Reclamation activities would include regrading of the non-PAG waste rock disposal facility, backfilled portions of mined-out pit areas, borrow areas, and heap leach facility; removal of structures after cessation of operations; regrading disturbed areas (including roads); drainage control; well closure (*e.g.*, piezometers); removal and regrading of stockpile areas; replacement of salvaged soil; seeding and planting; and reclamation monitoring (Newmont 2007a).

Approximately 98 acres of the Phase VIII mining sequence would be partially backfilled. Reclamation would include grading backfill material to drain, placing growth media, and revegetation. A highwall would remain along the east and north portions of the pit offering habitat for bats and raptors.

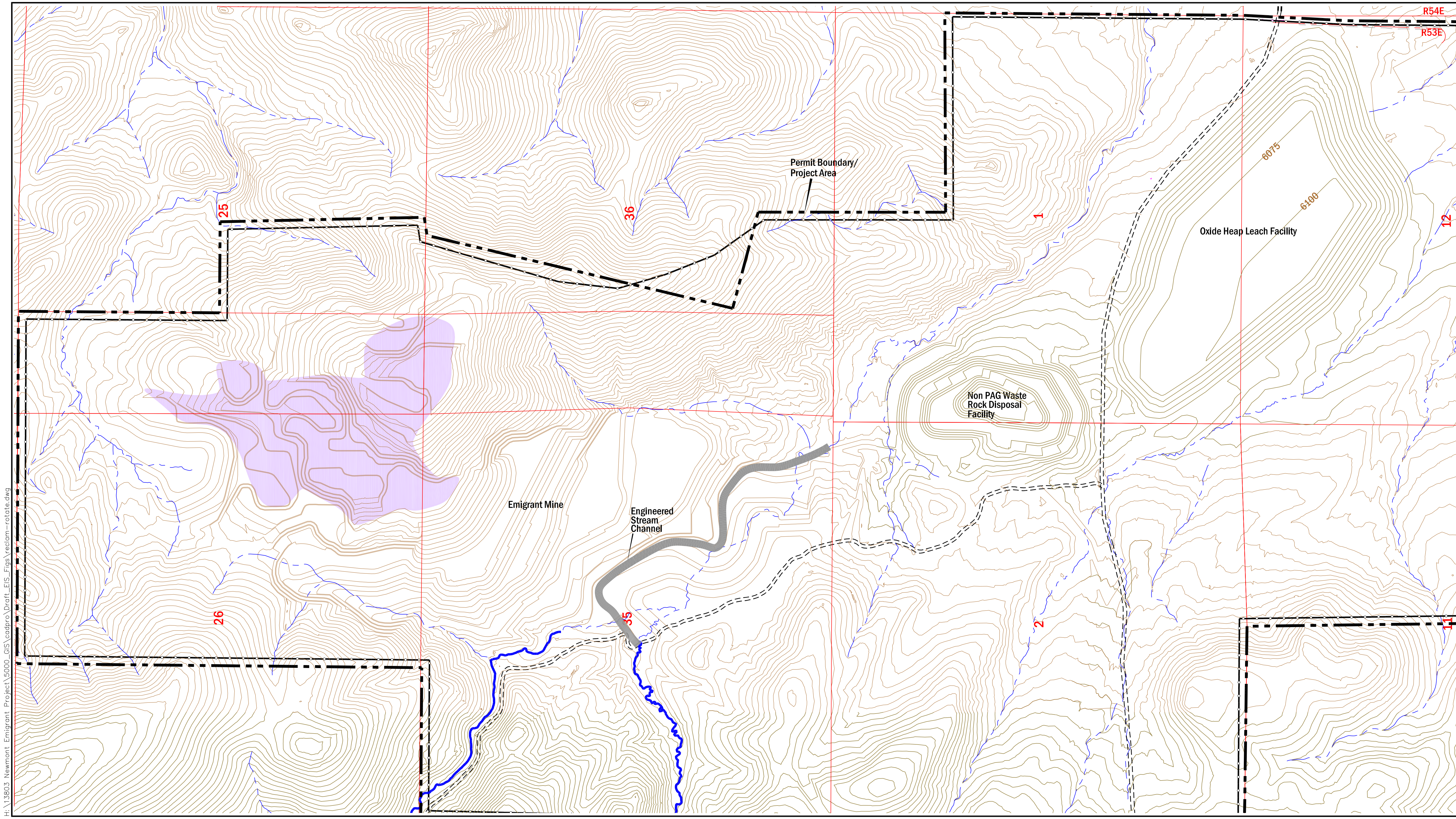
The reclamation schedule would encompass the period between cessation of mining through post-reclamation monitoring. Reclamation would take place concurrent with operations where possible. Proposed post-reclamation topography for the Emigrant Project is shown on **Figure 2-10**. A Closure Plan meeting and State of Nevada requirements (NAC 445A.447) would be filed with NDEP 2 years prior to mine closure.

Soil Salvage

As proposed mine areas, borrow sources, haul and access roads, stockpile sites, heap leach pad, and waste rock disposal areas are developed, Newmont would recover available growth media for future use in reclaiming disturbed areas. After completion of Phase I and II mine operations, growth media would be salvaged from active mine areas and direct hauled for placement over backfilled and regraded portions of previously mined out phases of the pit where possible. Growth media would be salvaged and transported to stockpiles using scrapers, wheel dozers, track dozers, haul trucks, and loaders. Newmont would implement Best Management Practices to reduce soil loss from stockpiles by constructing run-off control berms, mulching, adding organic matter, interim seeding, or leaving slopes in roughened condition. Soil suitability and salvage depths of growth media are summarized in Chapter 3, *Soil Resources*.

Grading Disturbed Areas

Prior to replacing growth media, disturbed areas would be regraded to create a stable post-mining configuration, establish effective drainage to minimize erosion, and protect surface water resources. To the extent practicable, grading would blend disturbed areas with the surrounding terrain. Angular features, including tops and edges of waste rock disposal facilities, would be rounded.



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0 Feet 1200

Contour Interval = 20'

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Legend

- Proposed Engineered Stream Channel
- Final Pit (Partial Backfill Only)
- Access Road
- Existing Drainage
- Perennial Flow
- Proposed Perimeter Fence

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Elko, Nevada

Reclamation Contour Map
Emigrant Project
Elko County, Nevada
FIGURE 2-10

Prior to initiating the proposed reclamation vegetation plan, Newmont would evaluate growth media replacement depths. Soil replacement depths would vary according to location and soil type. The variety of replacement depths would provide different vegetation mosaics on reclaimed areas. Regraded surfaces would be ripped where necessary prior to placement of growth media. Ripping would reduce compaction and provide a uniform seed bed.

Revegetation

The goal of Newmont's revegetation program is to stabilize reclaimed areas, ensure public safety, and establish a productive vegetative community in accordance with the Elko District Office Resource Management Plan (BLM 1987) and designated post-mining land uses (Newmont 2007a). Plants proposed for use on the non-PAG waste rock disposal facility, backfilled mine pits, and borrow areas are shown in **Table 2-7**. Modifications to the seed list, application rates, cultivation methods, and techniques may change based on success of concurrent reclamation. Site-specific seed mixtures, amendments, and application rates would be developed through consultation with and approval by BLM, NDEP, and NDOW. Seedlings may be substituted for seeds. The seed mix selected would represent a Reclaimed Desired Plant Community and would be appropriate for each ecological site in the Project area. A perimeter fence along the permit boundary would remain in place until vegetation is established on reclaimed areas.

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

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

Newmont would conduct annual weed surveys to direct weed control efforts. Monitoring weed infestations and weed control would continue until reclamation is complete and potential for weed invasion is minimized. Certified weed free straw bales would be used for sediment control.

Concurrent Reclamation

As various facilities reach the end of their period of use, Newmont would initiate reclamation activities concurrent with ongoing mining operations. As mining operations progress uphill (north), backfilled portions of the pit would be concurrently regraded, growth media placed, and seeded. In some areas, growth media would be temporarily stockpiled to allow adequate backfilling and regrading of mined-out portions of the pit prior to placement of growth media.

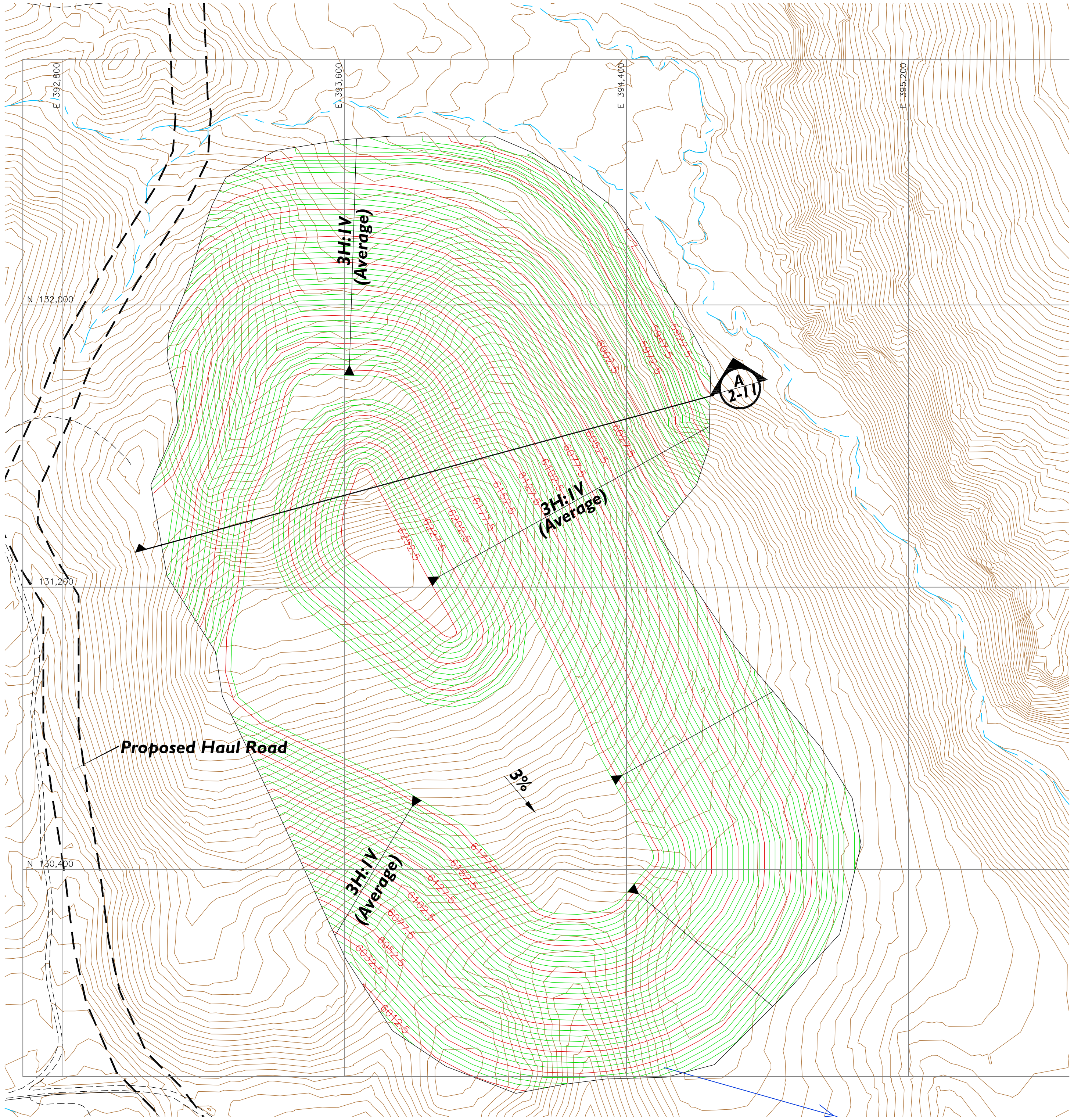
Waste Rock

The benched slopes associated with the non-PAG waste rock disposal facility would be regraded to an overall average slope of 3.0H:1.0V over the 190-ft height of the facility. Grading would be done to minimize erosion, facilitate reclamation activities (seeding, mulching), and provide a surface that would support vegetation. The top of the waste rock disposal facility would be ripped and graded to an overall 5 percent slope to promote runoff and eliminate ponding of precipitation and snowmelt (Newmont 2007a). The proposed closure plan for the non-PAG waste rock disposal facility is shown on **Figure 2-11.**

TABLE 2-7
Plant List for Emigrant Project

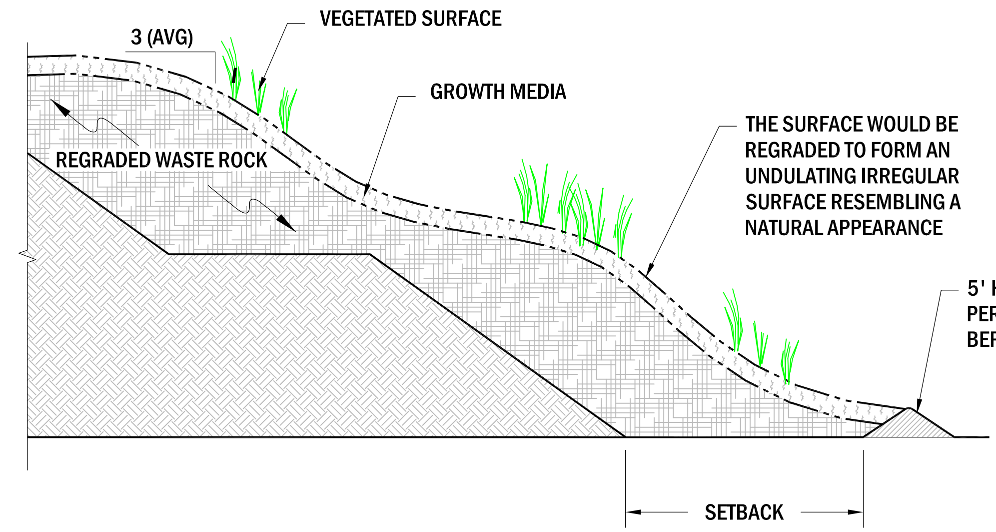
Common Name	Scientific Name
Grasses	
Bluebunch wheatgrass	*Agropyron spicatum*
Thickspike wheatgrass	*Agropyron dasystachyum*
Streambank wheatgrass	*Agropyron riparium*
Western wheatgrass	*Agropyron smithii*
Sandberg bluegrass	*Poa sandbergii*
Great Basin wildrye	*Elymus cinereus*
Barley	*Hordeum*
Annual ryegrass	*Lolium perenne multiflorum*
Indian ricegrass	*Oryzopsis hymenoides*
Webber's ricegrass	*Oryzopsis webberi*
Idaho fescue	*Festuca idahoensis*
Thurber needlegrass	*Stipa thurberiania*
Bottlebrush squirreltail	*Sytanion hystrix*
Crested wheatgrass	*Agropyron cristatum*
Sheep fescue	*Festuca ovina*
Slender wheatgrass	*Agropyron trachycaulum*
Canby's bluegrass	*Poa canbyi*
Sand dropseed	*Sporobolus cryptandrus*
Forbs	
Yellow sweet clover	*Melilotus officinalis*
Cicer milkvetch	*Astragalus cicer*
Northern sweetvetch	*Hedysarum boreale*
Buckwheat	*Eriogonum*
Common sainfoin	*Onobrychis viciifolia*
White sweet clover	*Melilotus alba*
Alfalfa	*Medicago sativa*
Western Yarrow	*Achillea millefolium*
Blue flax	*Linum lewisii*
Gooseberry leaf globemallow	*Sphaeralcea grossulariifolia*
Small burnet	*Sanguisorba minor*
Scarlet globemallow	*Sphaeralcea coccinea*
Desert globemallow	*Sphaeralcea ambigua*
Arrowleaf balsamroot	*Balsamorhiza sagittata*
Palmer's penstemon	*Penstemon palmeri*
Shrubs	
Wyoming big sagebrush	*Artemisia tridentata var. tridentata, wyomingensis*
Antelope bitterbrush	*Purshia tridentata*
Serviceberry	*Amelanchier (alnifolia) utahensis*
Snowbrush	*Ceanothus spp.*
Winterfat	*Ceratoides lanata*
Chokecherry	*Prunus virginiana*
Black sagebrush	*Artemisia nova*
Shadscale	*Atriplex confertifolia*
Fourwing saltbush	*Atriplex canescens*
Prostrate kochia	*Kochia prostrata*
Rubber rabbitbrush	*Chrysothamnus nauseosus*
Mormon tea	*Ephedra (nevadensis) (viridis)*
Currant	*Ribes spp.*
Woods' rose	*Rosa woodsii*
Snowberry	*Symphoricarpos spp.*

Source: Newmont 2007a.

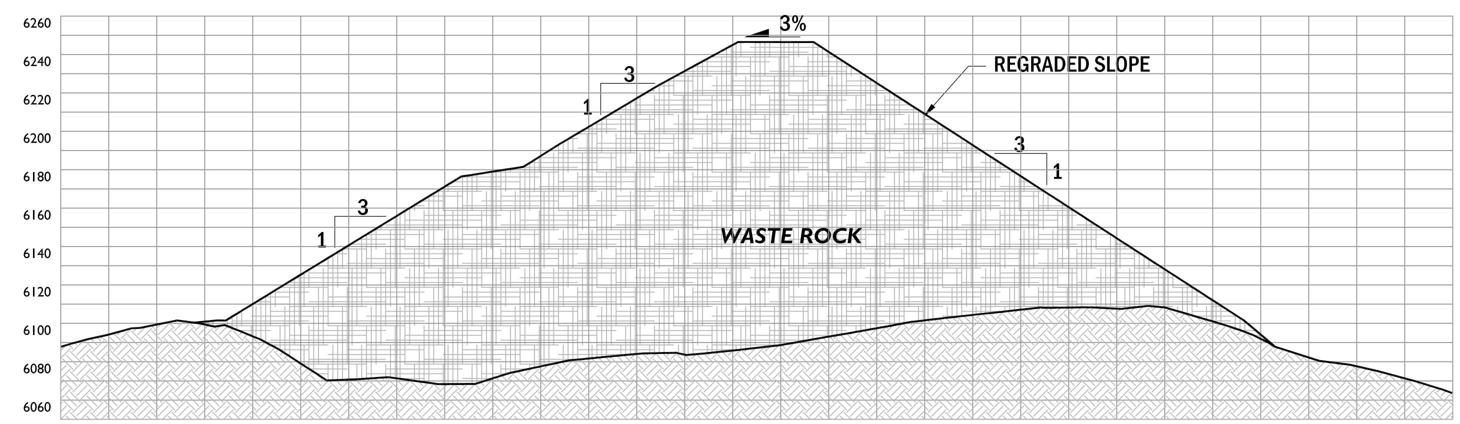


NOTES:

THE FINAL WASTE ROCK DISPOSAL FACILITY CAPPING SYSTEM DESIGN WILL BE COMPLETED DURING FINAL CLOSURE DESIGN TO ENHANCE EVAPORATION AND TRANSPIRATION SUCH THAT RUNOFF AND INFILTRATION ARE MINIMIZED.



PROPOSED NON PAG WASTE ROCK DISPOSAL FACILITY SIDE SLOPE
Not to Scale



NON PAG WASTE ROCK DISPOSAL FACILITY - SECTION A 2-11
Not to Scale

0 Feet 400

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EXISTING GROUND SURFACE CONTOUR AND ELEV., FEET
5850 REGRADED WASTE ROCK SURFACE CONTOUR AND ELEV., FEET
EXISTING DRAINAGES
EXISTING ROAD/TRAIL
PROPOSED HAUL ROAD

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Elko, Nevada

Proposed Closure Plan - Non PAG Waste Rock Disposal Facility
Emigrant Project
Elko County, Nevada
FIGURE 2-11

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Waste rock would be regraded and ripped (to relieve compaction from mining equipment). Upon completion of grading, suitable growth medium would be redistributed over the non-PAG waste rock disposal facility to a depth of 6 inches to support vegetation, and seeded according to the reclamation plan (Newmont 2007a).

Backfill of open pits and management of PAG waste rock encountered during Phase I through VIII mining are described previously in this chapter. Portions of the remaining non-PAG waste rock generated during Phase I through VIII mining would be placed in previously mined out portions of the pit as mining progresses, allowing for concurrent reclamation. Backfill would be placed with bench heights varying from 15 to 100 feet and with an operational slope of 1.4H:1V. Backfill would be regraded and recontoured to achieve 3H:1V slopes. Six inches of growth media would be placed over the regraded backfill and revegetated with an approved seed mix.

The last portion of Phase VIII mining operations would not be completely backfilled. Approximately 80 percent of the pit surface area and 40 percent of the volume would be backfilled, graded and seeded, leaving a portion of the high wall exposed. Safety berms and signage would be constructed around the highwall perimeter. Approximately 2,000 linear feet of safety berm would be required around 10 percent of the open pit during closure.

Heap Leach Facility

When recovery of gold from the heap leach facility is no longer cost-effective, the addition of cyanide to the process solution would cease. Residual solution draining into the process pond would be pumped to evaporative sprays (snowmaker evaporators or atomizers) located on the leach pad or near the process ponds. Spray from the atomizers would be kept within the containment area of the ponds. The total volume of solution in the pad and pond system would be reduced by evaporation, until flow has diminished to a point that it can be treated passively.

As drain-down from the process circuit subsides, evapotranspiration cells would be constructed by modifying the process and/or storm water ponds. These modifications would consist of placing growth media in the pond area, and constructing a solution distribution network of slotted pipe, drip-tube, and gravel to distribute water throughout the pond area, either on the surface or within a few feet of the surface. Vegetation would be established on the surface of the evapotranspiration cells.

The heap leach facility would be recontoured to an overall average slope of 2.5V:1.0H and eliminate areas that could pond meteoric water. Growth media would be placed as a 2-ft thick evapotranspiration cover and seeded (Newmont 2005a). Regrading of spent ore to achieve an overall average 2.5H:1.0V slope would not result in spent ore being placed outside of the liner system of the leach pad. The evapotranspiration cover would be designed to limit infiltration into the reclaimed ore pile by storing water during the dormant season so that it is available for plant uptake during the growing season. This "store and release" cover, would minimize the amount of water contacting spent ore. A conceptual closure plan for the heap leach facility is shown on **Figure 2-12**.

Roads

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

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

Exploration roads, drill pads, sumps, and trenches would be reclaimed in conjunction with ongoing operations. Exploration roads and drill pads would be bladed or shaped using a dozer or excavator. Soil material would form the roadbed or drill pad and during reclamation, the soil material would be recontoured or regraded onto the disturbed area to blend with surrounding topography. Trenches would be backfilled and regraded to conform to the surrounding topography and drainages reestablished.

Ancillary Facilities

At the end of Project life, the explosives magazine, ancillary buildings, water supply pipeline, shop and office complex, plant site, and other mine support structures with salvage value would be dismantled for salvage or used for other operations in the area. Concrete foundations would be broken up to the extent possible and buried a minimum of 5 feet below ground surface or left intact and buried beneath 10 feet of fill material. These sites would be reclaimed by regrading to provide proper drainage, ripping to reduce compaction, placement of 6-inches growth media, seedbed preparation, and seeding.

Unused explosives would be returned to the vendor or used at other mine sites in the area. Non-salvageable materials including scrap building materials and equipment would be buried onsite in the landfill or disposed offsite in accordance with federal and state regulations. Hazardous material would be recycled or disposed at approved landfills by licensed hazardous material transporters. The water pipeline would be reclaimed by plugging the pipe at both ends and allowing the pipe to remain buried. Storm water/sediment pond closure would include ripping and folding the liners, backfilling and regrading ponds, placement of 6-inches of growth media, and seeding.

Yard areas would be reclaimed by ripping compacted surfaces, regrading, placing 6 inches of growth media and seeding. Culverts and fencing would be removed.

MONITORING AND EVALUATION OF RECLAMATION

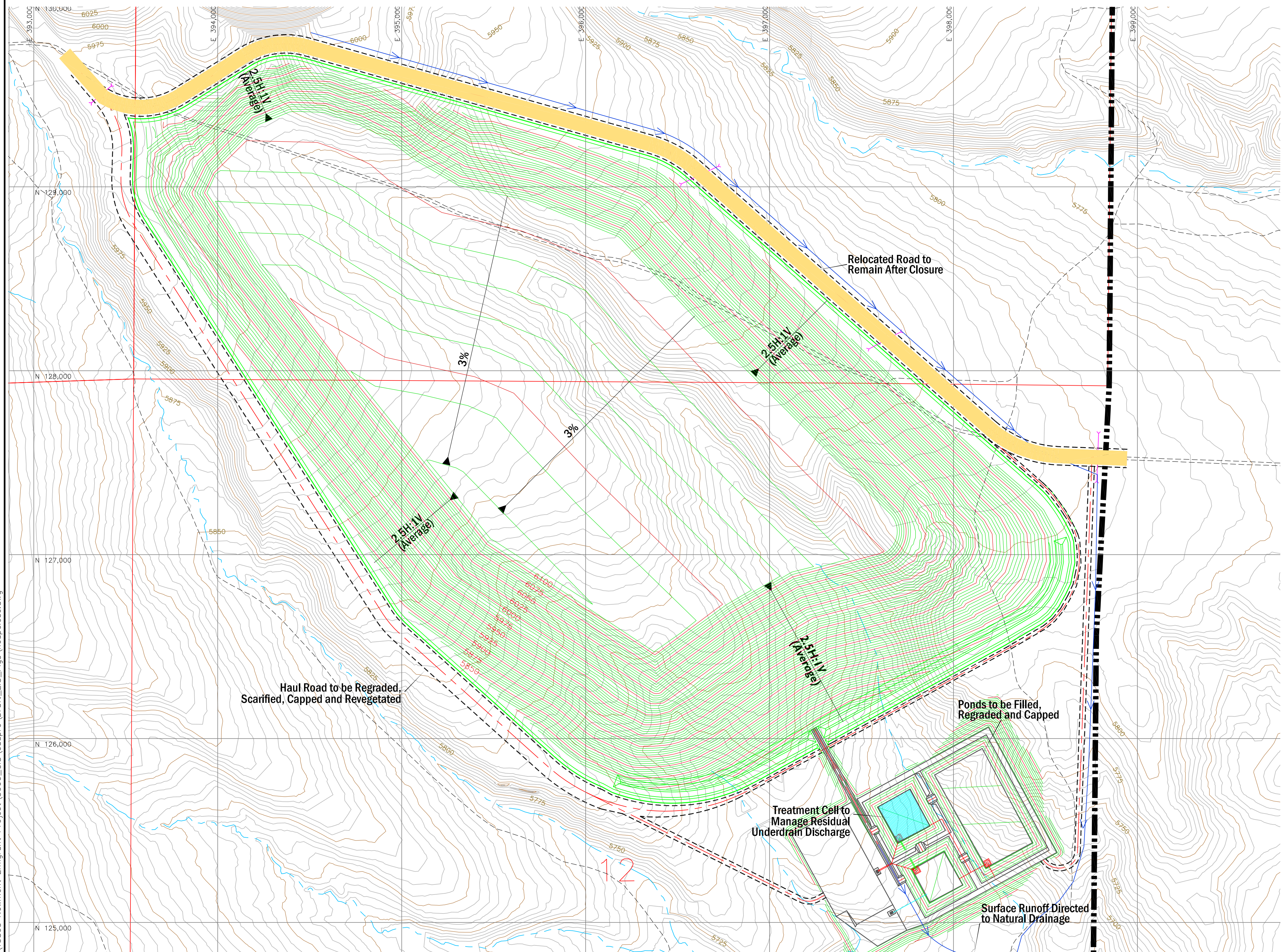
Newmont, in cooperation with BLM and NDEP, would evaluate the status of vegetative growth during three full growing seasons following completion of planting. Final bond release may be considered at that time. Interim progress of reclamation at the Emigrant Project area would be monitored as requested by the agencies. Water monitoring, as described in the *Resource Monitoring* section of this chapter, would also be used in evaluating reclamation success.

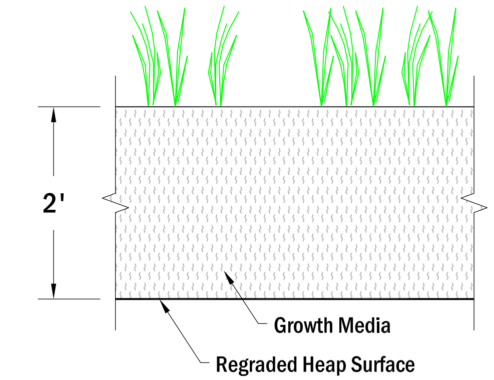
POST-CLOSURE MONITORING

Water Resources

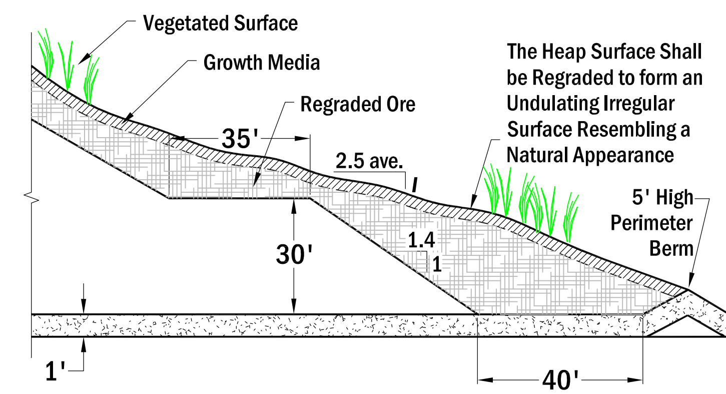
Newmont would monitor groundwater quality for a minimum of 5 years after mine closure. Monitoring would be performed quarterly for NDEP Profile I reference constituents.

Surface water monitoring would continue until vegetation is established and/or until monitoring is determined by BLM and NDEP to no longer be necessary.





PROPOSED HEAP EVAPO-TRANSPIRATION CAPPING SYSTEM



PROPOSED HEAP SIDE SLOPE

NOTES:

1. THE FINAL HEAP CAPPING SYSTEM DESIGN WILL BE COMPLETED DURING THE FINAL CLOSURE DESIGN TO ENHANCE EVAPORATION AND TRANSPIRATION SUCH THAT RUNOFF AND INFILTRATION ARE MINIMIZED.
2. THIS PLAN ACCOUNTS FOR SURFACE WATER CONTROL ONLY FROM THOSE AREAS ASSOCIATED WITH THE HEAP LEACH FACILITY. THE ACTUAL CLOSURE PLAN MAY BE AFFECTED DEPENDING ON THE FINAL CLOSURE PLAN OF UPSTREAM FACILITIES.
3. TOPSOIL WILL BE STRIPPED FROM THE FACILITIES AND BORROW AREAS PRIOR TO CONSTRUCTION AND STOCKPILED FOR REUSE AS CAPPING MATERIALS.

0 Feet 600
Contour Interval = 20'

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Elko, Nevada

5850 EXISTING GROUND SURFACE CONTOUR AND EL, FEET
REGRADED HEAP SURFACE CONTOUR AND EL, FEET
EXISTING DRAINAGES
PERMIT BOUNDARY/PROJECT AREA
LOCATION AND DIRECTION OF PERMANENT DIVERSION CHANNEL
RELOCATED ROAD (TO REMAIN)
EXISTING ROAD/TRAIL

Proposed Closure Plan - Heap Leach Facility
Emigrant Project
Elko County, Nevada
FIGURE 2-12

Vegetation

Reclamation goals for mining disturbances are to 1) stabilize the site; and 2) establish a productive vegetative community based on the designated post-mining land uses. The goal of revegetation would be to achieve as close to 100 percent of the perennial plant cover of selected comparison areas as possible. The comparison, or reference, areas would be selected from representative plant communities adjacent to the mine site, test plots or demonstration areas or, as appropriate, representative ecological or range site descriptions in conjunction with NDEP and BLM specialists. Newmont would monitor revegetation success for a minimum of 3 years after seeding until vegetation is established.

PROJECT ALTERNATIVES

The Proposed Action was determined to not have potentially adverse impacts requiring an alternative. Therefore, the only alternative considered in detail in this Draft EIS is the No Action alternative. Minor issues and potential impacts are addressed with specific mitigation measures in Chapter 3, *Affected Environment and Environmental Consequences*.

NO ACTION ALTERNATIVE

Under the No Action alternative, the Proposed Action would not be approved. Newmont would not be authorized to develop the defined ore reserves, construct ancillary mine facilities, construct a waste rock disposal facility or heap leach facility on public land. Potential impacts predicted to result from development of the Project would not occur.

ALTERNATIVES ELIMINATED FROM DETAILED ANALYSIS

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

USE EXISTING HEAP LEACH FACILITY AT RAIN MINE

This alternative would include all components of the Proposed Action, but would require Newmont to haul ore approximately 2.5 miles from the proposed Emigrant Mine to the existing heap leach facility at the Rain Mine. This alternative could eliminate the need to construct the proposed heap leach facility at the Emigrant Mine site.

RATIONALE FOR DISMISSAL

The existing heap leach facility at the Rain Mine encompasses approximately 40 acres and expansion of this facility to accommodate up to 92 million tons of ore from the Emigrant Project would require construction of an additional 320 acres of leach pad area. Expansion of the existing Rain Mine heap leach facility to accommodate proposed ore production from the Emigrant Mine would require extensive reconstruction of the existing heap leach pad. Such an expansion at the Rain Mine was determined to not have an advantage over the Proposed Action because the acres of disturbance associated with expansion of the Rain Mine leach facility would disturb an additional 320 acres, whereas the proposed heap leach pad at the Emigrant Project would disturb approximately 288 acres. Operation of the proposed leach facility at the Emigrant Project would also require less fuel because the haul distance for placement of ore on the leach pad is less.

AGENCY PREFERRED ALTERNATIVE

The BLM has identified the Proposed Action with mitigation as the preferred alternative.

CHAPTER 3
AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

INTRODUCTION

This chapter of the Draft EIS describes the affected environment in the proposed Emigrant Project area and the predicted direct and indirect impacts associated with the Proposed Action and No Action alternative. The Emigrant Project area is located on public and private land in Elko County, along the east slopes of the Piñon Range approximately 10 miles south of Carlin, Nevada. The general area is characterized by steep hills and ephemeral and intermittent drainages within the Dixie Creek watershed. Elevations in the Project area range from 5,700 feet to over 7,400 feet above mean sea level.

Mining and reclamation of the proposed Emigrant Project and alternatives identified in Chapter 2 would result in irreversible and irretrievable commitments of resources and residual effects to the environment. Irreversible commitments of resources are those that cannot be reversed, except over a very long period of time. Irretrievable commitments of resources are those that are lost. Residual effects are those effects that remain after completion of the Proposed Action and implementation of mitigation measures.

Study Area boundaries were developed for each resource area and are described in the respective resource sections of this chapter. Study Areas for each environmental resource are based on predicted locations of direct and indirect impacts associated with the Proposed Action.

Supplemental Authorities to be Considered

Appendix I of BLM's NEPA Handbook (H-1740-1) identifies Supplemental Authorities to be Considered in all BLM environmental documents. The appendix is a list of statutes and executive orders pertinent to the human and natural environment that must be considered in all BLM Environmental Assessments (EA) and Environmental Impact Statements (EIS). Supplemental Authorities for the proposed Emigrant Project are listed in **Table 3-1**.

These authorities are included in the evaluation for this Draft EIS.

This chapter provides a summary of environmental baseline information and a description of environmental consequences that could result from implementation of the Proposed Action and Alternatives. In the following sections, "Project area" refers to land included within the permit boundary associated with the Proposed Action and adjacent areas.

GEOLOGY AND MINERALS

AFFECTED ENVIRONMENT

Geology

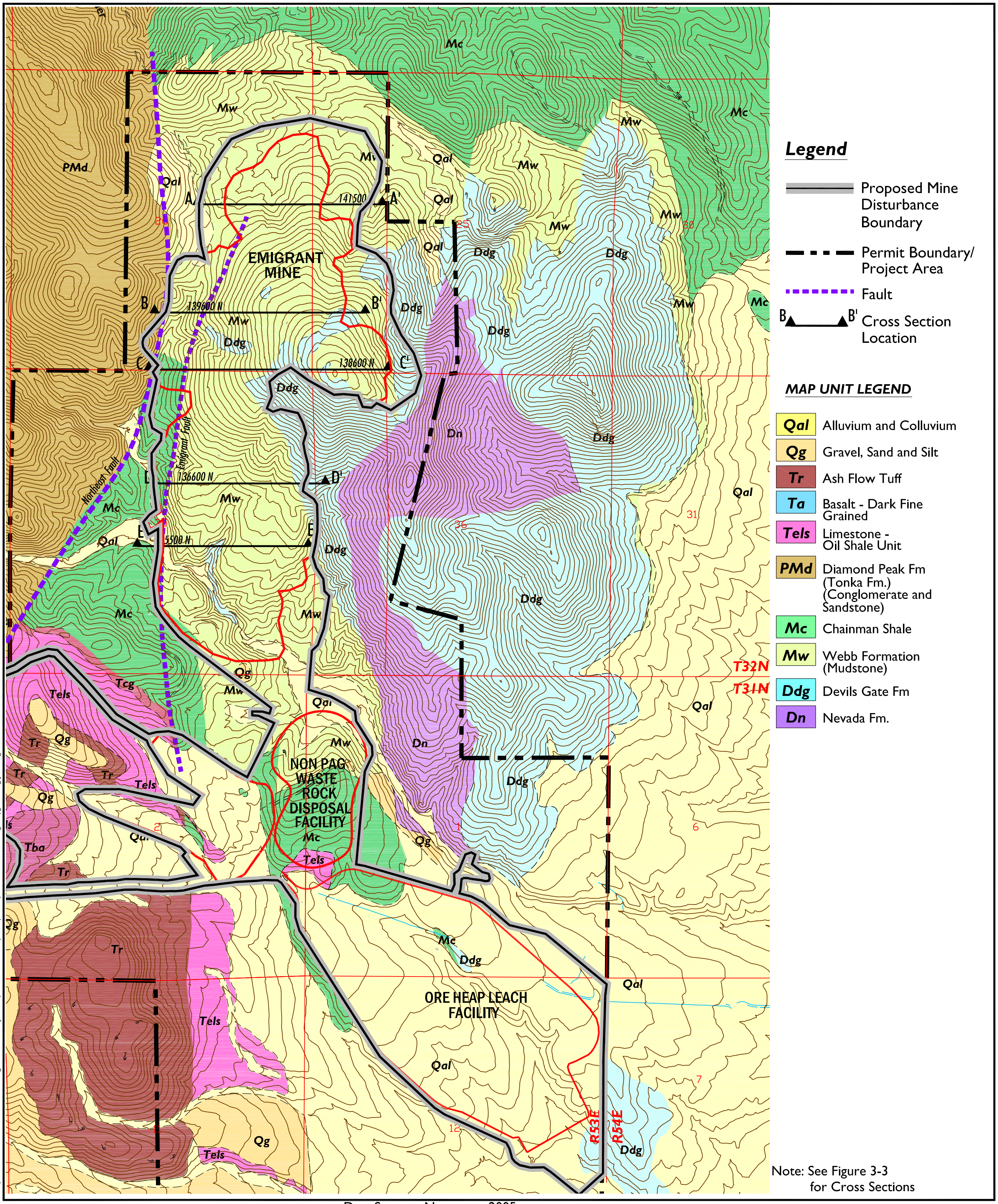
The Project area is located within the Basin and Range Physiographic Province, a region that extends over most of Nevada and parts of adjoining states. Range-front faulting in the province has created north-south trending fault-block mountain ranges separated by broad valleys filled with unconsolidated sediments (alluvium and colluvium). The Emigrant deposit end of the Piñon Range. This mountain range is comprised of Ordovician- through Permian-age shale, siltstone, limestone, and conglomerate. Deposition of this sequence of rocks was interrupted by the Antler Orogeny – a major mountain building event.

Figure 3-1 is a geologic map of the Emigrant Project area and **Figure 3-2** presents a generalized stratigraphic section. Emigrant gold deposits are contained primarily within the Lower Mississippian-age Webb siltstone and

is located near Emigrant Spring at the northern Devonian-age Devils Gate limestone (Thoreson 1991). Gold occurs in shallow west-dipping tabular bodies at or near the contact of the Webb siltstone and underlying Devils Gate limestone (unconformity), with secondary occurrence of gold along the Emigrant Fault (**Figure 3-3**). Gold mineralization is present near the surface. A small percentage of ore occurs in the Mississippian-age Chainman siltstone and Fresh Webb siltstone.

TABLE 3-1
Supplemental Authorities
Emigrant Project

Element	Authority
Air Quality	The Clean Air Act as amended (42 USC 7401 *et seq.*)
	The State of Nevada has been granted primacy in administration of the Clean Air Act under Nevada Revised Statutes (NRS) and Nevada Administrative Code (NAC) Chapter 445B by the Nevada Bureau of Air Pollution Control
Cultural Resources	National Historic Preservation Act, as amended (16 USC 470)
Fish Habitat	Magnuson-Stevens Act Provision: Essential Fish Habitat (EFH): Final Rule (50 CFR Part 600; 67 FR 2376, January 17, 2002)
Forest and Rangeland	Healthy Forests Restoration Act of 2003 (P.L. 108-148)
Migratory Birds	Migratory Bird Treaty Act of 1918, as amended (16 USC 703 *et seq.*)
	Executive Order (E.O.) 131186, "Responsibilities of Federal Agencies to Protect Migratory Birds" January 10, 2001.
Native American Religious Concerns	American Indian Religious Freedom Act of 1978 (42 USC 1996)
Threatened or Endangered Species	Endangered Species Act of 1983, as amended (16 USC 1531)
Wastes, Hazardous or Solid	Resource Conservation and Recovery Act of 1976 (43 USC 6901 *et seq.*)
	Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended (43 USC 9615)
Water Quality	Safe Drinking Water Act, as amended (43 USC 300f *et seq.*)
	Clean water Act of 1977 (33 USC 1251 *et seq.*)
	The State of Nevada has been granted primacy in administration of the Clean Water Act under Nevada Revised Statutes (NRS) and Nevada Administrative Code (NAC) Chapter 445B by the Nevada Bureau of Water Pollution Control
Wild and Scenic Rivers	Wild and Scenic Rivers Act, as amended 16 USC 1271)
Wilderness	Wilderness Act of 1964 (16 USC 1131 *et seq.*)
	Federal Land Policy and Management Act of 1976 (43 USC 1701 *et seq.*)
Environmental Justice	E.O. 12898, "Environmental justice" February 11, 1994
Floodplains	E.O. 11988, as amended, Floodplain Management Act
Wetland and Riparian Zones	E.O. 11990 Protection of Wetlands May 24, 1977



Data Source: Newmont, 2005

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Contour Interval = 20'

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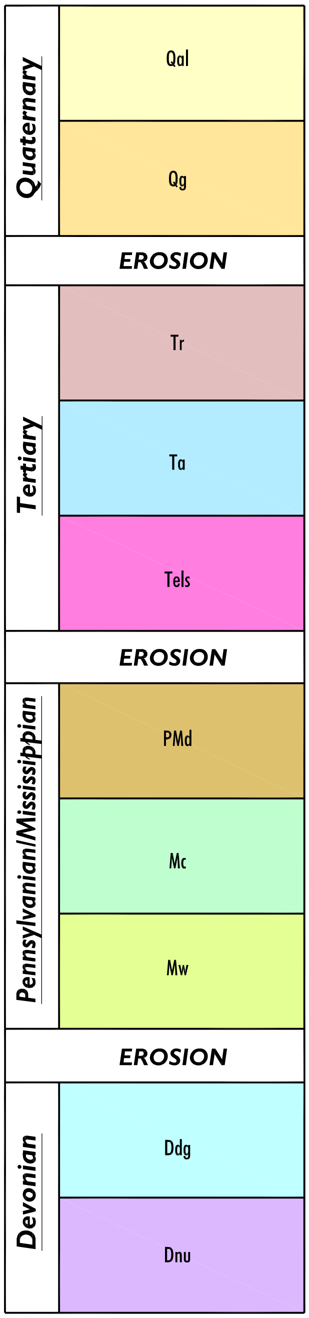
Bureau of Land Management
Elko District Office
Elko, Nevada

Geologic Map
Emigrant Project
Elko County, Nevada
FIGURE 3-1



Alluvium and Colluvium
Alluvium and colluvium deposited along active stream channels, valleys and alluvial fans

Gravel, Sand and Silt
Older alluvial gravel and sand deposits as major valley fill and playa lake deposits

Rhyolite Tuff
Massive rhyolitic lapilli tuff and minor volcanic breccia, locally glassy texture with phenocrysts of biotite and hornblende

Basalt
Dark fine grained volcanic rocks

Limestone (Oil Shale Unit)
Limestone, thin bedded light gray and tan, interbedded with laminated shale, siltstone, oil shale and tuff

Diamond Peak Formation (Tonka Formation)
Conglomeration and sandstone with minor marly shale interbeds; thickness 4700+ feet

Chainman Shale
Predominantly light gray and black, soft, carbonaceous shale with lesser amounts of gray siltstone, lenticular tan quartzose sandstone, and minor conglomerate and limestone; thickness 1600+ feet

Webb Formation
Predominantly laminated to thin-bedded, gray carbonaceous and siliceous mudstone and claystone that weathers grayish brown to black, thin sandstone and minor limestone; thickness 730-800+ feet

Devils Gate Formation
Predominantly thin to thick interbedded blue-gray limestone and black to white dolomite; thickness 800+ feet

Nevada Formation
Upper dolomite member - brown and gray dolomite in alternating layers; thickness 940+ feet

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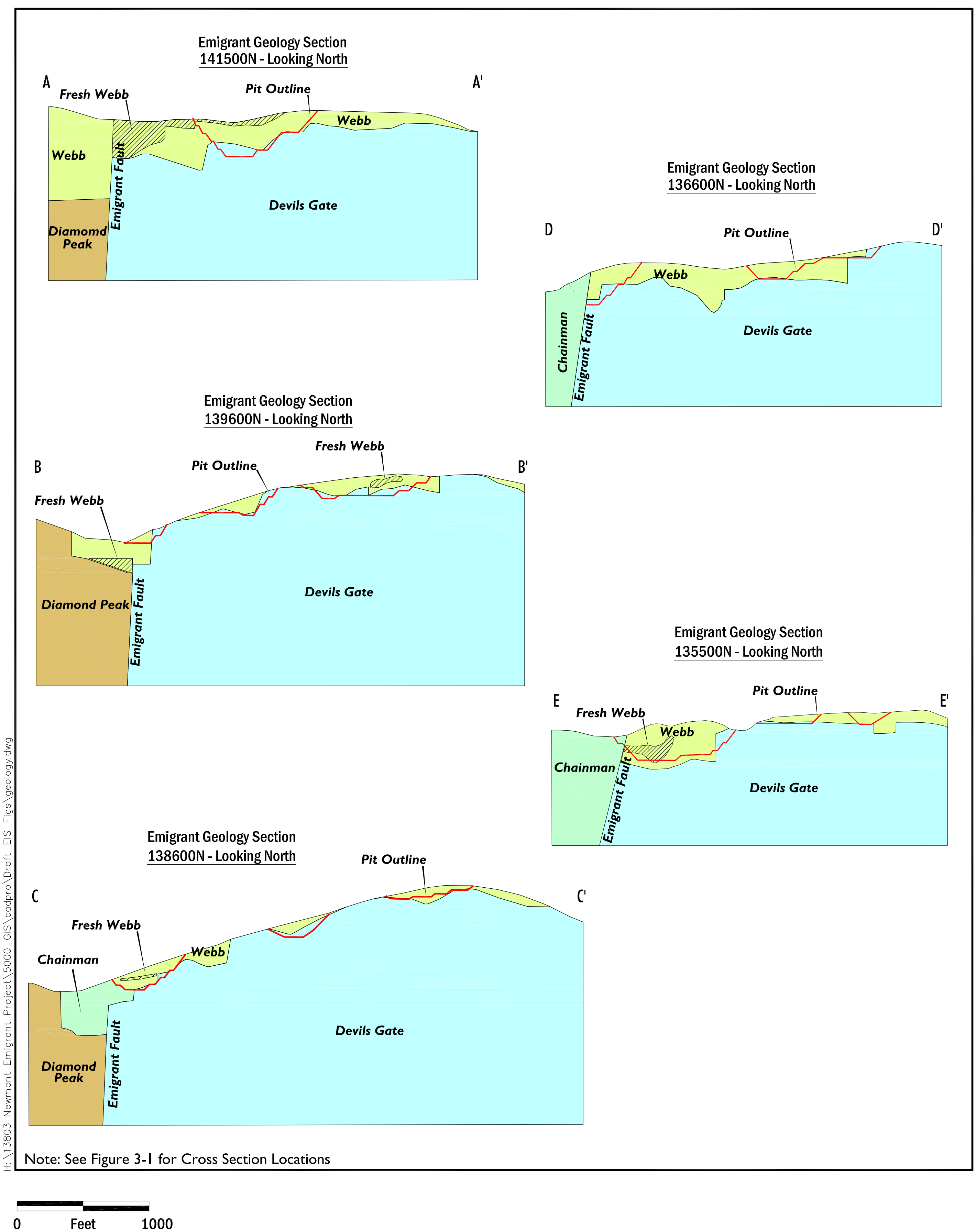
Elko, Nevada

Geologic Stratigraphic Section
Emigrant Project
Elko County, Nevada
FIGURE 3-2



Note: See Figure 3-1 for Cross Section Locations

U.S. Department of the Interior
Bureau of Land Management
Elko District Office
Elko, Nevada

Geologic Cross Sections
Emigrant Project
Elko County, Nevada
FIGURE 3-3

The Emigrant Fault occurs along the western margin of the Emigrant gold deposit. The fault strikes north-10 degrees-east and dips 80 to 85 degrees west. The fault separates the Chainman siltstone in the hanging-wall (above fault plane) with the Webb siltstone and Devils Gate limestone in the foot-wall (below fault plane) (**Figure 3-3**) (Thoreson 1991; Lapointe *et al.* 1991). Although mineralization commonly occurs adjacent to the Emigrant Fault, elsewhere mineralization lies as much as 3,000 feet east of the fault. The Emigrant Fault is a localizing structure for hydrothermal fluids that migrated up the fault, and outward into adjacent sediment to form disseminated low-grade gold deposits. Mineralization extends 12,000 feet along a north-south trend parallel to the fault, and thins away from the fault.

In the vicinity of the Emigrant ore deposits, siltstone and sandstone are argillaceous, fractured, silicified, bleached, and iron oxide stained (Bentz *et al.* 1983). Most of the ore proposed for mining is completely oxidized, with pyrite converted to limonite and hematite. A small percentage of ore is unoxidized carbon sulfur refractory rock (Chainman siltstone and Fresh Webb siltstone).

Seismic Conditions

The Basin and Range Province is an area of moderately high rates of seismic activity and contains three zones of significantly higher rates of activity within Nevada. The Emigrant Project area occurs about 90 miles east of the Nevada Seismic Zone, the nearest of these three zones. Recent movement along fault structures in the Project area has not been evaluated; however, many of the high-angle faults shown on the Emigrant area geologic map (**Figure 3-1**) are considered geologically active. Most of these faults have long recurrence intervals where the return period of seismic activity is thousands of years (most recent movement typically within Quaternary period). Recent work by the U.S. Geological Survey (USGS 2004a) in 2000-2001 documented Quaternary-age fault movement on a number of regional fault systems.

Based on the USGS (2007) earthquake database website, approximately 54 historical earthquakes with magnitudes greater than 3.0 on the Richter scale have occurred within a radius of 100 kilometers (62 miles) of the Project area during the period 1901-2007. Earthquake epicenters ranged in distance from 2.5 to 61 miles of the Project area, with Richter scale magnitudes from 3.0 to 5.1. The closest recorded earthquake event was magnitude 3.9, about 2.5 miles from the Project area (Valera Geoconsultants 2004; USGS 2007). A magnitude 6.0 earthquake occurred near Wells, Nevada, approximately 80 miles northeast of Elko on February 21, 2008. The preliminary event location determined by the Nevada Seismological Laboratory was approximately 6 miles northeast of Wells at a depth of 4.2 miles. The earthquake has not been associated with a previously mapped fault (Nevada Seismological Laboratory 2008).

In addition to buildings (*e.g.,* operations office, maintenance shop, and plant facility), the waste rock disposal facility and heap leach facility are the only structural mine facilities proposed for the Emigrant Project that could be affected by seismic events. A recent study by Valera Geoconsultants (2004) consisted of a seismic hazard assessment of the proposed heap leach facility. Foundation soil and bedrock materials at the site were evaluated and determined to consist mostly of gravel, sand, silt and clay to depths up to 30 feet, with underlying bedrock composed of siltstone and shale that is highly fractured near the surface. The dense soil and soft bedrock conditions place the Emigrant Project area in Seismic Zones 2B and 3 of the 1997 Uniform Building Code (UBC 2000). Depth to groundwater beneath the proposed heap leach facility is approximately 120 feet in shallow perched alluvial deposits, and 420 to 650 feet in underlying bedrock.

The probability of earthquakes occurring that have magnitudes causing potential damage to a facility are on the order of 3 percent for the 14-year operational mine life (475-year return period) and 2 percent for the appropriate post-closure period (2,475-year return period). In addition to the heap leach facility, this analysis can be applied to the proposed waste rock disposal facility at the Emigrant site. In a study of seismic activity of the nearby Rain Mine area (2.5 miles west of Emigrant Project area), Call and Nicholas (1986) predicted a maxim acceleration of 0.4 g, with a recurrence interval of about 1,000 years.

Paleontological Resources

Exposures in Paleozoic stratigraphic units of the Project area are similar to those commonly found across Nevada and are not considered either unusual or unique. Noteworthy fossil resources are generally considered vertebrate fossils. Vertebrate fossils occur primarily in Tertiary- and Quaternary-age sediments, and invertebrate fossils are more common in Paleozoic-age sedimentary rocks. No important paleontological resources have been identified within the Project area.

Waste Rock & Ore Characterization

Static Test Methods

Static Acid-Base Accounting testing is typically performed as an initial analysis to determine the potential for rock samples to generate acid. Representative waste rock and ore samples are subjected to laboratory analysis of carbon fractions (total, organic, and carbonate carbon) and sulfur fractions (total, sulfate, and sulfide sulfur). From these results, the following values are calculated: Neutralization Potential (NP); Acidification Potential (AP); Net Neutralization Potential (NNP); and Net Carbonate Value (NCV). **Table 3-2** lists the static tests that have been performed for the Emigrant Project.

Initial characterization uses Net Neutralization Potential values (NNP = NP – AP) and the ratio NP:AP to evaluate potential for acid generation from the various rock types. Criteria used to characterize acid generation potential using these values are presented in **Table 3-3**; these criteria were developed by BLM (1996) and USEPA (1994). When NP or AP values are low, NP:AP ratios become erratic and may incorrectly predict acid generation potential (Tetra Tech 2007). This condition typically occurs when sulfide concentrations in the sample are very low.

In addition to NP:AP and NNP-based criteria, Newmont (2003) developed NCV criteria for evaluating potential for rock to generate acid (NCV as %CO_2 = NP + AP). These criteria are presented in **Table 3-3**. The NCV method was recently approved as an accepted standard method of analysis (ASTM E1915-05, Standard Test Methods for Analysis of Metal Bearing Ores and Related Materials by Combustion Infrared Adsorption Spectrometry) (Bucknam 2005). NCV results are evaluated in combination with other static and kinetic data. Samples classified as "neutral" can contain both carbonates and sulfides, but adequate carbonate is present to neutralize any acidity. Samples classified as "inert" lack substantial carbonates and sulfides.

The NCV method typically is applied in the field during operations to determine final disposition of waste rock at the mine site. Every third blast hole is analyzed for NCV; if results show potential for acid generation, this rock volume would be encapsulated in rock that provides neutralization potential (Newmont 2007a).

Other static tests performed to assist in evaluation of acid generation potential include Paste pH, Meteoric Water Mobility Procedure, and Peroxide Acid Generation (Net Acid Generating) testing. Paste pH testing follows the

American Testing of Agronomy (ASA Monograph 9 method). The Meteoric Water Mobility Procedure test was developed by NDEP and standardized as ASTM E2242-02.

Kinetic Test Methods

Samples falling into the "uncertain" category from Acid-Base Accounting tests typically use kinetic testing methods to evaluate whether the samples or rock types would generate acid over an extended period of weathering. Kinetic testing also is used to confirm NCV results where samples are shown to have potential for acid generation. Kinetic test methods included Humidity Cell tests (ASTM D5744-96) and Biological Acid Production Potential.

Descriptions of the supplemental test methods are included in the following two reports: *Supplemental Geochemical Data for Environmental Impact Statement. Emigrant Project Elko, Nevada* (ERM 2006) and *Final Evaluation of Geochemical Data for the Emigrant Mine Project EIS* (Tetra Tech 2007). Additional references for the supplemental test include McClelland Laboratories, Inc. (2006a, 2006b); Little Bear Laboratories, Inc. (2006), and Newmont (2006b, 2006c, 2006d, 2006e).

General Background

Approximately 83 million tons (Mt) of waste rock and 92 Mt of ore would be mined in the Emigrant Project area (see *Proposed Action* in Chapter 2). Based on site geology, waste rock that would be excavated has been divided into three general classifications: oxidized Webb siltstone; oxidized Devils Gate limestone (oxide carbonate); and unoxidized Chainman/Fresh Webb siltstone (carbon sulfur refractory). Most rock to be removed from the mine pit would be Webb siltstone (67% of waste rock and 76% of ore) and Devils Gate limestone (32% of waste rock and 21% of ore). The Chainman/Fresh Webb siltstone accounts for the remainder of the rock to be mined (1% of waste rock and 3% of ore).

For comparison, the nearby Rain Mine has the following percentages of waste rock types: oxidized Webb siltstone = 75 percent; oxidized Devils Gate limestone = 10 percent; and unoxidized Chainman/Fresh Webb siltstone = 15 percent (Harris 2005). The amount of unoxidized Chainman/Fresh Webb siltstone waste rock at the Rain Mine (15%) is greater than that expected for the Emigrant Mine (1%); the amount of Devils Gate limestone waste rock at Rain (10%) is less than expected at Emigrant (32%). Overall mineralogical composition of the rock types at Rain Mine is similar to Emigrant, with the exception of higher barite content at Rain (Harris 2005).

In order to identify minerals in rock at the Emigrant mine site, numerous ore and waste rock samples from the proposed mine pit area were evaluated by Newmont (2006b, 2006c) using x-ray diffraction (XRD) analysis. Quartz was identified as a constituent in all samples. Sericite, alunite, illite, barite, jarosite, and iron oxide are common constituents in most samples, indicating the rock has been hydrothermally altered and subsequently oxidized. Pyrite was detected in a minority of the samples. Carbonate minerals include calcite, dolomite, and siderite.

Various static and kinetic tests were performed on the primary rock types to characterize the potential to generate acid and/or mobilize metals from rock at the Emigrant Mine. These test types are summarized in **Table 3-2** and described in the following sections.

TABLE 3-2
Initial and Supplemental Static and Kinetic Tests
Emigrant Mine Project

Testing Method	Rock Type	Number of Samples Tested
INITIAL STATIC TESTING (2002)		
Acid-Base Accounting (NP:AP, NNP, NCV)	Chainman/Fresh Webb Siltstone; Devils Gate Limestone; Webb Siltstone	1,100 waste rock
		172 ore
		Total = 1,272 samples
SUPPLEMENTAL STATIC TESTING (2005-2006)		
Acid-Base Accounting (NP:AP, NNP, NCV)	Chainman/Fresh Webb Siltstone	1 waste rock + 1 ore
	Devils Gate Limestone	6 waste rock + 4 ore
	Webb Siltstone	11 waste rock + 11 ore
		Total = 34 samples
Meteoric Water Mobility Procedure	Chainman/Fresh Webb Siltstone	1 waste rock + 1 ore
	Devils Gate Limestone	4 waste rock + 3 ore
	Webb Siltstone	8 waste rock + 10 ore
		Total = 27 samples
Peroxide Acid Generation (Net Acid Generating)	Chainman/Fresh Webb Siltstone	1 waste rock + 1 ore
	Devils Gate Limestone	4 waste rock + 2 ore
	Webb Siltstone	11 waste rock + 11 ore
		Total = 30 samples
Paste pH	Chainman/Fresh Webb Siltstone	1 waste rock + 1 ore
	Devils Gate Limestone	4 waste rock + 3 ore
	Webb Siltstone	8 waste rock + 10 ore
		Total = 27 samples
SUPPLEMENTAL KINETIC TESTING (2005-2006)		
Humidity Cells	Chainman/Fresh Webb Siltstone	1 waste rock + 1 ore
	Webb Siltstone	6 waste rock + 7 ore
		Total = 15 samples
Biological Acid Production Potential	Chainman/Fresh Webb Siltstone	1 waste rock + 1 ore
	Devils Gate Limestone	4 waste rock + 2 ore
	Webb Siltstone	11 waste rock + 11 ore
		Total = 30 samples
METAL MOBILITY TESTING (Initial[2002]and Supplemental [2005-2006])		
Meteoric Water Mobility Procedure	Chainman/Fresh Webb Siltstone	3 waste rock + 1 ore
	Devils Gate Limestone	6 waste rock + 3 ore
	Webb Siltstone	10 waste rock + 10 ore
	Run-of-Mine	1 waste rock
		Total = 34 samples
Humidity Cells	Chainman/Fresh Webb Siltstone	1 waste rock + 1 ore
	Webb Siltstone	6 waste rock + 7 ore
		Total = 15 samples
ADDITIONAL STATIC TESTING (2008)		
NCV and Paste pH	Representative Composite Samples of Waste Rock and Ore	Total = 1,271 samples

Note: NP = Neutralization Potential; AP = Acidification Potential; NNP = Net Neutralization Potential; NCV = Net Carbonate Value. The paste pH tests performed in 2005-2006 were conducted only on those samples subject to humidity cell testing.
Source: Tetra Tech 2007; ERM 2006; Newmont 2008a.

TABLE 3-3
Criteria Used to Determine Acid Generating Potential
Emigrant Mine Project

Classification for Acid Generation Potential	Criteria for Classification
Acid-Base Accounting	
Potentially Acid Generating	NP:AP < 1 and NNP < -20
Uncertain Acid Generation Potential	NP:AP between 1 and 3 and/or NNP between -20 and +20
Unlikely to Generate Acid	NP:AP > 3 and NNP > +20
Net Carbonate Value (NCV)[1]	
Highly Acidic	NCV ≤ -5
Acidic	-5 < NCV ≤ -1
Slightly Acidic	-1 < NCV ≤ -0.1
Neutral	-0.1 < NCV < 0.1 and (NP ≥ 0.1 or AP ≤ -0.1)
Inert	-0.1< NCV < 0.1 and (NP < 0.1 or AP > -0.1)
Slightly Basic	0.1 ≤ NCV < 1
Basic	1 ≤ NCV < 5
Highly Basic	NCV ≥ 5
Recommended Field Classification for Emigrant Project	
Potentially Acid Generating	NCV ≥ 0.0 and paste pH < 6.0; or NCV < 0.0

[1] Newmont 2003 (also ASTM E-1915-05).
NCV = Net Carbonate Value (%CO_2); NP = Neutralization Potential; AP = Acidification Potential; NNP = Net Neutralization Potential
Source: BLM 1996; USEPA 1994; Newmont 2008a.

Initial static testing was performed by Newmont in 2002, whereby 1,100 waste rock samples and 172 ore samples were collected from the proposed Emigrant mine pit area for characterization of potential acid generation (**Table 3-2**). These samples generally represented 20-ft bench composites from selected drill holes in the proposed mine pit area. Initial static testing consisted of Acid-Base Accounting, which includes determination of Neutralization Potential, Acidification Potential, Net Neutralization Potential, and Net Carbonate Value.

In 2005-2006, Newmont performed supplemental static testing on 36 composite samples that were prepared by blending samples of similar acid generation potential classes within a respective waste rock type. Of the 36 total composite samples, 34 were accepted as valid tests (22 Webb siltstone samples, 10 Devils Gate limestone samples, and two Chainman/Fresh Webb siltstone samples). Two of the samples were not properly prepared. Of the 34 composite samples, 18 represent waste rock and 16 are ore samples. Supplemental testing included static tests (Acid-Base Accounting; Peroxide Acid Generation (Net Acid Generating); and Meteoric Water Mobility Procedure), and kinetic tests (Humidity Cell and Biological Acid Production Potential tests). Paste pH measurements were also taken on samples undergoing humidity cell testing.

During the 2005-2006 testing, a geochemical review team noted that some samples with NCV values between 0.0% and 0.3% CO_2 produced acid during static and/or kinetic testing contrary to the NCV classification (see **Table 3-3** for NCV classification). As a result, the geochemical review team recommended that the break between acid generating and acid neutralizing NCV values should be established at 0.3% CO_2, rather than the -0.1% CO_2 classification (Tetra Tech 2007). It was also noted that conflicting NCV and Biological Acid Production Potential test data indicated presence of active acidity from non-sulfide minerals (*e.g.*, jarosite), and recommended that combining the NCV test with Acid Concentration Present Low Range titrations (Newmont 2003) may resolve uncertainty in the lower NCV range and allow the acid generating NCV cutoff to be lowered based on the data set (Tetra Tech 2007).

Based on the above recommendations, Newmont (2008a) conducted another study in 2008 that evaluated Paste pH and NCV of 1,271 composite samples from oxide and ore material collected from within the proposed Emigrant mine pit. Paste pH is similar to Acid Concentration Present Low Range testing in that they both evaluate the immediate availability of acid from dissolution of minerals. Results of these tests are described below.

Initial Static Test Results

As described previously, initial static tests were performed on 1,100 waste rock and 172 ore samples from the Emigrant site (**Table 3-2**). Average or mean results of initial Acid-Base Accounting tests are shown in **Table 3-4**. The average NP:AP ratios and NNP values show that the Devils Gate limestone is unlikely to generate acid. In contrast, Chainman/Fresh Webb siltstone (unoxidized carbon sulfur refractory) has potential to generate acid. Oxidized Webb siltstone has some uncertainty with respect to acid generation potential, primarily based on the NNP values. Graphs of NP:AP values for the waste rock and ore samples are presented as **Figure A-1** in **Appendix A**.

Average NCV results for waste rock and ore samples collected in 2002 are included in **Table 3-4**. Results of NCV analyses and classification schemes show that Webb siltstone is slightly basic, Devils Gate limestone is highly basic, and Chainman/Fresh Webb siltstone is slightly acidic to acidic. These results generally coincide with the average NP:AP ratios and NNP values, except that the Webb siltstone exhibits some uncertainty for acid generation potential.

NCV criteria were developed to address samples showing "uncertain" acid generation potential, or some level of "potentially acid generating" using NP:AP criteria. Such samples can exhibit NP:AP and NNP values that indicate potential for acid generation, despite an absence of acid-generating sulfide minerals. The relationship between NP:AP and NCV-based classification schemes for Emigrant waste rock samples with a NP:AP ratio of less than 10 is presented as **Figure A-2** in **Appendix A**. This cut-off excludes Devils Gate limestone samples which have large NP:AP ratios. **Figure A-2** shows that for the portion of Webb siltstone samples having NP:AP ratios in the "uncertain" and "potentially acid generating" categories, NCV results are "inert" or "neutral".

Average sulfide sulfur percentages determined from initial Acid-Base Accounting tests are less than 0.1 percent for Devils Gate limestone and Webb siltstone samples (**Table 3-4**). These values indicate that these rock types have little or no potential to generate acid. Average sulfide sulfur for the Chainman/Fresh Webb siltstone is 0.5 to 1.0 percent, which indicates a greater potential for acid generation.

TABLE 3-4
Initial Acid-Base Accounting Data for Waste Rock and Ore
Static Testing in 2002
Emigrant Mine Project

Formation	Average or Mean Values[2]										
	Total Carbon %	Organic Carbon %	Carbonate Carbon %	Total Sulfur %	Sulfate Sulfur %	Sulfide Sulfur %	NP[1]	AP[1]	NP : AP	NNP[1] (tons/kton $CaCO_3$)	NCV[1]
Waste Rock (1,100 samples)											
Chainman/ Fresh Webb Siltstone	0.7	0.6	0.03	1.336	0.385	0.951	0.1	-1.3	**0.1**	**-27.4**	**-1.2**
Devils Gate Limestone	5.9714	0.1604	5.8111	0.2989	0.2284	0.0705	21.3	-0.1	221	481.9	21.2
Webb Siltstone	0.2317	0.1917	0.0400	0.3338	0.3152	0.0186	0.1	0.0	5.8	2.8 (U)	0.1
Ore (172 samples)											
Chainman/ Fresh Webb Siltstone	0.3269	0.3204	0.0065	1.4451	0.8642	0.5809	0.0	-0.8	**0.0**	**-17.5**	**-0.8**
Devils Gate Limestone	4.3357	0.1090	4.2267	0.4063	0.3797	0.0266	15.5	0.0	424	351.3	15.5
Webb Siltstone	0.1831	0.1399	0.0432	0.7577	0.7376	0.0201	0.2	0.0	5.7	3.0 (U)	0.2

[1] NP = neutralization potential; AP = acidification potential; NNP = net neutralization potential; kton = kiloton; NCV = net carbonate value (%CO_2). Note: shaded & bolded cell indicates acid generating potential; (U) value indicates uncertain acid generating potential.
[2] Run-of-mine averages based on tonnages reported in Chapter 2. Carbon and sulfur fractions were analyzed by laboratory for each rock sample; NP, AP, NNP, and NCV values are calculated.
Source: Newmont 2005b.

Supplemental Test Results

Acid-Base Accounting tests, including NCV calculations, do not measure reactivity of rock material. To confirm initial static test results from 2002, supplementary geochemical testing was conducted in 2005-2006 (**Table 3-2**), including static and kinetic tests, with a focus on composite samples of oxidized Webb siltstone; the only rock type at Emigrant with uncertain potential to generate acid based on NNP calculations (Newmont 2006f). Initial static test results showed Devils Gate limestone as acid neutralizing and Chainman/Fresh Webb siltstone as acid generating. Results of supplemental static and kinetic tests with respect to potential to generate acid are summarized in **Table 3-5** (ERM 2006; Tetra Tech 2007).

Acid-Base Accounting Static Testing

Acid-Base Accounting test values for NP:AP, NNP, and NCV indicate the following with respect to acid generation potential for the 34 composite samples of waste rock and ore:

- NP:AP = 15 samples "potentially acid generating" (two Chainman/Fresh Webb siltstone; 13 Webb siltstone); sulfide sulfur content for these samples ranged from 0.06 to 1.24 percent by weight.
- NNP = three samples "potentially acid generating" (two Chainman/Fresh Webb siltstone; one Webb siltstone).

- NCV = two samples “slightly acidic” (Chainman/Fresh Webb siltstone).
- NP:AP = six samples “uncertain” acid generation potential (five Webb siltstone; one Devils Gate limestone).
- NNP = 23 samples “uncertain” acid generation potential (21 Webb siltstone; two Devils Gate limestone).
- NCV = seven samples “inert” (all Webb siltstone).

The NP:AP results indicate more samples as potentially acid generating as compared to the NNP and NCV values. With the exception of one sample (Webb siltstone), NNP and NCV values are in agreement with respect to classifying the samples as potentially acid generating. NNP values indicate more samples in the “uncertain” classification. The NCV classifications are inert or basic for rock samples with low sulfide concentrations and are classified by NP:AP ratios and/or NNP values as “uncertain” or “potentially acid generating.”

Meteoric Water Mobility Procedure Static Testing

Of the 27 Meteoric Water Mobility Procedure tests, three indicated a reduction in pH when comparing the initial pH to the final extract pH (implies potentially acid generating). One of these samples is Chainman/Fresh Webb siltstone, and the other two are Webb siltstone. The other Chainman/Fresh Webb siltstone sample that did not show a reduction in pH showed potentially acid generating conditions for most of the other supplemental static and kinetic tests (Newmont 2005a).

Peroxide Acid Generation Static Testing

Four of the 30 samples subject to Peroxide Acid Generation testing indicated acid producing potential. Two of these are the Chainman/Fresh Webb siltstone samples, and the other two are Webb siltstone. Three out of the four samples coincide with acid generation potential determinations from NCV numbers (Newmont 2005a).

Paste pH Testing

Paste pH tests were performed on two Chainman/Fresh Webb siltstone samples, seven Devils Gate limestone samples, and 18 Webb siltstone samples. Results show that four Webb siltstone samples (three waste rock and one ore) and one Chainman/Fresh Webb siltstone sample is acid producing (ERM 2006).

Humidity Cell Kinetic Testing

Humidity Cell tests were performed on two Chainman/Fresh Webb siltstone samples and 13 Webb siltstone samples. Results of these tests show that one of the Chainman/Fresh Webb samples (ore) is acid producing, along with two Webb siltstone samples (waste rock and ore) (Newmont 2005a).

Biological Acid Production Potential Kinetic Testing

Of the 30 samples subject to Biological Acid Production Potential testing, two were from Chainman/Fresh Webb siltstone, six were from Devils Gate limestone, and 22 were from Webb siltstone. Results show that the two Chainman/Fresh Webb samples and seven Webb siltstone samples (three waste rock and four ore) are acid producing (Newmont 2005a).

TABLE 3-5
Supplemental Test Results for Waste Rock and Ore
Static and Kinetic Testing in 2005-2006
Emigrant Mine Project

Composite Sample[1] No.	Rock Type[1]	Tests That Indicate Potential to Generate Acid[2]							
		Static Tests[3]						Kinetic Tests[3]	
		NP:AP	NNP ($TCaCO_3$ / kton)	NCV ($\%CO_2$)	MWMP (delta pH)	Peroxide Acid Generation (final pH)	Paste pH	Humidity Cell (final pH)	BAPP (final pH)
Waste Rock Samples									
1-pulp	C/FW	**0.40:1**	**-22.2**	**-0.54**	+3.4	**2.86**	6.59	7.25	**3.18**
3-pulp	DG	3.55:1	48.0	3.52	---	10.41	---	---	7.36
4-pulp	DG	41.46:1	52.7	2.49	---	10.16	---	---	7.35
5-pulp	W	4.54:1	17.7	2.81	---	6.7	---	---	4.08
6-pulp	W	**0.95:1**	-0.3	0.77	---	8.28	---	---	3.71
16-pulp	W	29.83:1	17.3	0.8	---	10.8	---	---	5.71
34-reject	W	**0.80:1**	-1.1	0.31	+1.4	7.8	6.85	6.45	3.7
35-reject	W	**0.13:1**	-6.5	0.15	+2.1	6.38	7.34	6.27	**3.47**
36-reject	W	**<0.06:1**	-5.3	0.1	+0.4	6.3	**5.96**	5.37	**3.35**
37-reject	W	2.32:1	2.9	0.3	+1.9	7.45	7.20	5.97	3.59
38-reject	W	**<0.04:1**	-7.2	0.11	**-1.3**	**4.37**	**5.10**	**4.98**	**3.18**
39-reject	W	**<0.16:1**	-1.9	0.28	**-1.3**	6.14	**5.79**	---	3.65
44-reject	DG	3.86:1	20.6	0.97	+1.9	9.37	7.34	---	4.9
45-reject	DG	2413:1	724	31.83	+2.1	---	8.12	---	---
46-reject	DG	>2153:1	646	29.25	+2.0	---	8.03	---	---
47-reject	DG	2.91:1	14.9	1.8	+1.7	8.36	6.54	---	5.39
48-reject	W	1.73:1	9.6	0.6	+2.1	7.81	6.54	5.83	5.85
49-reject	W	6.23:1	6.8	0.39	+2.2	9.54	7.62	---	4.05
Ore Samples									
17-pulp	C/FW	**<0.01:1**	**-38.8**	**-0.22**	**-0.8**	**3.09**	**5.29**	**2.91**	**2.15**
18-pulp	DG	6.25:1	83.4	5.05	---	11.09	---	---	7.99
20-pulp	W	2.02:1	5.4	0.57	---	8.22	---	---	4.31
21-pulp	W	**<0.01:1**	**-36.9**	0.61	+1.7	**3.31**	**4.97**	**4.14**	**2.93**
25-reject	W	>1.67:1	0.5	0	+0.8	5.47	6.65	6.73	**3.32**
26-reject	W	**0.24:1**	-3.1	0	+1.4	6.16	6.75	6.71	**3.27**
27-reject	W	**<0.03:1**	-10.0	0.07	+1.5	5.45	6.79	---	**3.4**
28-reject	W	**0.90:1**	-0.5	0	+1.4	7.44	7.31	---	3.59
29-reject	W	9.33:1	5.0	0.03	+1.7	9.51	7.39	6.76	3.74
30-reject	W	**0.24:1**	-4.8	0.11	+1.5	7.49	7.06	6.5	3.63
31-reject	W	1.40:1	1.0	0	+1.7	7.16	7.40	---	3.91
32-reject	W	**0.21:1**	-7.4	0	+1.3	7.21	7.21	6.42	3.71
33-reject	W	**0.26:1**	-1.4	0.14	+0.1	6.85	6.12	6.1	3.63
41-reject	DG	3.61:1	7.3	0.81	+1.1	10.12	7.20	---	5.13
42-reject	DG	>1093:1	328.0	14.99	+2.0	---	7.77	---	---
43-reject	DG	>1313:1	394.0	17.95	+1.3	---	7.83	---	---

Footnotes for Table 3-5:

[1] Composite sample 22 not included because it was collected from outside the proposed mine pit area; sample 40 not included because it was prepared with a combination of both Webb and Fresh Webb siltstone. C/FW = Chainman/Fresh Webb siltstone; DG = Devils Gate limestone; W = Webb siltstone.
[2] Shaded & bolded cell = acid generating potential.
[3] NP = Neutralization Potential; AP = Acidification Potential; NNP = Net Neutralization Potential; NCV = Net Carbonate Value; MWMP = Meteoric Water Mobility Procedure; BAPP = Biological Acid Production Potential; $TCaCO_3$/kton = tons calcium carbonate per kiloton; $\%CO_2$ = percent carbon dioxide. "---" = not tested. Delta pH for the MWMP testing indicates the difference between the final extract pH and the initial pH of the solution, in standard pH units (negative value means the final pH was lower than initial pH).
Source: Tetra Tech 2007; ERM 2006; Little Bear Laboratories 2006; McClelland Laboratories 2006a, 2006b; Newmont 2006b,c,d,e.

Comparison of Initial and Supplemental Test Results

Supplemental test results were in general agreement with the original static test results, although some inconsistencies were observed (Tetra Tech 2007). Both Chainman/Fresh Webb siltstone samples are classified as "slightly acidic" based on NCV values. With the exception of one Humidity Cell test, one Meteoric Water Mobility Procedure test, and one Paste pH test, all supplemental static and kinetic tests confirmed acid generation potential from this rock type. The discrepancy Humidity Cell test, however, indicates a trend of increasing acidity near the end of the test (Tetra Tech 2007). All initial and supplemental Devils Gate limestone samples indicate no potential to generate acid.

Initial static tests indicate some uncertainty with respect to potential to generate acid for the Webb siltstone samples. Most supplemental static tests (total of six types of tests or calculations) indicate that the Webb siltstone has little or no potential to generate acid. However, NP:AP ratios for the supplemental tests indicate approximately half the samples have some acid generation potential. NNP values for the supplemental tests show that the majority of Webb siltstone samples (21 of 22 samples) have an uncertain potential to generate acid. None of the NCV tests for the supplemental Webb siltstone samples indicated acid generation potential.

Three of the supplemental Webb siltstone samples each had three or four of the six static tests or calculations showing acid generation potential (**Table 3-5**). The other 19 Webb siltstone samples show one or none of the static test results indicating acid generation potential, except for one sample that shows two tests with acid generation potential.

Seven Webb siltstone samples indicated some potential for acid generation (three waste rock and four ore samples) as a result of supplemental kinetic testing. Of the seven samples, two were confirmed from Humidity Cell tests and all seven were confirmed from Biological Acid Production Potential tests. Six of these seven supplemental kinetic test samples also were classified as potentially acid generating by one or more of the static tests.

Tetra Tech (2007) concluded that many of the composite samples classified as "potentially acid generating" or "uncertain" based solely on acid-base account data, which is used as guidance by regulatory agencies, did not generate acid in other static or kinetic tests, including 20-week humidity cell testing. Approximately 75 percent of the rock originally identified as having an uncertain potential to generate acid is shown to be unlikely to generate acid in the supplemental test results. These data support the site-specific use of NCV classification as an alternative means of identifying PAG and non-PAG materials during mine operations (see ASTM 1915-05).

Certain static and kinetic test results from 2002 and 2005-2006 conflict for samples with NCV classifications between -0.1 and 0.15% CO_2. Tetra Tech (2007) also noted that conflicting NCV and Biological Acid Production Potential data suggest the presence of active acidity from the presence of non-sulfide minerals. As a result, Tetra Tech (2007) recommended combining the NCV test with Acid Concentration Present Low Range titration testing to see if this would resolve the uncertainty in the lower NCV range which may allow lowering of the cutoff for PAG waste rock to be determined in the field.

Additional NCV and Paste pH Test Results

In 2008, Newmont (2008a) prepared an additional 1,271 composite samples of waste rock and ore to be analyzed for NCV and Paste pH. NCV modeling was completed by Newmont for these samples, along with previous NCV results. When the NCV data are plotted against the Paste pH data for the 1,271 samples analyzed in 2008, the largest grouping for proposed non-PAG designation of Emigrant rock is when NCV ≥ 0.0% CO_2 and Paste pH ≥ 6.0 (Newmont 2008a). Newmont (2008a) further compared the NCV and Paste pH values for the 16 samples subjected to Humidity Cell testing from the 2005-2006 supplemental testing. Based on these results, there was a predictive accuracy of 100 percent compared to the Humidity Cell test predictions for NCV ≥ 0.0% CO_2 combined with a Paste pH cutoff of 6.0. This relationship for designating PAG rock occurs with the following: [NCV < 0.0% CO_2] or [NCV ≥ 0.0% CO_2 and Paste pH < 6.0]. These criteria are included in **Table 3-3**.

A summary comparison of the 16 Paste pH, NCV, and Humidity Cell results, along with other previous static and kinetic test results, is presented in **Table 3-6**. Based on the new NCV and Paste pH classification criteria identified above, total tons of PAG waste rock associated with the proposed Emigrant Project is approximately 4 million tons, or 5 percent of total waste rock.

Metal Mobility Potential

Potential for mobilizing metals from waste rock and ore samples at the Emigrant Mine was evaluated using analysis of leachate collected during Meteoric Water Mobility Procedure and Humidity Cell tests. Humidity Cell tests were conducted on eight waste rock samples (2 Chainman/Fresh Webb siltstone and 6 Webb siltstone samples) and eight ore samples (1 Chainman/Fresh Webb and 7 Webb siltstone).

A total of 13 waste rock samples (1 Chainman/Fresh Webb siltstone, 8 Webb siltstone, and 4 Devils Gate limestone samples) and 14 ore samples (1 Chainman/Fresh Webb siltstone, 10 Webb siltstone, and 3 Devils Gate limestone samples) were subject to Meteoric Water Mobility Procedure testing as part of the 2005-2006 supplemental testing program. An additional seven composite waste rock samples (2 Chainman/Fresh Webb, 2 Devils Gate, 2 Webb, and 1 run-of-mine composite) prepared in 1995, 1997, and 2002 during exploration drilling were subject to Meteoric Water Mobility Procedure testing (Tetra Tech 2007; Newmont 2005a). The 1995-1997 waste rock samples were composites based on a preliminary mine plan that focused exploration drilling in what is now the southern portion of the proposed Emigrant pit.

Results of metal concentrations and some other constituents from waste rock and ore samples are compared to NDEP Profile I reference values for Meteoric Water Mobility Procedure testing (**Table 3-7**). Profile I reference values typically are the same as federal drinking water standards; however, Profile I reference values for antimony and arsenic are greater to account for elevated concentrations of these elements in water in Nevada.

TABLE 3-6
Comparison of Humidity Cell and Paste pH Test Results with Other Tests for Waste Rock and Ore
Emigrant Mine Project

Composite Sample No.	Rock Type[1]	Tests That Indicate Potential to Generate Acid[2]							
		Static Tests[3]						Kinetic Tests[3]	
		NP:AP	NNP	NCV	MWMP	Peroxide Acid Generation	Paste pH	Humidity Cell	BAPP
Waste Rock Samples									
1-pulp	C/FW	**Y**	**Y**	**Y**	N	**Y**	N	N	**Y**
34-reject	W	**Y**	U	N	N	N	N	N	N
35-reject	W	**Y**	U	N	N	N	N	N	**Y**
36-reject	W	**Y**	U	N	N	N	N	N	**Y**
37-reject	W	U	U	N	N	N	N	N	N
38-reject	W	**Y**	U	N	**Y**	**Y**	**Y**	**Y**	**Y**
40-reject	W/FW	**Y**	U	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**
48-reject	W	U	U	N	N	N	N	N	N
Ore Samples									
17-pulp	C/FW	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**
21-pulp	W	**Y**	**Y**	N	N	**Y**	**Y**	**Y**	**Y**
25-reject	W	U	U	N	N	N	N	N	**Y**
26-reject	W	**Y**	U	N	N	N	N	N	**Y**
29-reject	W	N	U	N	N	N	N	N	N
30-reject	W	**Y**	U	N	N	N	N	N	N
32-reject	W	**Y**	U	N	N	N	N	N	N
33-reject	W	**Y**	U	N	N	N	N	N	N

[1] C/FW = Chainman/Fresh Webb siltstone; W = Webb siltstone.
[2] Bolded "Y" = Yes for acid generating potential; "N" = No for acid generation potential; "U" = uncertain acid generation potential. Only those "Y" cells are shaded in the rows that have "Y" for Humidity Cell tests.
The following criteria are used to determine "Y", "N", and "U":
NP:AP --- "Y" <1; "N" > 3; "U" ≥ 1 and ≤ 3 (note: BLM guideline for non-PAG is NP:AP > 3:1; while Nevada uses NP:AP > 1.2:1.0).
NNP --- "Y" < -20; "N" > +20; "U" ≥ -20 and ≤ +20.
NCV --- "Y" < 0.0; "N" ≥ 0.0.
MWMP --- If MWMP extract pH is less than initial pH, then "Y".
Peroxide Acid Generation --- "Y" <4.5; "N" ≥ 4.5.
Paste pH --- "Y" < 6.0; "N" ≥ 6.0.
Humidity Cell --- "Y" < 5.0; "N" ≥ 5.0.
BAPP --- "Y" < 3.5; "N" ≥ 3.5.
[3] NP = Neutralization Potential; AP = Acidification Potential; NNP = Net Neutralization Potential as tons calcium carbonate per kiloton; NCV = Net Carbonate Value as %CO_2; MWMP = Meteoric Water Mobility Procedure; BAPP = Biological Acid Production Potential.
Source: Tetra Tech 2007; Newmont 2008a.

TABLE 3-7
Metal Mobility Results for Waste Rock and Ore Samples from Meteoric Water Mobility Procedure Tests
Emigrant Mine Project

Chemical Parameter	NDEP Profile I Ref. Value	Concentrations of Parameters from Meteoric Water Mobility Procedure Tests that Exceed NDEP Profile I Reference Values: Chainman/ Fresh Webb Siltstone			Devils Gate Limestone			Webb Siltstone			1997 Waste Rock
		1995 & 2002 Waste Rock	2005 & 2006 Waste Rock	2005 & 2006 Ore	1995 & 2002 Waste Rock	2005 & 2006 Waste Rock	2005 & 2006 Ore	1995 & 2002 Waste Rock	2005 & 2006 Waste Rock	2005 & 2006 Ore	
Aluminum	0.05-0.2			59			0.059				
Antimony	0.146				0.163						
Arsenic	0.05	0.06		0.081		0.0562	0.0871	0.114		0.06-0.111	0.07
Cadmium	0.005	0.005		0.022		0.00847					
Chromium	0.1			0.132							
Iron	0.3-0.6			77							
Lead	0.015	0.05									
Manganese	0.05-0.1	5.85	3.66	29.7		1.05	0.079		0.085-19.5	0.071-16.5	
Mercury	0.002					0.00245	0.0029			0.00284-0.0067	
Nickel	0.1	3.64	0.393	4.15					0.265-2.76	0.842-1.81	
Selenium	0.05	0.1	0.17			0.0617			0.0597-0.0902		
Thallium	0.002	0.232	0.0022	0.0127		0.0022	0.0037		0.00236	0.00204-0.0263	
Zinc	5.0	5.16		5.12					13.4		
Fluoride	2 – 4		4.3	6.6		2.78	2.95			3.6	
Sulfate	250-500		1650	2320		526	326		856		
pH	6.5-8.5	6.39		4.08						5.98	

Note: Concentrations in milligrams per liter (mg/L), except pH in standard units. This table shows only those chemical parameters and concentrations that exceed the Nevada Division of Environmental Protection (NDEP) Profile I reference values; if more than one sample result exceeded a reference value, the range in exceedences is shown.
Source: Tetra Tech 2007.

Meteoric Water Mobility Procedure test results show that the Chainman/Fresh Webb siltstone samples for waste rock exceeded NDEP Profile I reference values for arsenic, cadmium, lead, manganese, nickel, selenium, thallium, zinc, pH, fluoride, and sulfate (**Table 3-7**). The Devils Gate limestone waste rock samples exceeded NDEP Profile I reference values for antimony, arsenic, cadmium, manganese, mercury, selenium, thallium, fluoride, and sulfate. The Webb siltstone waste rock samples exceeded NDEP Profile I reference values for arsenic, manganese, nickel, selenium, thallium, zinc, and sulfate. The 1997 waste rock sample exceeded the reference value for arsenic.

Meteoric Water Mobility Procedure test results for ore samples show that the Chainman/Fresh Webb siltstone samples exceeded NDEP Profile I reference values for aluminum, arsenic, cadmium, chromium, iron, manganese, nickel, thallium, zinc, pH, fluoride, and sulfate (**Table 3-7**). The Devils Gate limestone ore samples exceeded NDEP Profile I reference values for aluminum, arsenic, manganese, mercury, thallium, fluoride, and sulfate. The Webb siltstone ore samples exceeded NDEP Profile I reference values for arsenic, manganese, mercury, nickel, thallium, pH, and fluoride.

In general, Humidity Cell leachate samples collected during 20 weeks of testing show that fewer constituents exceeded NDEP Profile I reference values than were measured in Meteoric Water Mobility Procedure samples (**Tables 3-7** and **3-8**). Constituents for which reference values were most commonly exceeded in waste rock and ore Humidity Cell tests included aluminum, arsenic, manganese, nickel, pH, and sulfate. Other constituents, including beryllium, cadmium, chromium, iron, and thallium occasionally exceeded NDEP Profile I reference values in the leachate samples. Constituent mobility generally was higher for potentially acid producing samples.

TABLE 3-8
Metal Mobility Results for Waste Rock and Ore Samples from Humidity Cell Tests
Emigrant Mine Project

Chemical Parameter	NDEP Profile I Reference Value	Concentrations of Parameters from Humidity Cell Tests that Exceed NDEP Profile I Reference Values			
		Chainman/Fresh Webb Siltstone		Webb Siltstone	
		Waste Rock	Ore	Waste Rock	Ore
Aluminum	0.05 - 0.2		9.19 – 21.2	0.051 – 0.179	0.063 – 0.641
Arsenic	0.05	0.0518 – 0.0529		0.0562 – 0.0994	0.0565 – 0.119
Beryllium	0.004		0.00068 – 0.0024	0.00141	
Cadmium	0.005		0.0069 – 0.0094		
Chromium	0.1		0.24 – 0.907		
Iron	0.3 - 0.6		4.1 – 32.1		0.338
Manganese	0.05 - 0.1	0.0525 – 0.17	0.169 – 7.08	0.069 – 2.76	0.072 – 2.78
Nickel	0.1		0.125 – 0.855	0.157	0.131 – 0.197
Thallium	0.002				0.0039 – 0.0068
pH	6.5 – 8.5	5.77 – 5.89	2.82 – 3.83	4.27 – 6.46	4.5 – 6.47
Sulfate	250 – 500	334	360		278

Note: Concentrations in milligrams per liter (mg/L), except pH in standard units. This table shows only those chemical parameters and concentrations that exceed the Nevada Division of Environmental Protection (NDEP) Profile I reference values; if more than one sample result exceeded a reference value, the range in exceedences is shown. Samples from Humidity Cell tests were collected for the following periods: weeks 1-5; weeks 6-10; weeks 11-15; and weeks 16-20.
Source: Tetra Tech 2007.

DIRECT AND INDIRECT IMPACTS

Proposed Action

Geology

Implementation of the Proposed Action would include excavating and relocating waste rock, processing ore, and removing gold from the ore rock. The principal direct effect of mining is removing rock from the natural setting and placing this rock at other locations (*i.e.*, waste rock disposal facility and leach pad), and creation of open mine pits. Ultimately, mining would result in the extraction and relocation of approximately 83 Mt of waste rock and 92 Mt of ore rock. Mining operations are expected to remove all recoverable mineral resources based on available technology and at current or reasonably foreseeable gold prices. Open pit mining would cause modification of existing topography. Backfilling the open pits (see *Proposed Action* in Chapter 2) and using natural regrade techniques would eventually restore most of the mine pit to blend with surrounding topography.

Areas of no potential economic value in the Project area are usually identified by condemnation drilling, and these areas are often used for waste rock disposal, ore processing, and infrastructure facilities. These surface disturbances are not expected to result in loss of access to future mineral resources.

Area Seismicity

Earthquakes with characteristics determined for the Project area represent limited risk to the stability of proposed waste rock and heap leach facilities at the Project area. In a study of seismic activity of the nearby Rain Mine area (2.5 miles west of Emigrant Mine area), Call and Nicholas (1986) predicted a maxim acceleration of 0.4 g, with a recurrence interval of about 1,000 years. Earthquakes with these characteristics represent limited risk to stability of proposed waste rock and heap leach facilities at the Emigrant site where reclaimed slopes would be at an angle of 2.5H:1.0V for the heap leach pad and 3.0H:1.0V for the non-PAG and in-pit waste rock disposal facilities.

Acceptable levels of risk for heap leach and waste rock disposal facilities are determined by regulatory agencies and are usually based on consequences envisioned from potential failure of the facility. Valera Consultants (2004) calculated the probability of earthquakes occurring that have magnitudes causing potential damage to the proposed heap leach facility at the Emigrant Project site. Results are on the order of 3 percent for the 14-year operational mine life (475-year return period) and 2 percent for the 200-year closure and post-closure period (2,475-year return period). The conservative nature of seismic calculations by Valera Consultants (2004) and the limited consequences of a potential failure are considered acceptable seismic risks for proposed Project facilities.

United Building Code standards based on the nature of foundation materials, and USGS earthquake record data, were used by Valera Consultants (2004) to assess seismic risk to the heap leach facility. The maximum credible earthquake used for the evaluation was magnitude 6.1 occurring at distances ranging from 10 to 17 miles from the site. These earthquakes have potential to produce strong ground shaking. Therefore, design of the heap leach facility addressed these conditions to prevent damage to the facility from material slumping on the 2.5H:1.0V slopes.

Paleontological Resources

Physical disturbance associated with the Emigrant Project could result in limited direct impacts to paleontological resources. The location of potential buried paleontological deposits cannot be predicted by surface inspections and would not be identified until encountered in actual mining excavations. Other mining-related excavations associated with facilities development (*e.g.*, facility pads, heap leach pads, and waste rock disposal areas) are shallow and would typically only affect near-surface unconsolidated soil materials.

If vertebrate fossils are discovered during mine development or operational activities, Newmont would cease mining in the vicinity of the discovery, and contact BLM to determine steps necessary to evaluate the discovery. No fossil localities, quarries, or significant vertebrate fossil remains are known to be located in the Emigrant Project area.

Waste Rock and Ore Geochemical Characterization

Devils Gate limestone, which has no potential to generate acid, would comprise approximately 32 percent of waste rock for the Emigrant Project. Isolation and encapsulation of PAG waste rock with compacted neutral waste rock would place buffering material around potentially acid generating rock, and would limit exposure of this rock to oxygen and direct meteoric water, thereby reducing potential for acid generation leachate formation. In addition, potentially acid generating waste rock would be placed onto limestone benches in the Emigrant mine pit. Acidic leachate that may be generated by waste rock would be neutralized by the underlying limestone. Results of potential leachate migration modeling are included in the *Water Quantity and Quality* section of this Chapter.

Potentially acid generating waste rock at Emigrant would total approximately 4 million tons (Mt) or 5 percent of total waste rock to be removed during mining. The rock would be segregated and placed in a mined-out portion of the mine pit on benches of Devils Gate limestone, and encapsulated with a minimum 10-ft thick layer of non-PAG acid neutralizing waste rock. Potentially acid generating rock may be exposed during Phase 3 of mining in the west pit high walls. These exposures would be reclaimed by backfilling with non-PAG waste rock at a 3H:1V slope.

Potential impacts to groundwater and/or surface water from release of trace metals in waste rock is described in the *Water Quantity and Quality* section of this Chapter. Impacts are expected to be minimal due to the distance to groundwater (approximately 450 feet or more in the proposed mine pit area) and the potential for sorption by ferric oxides and precipitation of non-soluble minerals (Langmuir 1997). As previously discussed, potential for acid generation would be minimized by encapsulation of appropriate waste rock, and the presence of limestone beneath most of the Emigrant mine pit area.

The thickness of an unsaturated zone beneath the mine pit would result in slow dispersed movement of unsaturated flow (see modeling results in the *Water Quantity and Quality* section). Fractures created in the Devils Gate limestone as a result of blasting would not propagate to depth. Unsaturated flow from backfilled pits into the limestone would first fill these fractures and then would move within the undisturbed limestone bedrock. The advancement of the unsaturated flow in the limestone provides increased opportunity for attenuation and precipitation of metals in the limestone.

Ore placed on the leach pad would be neutralized by the leaching solution which is maintained at basic pH values. Potentially acid producing ore (mined during early phases) represents approximately 3 percent of ore placed on the heap leach pad. In addition, during closure, a water balance cover would be placed on the heap leach pad. Residual drain-down of leachate from the heap would be managed in an evapotranspiration cell. This cell would remain functional until such time as leachate ceases to report to the cell or the quality of the leachate requires no further treatment. For these reasons, it is unlikely that trace metals in the spent ore pile would release to environmental receptors.

No Action Alternative

The No Action alternative would avoid potential direct and indirect impacts of the Proposed Action. It would also eliminate recovery of approximately 92 Mt of ore from the geologic resource, and the gold reserve intended to be mined would remain in-place. Paleontological resources, if present, would not be affected.

POTENTIAL MONITORING AND MITIGATION MEASURES

A waste rock management report that summarizes mining progress and disposition of waste rock would be submitted to BLM and NDEP annually. This report would describe testing completed to characterize PAG waste rock, and how such rock was segregated from other waste rock. Newmont would collect waste rock characterization data required for the Water Pollution Control Permit. These data would be provided to BLM and NDEP on a quarterly basis. Quarterly compliance inspections of the mine site would be conducted by NDEP and BLM.

No mitigation measures for potential impacts associated with the extraction, processing, and disposal of rocks from implementation of the Proposed Action beyond those included in the Proposed Action have been identified by BLM or NDEP.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

Under the Proposed Action, approximately 83 Mt of waste rock and 92 Mt of ore would be mined from the Emigrant Project area. About 1.5 million ounces of gold would be produced from the geologic resource. Removal of gold from the rock package would constitute an irreversible commitment of the geologic resource because the gold could not be replaced in its original setting. The recovered gold, however, would be available for uses identified in Chapter 1 and is generally competitive in the recycling industry.

Irreversible and irretrievable commitment of paleontological resources could occur as a result of mining activities if fossils are encountered in disturbance areas. Should fossil artifacts be identified and recovered, the paleontological resource would be archived and could be made available for viewing and study.

RESIDUAL EFFECTS

No residual effects to water quality or other resources are expected as a result of the extraction, processing, and disposal of rocks associated with the Proposed Action.

AIR QUALITY

AFFECTED ENVIRONMENT

Meteorology

The proposed Emigrant Project area is subject to daily temperature fluctuations, low relative humidity, and limited cloud cover. Wind data collected at Newmont's Rain Mine (located adjacent to the Emigrant Project area) from April 1993 through December 2003 indicate the most common wind direction is from the south-southeast and southeast, with an average speed of 8.2 miles per hour. The Emigrant Project area is at an elevation of approximately 6000 feet above mean sea level.

Temperature and Precipitation

Mean monthly temperature recorded at the Emigrant Project meteorological station ranges from 27.5˚ Fahrenheit (F) in January to 74.7˚F in July. Precipitation measured at the Emigrant Project meteorological station shows the heaviest precipitation occurring from November through April. Summer precipitation occurs mostly as scattered showers and thunderstorms that contribute relatively small amounts to overall precipitation. Average annual precipitation in the Emigrant Mine area is 9.7 inches. Average annual pan evaporation for the Emigrant Project area is about 46 inches per year (in/yr), with a lake/pond surface evaporation rate of about 35 in/yr (Telesto Solutions, Inc. 2004). Average precipitation and temperatures recorded at the Emigrant Project meteorological station are shown in **Table 3-9.**

Ambient Air Quality Standards

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

Ambient air quality standards must not be exceeded in areas accessible to the general public. National primary standards are the levels of air quality necessary, with an adequate margin of safety, to protect public health. National secondary standards are levels of air quality necessary to protect public welfare from known or anticipated adverse effects of a regulated air pollutant.

Attainment status for pollutants within the Project area is determined by monitoring levels of criteria pollutants for which National Ambient Air Quality Standards (NAAQS) and Nevada Ambient Air Quality Standards exist. Standards for PM_{10} are 150 micrograms per cubic meter ($\mu g/m^3$) for a 24-hour average and 50 $\mu g/m^3$ for the annual mean. Air quality in Elko County is classified as attainment or unclassified for all pollutants. Attainment or unclassified designation means no violations of Nevada or national air quality standards have been documented in the region.

Air Quality Monitoring Data

PM_{10} ambient air quality data have been collected within the town of Elko since 1993. Ambient ozone data were also collected at the town of Elko from 1997 through 2001. Newmont collected PM_{10} data at the Gold Quarry Project located approximately 13 miles northwest of the Emigrant Project area. **Table 3-10** lists available PM_{10} and ozone monitoring data for sites nearest the Emigrant Project.

TABLE 3-9
Precipitation and Temperature for the Period of 2000 - 2007
Emigrant Project Area

Year	Jan	Feb	March	April	May	June	July	August	Sept	Oct	Nov	Dec	Annual
Precipitation (inches)													**Total Annual Precipitation**
2000	--	--	--	--	0.4	0.16	0.16	0.25	0.15	--	--	--	--
2001	--	--	--	0.41	0.08	0.08	0.61	0.24	0.51	0.38	2.31	--	--
2002	0.22	0.46	0.58	1.66	0.24	--	--	0.08	0.89	0.03	1.47	0.48	--
2003	0.96	0.79	1.73	2.27	1.44	0.07	0.35	2.09	--	0.28	--	--	--
2004	--	3.33	0.92	1.76	1.11	0.32	0.37	1.17	0.96	--	--	--	--
2005	1.74	0.7	1.71	0.13	2.7	--	--	0.17	0.71	1.51	1.54	2.76	--
2006	1.85	1.72	1.34	1.99	0.32	0.35	0.54	0.00	0.29	1.19	0.6	0.42	10.61
2007	0.62	0.77	0.47	1.03	0.68	1.16	0.08	0.38	0.71	0.98	0.59	1.31	8.78
Mean	1.08	1.30	1.13	1.32	0.87	0.36	0.35	0.55	0.60	0.73	1.30	1.24	9.70
Temperature (°F)													**Mean Annual Temperature**
2000	--	--	--	48.9	54.7	66.8	74	73.2	61	47.3	30.1	31.5	--
2001	25.4	28.8	39.9	42	59.4	66	71.3	75.1	65	53.7	38.9	26.3	49.3
2002	26.4	28.4	34.2	45.1	52.9	--	--	69.6	61.6	47	38	32.2	--
2003	38.3	30	39.9	39.6	53.6	66.2	77	71.8	--	55.6	32.5	30.6	--
2004	23.8	26.5	44.3	45	52.7	64.2	72.4	67.6	59.3	46.7	34.1	31	47.3
2005	28.4	29.1	30.1	42.3	52	52.2	75.7	70.9	59.2	51.6	45.7	--	48.8
2006	--	--	--	42.3	57.2	66.9	75.6	71.4	59.6	46.8	30	27.3	--
2007	22.6	32.9	42.3	45	56.1	65.8	76.8	72.3	59.5	46.8	39.6	25.9	48.8
Mean	27.5	29.3	38.5	43.8	54.8	64.0	74.7	71.5	60.7	49.4	36.1	29.3	48.6

Note: -- Data not available.
Source: Newmont 2008c.

TABLE 3-10
PM_{10} and Ozone Monitoring Data

PM_{10} Monitoring Data[1]					
Site	**Year**	**Annual mean (µg/m³)**	**24-Hour High (µg/m³)**		**24-Hour 2nd High (µg/m³)**
City of Elko	1997	25	49		48
	1998	22	103		65
	1999	25	97		78
	2000	25	87		76
	2001	25	102		71
	2002	23	214		151
	2003	20	163		111
	2004	21	77		72
	2005	21	88		71
	2006	26	134		125
	2007	26	94		88
Newmont Gold Quarry Project	1995[2]	19	44		NA
	1996	23	83		
	1997[3]	15	35		
Ozone Monitoring Data[1]					
Site	**Year**	**Annual Mean (ppm)**	**1-Hour High (ppm)**	**1-Hour 2nd High (ppm)**	**8-Hour Running Average (ppm)**
City of Elko	1997	0.0469	0.089	0.077	0.076
	1998	0.0502	0.084	0.08	0.073
	1999	0.0518	0.08	0.075	0.069
	2000	0.0514	0.086	0.076	0.069
	2001	0.0559	0.091	0.086	0.075

Source: U.S. Environmental Protection Agency 2008.

[1] PM_{10} = particulate matter smaller than 10 microns; µg/m³ = micrograms per cubic meter; ppm = parts per million; NA = not available.

[2] Data collection is for last three quarters of 1995 only.

[3] Data collection is for first quarter of 1997 only.

PM_{10} data from the Elko monitoring station represent air quality within populated areas. Primary contributors to ambient particulate concentrations in populated areas are road dust and residential wood smoke. Air quality data from Newmont's Gold Quarry Mine monitoring station are representative of air quality surrounding active mine sites in the area, however Gold Quarry mining and ore processing operations are considerably larger than the proposed Emigrant Project.

Prevention of Significant Deterioration Classification

The area surrounding the proposed Emigrant Project is a designated Class II area as defined by the federal Prevention of Significant Deterioration of Air Quality program. The Class II designation allows moderate growth or degradation of air quality within certain limits above baseline air quality. Industrial sources proposing construction or modifications must demonstrate that emissions would not cause deterioration of air quality in all areas. Standards for deterioration are stricter for Class I areas than Class II areas. The nearest Class I area is the Jarbidge Wilderness, located approximately 80 miles northeast of the proposed Emigrant Project area. As a federal mandatory Class I area, the Jarbidge Wilderness receives visibility protection through the air quality permitting process. No designated Integral Vistas are associated with the Jarbidge Wilderness.

Two other wilderness areas are located in the Humboldt National Forest southeast of the Project area: East Humboldt Wilderness and Ruby Mountain Wilderness. Neither of these wilderness areas are mandatory federal Class I airsheds. BLM manages 10 Wilderness Study Areas in the Elko District, of which seven (all or portions of) have been recommended for wilderness designation. None of these Wilderness Study Areas are mandatory Class I airsheds (Hawthorne 2004).

Current Activity

Existing exploration operations in the Project area produce criteria pollutant emissions, most notably from particulate matter. Fugitive particulate matter emissions are created from drilling and road dust. Combustion products including CO, NO_2, SO_2, and hydrocarbons are emitted from vehicle engines. Newmont's Rain Mine is the only existing mining operation in the vicinity of the proposed Emigrant Project. The Rain Mine is currently in closure with process solution collection and disposal the only remaining activities at the site.

DIRECT AND INDIRECT IMPACTS

Proposed Action

Carbon dioxide (CO_2), SO_2, oxides of nitrogen (NOx), volatile organic compounds (VOCs) and particulate emissions would be generated during construction and continue throughout the mining period. Mercury emissions would result from carbon processing at South Operations Area. Particulate emissions from construction and mining would be caused by drilling, blasting, excavating, loading, hauling, and dumping of waste rock and ore. Particulate emissions would be limited through implementation of Best Management Practices (BMPs), including minimizing drop heights during loading, and watering and chemical stabilization of haul roads. Diesel engine exhaust from construction equipment, mining equipment, and various transportation vehicles would generate gaseous air pollutants.

Gaseous Emissions

The Emigrant Project would be a source of gaseous air pollutants including SO_2, CO, NOx, and VOCs. The primary source of these emissions would be exhaust from diesel engines used to power construction equipment, mining machines, and haul trucks. Gaseous emissions from diesel engines would be minimized through proper operation and maintenance.

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

Particulate Emissions

Mining would occur in an open pit with fugitive dust emissions controlled at the point of generation. Ore and waste rock would be drilled and blasted in sequential benches to facilitate loading and hauling. Blasted ore and waste rock would be loaded into off-road, end-dump haul trucks using shovels and front-end loaders. Benches would be established at approximately 20-ft intervals with bench widths varying to include safety berms and haul roads. Haul trucks would move within the open pit using roads on the surface of benches with ramps extending between two or more benches. Once the haul trucks leave the pit, they would travel on main haul roads to the waste rock disposal facility, pit backfill areas, or heap leach facility.

Fugitive dust emissions would be generated from wind erosion of disturbed areas and road dust. All haul roads would be maintained on a continuous basis for safe and efficient haulage and to minimize fugitive dust emissions. Generation of fugitive dust from ore handling activities would be controlled using Best Management Practices (Nevada State Conservation Commission 1994) which could include direct water application, use of approved chemical binders or wetting agents, water spray, and revegetation of disturbed areas concurrent with operations.

Mercury Emissions

Ore from the Emigrant Project would be processed by run-of-mine oxide heap leach techniques. Loaded carbon (carbon containing metal) resulting from the leaching process would be transported by enclosed truck to Newmont's South Operations Area processing facility. Mercury concentrations in ore from the Emigrant Project are approximately 4 parts per million (ppm). This concentration is less than average mercury concentrations in other sources of ore being processed at the South Operations Area facility (*e.g.*, Leeville Project ore = 17.54 ppm mercury; and South Operations Area Gold Quarry = 6.90 ppm mercury) (Newmont 2008d). Carbon handling and refinery services at the South Operations Area facility that emit mercury to the atmosphere include carbon regeneration, carbon stripping, electro-winning, retorting, and melting. Mercury emissions at each of these processes are subject to controls that have been determined by the Environmental Protection Agency to provide the Maximum Achievable Control Technology (per Mercury Reduction Program 2002) and are listed in NAC 445B.3651 as constituting presumptive Nevada Maximum Achievable Control Technology proposed for mercury. Diesel and gas combustion sources also emit mercury.

Maximum potential hourly emissions would not increase due to processing of loaded carbon columns from the Emigrant Project at the South Operations Area. Carbon columns from the Emigrant Project would replace production from existing sources with no projected increases in total annual mercury emissions from the South Operations Area.

Regulatory Requirements

The Emigrant Project would comply with the Nevada Revised Statutes (NRS) and the Nevada Administrative Code (NAC) Chapter 445B which contain the Nevada air pollution rules and regulations. The Emigrant Project would also comply with all applicable federal air regulations. Nevada regulations require operators to obtain air quality permits from the Nevada Bureau of Air Pollution Control for each emission source (process/activity) that emits air contaminants at the mine property. Nevada Revised Statute (NRS) 445B.155 defines an emission source as "any property, real or personal, which directly emits or may emit any air contaminant." NRS 445B.110 defines an "air contaminant" as "any substance discharged into the atmosphere except water vapor and droplets."

Newmont has obtained the Class II Air Quality Operating Permit from the Nevada Bureau of Air Pollution Control for the Emigrant Project. The Nevada Bureau of Air Pollution Control permits are:

- **Class III** - Typically for facilities that emit 5 tons per year (tons/yr) or less in total of regulated air pollutants and emit less than ½-tons/yr of lead, and must not have any emission units subject to Federal Emission Standards (i.e. NSPS, NESHAPS, MACT).

- **Class II** - Typically for facilities that emit less than 100 tons/yr for any one regulated pollutant and emit less than 25 tons/yr total HAP and emit less than 10 tons/yr of any single hazardous air pollutant (HAP).

- **Class I** - Typically for facilities that emit more than 100 tons/yr for any one regulated pollutant or emit more than 25 tons/yr total HAP or emit more than 10 tons/yr of any single HAP or is a PSD source or major MACT source.

- Surface Area Disturbance greater than 5 acres.

The U.S. Environmental Protection Agency (EPA) promulgated a New Source Performance Standard (NSPS) for stationary compression ignition internal combustion engines in 40 CFR Part 60 Subpart IIII. The final rule became effective in September 2006 and would reduce particulate, NOx, SO_2, CO and hydrocarbon emissions from stationary diesel internal combustion engines whose construction, modification, or reconstruction commenced after July 11, 2005 by requiring compliance with new emission standards. In addition to new emission standards, the diesel fuel used for stationary compression ignition internal combustion engines must meet the requirements of 40 CFR 80.51(a), which requires diesel fuels have a maximum sulfur content of 500 ppm and either a minimum cetane index of 40 or a maximum aromatic content of 35 volume percent. Operations at the Emigrant Project would be required to meet New Source Performance Standards for diesel engines at the mine.

No Action Alternative

The No Action alternative would avoid potential direct and indirect impacts of the Proposed Action to air resources.

POTENTIAL MONITORING AND MITIGATION MEASURES

No monitoring or mitigation measures for air resources have been identified by BLM or NDEP.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

No irreversible or irretrievable commitment of air resources would result from implementation of the Proposed Action.

RESIDUAL EFFECTS

No residual effects on air resources would occur as a result of the Proposed Action and mitigation measures. After cessation of mining and completion of reclamation activities, air quality would be expected to reach pre-mining conditions.

WATER QUANTITY AND QUALITY

AFFECTED ENVIRONMENT

The Study Area for water resources includes the Dixie Creek watershed within hydrographic area No. 48 (Dixie Creek – Tenmile Creek Area) as shown on **Figure 3-4**. Hydrographic area No. 48 encompasses 392 square miles. Dixie Creek drains north to the South Fork Humboldt River approximately 8 miles northeast of the Emigrant Project area. Dixie Creek is located 4 miles east of the Project area and encompasses a watershed area of about 170 square miles (**Figure 3-4**). Drainages in this watershed are either perennial (year-round flow), intermittent (flow is seasonal in response to precipitation and groundwater discharge), or ephemeral (short-term flow only in response to snowmelt and major rain events).

Surface Water Quantity

Dixie Creek flows north to the South Fork Humboldt River, which then flows to the Humboldt River approximately 10 miles northeast of the Emigrant Project area (**Figure 3-4**). This watershed is bounded on the west and south by the Piñon Range and on the east by White Flats and Cedar Ridge.

The main channel of Dixie Creek is intermittent in some segments and perennial in other segments (**Figure 3-4**). Tributary channels to Dixie Creek are small intermittent or ephemeral drainages with flow occurring primarily in response to precipitation events or snowmelt runoff, typically during the period of March through June. According to Siebert and Kiracofe (1988), the entire Dixie Creek watershed has 39 miles of perennial stream and 153 miles of ephemeral or intermittent channels. The tributary channels in and near the Emigrant Project area extend southeast and east to the main channel of Dixie Creek. Where flow occurs in these channels, base-flow rates usually are in the range of 0.1 to 1 cubic foot per second (ft^3/sec) or less; this is equivalent to approximately 45 to 450 gallons per minute (gal/min).

Tributary drainages within the Emigrant Project area (**Figure 3-4**) encompass an area of about 28 square miles, or 16 percent of the 170-square mile Dixie Creek watershed. The proposed Project area is located in the upper half of this tributary drainage area located along the west side of the Dixie Creek watershed. Tributaries that drain the Project area are relatively small ephemeral channels, except for some upper reaches that are perennial due to discharge from springs and seeps (**Figure 3-4**). Flow typically disappears in these channels near the west side of the Emigrant Project area, except during periods of spring runoff when water flows to or near Dixie Creek.

Dixie Creek is perennial in its upper reaches, but typically flows several months each year at its confluence with South Fork Humboldt River (**Figure 3-4**). A gauging station (No. 10320100) was operated by the USGS on lower Dixie Creek for 7 years from 1990 through 1996. Newmont has monitored flow at seven stations (DC-1 through DC-7) along Dixie Creek (**Figure 3-4**). Only station DC-5 is monitored on a regular basis; the other stations were monitored primarily in 1988-1989 and 1994-1997.

BLM monitored flow on Dixie Creek at two temporary Remote Automated Weather Station (RAWS) locations from 2000-2002. The lower site was located at the USGS gauging station and the upper site was in the SE¼ of Section 31, Township 30 North, Range 54 East. BLM has monitored discharge periodically at the upper RAWS location since the station was removed. Discharge was also monitored at another location approximately one mile upstream of the upper RAWS in Section 6 during 1982 and from 2001 to the present time. During March and April 2004, BLM measured discharge at six sites on two tributary channels that drain the Emigrant Project area to Dixie Creek. BLM also measured discharge on lower Dixie Creek approximately ½-mile upstream of DC-6 (**Figure 3-4**) in the early 1980s and in 2003-2004.

Flow along Dixie Creek was measured by Newmont (2004b) at five of the DC-stations and the USGS gauging station in June 1993, November 1994, October 1995, and September 1996. Based on these synoptic flow measurements (**Table 3-11**), Dixie Creek has perennial flow at uppermost station DC-1 and in the vicinity of DC-6 (**Figure 3-4**). Flow around station DC-5 may also be perennial. In general, flow along Dixie Creek is highest at the uppermost monitoring site (DC-1), declines down to between stations DC-5 and DC-6, increases at DC-6, declining again down to the mouth (DC-7) where flow was always dry for the four measurement dates (**Table 3-11**).

Table 3-11 also presents mean monthly precipitation values for the month of measurement and the previous month from one of the nearby precipitation stations. The first two synoptic runs in June 1993 and November 1994 had average or above average precipitation, whereas the last two events in October 1995 and September 1996 had below average precipitation. As previously stated, Dixie Creek usually contributes surface flow to South Fork Humboldt River seasonally for several months each year. Riparian habitat improvements along portions of lower Dixie Creek likely have resulted in longer periods of flow in this area.

The drainage area upslope of the Emigrant Project area includes a reclaimed waste rock disposal facility associated with the Rain Mine and undeveloped hills with sagebrush and grass vegetation. The primary drainage channel that extends through the proposed mine area generally is trapezoidal with a top width of about 20 feet, bottom width of about 5 feet, depths of 5 to 10 feet, and a longitudinal slope of 3 to 4 percent (Simons & Associates 2004). The channel bottom consists of silt. sand, gravel, and cobbles. Channel cross-sections for Dixie Creek at stations DC-1, DC-4, DC-5, and the USGS gauge are presented in Newmont's (2004b) report, "Dixie Flats, Ground-Water and Surface-Water Monitoring Results".

Table 3-12 summarizes 1990-1996 flow data for Dixie Creek at USGS gauging station 10320100, located approximately 1.5 miles upstream of the confluence with South Fork Humboldt River. A hydrograph of mean daily discharge versus time for this Dixie Creek gauging station is presented on **Figure 3-5**. Mean monthly flows at the gauging station range from no flow in some years for July/August/September, to approximately 50 ft^3/sec in some years during March/April/May. Highest mean monthly flows occur in March/April/May and range 17 to 22 ft^3/sec. Lowest mean monthly flows occur in August/September (0.05 to 0.07 ft^3/sec).

Mean annual flow for Dixie Creek during 1990-1995 ranged 0.87 ft^3/sec (1992) to 13.6 ft^3/sec (1995) (**Table 3-12**). Annual peak flow measurements for the same period ranged from 6 ft^3/sec (March 1992) to 350 ft^3/sec (March 1993). According to Siebert and Kiracofe (1988), estimated annual discharge from the Dixie Creek watershed is 2,290 acre-feet. Based on the USGS flow data and assuming that flow in Dixie Creek reaches South Fork Humboldt River primarily during the period March through June, it appears that a flow rate of at least 5 ft^3/sec is required at USGS gauging station for water in Dixie Creek to reach the South Fork Humboldt River.

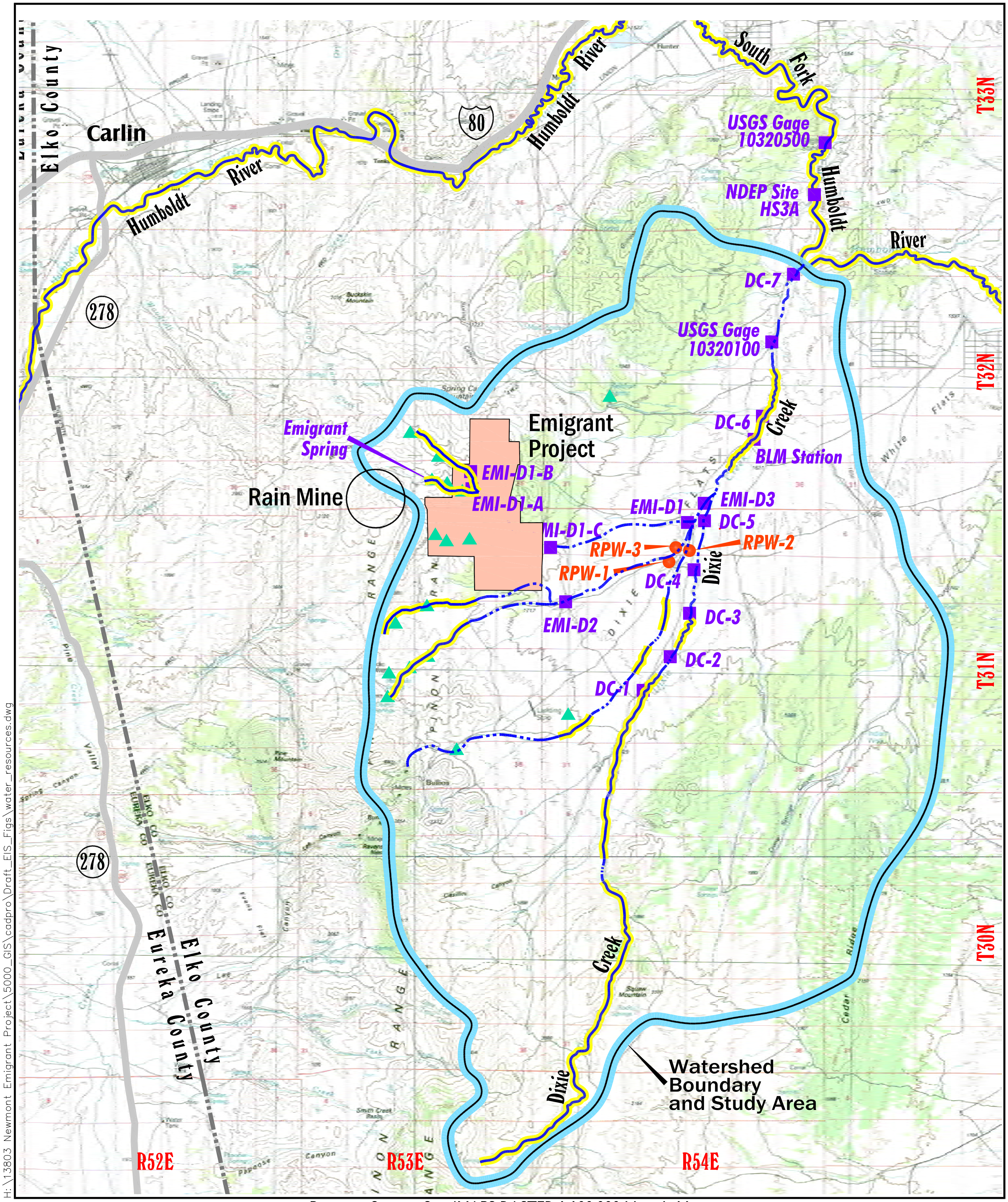
TABLE 3-11
Synoptic Flow Measurements for Dixie Creek
Emigrant Mine Project

Dixie Creek Station [1]	**Flow Measurement (cubic feet per second – ft³/sec)** [2]			
	June 17, 1993	**Nov. 4, 1994**	**Oct. 10, 1995**	**Sept. 24, 1996**
Upstream				
DC-1	3.10	1.38	0.26	NM
DC-4	1.78	0	0	0
DC-5	1.37	0.02	0.01	NM
DC-6	2.18	0.32	NM	NM
USGS Gauge	1.71	0	NM	NM
DC-7	0	0	0	0
Downstream				
Precipitation at Jiggs 8 SSE Zaga, NV (inches per month) [3]	May – 2.07 / 2.03 June – 1.86 / 0.92	Oct. – 1.47 / 0.93 Nov. – 2.58 / 1.22	Sept. – 0.71 / 0.98 Oct. – 0.00 / 0.93	Aug. – 0.05 / 0.66 Sept. – 0.40 / 0.98

Source: Newmont 2004b; Western Regional Climate Center 2004.
[1] See **Figure 3-4** for station locations.
[2] NM = not measured. Note: 1 ft³/sec = 448.8 gal/min.
[3] First value is monthly total precipitation (inches) for specified month/year; second value is mean monthly precipitation (inches) for period of 1978 – 2004.

Flow measurements and observations by BLM at two stations on Dixie Creek in 2000-2001 had the following approximate stream flow rates at the lower site at USGS gauge 10320100 (**Figure 3-4**): May 2000 = 6 to 10 ft³/sec; late March 2001 = 20 to 40 ft³/sec or more; April 2001 = 10 to 20 ft³/sec; June 2001 = 3 to 5 ft³/sec; and July 2001 = 2+ ft³/sec (BLM 2005). BLM measurements at the upper Dixie Creek site approximately ½-mile upstream of DC-6 (**Figure 3-4**) were approximately: April and May 2000 = 2 to 4 ft³/sec; June 2000 = 1 ft³/sec; May 2001 = 4.5 to 6.5 ft³/sec; June 2001 = 3.5 ft³/sec; and July 2001 = 3 ft³/sec (BLM 2005).

In March-April 2004, BLM measured stream flow at six sites (EMI-D1, EMI-D1-A, EMI-D1-B, EMI-D1-C, EMI-D2, and EMI-D3) along two tributary channels to Dixie Creek that drain the Project area (**Figure 3-4**). Station EMI-D1 is located on the lower part of the channel that primarily drains the proposed mine pit area. Stations EMI-D1-A, -B, and -C are located farther upstream from EMI-D1 near the Emigrant Project area. Station EMI-D2 is located along the middle portion of the channel that primarily drains the proposed leach pad area. Station EMI-D3 is located below the confluence of the two channels described above and near their confluence with Dixie Creek.



Basemap Source: Sure!MAPS RASTER 1:100,000 Nevada Map

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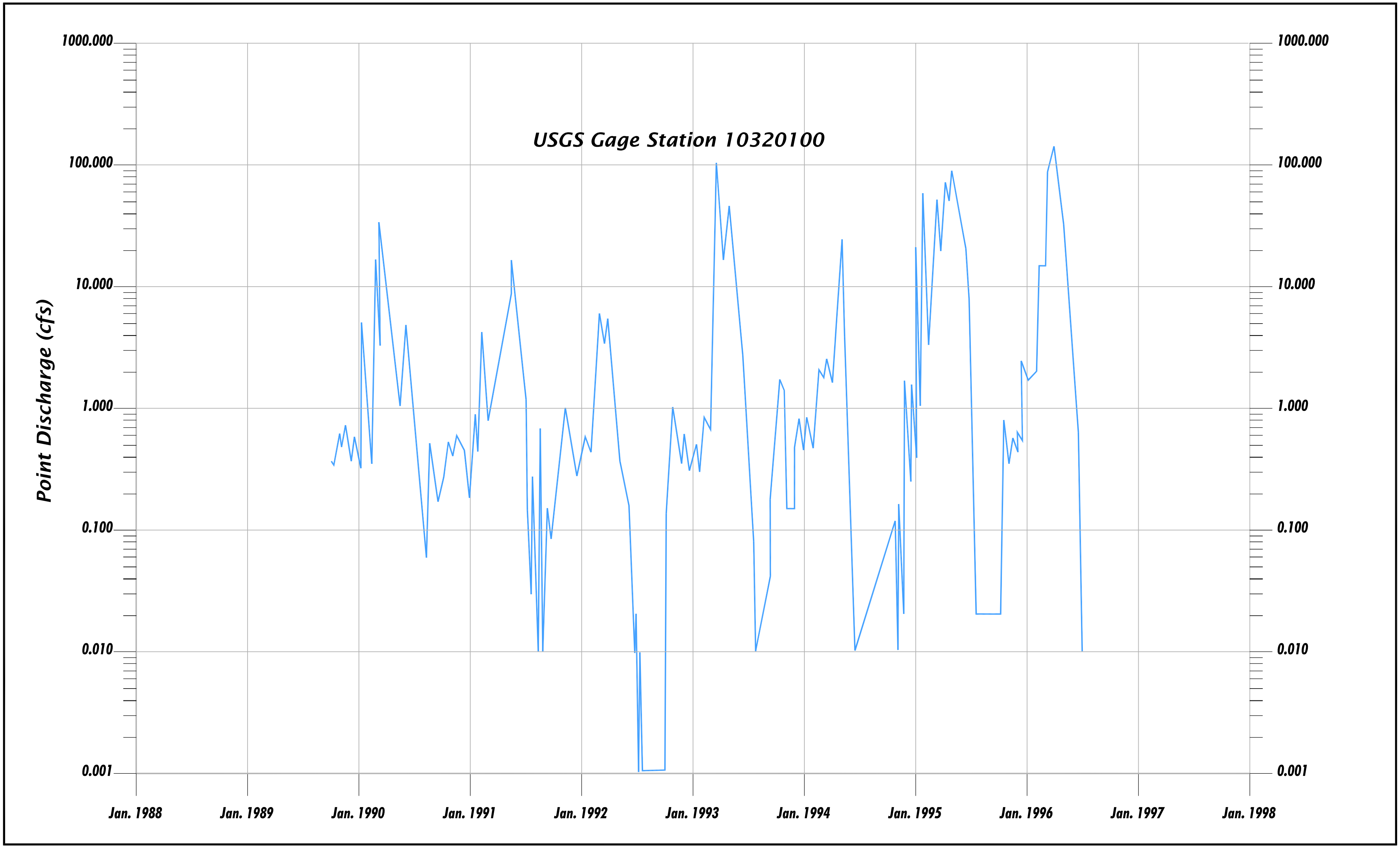
U.S. Department of the Interior
Bureau of Land Management
Elko District Office
Elko, Nevada

Spring or Spring Complex
Surface Water Monitoring Station
Water Supply Well
Perennial Stream Reach
Ephemeral or Intermittent Stream Reach

Water Resources
Emigrant Project
Elko County, Nevada
FIGURE 3-4



Source: Newmont 2004

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U.S. Department of the Interior
Bureau of Land Management
Elko District Office
Elko, Nevada

Hydrograph for Dixie Creek Flow at USGS Gage
Emigrant Project
Elko County, Nevada
FIGURE 3-5

TABLE 3-12
Dixie Creek Stream Flow Summary at USGS Gauging Station 10320100
Emigrant Mine Project

Year	Mean Monthly Stream Flow (cubic feet per second – ft^3/sec)											
	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec
1989	NM	NM	NM	NM	NM	NM	NM	NM	NM	0.43	0.53	0.48
1990	0.69	2.09	9.83	5.26	2.02	2.23	0.17	0.20	0.24	0.40	0.52	0.36
1991	0.51	0.99	1.32	3.40	10.9	4.19	0.14	0.14	0.11	0.31	0.64	0.38
1992	0.49	1.57	4.14	2.43	0.39	0.12	0.002	0.0	0.0	0.29	0.62	0.41
1993	0.38	0.67	65.6	27.7	21.9	4.02	0.13	0.0	0.13	1.02	0.26	0.49
1994	0.61	1.10	1.83	3.07	5.60	0.20	0.0	0.0	0.0	0.0	0.04	0.53
1995	3.49	12.2	22.9	39.8	57.9	24.0	2.07	0.0	0.0	0.17	0.45	0.67
1996	1.86	6.32	43.4	74.2	23.8	2.11	0.001	0.0	0.0	NM	NM	NM
Mean Monthly Flow	1.15	3.56	21.3	22.3	17.5	5.27	0.36	0.05	0.07	0.37	0.44	0.47

Year	Mean Annual Flow (ft^3/sec)	Year	Peak Annual Flow (ft^3/sec)	Gauge Height (feet)	Peak Flow Date
1990	2.00	1990	65	2.50	3-3-90
1991	1.92	1991	26	2.11	5-14-91
1992	0.87	1992	6	Not measured	5-4-92
1993	10.3	1993	350	4.54	3-17-93
1994	1.09	1994	113	3.14	5-12-94
1995	13.6	1995	140	3.67	5-10-95

Source: USGS 2004b.
Note: See **Figure 3-4** for station location. USGS = U.S. Geological Survey; NM = not measured.

Results of BLM measurements show that on March 16, 2004, flows at stations EMI-D1 and EMI-D2 were 10.9 and 4.1 ft^3/sec, respectively (**Table B-1, Appendix B**). Flow measured at the combined channels farther downstream (EMI-D3) on the same day, however, was only 6.9 ft^3/sec, indicating that about 8 ft^3/sec was lost to the subsurface in Dixie Creek valley prior to reaching Dixie Creek. Flow in Dixie Creek below the tributary confluence (near DC-6) on March 16, 2004 was about 34 ft^3/sec.

On March 24, 2004, measurements at the same locations indicate that combined flow of the two tributary channels (EMI-D1 & EMI-D2) was 7.4 ft^3/sec, which is similar to the measurement of 7.6 ft^3/sec for the combined channels at EMI-D3 on March 24 (**Table B-1, Appendix B**). On the same day, Dixie Creek below the tributary confluence near DC-6 had a flow rate of about 38 ft^3/sec.

Highest flow measured by BLM (2004) for tributary channel stations EMI-D1, EMI-D2, and EMI-D3 was 12.7 ft^3/sec at EMI-D1 on March 23, 2004 (**Table B-1, Appendix B**). This tributary drains the northern part of the Emigrant Project area. Lowest flow was 0.26 ft^3/sec at EMI-D2 on March 24, 2004. Flow measurements in 2003-2004 for lower Dixie Creek ½-mile upstream of DC-6 were in the range of 0.34 ft^3/sec (July 21, 2003) to 42 ft^3/sec (March 23, 2004). Flow rates at this Dixie Creek station between 1982 and 1985 were in a similar range of 1.3 to 45 ft^3/sec.

Flow was measured by Newmont (2007a) at tributary stations EMI-D1-A, EMI-D1-B, and EMI-D2, and at Dixie Creek station DC-5 (**Figure 3-4**) between May 2005 and April 2007 (**Table B-1, Appendix B**). Highest measured flow in the tributaries was 1.5 ft^3/sec at station EMI-D1-A on May 2, 2005 in the Emigrant Spring tributary above the Project area. At station EMI-D2 (south tributary below Project area), the channel had no flow on the six measurement dates between July and December 2005, and the five measurements between July and November 2006.

Several springs are located in the vicinity of the Emigrant Project area, most of which are located in headwater areas of the Piñon Range (6,000 to 6,500 feet elevation) west-southwest of the Study Area (**Figure 3-4**). The two forks of the tributary drainage to Dixie Creek that extend through the north-central portion of the Project area immediately west of the proposed mine area each contain two or three springs or spring complexes that provide year-round base flow to these channel segments. Emigrant Spring is located in the upper reach of the southern-most of the two forks in the SW¼NE¼ of Section 34 (**Figure 3-4**). Three more springs are located in the upper portion of the tributary drainage located in the southern portion of the Project area. This channel extends immediately west and south of the proposed heap leach facility area. Most springs are associated with major geologic structures.

Flow from Emigrant Spring has been periodically measured since May 1997 (Newmont 2004b). Results of these measurements show that flow generally ranges 0.01 to 0.03 ft^3/sec (5 to 15 gal/min) during the summer-fall period, with some instances of no flow. Flow measurements taken in April, May, and June 2003-2004 were less than 0.6 ft^3/sec downstream of the Emigrant Spring site where surface water runoff contributes to flow from Emigrant Spring.

Flow rates of other springs discussed above that are west of the Emigrant Project area are generally less than 0.01 ft^3/sec. BLM measured flow in springs upgradient (west) of the Emigrant Project area in September 1981 and August 2003, with resulting flow rates of 0.002 ft^3/sec or less (BLM 1981, 2003). There are no natural ponds or lakes in the vicinity of the Emigrant Project. In general, flow from springs upgradient (west) of the Project area extend down to the west side of the Project area, and then often go subsurface prior to reaching the middle of the Project area (**Figure 3-4**).

On March 31, 2004, BLM measured flow in two forks of the tributary that extend through the northern portion of the Project area; these measurements were 1.1 and 2.7 ft^3/sec in the west side of the Project area (stations EMI-D1-A and EMI-D1-B, **Figure 3-4**; also see **Table B-1, Appendix B**). On the east side of the Project area, the flow rate in the tributary channel was 3.2 ft^3/sec on March 31, 2004 (station EMI-D1-C, **Figure 3-4**). Therefore, on that day, water was flowing in that tributary channel through the entire Emigrant Project area. Farther downstream at station EMI-D1, flow measured on March 31, 2004 was 2.6 ft^3/sec, indicating that about 0.6 ft^3/sec was lost in this channel between EMI-D1-C and EMI-D1 (**Table B-1, Appendix B** and **Figure 3-4**).

Surface water runoff in the watershed that contains the Emigrant Project area was calculated by Simons & Associates (2004) using the HEC-1 computer model. For this model, the amount of area to be mined was estimated at 0.48 square mile, with an upstream drainage area of 4.18 square miles (i.e., drainage area upstream of sub-basins where mining would occur). The total sub-basin area down to the outlet point below the area to be mined is 5.17 square miles. The estimated area to be mined would be about 9 percent of this 5.17 square mile sub-basin used in the model. The HEC-1 model was used to compute runoff for a range of storm events having return periods of 2 years to 500 years, as well as the Probable Maximum Flood (PMF), for several locations upstream and inside the Emigrant Project area. **Table 3-13** presents peak flow and volume calculated for the 5.17 square mile sub-basin that includes the proposed mine area. At this location, modeled peak flow ranges from 44 to 707 ft^3/sec for return periods ranging from 2 to 500 years.

Flooding that occurred periodically from 1910 to the mid-1980s caused damage to the Dixie Creek channel and bridge (Siebert and Kiracofe 1988), and likely had similar effects on some tributary channels to Dixie Creek. Estimated peak flow in 1979 at the Dixie Creek site located in Section 26 (T32N, R54E) was 752 ft^3/sec (Siebert and Kiracofe 1988).

The Crane Springs sub-watershed is located along the east side of the Dixie Creek watershed and covers an area of 17,920 acres. A numerical model was used to calculate a maximum discharge of about 112 ft^3/sec for the 20-year return period from the Crane Springs area (Siebert and Kiracofe 1988). A portion of Dixie Creek watershed that does not contain the Crane Springs drainage was estimated to have seven times more surface water flow than the Crane Springs sub-watershed. Based on this assumption, the largest peak flow in lower Dixie Creek during 1965-1985 was 784 ft^3/sec (in 1975) above the confluence with Crane Springs drainage, and 896 ft^3/sec at the mouth of Dixie Creek (Siebert and Kiracofe 1988).

A USGS gauging station is located on South Fork Humboldt River below the Dixie Creek confluence (**Figure 3-4**). This station (No. 10320500) is outside of the Study Area, but flow data are summarized here because it is located just downstream of the Study Area. The station was monitored from 1937 to 1973, with some gaps in the record. Results of this monitoring show that mean monthly flows for lower South Fork Humboldt River are lowest in August/September/October (6.4 to 16.8 ft^3/sec), and highest in May and June (376 to 482 ft^3/sec) (**Table 3-14**). Mean annual flows for the lower South Fork Humboldt River station are in the range of 23 to 226 ft^3/sec for the most recent 25-year period of record (USGS 2004c).

Surface Water Quality

Water Quality Standards

Nevada water is regulated for quality standards that are established by the State of Nevada under Nevada Water Pollution Control regulations and statutes (Nevada Administrative Code [NAC] 445A.070 et seq.; Nevada Revised Statutes [NRS] 445A.300 et seq.). Both numeric and narrative criteria are included in Nevada's water quality standards. Numeric water quality criteria (NAC 445A.144) apply to Class water and Designated water. Numeric standards are established for designated beneficial uses (i.e., irrigation, livestock watering, aquatic life, recreation, municipal or domestic supply, industrial supply, and propagation of wildlife) and are summarized in **Table B-2** (**Appendix B**). Some of these standards are taken from the Humboldt River control point (Designated water) at the Palisade gauge (NAC 445A.204), which is located approximately 10 air miles downstream of the Carlin gauge.

TABLE 3-13
Modeled Peak Flow and Volume for Watershed Containing Proposed Emigrant Mine

Peak Flow Return Period (years)	Peak Flow (cubic feet per second)	Volume (acre-feet)
2	44	19
5	67	32
10	98	48
25	169	89
50	214	112
100	312	166
500	707	343
Probable Maximum Flood (PMF)	6,552	1,939

Note: Watershed includes 5.17 square miles, extending from the west side to east side of the proposed mine pit area.
Source: Simons & Associates 2004.

TABLE 3-14
Monthly Stream Flow for Lower South Fork Humboldt River
Emigrant Mine Project

Period of Record	Mean Monthly Stream Flow (cubic feet per second)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
South Fork Humboldt River Below Dixie Creek (USGS Gauge No. 10320500)												
1937-1973	38.1	64.8	105	210	376	482	133	16.8	6.4	14.5	25.3	29.5

Source: USGS 2004c.
Note: See **Figure 3-4** for station location. USGS = U.S. Geological Survey.

Some streams in Nevada are classified as Class A, B, C, or D, with Class A streams of best quality and Class D streams of poorest quality (NAC 445A.123-127). Dixie Creek and its tributaries are not specifically classified; however, South Fork Humboldt River in this area is Class B. As such, Dixie Creek would also be a Class B water under the "tributary rule" (NAC 445A.145). Standards for Class B streams are summarized in **Table B-3** (**Appendix B**). Narrative standards applicable to all surface water in the state are specified in NAC 445A.121.

For purposes of comparison, Nevada "Profile I" reference values included in **Table B-2** (**Appendix B**) are used to evaluate groundwater quality in the Study Area. These values are more applicable to groundwater that is not used as a drinking water source.

NDEP compiles the Section 303(d) list (Clean Water Act) for development of "Total Maximum Daily Loads" (TMDLs) for impaired water bodies. In general, a water body is included on the Section 303(d) list if the beneficial uses are not met more than 25 percent of the time. Dixie Creek has not been evaluated for inclusion on Nevada's 303(d) list of impaired water bodies; however, South Fork Humboldt River from Lee to its confluence with the Humboldt River is listed as impaired for total iron and total phosphorus (NDEP 2002).

Waste discharges to any state water must be such that no impairment of beneficial use occurs as a result of the discharge (NAC 445A.120[2]). No discharges, however, are planned for the Emigrant Project.

Study Area Watersheds

Surface water has been sampled and analyzed from several locations along Dixie Creek and from some tributaries of Dixie Creek that drain the Emigrant Project area. During a 4-year period from 1982 through 1985, eight water samples were collected by BLM from Dixie Creek ½-mile upstream of station DC-6 where the road crosses the channel (**Figure 3-4**) (Siebert and Kiracofe 1988). These water quality results are summarized in **Table 3-15**. The flow rate of Dixie Creek at the time these samples were collected ranged from 1.3 to 45 ft^3/sec. Another eight water samples from the same location on Dixie Creek were collected by BLM (2004) in 2003-2004 and analyzed for six to eight parameters (**Table 3-15**).

Surface water in Dixie Creek upstream from DC-6 generally is a sodium-bicarbonate type with pH in the range of 7.1 to 8.8 standard units (su). Water temperature ranges from 7 to 25 degrees Celsius (°C), and total dissolved solids (TDS) is in the range of 150 to 300 milligrams per liter (mg/L). Electrical conductivity ranges from 150 to 550 micromhos per centimeter (µmhos/cm). Sulfate in Dixie Creek ranged from 14 to 31 mg/L. Nitrate concentrations were less than 2 mg/L. Comparison of the early Dixie Creek samples (1982-1985) to recent samples (2003-2004) shows no significant changes or trends.

The range of total suspended solids (TSS) measured in 1986 at the BLM Dixie Creek station upstream of DC-6 was 160 to 2,910 mg/L, with flow rates in the range of 8 to 70 ft^3/sec (Siebert and Kiracofe 1988). Turbidity measurements at the same Dixie Creek location in 1982-1985 range from 1 to 585 Jackson Turbidity Units (JTU), with highest sediment load occurring during higher flows (**Table 3-15**). In 2003-2004, TSS and turbidity measured by BLM (2004) in Dixie Creek upstream of DC-6 were in the ranges of 5 to 206 mg/L, and 5 to 233 Nephelometric Turbidity Units (NTU), respectively (**Table 3-15**). These values show that sediment concentrations decline in Dixie Creek below where tributary channels from the Emigrant Project area enter the creek. Additional reduction in sediment load along lower Dixie Creek is expected due to riparian improvements.

In 2004-2007, BLM (2004) and Newmont (2007a) collected and analyzed surface water samples from some channels in and near the Emigrant Project area that are tributary to Dixie Creek (**Table B-4, Appendix B**). The sample sites (EMI-D1, EMI-D1-A, EMI-D1-B, EMI-D1-C, EMI-D2, EMI-D3, and Dixie Creek ½-mile upstream of confluence of Dixie Creek and the tributary channels) are shown on **Figure 3-4**. Water temperature for these samples typically was in the range of 10 to 20°C. Electrical conductivity and pH were typically in the range of 100 to 400 µmhos/cm, and 7.0 to 9.0 su, respectively.

TABLE 3-15
Water Quality Data for Dixie Creek at Road Crossing One-Half Mile Upstream of DC-6 (1982-1985 and 2003-2004)
Emigrant Mine Project

Parameter	Sample Date							
	5-10-82	**7-13-82**	**9-14-82**	**6-21-83**	**9-26-83**	**4-24-84**	**6-26-84**	**8-19-85**
Flow (ft^3/sec)	30	1.7	1.3	37	1.5	45	22	2
Temperature (˚C)	---	19	15	20	17	8	19	25
Conductivity (µmhos/cm)	---	---	---	150	400	185	200	---
pH (su)	7.7	8.3	7.7	8.1	8.8	8.0	8.2	---
TDS	152	281	264	---	---	---	---	---
Dissolved Oxygen	---	---	---	---	---	12.3	---	---
Turbidity (JTU)	115	9.6	1.5	37	3	585	33	1.7
Sulfate	15	26	25	---	---	---	---	---
Chloride	5.2	29	25	1	3	11	17	30
Nitrate as N	0.43	ND	0.16	0.4	0.7	1.6	1.5	0.4
Total Phosphate	---	---	---	0/9	0.2	1.2	0.4	0.1
Alkalinity as HCO_3	---	---	---	96	95	74	94	106
Alkalinity as CO_3	---	---	---	0	12	0	ND	10
Bicarbonate	94	168	165	---	---	---	---	---
Carbonate	0	0	0	---	---	---	---	---
Calcium	7.6	22	24	---	---	---	---	---
Magnesium	4.9	5.6	6.0	---	---	---	---	---
Potassium	2.1	7.4	8.6	---	---	---	---	---
Sodium	12	32	53	---	---	---	---	---
Manganese	0.1	ND	ND	---	---	---	---	---
	5-20-03	**7-21-03**	**9-11-03**	**3-8-04**	**3-16-04**	**3-23-04**	**3-24-04**	**4-13-04**
Temperature (°C)	7.8	23.9	12.2	8.3	8.9	10.0	6.7	9.4
Conductivity (µmhos/cm)	230	---	550	399	182	156	161	192
pH (su)	7.13	---	7.14	8.21	8.34	8.63	8.30	8.31
Dissolved Oxygen	---	>11	---	>11	---	9.5	9.6	10.9
Turbidity (NTU)	23	4.5	233	68	167	106	96	45
TSS	19	5	206	68	153	103	94	50
Sulfate	14	21	15	29	16	31	31	21
Total Phosphorus	0.157	0.238	0.26	1.76	0.157	0.0978	0.134	0.107

Source: Siebert and Kiracofe 1988; BLM 2004.
Note: All units are in milligrams per liter (mg/L) unless otherwise specified; ft^3/sec = cubic feet per second; ˚C = degrees Celsius; µmhos/cm = micromhos per centimeter; su = standard units of pH; TDS = total dissolved solids; JTU = Jackson Turbidity Units; NTU = nephelometric turbidity units; TSS = total suspended solids; ND = not detected; --- = not analyzed. Samples collected in 2003-2004 were analyzed by BLM using in-house instruments.

Turbidity and TSS in most samples from Dixie Creek tributary channels collected in 2003-2007 were in the range of 10 to 250 NTU and 10 to 250 mg/L, respectively. Several samples, however, had higher sediment levels that were associated with higher flow measurements (**Table B-4, Appendix B**). Other parameters analyzed in some of the sample results presented **Table B-4** (**Appendix B**) include nitrate, nitrite, ammonia, total nitrogen, phosphorus, orthophosphate, chloride, and fecal coliform.

Newmont (2004b) collected and analyzed water samples from Emigrant Spring on a quarterly basis since mid-1994. A statistical summary of water quality data from the Emigrant Spring monitoring site is presented in **Table B-5** (**Appendix B**) for samples collected during the Fall low-flow season. Results of these water analyses show that TDS is in the range of 407 to 852 mg/L, with a mean value of 529 mg/L. Temperature varies widely from about 10 to 21°C. This spring water has a mean pH and sulfate of 7.4 standard units and 180 mg/L, respectively. The primary federal drinking water standard for arsenic was exceeded in some samples from Emigrant Spring, while secondary drinking water standards for aluminum, iron, and manganese also were exceeded (**Table B-5, Appendix B**). Surface water or aquatic life standards (**Table B-2, Appendix B**) for iron, selenium, and silver have been exceeded in one or more samples from Emigrant Spring.

Groundwater Quantity

Groundwater in the Emigrant Project area moves through bedrock consisting of volcanics (extrusive ash/tuff) and sedimentary rocks (limestone, shale, sandstone, and conglomerate) along the Piñon Range. Localized deposits of unconsolidated alluvium along some of the stream channels also have limited groundwater. Groundwater in the Project area flows eastward into basin fill deposits in the Dixie Creek Valley.

Figure 3-6 illustrates a conceptual model of groundwater flow in the vicinity of the Project area. The figure covers the Project area portion of a larger-scale groundwater flow system that includes the entire groundwater basin. At this intermediate scale, the upland areas and valleys form a series of groundwater basins bounded by groundwater divides, which are typically at or near the surface water divides. Groundwater flows from the upland areas toward the valleys. The uplands are the primary recharge areas, and valleys are the primary discharge areas. This results in a system where net water movement in the recharge areas is downward, and net groundwater flow in the discharge areas is upward. Between these areas, lateral groundwater flow predominates.

On a smaller localized scale, groundwater movement can be controlled by sub-basin topography and/or geologic controls (e.g., faults and fracture zones). Examples of such local flow systems are springs that occur in the valleys west of the proposed Emigrant mine pit area. Here the springs are localized by the faults and generally occur near where the fault planes intersects the sub-basin valley bottom. This spring discharge initially flows on the surface, but as it flows downstream, the flow typically enters the perched alluvial groundwater system in the stream valley. This perched groundwater in valley alluvium eventually seeps back into the bedrock, thus entering an adjacent groundwater local flow system.

Mine Area

Geologic cross-sections (stacked blocks) in **Figure 3-7** illustrate depths to groundwater and the fault blocks in the Emigrant Project area that isolate zones of groundwater. Two piezometers were installed by Newmont west and east of the Emigrant Fault. Piezometer REP-6, west of the fault, encountered groundwater above and within the Chainman Formation at a depth of about 100 feet (Simons & Associates 1997). Piezometer REP-5, east of the fault in the proposed Emigrant Mine area, did not encounter groundwater at a depth of 360 feet in the Devils Gate limestone.

No groundwater was encountered in over 950 exploration holes (drilled on 100-ft centers) in the proposed mine pit area. However, projection of groundwater levels in the proposed pit area, based on water levels in piezometers EMW-5 and EMW-2 installed in the areas of the proposed waste rock disposal and oxide heap leach facility, indicates that depth to groundwater would be approximately 450 feet below the base of the proposed Emigrant mine pit. Shallow perched groundwater was also encountered in some exploration drill holes in alluvium overlying sedimentary bedrock at depths of less than 15 feet (Simons & Associates 1997). Shallow alluvial deposits of interbedded sand and gravel in the drainage bottoms are up to 50 feet thick.

Wells and piezometers in the Emigrant Project area are shown on **Figure 3-8**, along with groundwater potentiometric contours for alluvium along Dixie Creek and for bedrock in the proposed mine area. Groundwater in Dixie Creek Valley alluvium generally flows to the north at a low gradient of about 0.01 ft/ft. Groundwater in siltstone bedrock in the proposed mine area generally flows west to east at a gradient of about 0.08 ft/ft.

Depth to groundwater in the proposed heap leach facility area was measured in some exploration and condemnation drill holes. In five holes, depth to water was in the range of 145 to 590 feet below ground surface (Simons & Associates 1997). Three other drill holes did not encounter groundwater at total drilled depths of 175, 255, and 505 feet. Piezometers EMW-2 and EMW-5 in the proposed heap leach facility area encountered groundwater at depths of approximately 360 and 480 feet below ground surface, respectively, as shown on **Figure 3-7**. Shallow groundwater also was encountered in alluvium in the drainage bottom to the west and south of the proposed heap leach facility (Simons & Associates 1997).

Precipitation in the Piñon Range is the primary source of groundwater recharge in the Project area. Average annual precipitation at the Rain Mine (1997-2004) is 13 inches per year (in/yr) and about 10 in/yr in the proposed Emigrant Project area, with up to 20 in/yr in the highest elevations.

An estimate of recharge to the groundwater system from precipitation infiltration was developed using methods presented by Maurer *et al.* (1996). Working in the northern part of the Carlin Trend, Maurer *et al.* (1996) developed a correlation between elevation and precipitation, and estimates of the percentage of precipitation that infiltrates to recharge the groundwater system for various elevations. Precipitation is estimated by the equation (Maurer *et al.* 1996): $P = (A \times 0.00356) - 8.56$, where P is the mean annual precipitation in inches and A is the altitude in feet above mean sea level. Maurer *et al.* (1996) estimated that, for a mean annual precipitation range of 8 to 12 inches, 3 percent of total precipitation recharges the groundwater system; for a precipitation range of 12 to 15 in/yr, 7 percent recharges the groundwater system; and for 15 to 20 in/yr precipitation, 15 percent recharges the groundwater system.

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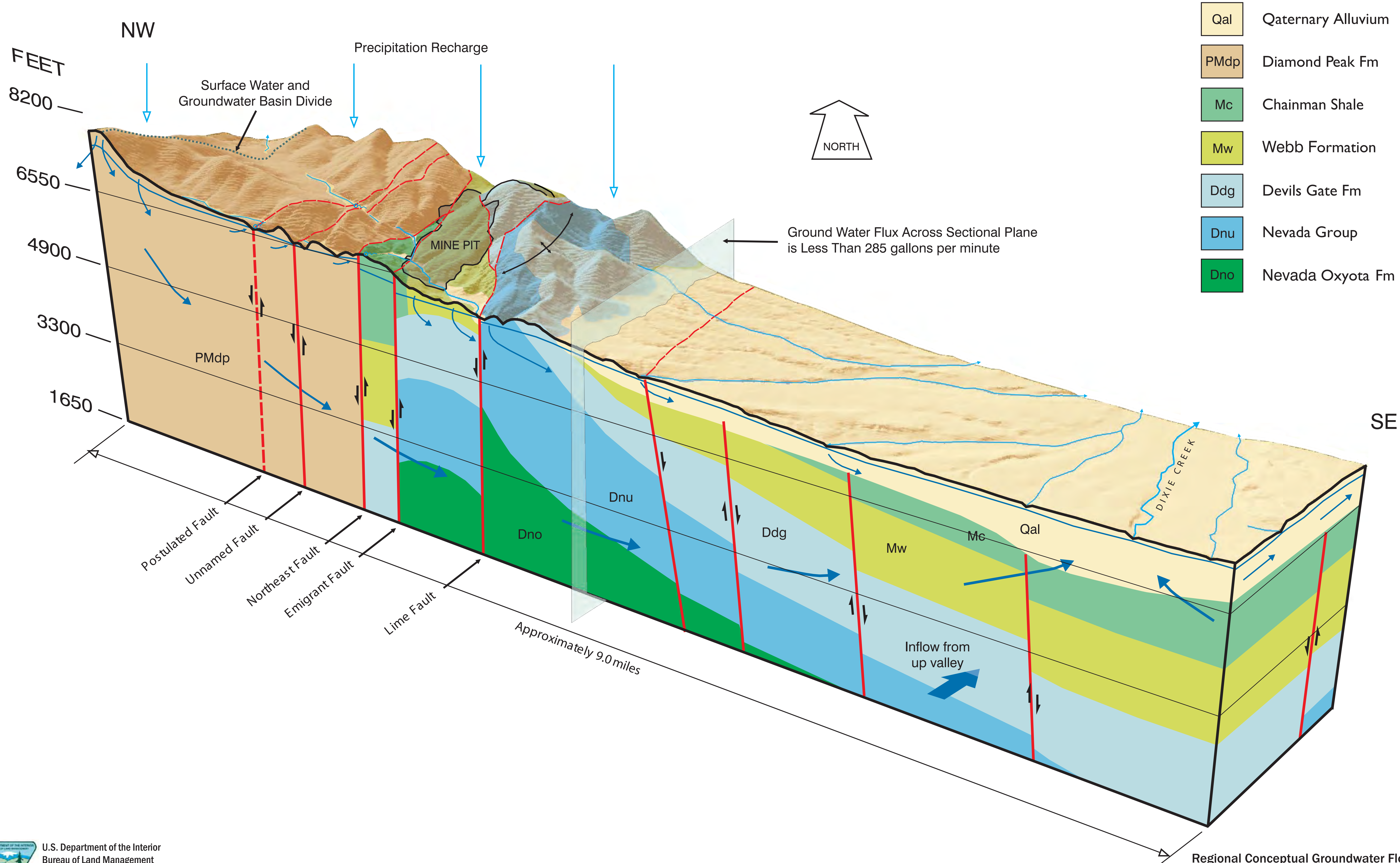
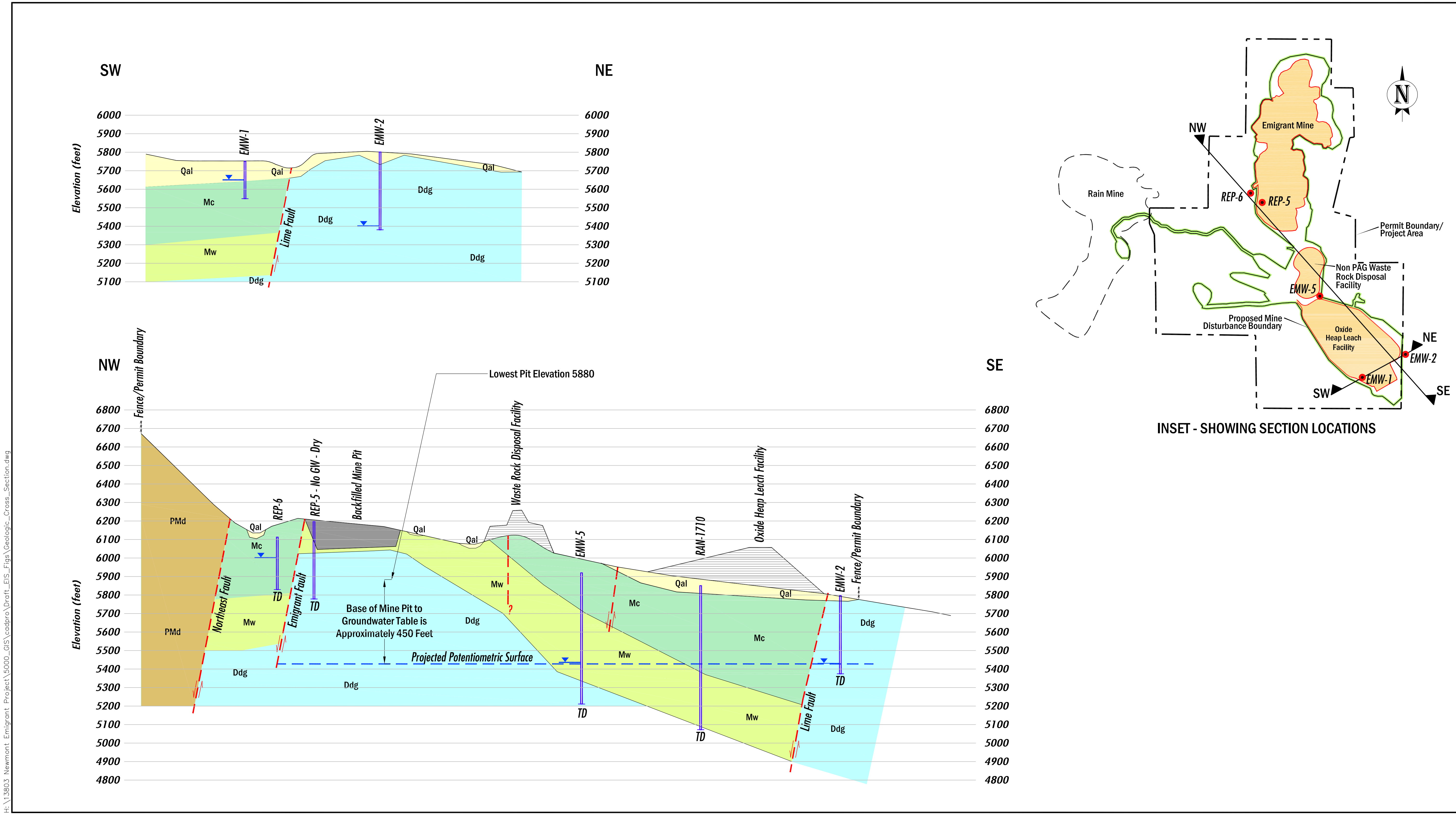


U.S. Department of the Interior
Bureau of Land Management
Elko District Office
ELko, Nevada

Regional Conceptual Groundwater Flow Path
Emigrant Project
Elko County, Nevada
FIGURE 3-6



Horizontal
0 Feet 2000

Vertical
0 Feet 500

U.S. Department of the Interior
Bureau of Land Management
Elko District Office
Elko, Nevada

Well Collar

Measured Groundwater (GW) Level in Well

TD Total Depth of Well

Qal Alluvium and Colluvium

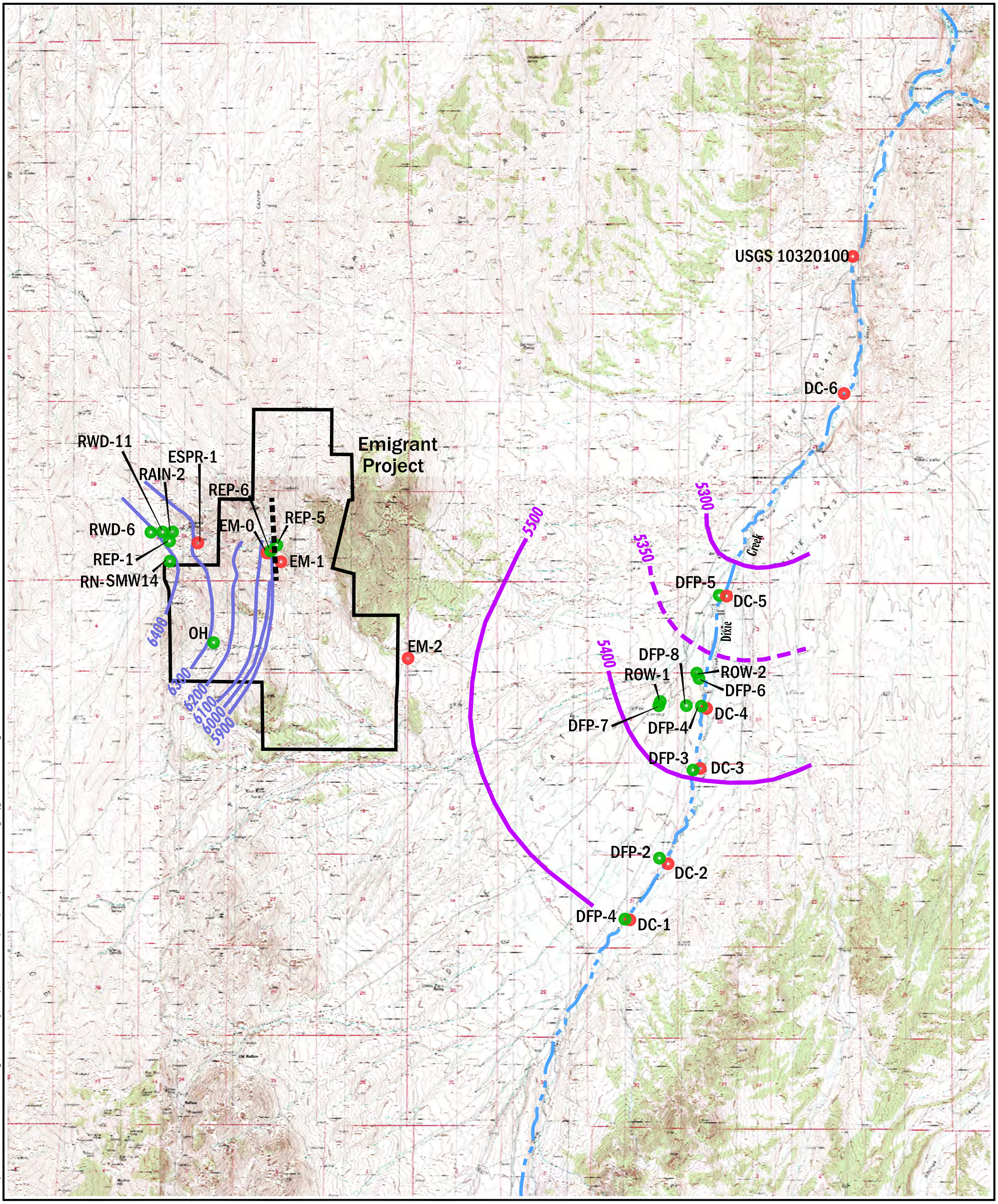
PMd Diamond Peak Formation (Tonka Formation.) (Conglomerate and Sandstone)

Mc Chainman (Sandstone)

Mw Webb Formation (Mudstone)

Ddg Devils Gate Formation

Geologic Cross Sections Showing Wells and Depth to Groundwater
Emigrant Project
Elko County, Nevada
FIGURE 3-7



Basemap Source: USGS 7.5 min DRG files
Data Source: Newmont 2005

U.S. Department of the Interior
Bureau of Land Management
Elko District Office
Elko, Nevada

Groundwater Contours
Emigrant Project
Elko County, Nevada
FIGURE 3-8

To apply the method of Maurer *et al*. (1996) to the Emigrant Project site, the drainage basin west of the proposed mine site was subdivided into three elevation zones: one zone between 7,000 feet and the highest point in the drainage basin (7,417 feet); a second zone between 6,500 and 7,000 feet; and a third zone between 6,100 and 6,500 feet. The elevation at the low point on the west side of the proposed mine pit is approximately 6,100 feet. Based on the surface area and median elevation of each elevation zone, precipitation and groundwater recharge were calculated. Recharge for the selected drainage basin was calculated at 478 acre-ft/yr.

Additional components of the overall water balance for the groundwater system as a whole (including both the alluvium and the underlying bedrock) must be incorporated to estimate the quantity of water entering and flowing through the Project area. Over the long-term, change in groundwater storage is minimal. Groundwater flow into the area is assumed to be zero, because the upgradient boundary of the area for which the water balance is being developed is the surface water divide. Also, there is likely no flow into the area through shallow alluvium, as alluvium is typically absent or its thickness is very small at the divide.

Maurer *et al.* (1996) provide estimates of evapotranspiration (ET) depending on the type of vegetation and depth to groundwater. For the Emigrant mine area, total ET rate from this area is approximately 2 acre-ft/yr. Using all information presented above, the estimated volume of groundwater flowing through the total area of the proposed Emigrant mine is 285 gal/min.

Dixie Creek Area

Two water supply production wells (RPW-1 and RPW-2) were installed by Newmont during 1988 along Dixie Creek to provide water for the Rain Mine. A third production well (RPW-3) was installed in the same area in 1984; however, this well currently is not used by Newmont. These three wells are shown on **Figure 3-4**. Highest annual pumping volumes from wells RPW-1 and RPW-2 occurred during 1988-1994, averaging about 100 million gallons per year (gal/yr), decreasing to about 15 million gal/yr during 1995-2004 (Newmont 2004b). Maximum total pumping rate was about 1,500 gal/min.

Fourteen piezometers have been installed in the vicinity of production wells RPW-1 and RPW-2 along the Dixie Creek channel. South of the production wellfield, groundwater levels in piezometers are below creek bed elevation. This is one intermittent reach of Dixie Creek where flow does not occur year-round. Depth to water near RPW-1 and RPW-2 is about 50 feet and 10 feet, respectively (Newmont 2004b). Well RPW-2 is located closer to Dixie Creek. Water levels in these wells decline a few feet seasonally due to production pumping, with recovery typically occurring during wetter periods and during times of reduced pumping from the production wells (Newmont 2004b).

Well construction logs for the production wells and nearby piezometers are presented in Newmont's (2004b) report, "Dixie Flats, Ground-Water and Surface-Water Monitoring Results." These logs show that the production wells (RPW-1, RPW-2, and RPW-3) were drilled to depths ranging from 700 to 860 feet below ground surface. Only well log RPW-3 has lithologic descriptions, indicating that all material intercepted was unconsolidated valley-fill deposits of clay, sand, and gravel. Most of the monitoring wells/piezometers are less than 100 feet deep; however, two of these monitoring wells are 700 and 860 feet deep (ROW-1 and ROW-2, respectively).

Aquifer hydraulic properties have not been determined for the Emigrant Project area; however, the Dixie Creek valley-fill material has yielded an average of about 1,500 gal/min collectively to Newmont's water supply wells (RPW-1 and RPW-2) since 1988 (Newmont 2004b). This unconsolidated material has relatively high transmissivity. Using an estimated hydraulic conductivity of 100 feet/day for alluvium in the smaller tributary channels, cross-sectional area of 200 ft^2, and hydraulic gradient of 0.04 feet/feet, groundwater flux in alluvium located along the two tributary channels west of the proposed Emigrant Mine pit area is about 800 ft^3/day, or 4 gal/min.

Bedrock in the vicinity of the proposed mine site is expected to have low primary permeability, with zones of higher permeability where fractures are prevalent and interconnected. As stated above, the Emigrant Fault appears to be a barrier to groundwater flow rather than a zone of higher permeability.

Groundwater Quality

Groundwater quality data in the Emigrant Project area includes water samples collected from Emigrant Spring and other small springs west of the Project area. Newmont would install and sample monitoring wells in selected locations to establish baseline water quality conditions in the Project area in accordance with State Water Pollution Control Permit requirements.

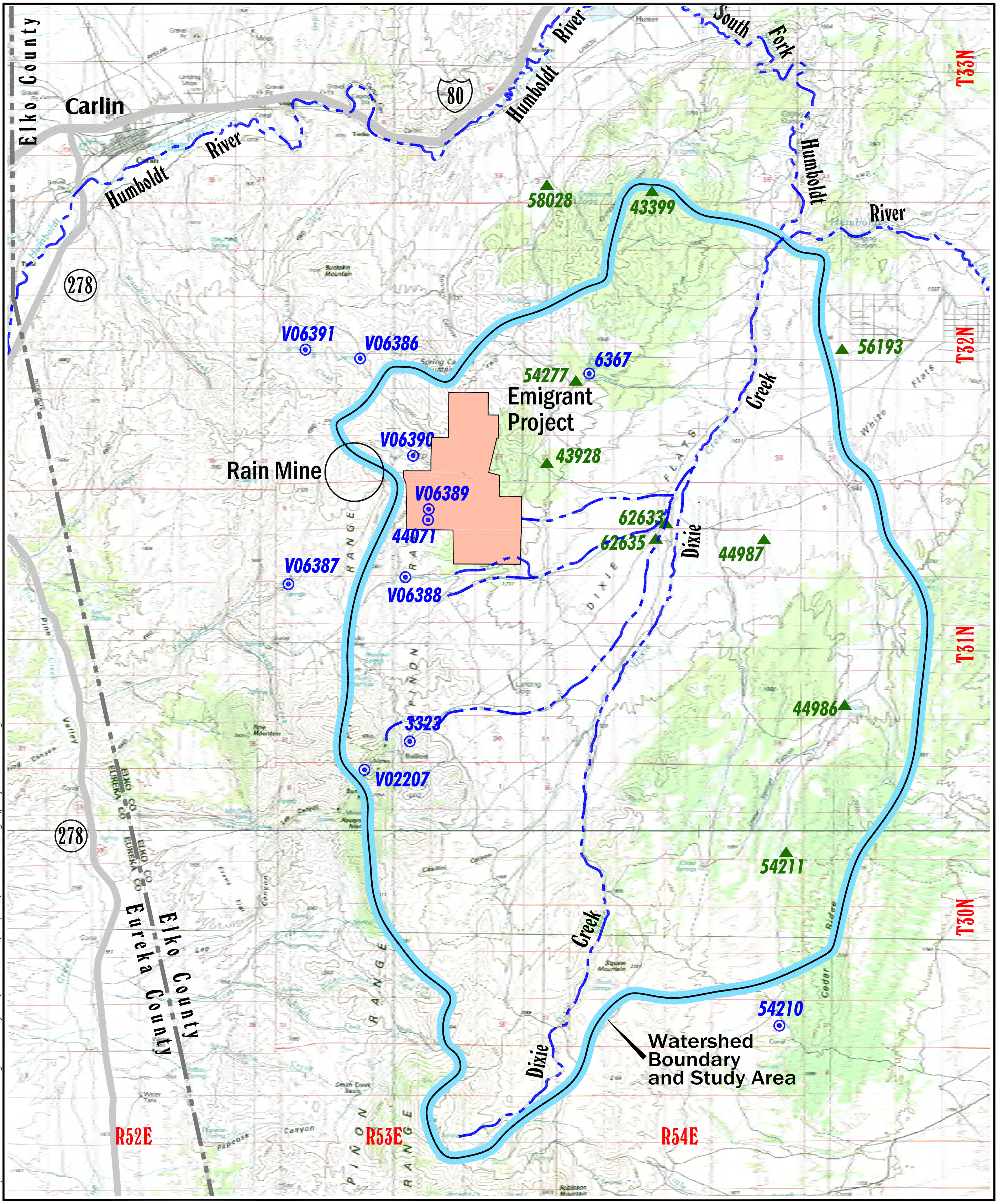
Newmont collected samples from Emigrant Spring on a quarterly basis since mid-1994. A summary of these analyses is included in the *Surface Water Quality* section and in **Table B-5** (**Appendix B**). Comparison of water quality data for Emigrant Spring (**Table B-5, Appendix B**) to Nevada Profile I reference values (**Table B-2, Appendix B**) shows that the following parameters have concentrations that exceed one or more Profile I reference values: TDS, sulfate, aluminum, arsenic, iron, and manganese. These exceedances of reference values likely reflect the regional and mineralized groundwater flow system that is a source of water to Emigrant Spring.

Some field parameters were measured by BLM in 1981 and 2003 from springs located in the tributary drainages west of the Emigrant Project area. Parameters measured include: electrical conductivity = 100 to 800 µmhos/cm; temperature = 10 to 24°C (one spring was 32°C); and pH = 7.0 to 8.0 su (BLM 1981, 2003).

Water Use

Water in the Study Area is used for wildlife, stock watering, mining/milling, irrigation, and domestic purposes. Locations of water right points-of-diversion are shown on **Figure 3-9** and listed in **Table 3-16**. Stock watering uses are scattered throughout Dixie Creek Valley, whereas mining and milling uses are associated primarily with water supply wells located near Dixie Creek that supply water to the Rain Mine and would supply water to the Emigrant Project. The two domestic uses are located in the vicinity of Bullion in the southwest part of the Study Area. The Bartlett Decree of October 20, 1931 and the Edwards Decree of October 8, 1935 adjudicated water rights along Dixie Creek to the Cord Estate and J. Tomera Ranches Inc. (Seibert and Kiracofe 1988).

As of September 2004, 11 surface water and spring diversion water rights and 10 groundwater rights are on record with the Nevada Division of Water Resources (NDWR) (**Table 3-16**). These include certificates, permits, and vested rights. Other historic water rights have been abandoned, cancelled, denied, revoked, or withdrawn. None of the water rights listed in **Table 3-16** are designated as Public Water Reserve (PWR); however, some of the springs located on public land likely qualify as PWRs.



Basemap Source: Sure!MAPS RASTER 1:100,000 Nevada Map

0 Miles 3

N

POINT OF DIVERSION

- Stream or Spring
- Well

U.S. Department of the Interior
Bureau of Land Management
Elko District Office
Elko, Nevada

Water Rights
Emigrant Project
Elko County, Nevada
FIGURE 3-9

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Not included in **Table 3-16** are decreed water rights for approximately 1,500 acre-feet per year (af/yr) of irrigation water from Dixie Creek by Circle L Ranch. Eight surface water diversions permitted to J. Tomera Ranches Inc. for stock watering are located within a 4-mile radius of the Emigrant Project area. Two surface water diversions located approximately 5 miles south of the Project area near Bullion are designated for domestic use.

Four groundwater rights are located within a 4-mile radius of the Emigrant Project area (**Table 3-16**). Three of the four wells are permitted to Newmont Exploration for mining and milling purposes; two of these wells are located along Dixie Creek; and the third water right is located closer to the Emigrant Project area. The fourth groundwater right is about 2 miles to the northeast of the Emigrant Mine site, and is held by J. Tomera Ranches Inc. for stock watering purposes.

The two water supply wells (RPW-1 and RPW-2) installed by Newmont for the Rain Mine in 1988 were periodically pumped at a maximum instantaneous rate of 1,500 gal/min from 1988 to 2004 (Newmont 2004b). Highest annual pumping volumes occurred during 1988-1994, averaging about 100 million gal/yr, decreasing to about 15 million gal/yr during of 1995 to 2005, and 2 million gal/yr in 2006-2007 (Newmont 2007a). Water from these production wells near Dixie Creek is transported 6 miles to the Rain Mine by a 12-inch diameter buried pipeline. Approximately 2 to 3 million gal/yr will continue to be pumped from these wells for the Rain Mine for about another 5 years or less.

DIRECT AND INDIRECT IMPACTS

Proposed Action

This section describes potential direct and indirect impacts to Water Quantity and Quality due to proposed mining-related activities at the Emigrant Project site.

Surface Water Quantity and Quality

The Proposed Action would result in disturbance of land (removal of vegetation and modification of the natural landscape) that can result in exposure of soil and bare rock to wind and water erosion. In addition, mine development can include excavation of some rock types that upon exposure to oxygen and water (precipitation) can result in release of trace metals to the environment. Without proper planning and design of the mine project, potential impacts of these activities can result in degrading the quality of surface water and groundwater downgradient of the mine site.

Implementation of the Proposed Action includes control and capture of sediment throughout the Project area during operations and in the post-closure period through installation and maintenance of sediment ponds, run-on and run-off control ditches, and revegetation of disturbed areas. Sediment ponds with run-off ditch systems would be installed at locations throughout the mine area wherever sediment could mobilize and move down slope.

Sediment collected in the run-off and sediment pond system would be periodically removed and returned to soil stockpiles or reclaimed areas within the mine area. Removal of sediment from these structures would maintain the capacity of the ditch and pond system to capture and store subsequent storm events.

TABLE 3-16
Water Rights in Emigrant Project Area

Water Right No. & Status[1]	Owner Name	Point of Diversion[2]	Diversion Rate (ft³/sec)[3]	Water Use	Distance from Emigrant Project Area (miles)
SURFACE WATER					
54210-cer	Elko Blacksmith Shop	T30N, R54E, Sec. 36 NWSE	0.008	Stock	12.5
3323-cer	James Burke	T31N, R53E, Sec. 34 NWSE	---	Domestic	4.25
6367-cer	J.T. Ranches	T32N, R54E, Sec. 20 SENW	0.003	Stock	2.0
44071-rfa	J.T. Ranches	T31N, R53E, Sec. 03 SESE	---	Stock	0.75
V02207-vst	Hesson, Hunter, & Hylton	T30N, R53E, Sec. 04 NENW	---	Domestic	5.75
V06388-vst	J.T. Ranches	T31N, R53E, Sec. 15 NENW	---	Stock	2.0
V06389-vst	J.T. Ranches	T31N, R53E, Sec. 03 NESE	---	Stock	0.75
V06390-vst	J.T. Ranches	T32N, R53E, Sec. 34 SWNE	---	Stock	0.75
V06386-vst	J.T. Ranches	T32N, R53E, Sec. 21 NWNE	---	Stock	2.5
V06391-vst	J.T. Ranches	T32N, R53E, Sec. 20 NENW	---	Stock	3.75
V06387-vst	J.T. Ranches	T31N, R53E, Sec. 18 LT01	---	Stock	4.0
GROUNDWATER					
43928-per	Newmont Exploration	T32N, R54E, Sec. 31 LT04	---	Mining & Milling	1.0
44987-cer	BLM	T31N, R54E, Sec. 12 NENW	0.005	Stock	6.0
54211-per	Elko Blacksmith Shop	T30N, R54E, Sec. 12 SWSE	0.011	Stock	9.5
54277-per	BLM; Tomera	T32N, R54E, Sec. 20 SWSW	0.009	Stock	1.8
62633-per	Newmont Exploration	T31N, R54E, Sec. 03 SWSW	0.42	Mining & Milling	4.5
62635-per	Newmont Exploration	T31N, R54E, Sec. 09 SENE	0.84	Mining & Milling	3.5
44986-rfp	BLM	T31N, R55E, Sec. 30 NESE	0.006	Stock	8.5
56193-per	BLM	T32N, R55E, Sec. 19 NENE	0.006	Stock	7.5
43399-cer	J.T. Ranches	T33N, R54E, Sec. 33 NESE	0.016	Stock	5.75
58028-cer	Maggie Creek Ranch	T33N, R54E, Sec. 31 NWSE	0.025	Stock	4.75

Source: Nevada Division of Water Resources 2004.
[1] See **Figure 3-9** for locations of water rights. Status abbreviations: cer = certificate; vst = vested right; per = permit; rfa = ready for action; rfp = ready for action (protested).
[2] T = Township, R = Range, Sec. = Section, quarter sections.
[3] ft³/sec = cubic feet per second. -–– indicates no information available.

A Storm Water Permit (No. MSW-365) has been issued by NDEP to Newmont for the Emigrant Project that specifies monitoring and mitigation measures to reduce and control runoff and sediment from disturbed areas. Surface water management and sediment control measures are described in Chapter 2 – *Proposed Action*.

Design of the engineered stream channel that replaces the existing stream channel would allow sediment from undisturbed areas upstream of the mine area to accumulate in the channel which would facilitate establishment of riparian zones within the new channel. In addition, construction of a riparian area and groundwater cut-off wall upstream of the engineered stream channel would cause groundwater to rise to ground surface and flow into the new channel at this upstream location (see Chapter 2 – *Proposed Action*).

Impacts to surface water quantity, including springs, are not expected to occur as a result of the Proposed Action; primarily due to the intermittent/ephemeral nature of surface water flow in the area. Measures included in the Proposed Action as described above and in Chapter 2 are designed to minimize impacts to water quantity.

Potential release of trace metals and other constituents to surface water from development of the Emigrant Mine would not be expected due to the surface water control systems, site reclamation, isolation of PAG rock, and lack of interconnection between groundwater and surface water. Potentially acid generating waste rock would be segregated and placed in mined-out portions of the mine pit on benches of Devils Gate limestone, and encapsulated with a minimum 10-ft thick layer of non-PAG acid neutralizing waste rock. Refer to the *Geology and Minerals* section in this chapter for more information about waste rock characterization.

During closure and decommissioning of the leach pad, addition of makeup water would be suspended and process solutions contained in the heap leach facility would be circulated through the leach pile to promote evaporation of the solution. This method would be used until the bulk of the solution has been removed from the leach pad circuit. As described in Chapter 2 – *Proposed Action*, residual draindown of process solution will be discharged to an evapotranspiration cell. No process solutions would be discharged from the site.

Sediment

Potential direct and indirect impacts to water resources from the proposed Emigrant Project would include erosion and sedimentation to drainages in the vicinity of disturbed areas until vegetation is sufficiently established during reclamation. Primary disturbance areas include the backfilled mine pit, non-PAG waste rock disposal facility, heap leach pad, and roads. These facilities are located in two tributary drainages that extend eastward from the Piñon Range, through the northern and southern portions of the Project area, and eventually to Dixie Creek located approximately 5 miles east of the Project area. Dixie Creek flows into the South Fork Humboldt River approximately 8 miles northeast of the Project area. Since the tributary channels are ephemeral downstream of the Project area, potential increases in sediment load to surface water would occur during snowmelt and major rain events. The natural sediment load in surface water in this area, however, already is high during these high flow events (also see *Soil Resources* section in this chapter for more information regarding erosion).

As mentioned above, Newmont has obtained a Storm Water Permit for the Emigrant Project that specifies monitoring and mitigation measures to reduce and control runoff and sediment from disturbed areas. Surface water and sediment control measures also are described in Chapter 2 – *Proposed Action*. If increased sediment load did move downstream from the Project area to Dixie Creek, the riparian habitat improvement areas and beaver dams along lower Dixie Creek would help trap sediment and prevent or reduce sediment load to South Fork Humboldt River from this area. Refer also to the *Engineered Stream Channel* section below for a description of other erosion control measures.

Engineered Stream Channel

A permanent surface water engineered stream channel, 5,000 feet in length, would be constructed through the operational and reclaimed mine pit area. Increased sedimentation to the affected drainage channel below the Project area is not expected from the channel, because most of this channel would be constructed on limestone bedrock. The engineered stream channel would be designed to transmit the 500-year, 24-hour storm event. Retention of sediment in portions of the engineered stream channel would be a benefit to establishment of riparian areas, and increasing habitat for aquatic species. A detailed description of the construction of the engineered stream channel, including sediment control measures, is included in Chapter 2 – *Proposed Action*.

A sediment catchment basin would be constructed downstream of the heap leach facility to collect sediment transported in surface water above and through the engineered stream channel. The engineered stream channel through the mine pit area would be constructed almost entirely in Devils Gate limestone and, therefore, would not adversely affect water quality.

Placement of the engineered stream channel during and after mining operations would allow continued surface water flow through the Emigrant Project site. Backfilling and reclamation of the mine pit also would allow natural runoff conditions to occur after completion of post-mining closure activities. During mining operations, open pit areas would capture precipitation on a temporary basis.

Groundwater Quantity

Fault blocks isolate zones of groundwater in the Project area, and depth to groundwater in bedrock varies as a result. Groundwater was encountered in the Chainman siltstone at a depth of about 100 feet in a piezometer completed west of the Emigrant Fault (west of proposed mine pit area). On the east side of the fault (in the proposed mine pit area), a piezometer did not intercept groundwater to its total depth of 360 feet in the Webb siltstone. The Emigrant Project ore body is shallow and would be mined above the groundwater table in bedrock. The mine pit would not extend to the water table west of the fault and, therefore, not intercept bedrock groundwater in that area. The lowest point in the proposed mine pit would be approximately 450 feet above the projected bedrock water table east of the Emigrant Fault.

Shallow perched groundwater was encountered in some exploration drill-holes in alluvium overlying sedimentary bedrock at depths of less than 15 feet (Simons & Associates 1997). Shallow alluvial deposits of interbedded sand and gravel in the drainage bottoms are up to 50 feet thick. This alluvial material would be removed by the proposed Emigrant Project pit. Therefore, some minor groundwater (approximately 5 gal/min in each of two tributary channels) would flow from alluvium into the west side of the open and backfilled mine pit, causing drawdown of water levels in alluvium upstream of the mine pit. A cutoff wall, however, would be constructed through alluvium in the drainage above the mine pit, thereby directing flow of alluvial groundwater upward into the engineered stream channel. Water exiting the engineered stream channel back into the natural channel would be available to recharge alluvium downgradient of the mine pit.

Discharge from several small springs and seeps west of the Project area, including Emigrant Spring, would not be influenced by the Emigrant Project, because the springs are located upgradient and at elevations higher than the mine facilities, and their locations are controlled by faults not intercepted by the mine pit. Additionally, the proposed mine pit would not intercept groundwater in bedrock, which is the source of water to the springs. A groundwater monitoring program would be implemented for wells in the Emigrant Project area to track water level and water quality conditions throughout Project life.

Production Wells

Short-term impacts to groundwater levels would occur in the central Dixie Creek valley due to removal of water by two production wells (RPW-1 and RPW-2). These wells would transport water from the valley bottom to the Emigrant Mine site for consumptive uses. The production wells are completed into 700 to 860 feet of unconsolidated valley-fill deposits of clay, sand, and gravel. The two production wells were pumped at average combined rates of about 120 to 130 million gal/yr from 1988-1995 for Newmont's nearby Rain Mine.

Water use at the Rain Mine will continue for about another 5 years or less at an expected rate of approximately 3 million gal/yr (Newmont 2008b). The proposed volume to be pumped from Dixie Creek Valley production wells for the Emigrant Project would total about 130 million gal/yr for the 14-year operational mine life. The combined pumping volumes for the Emigrant Mine and Rain Mine for the initial 5-year period (133 million gal/yr) would be less than the peak pumping rate of 138 million gal/yr that occurred for the Rain Mine in 1991 (Newmont 2004b), and slightly more than the average pumping rates at Rain Mine from 1988 to 1995 (120 to 130 million gal/yr). Lower pumping rates would occur at the Emigrant Project for post-mine reclamation activities.

No adverse impacts are expected to surface water flow in Dixie Creek and groundwater levels in the valley bottom from proposed pumping for the Emigrant Project. Groundwater withdrawals for the Rain Mine from the Dixie Creek Valley production wells have not measurably impacted flows in Dixie Creek (Newmont 2004b). Depth to groundwater measured in the production wells and nearby piezometers shows that water levels decline a few feet seasonally due to production well pumping, with recovery typically occurring during wetter periods and during times of reduced pumping from the production wells (Newmont 2004b). A piezometer (DFP-8) located midway between the production wells and Dixie Creek has shown no response to increased pumping rates from the production wells. Portions of Dixie Creek are perennial and appear to be in connection with groundwater; however, the creek is intermittent in the area of the production wells and flows mainly in response to springs, seasonal snowmelt, and major rain events. Monitoring water levels in the wells would continue during the life of the Emigrant Project to detect any possible adverse effects to groundwater.

Groundwater Quality

Static and kinetic geochemical tests of Project area ore and waste rock were used to evaluate potential for acid generation from water contacting the rock. Using these results and recommended criteria for establishing PAG classification, total PAG waste rock at the Emigrant Mine would be approximately 4 million tons, or 5 percent of total waste rock to be removed during mining. Potential for mobilizing trace metals from waste rock and ore also was evaluated using some of the static and kinetic tests. See the *Geology and Minerals* section in this chapter for more information about geochemical rock characterization.

Potential for mobilizing metals from waste rock and ore at the Emigrant site was evaluated using analysis of leachate collected from the Meteoric Water Mobility Procedure and Humidity Cell tests. In general, metal mobility was higher for

PAG rock. Constituents for which NDEP Profile I reference values were most commonly exceeded in waste rock and ore include fluoride, sulfate, aluminum, arsenic, manganese, nickel, and thallium. As a comparison, concentrations of TDS, sulfate, aluminum, arsenic, iron, and manganese measured in some samples from Emigrant Spring have exceeded associated Profile I reference values.

Devils Gate limestone, which has no acid generating potential, would comprise 32 percent of waste rock for the Emigrant Project. Isolation and encapsulation of PAG waste rock with a minimum 10-ft thickness of non-PAG acid-neutralizing waste rock would provide some buffering material around the PAG rock. This method would also limit exposure of PAG rock to oxygen and direct meteoric water, thereby reducing potential for acid generation. In addition, the PAG waste rock would be placed onto Devils Gate limestone benches in the Emigrant mine pit. Therefore, any acidic solution that could be generated by waste rock would be neutralized by the underlying limestone. During mining of the Phase III pit, PAG rock may be exposed in the west pit high wall. These exposures would be reclaimed by backfilling with non-PAG waste rock from Phase IV mining.

Approximately 450 feet of unsaturated zone thickness occurs beneath the mine pit which would result in slow dispersed movement of any seepage from the backfilled mine pit. Fractures created in the Devils Gate limestone as a result of blasting would not propagate very far. Unsaturated flow from backfilled pits into the limestone would first fill these fractures and then would move within the undisturbed limestone bedrock. The slow advancement of unsaturated flow in limestone would provide increased opportunity for attenuation and precipitation of metals in limestone bedrock prior to reaching the groundwater table.

Seepage of water into the unsaturated zone in bedrock underlying a PAG cell was modeled by Geomatrix (2008) using a typical PAG cell design and a calculated average rate of flux out of the cell into underlying limestone. HYDRUS-1D and HYDRUS-2D/3D software were used to predict the flux rate of seepage from the base of the backfilled mine pit. Kinetic Humidity Cell test results were used to estimate the chemistry of seepage from the PAG rock for input into the geochemical equilibrium-speciation software PHREEQC. This model was used to predict equilibrium concentrations of constituents at the top of Devils Gate limestone bedrock immediately underlying the backfilled mine PAG cell. A low permeability growth media cap would be constructed over the final reclaimed encapsulation cell, and vegetation would be established to minimize water seepage to the PAG.

Geomatrix (2008a) modeled both 0.5-ft and 2.0-ft thick growth media cap (HYDRUS-1D and HYDRUS-2D/3D), and both 1 and 5 percent slopes for the top of the reclaimed surface (HYDRUS-2D/3D only). Average rates of seepage to underlying limestone through a typical PAG cell are summarized in **Table 3-17**. For the 0.5-ft thick growth media cap, seepage ranges from 1.33 to 2.67 in/yr, and for the 2.0-ft thick cap, seepage ranges from 0.25 to 1.47 in/yr. The Hydrus-1D model predicts greater seepage for the 2.0-ft thick cap (1.47 in/yr) than the equivalent Hydrus-2D model (0.25 to 0.46 in/yr). In the Hydrus-2D model, the thicker growth media cap maintains moisture closer to the surface over a greater surface area, and thus results in greater actual evaporation and less seepage through the PAG cell to underlying limestone.

No vegetative cover was included with the model scenarios. Based on model results, total water flux down through the PAG cell would be 0.121 to 0.223 acre-ft/acre/yr for the Hydrus-1D model, and 0.021 to 0.145 acre-ft/acre/yr for the Hydrus-2D model. For a 100-acre PAG cell footprint, total water flux from the base of the cell would be approximately 12 to 22 acre-ft/yr (7 to 14 gal/min) based on the Hydrus-1D model, and approximately 2 to 15 acre-ft/yr (1 to 10 gal/min) based on the Hydrus-2D model.

Results of the PHREEQC model show that unsaturated zone seepage that enters Devils Gate limestone immediately beneath the backfilled mine PAG cell would have concentrations of manganese, nickel, sulfate, and TDS above NDEP Profile I reference standards (Geomatrix 2008). Establishment of a vegetative cover would reduce seepage volume. In addition, attenuation of chemical constituents would likely occur as seepage water moves down to groundwater through about 450 feet of unsaturated limestone bedrock.

TABLE 3-17
Seepage Model Results for PAG Cell in Backfilled Mine Pit
Emigrant Mine Project

Growth Media Cover Thickness	Seepage/Flux Rates from Hydrus-1D Model Results		Seepage/Flux Rates from Hydrus-2D Model Results			
			1% Surface Slope		5% Surface Slope	
	in/yr	acre-ft/acre/yr	in/yr	acre-ft/acre/yr	in/yr	acre-ft/acre/yr
0.5 feet	2.67	0.223	1.74	0.145	1.33	0.111
2.0 feet	1.47	0.121	0.25	0.021	0.46	0.038

Note: PAG = potentially acid generating; in/yr = inches per year; acre-ft/acre/yr = acre-feet per acre per year. Seepage/flux rates are from the base of the PAG cell on top of Devils Gate limestone in the backfilled mine pit.
Source: Geomatrix 2008.

Near the Intera Pond in the Robinson Mining District, Nevada, the presence of limestone underlying the acidic Intera Pond effectively attenuated acid and solutes (Davis *et al.* 2001). Attenuation of inorganic solutes in subsurface environments includes precipitation and coprecipitation (Langmuir 1997). Solid phases precipitate in response to a change in pH that occurs when an acidic solution is neutralized by an alkaline solution or by a neutralizing solid phase such as calcite and/or dolomite, which is abundant (25%) in the 450 feet of Devils Gate limestone under the pit bottom and is also present in lesser amounts in the oxidized Webb siltstone.

Based on simple geochemical model calculations (PHREEQC version 2.13.05; Parkhust and Appello 1999) using the Meteoric Water Mobility Procedure data, neutralization of acidic solutions from the Chainman/Fresh Webb siltstone by the acid neutralizing Devils Gate limestone and/or Webb siltstone would result in precipitation of secondary solid phases (e.g., iron hydroxides (ferrihydrite or goethite), aluminum hydroxide (gibbsite), iron-aluminum-barium sulfate (alunite, jarosite, $Al_4(OH)_{10}SO_4$, $AlOHSO_4$, and barite). Precipitation of these secondary phases would reduce metal solubility, and thus decrease solute concentrations. The presence of iron oxide in waste rock and ore samples from all lithologies (Chainman/Fresh Webb siltstone, Webb siltstone, and Devils Gate limestone) was also detected by XRD.

The heap leach facility and collection ponds would be lined and, therefore, no drain-down water would be expected to move through the liner systems. Atomizers would be used in ponds to increase evaporation of water for about 7 years after cessation of processing. Atomizers would not be used during periods of high wind in order to keep solutions within areas defined for containment. After atomizer use ceases, one or more of the lined ponds would be filled with growth media and vegetated such that natural evapotranspiration would remove residual drain-down water flowing to the "treatment cell". Drain-down rate of water infiltrating through the reclaimed heap leach facility would decline to about 20 gal/min after 5 to 7 years from cessation of processing (Telesto Solutions Inc. 2004, 2005). The final reclaimed surface of the heap leach facility would temporarily store most excess infiltrated meteoric water in the growth media during periods of precipitation, and then release the water by evapotranspiration.

Where needed, diversion ditches would be constructed around the mine pit, waste rock disposal and heap leach facilities, and other ancillary facilities to prevent undisturbed area surface water runoff from entering disturbed areas. These diversion ditches would be designed to convey runoff from the 100-year/24-hour storm event, except for the engineered stream channel through the reclaimed mine pit, which would be designed to transmit the 500-year/24-hour storm event. After cessation of mining, the mine-related facilities would be contoured to promote runoff and prevent water ponding.

The non-PAG waste rock disposal and heap leach facilities, as well as the backfilled mine pit would be subject to placement of growth media and vegetated to enhance evapotranspiration so that minimal precipitation would infiltrate into the rock.

A surface water and groundwater monitoring program would be implemented during the Emigrant Project life to detect any possible effects on water quality, depth to groundwater, and surface water flows in the Study Area.

No Action Alternative

The No Action alternative would avoid potential direct and indirect impacts of the Proposed Action to water resources. Some groundwater pumping (approximately 3 million gal/yr) from production wells in Dixie Creek Valley likely would continue for 5 years or less for use in closure activities at the nearby Rain Mine.

POTENTIAL MONITORING AND MITIGATION MEASURES

BLM would require Newmont to monitor total suspended solids (TSS) and possibly other chemical constituents in surface water at locations upstream and downstream of the proposed Emigrant Project site and in natural stream channels located in Dixie Creek drainage, but outside the influence of the proposed Project. Samples would be collected during periods when flow is occurring at these monitoring locations. Results of the monitoring episodes would be provided to BLM periodically throughout the monitoring period.

Data would be reviewed to determine whether sediment is being contributed by the proposed Project at levels that exceed TSS levels measured in stream channels that are unaffected by the Emigrant Project or if there is a substantial change in TSS levels as measured in the upstream versus downstream monitoring stations. Since natural TSS levels in area streams are elevated during certain periods of the year, the evaluation of TSS levels at selected monitoring stations would require site specific assessments.

In the event that monitoring identifies sediment contribution from the proposed Project site, BLM and NDEP personnel would review the sediment control system at the Project with Newmont to identify the source of sediment contribution and to implement corrective actions as necessary. Corrective actions could include construction of additional sediment pond capacity, modification of the run-off control ditch system, and/or revegetation to bind soil to slopes.

As stated in the *Resource Monitoring* section of Chapter 2, other monitoring wells may be required by NDEP prior to issuing a mine permit, and as part of a Mitigation and Monitoring Plan developed at that time.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

No irreversible or irretrievable commitment of water resources would result from the Proposed Action.

RESIDUAL EFFECTS

Based on the information presented, there would be no residual effects to water resources associated with the Emigrant Project. No impacts from implementation of mitigation measures are expected for this Project.

SOIL RESOURCES

AFFECTED ENVIRONMENT

Information for soil resources in the Emigrant Project area was obtained from the Order III Soil Survey of Elko County, Nevada, Central Part (USDA 1997) and an Order II Soil Survey conducted in the proposed disturbance areas by Maxim Technologies (2004a). These surveys characterized the soil resources in the Project area. Soil information included potential erosion hazards and general construction- and reclamation-related parameters. Distribution of soil map units and soil salvage potential within the Project area is described in **Appendix C, Tables C-1** and **C-2,** and shown on **Figure C-1**, respectively. Additional information concerning physical and chemical properties of soil in the Project area was obtained from the Natural Resource and Conservation Service (NRCS).

Soil types in the Project area are divided into two physiographic zones: 1) pediment surfaces in the southern portion of the Project area near the proposed leach pad; and 2) steeply sloping terrain at the proposed mine site. Soil types in the leach pad area are comprised of loamy to silty loam surfaces with occasional clay loam subsurface underlain by compacted zones at depths of approximately 24 inches. With the exception of terrace edges, this area is gently sloping with less than 15 percent surface coarse fragments. Clay-rich horizons are occasionally present. Soil at the proposed mine pit site is generally comprised of clayey surface textures with clay-rich subsoil. Soil in this area is shallow, includes bedrock outcrops, has a high percentage of coarse fragments, and is located on steep slopes.

Depth of soil varies throughout the Emigrant Project area. Shallow soil (less than 20 inches to bedrock) and bedrock outcrops are found along weathered slopes and ridges in the mine portion of the Project area. Shallow soil interspersed with moderately deep soil (20 to 40 inches) is also located along the western margin of the Project area.

Soil types encountered at lower elevations in the Project area are dominated by weathered hardpans present approximately two feet below ground surface. The soil types on these pediments, alluvial fans, and terraces are most often without clay-rich horizons. Soil depths of 60 inches or more are found within the drainage bottoms and lower alluvial features.

Restrictive properties of soil that affect suitability as growth media include physical or chemical characteristics that result in inhibition of plant growth or restrict soil structure development. Soil encountered in the Project area generally contains low percentages (three percent) of organic matter resulting in low fertility. Other soil properties considered when determining use as growth medium include: coarse fragment content and size (greater than 3 inches in diameter) in the profile; clay content; soil erodibility or K-factor; and depth to bedrock. Physiographic and non-soil features such as steep slopes, rough terrain, and rock outcrops would also limit the ability for equipment to salvage soil in these areas.

The ability of soil to support vegetation varies throughout the area. On some soil, vegetation is relatively easy to establish and maintain, the surface is stable and resists erosion. Other soil types can support vegetation by modifying one or more properties. Laboratory analytical data did not indicate soil chemistry would interfere with revegetation success. However, soil types in this region generally exhibit low concentrations of organic matter and resultant nutrient availability.

Shallow depth to a restrictive layer, high clay content, and coarse fragments are the common limiting characteristics of soil in the Project area. Eight soil map units (approximately 173 acres) in the area are not suitable for opportunistic salvage due to shallow soil and high concentrations of coarse fragments. Ten soil map units (approximately 557 acres) rate as "poor" overall. The remainder of footprint acreage (626 acres) rate fair for salvage potential. Portions of Map Units M and I have surface horizons with sufficient organic matter composition and other characteristics to rate as "good" for growth medium potential.

Information on each soil family, including percent of soil series included in each mapping unit, slope range, landform, depth to induration or bedrock, rooting restriction depth, permeability, available water holding capacity, surface runoff class, hydrologic group, and erosion hazard potential, is contained in Soil Survey of Elko County, Nevada, (USDA 1997). Additional details on soil family designations are presented in the Order II Soil Survey (Maxim 2004a).

Soil Erosion Hazard

The rate of soil erosion (undisturbed soil conditions) is dependent primarily on slope, soil surface texture, and soil surface cover. The NRCS rates suitability of in-situ soil for potential erosion hazards of water and wind. NRCS erosion hazard ratings for soil in the Emigrant Project area are summarized in the referenced USDA Soil Survey (USDA 1997) and the Order II Soil Survey (Maxim 2004a).

The hazard of water erosion ranges from slight to high within the Project area. Soil types in the northern portion of the Project area rate moderate due to steep, long slopes. However, the high percentage of coarse fragments on the surface, and generally clayey textures, mitigate these values under existing conditions. Water erosion values in lower elevations of the southern Project area generally rate as moderate to high, due primarily to silt and very-fine sand content.

The wind erosion hazard is generally low to moderate due to predominance of surface rock fragments which reduces susceptibility to wind entrainment. Clayey surface textures occur at many locations throughout the Project area which reduces susceptibility to wind erosion. Exceptions include localized very fine sand and silt loam surfaces encountered on pediment surfaces.

DIRECT AND INDIRECT IMPACTS

The National Soil Survey Handbook (1993), Table 620-11, Soil Reconstruction Material for Drastically Disturbed Areas, rates suitability of soil based on properties that influence erosion and stability of the surface, and productive potential of reconstructed soil. A number of restrictive properties are evaluated in descending order of importance. Reconstruction of soil in drastically disturbed areas involves replacing layers of soil material or unconsolidated geologic material, or both, in a vertical sequence of such quality and thickness that a favorable plant growth medium results.

Potential impacts to soil resources would occur during soil salvage operations and soil redistribution activities. Impacts to soil during salvage and stockpiling operations include physical loss of soil from excavating and handling the soil and interruption of soil biological, physical, and chemical activity as a result of placement of soil in stockpiles. Additional soil loss occurs during reclamation when soil is re-handled from stockpiles and distributed on regraded areas.

Proposed Action

Direct impacts to soil resources resulting from implementation of the Proposed Action include modification of the soil chemical, biological, and physical characteristics as well as direct loss of soil from handling and stockpiling. These impacts would be reduced through direct hauling stripped growth media from active mine pits for placement over backfilled portions of previously mined pit areas where possible. Such efforts would reduce the duration of time that soil is exposed in stockpiles to erosional elements. Direct haulage and placement of stripped growth media would also reduce the losses of biological activity and chemical changes in the growth media.

In areas where direct haul and placement of growth media is not feasible (e.g., borrow areas, ancillary facilities, heap leach pad), growth media would remain in stockpiles over the duration of mining activity. Stockpiled soil would be subject to wind and water erosion resulting in greater loss over the life of the mine. Stockpiled soil would also exhibit decreased biological activity and altered physical and chemical characteristics.

The primary mechanism for direct soil loss is wind erosion. Wind erosion hazard increases when soil is stockpiled, because the surface soil which contains more organic matter (which reduces wind erosion susceptibility) is mixed with subsoil and substratum which contain less organic matter, soil aggregates are destroyed, biological soil crusts are buried, and vegetative cover and litter is removed.

Water erosion potential on disturbed soil could occur during periods of heavy precipitation due to exposed soil, steep slopes, lack of biological soil crusts, and low organic matter content. Under the Proposed Action, Best Management Practices (BMPs) would be implemented to control soil loss including: run-on/run-off control berms, installation of sediment ponds, mulching, interim seeding, leaving selected slopes in a roughened condition, and maintenance of surface water control structures. Soil would be removed from the run-off control ditch system and sediment ponds as needed to maintain capacity. Soil removed from ditches and ponds would be returned to the stockpiles and subsequently used in reclamation.

Chemical changes would result from mixing surface soil horizons with subsoil during salvage and stockpiling of soil from the site. Mixing soil horizons during salvage and stockpiling would reduce the amount of organic matter contained in the surface horizon by diluting the surface horizon with subsoil. Redistributed soil would have lower organic matter content as a result of salvage and stockpiling. Soil biological activity would be reduced or eliminated during stockpiling as a result of anaerobic conditions created in deeper portions of stockpiles. After soil redistribution, biological activity would increase and eventually reach pre-salvage levels.

Soil movement that could occur during the post-closure/reclamation period of the mine site would be controlled through maintenance of BMPs implemented during mining operations. BMPs including sediment control ponds, diversion ditches, silt fences, and revegetation would continue to be used to trap soil that moved from reclaimed areas. The soil would be replaced on reclaimed areas. The use of BMPs would remain until the site stabilizes and meets bond release criteria.

Impacts to physical characteristics of soil include mixing of horizons (loss of soil structure), compaction, and pulverization as a result of equipment handling and traffic; especially during reclamation activities. Soil compaction and pulverization would result in decreased permeability, water-holding capacity, and loss of soil structure. Seedbed preparation activities, including ripping compacted surfaces, would reduce effects of compaction.

No Action Alternative

Implementation of the No Action Alternative would eliminate potential impacts of the Proposed Action on soil resources.

POTENTIAL MONITORING AND MITIGATION MEASURES

No monitoring or mitigation measures for soil resources have been identified by BLM or NDEP. Implementation of reclamation activities and BMPs outlined in the Proposed Action would reduce potential soil loss associated with the Emigrant Project.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

Soil loss as a result of the Proposed Action would constitute an irreversible commitment of the resource as it pertains to soil movement from the natural setting to another physical location. Reclamation of disturbed areas using available growth media would re-initiate soil development processes on reclaimed sites. Soil development would reduce or eliminate the potential irretrievable commitment of soil resources.

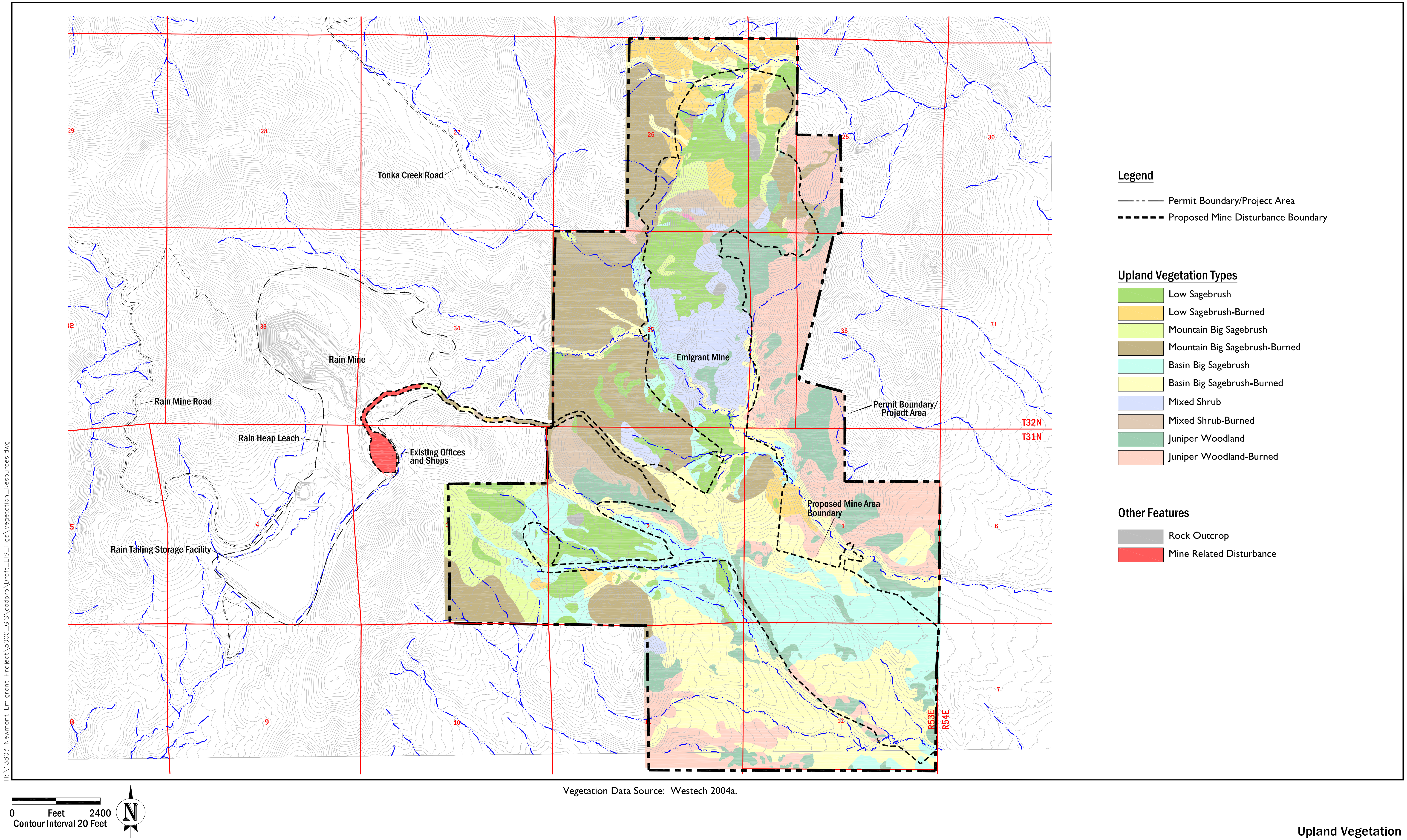
RESIDUAL EFFECTS

Loss of soil and interruption of natural soil processes and functions (*e.g*., soil development, infiltration, percolation, water holding capacity, structure, and organic matter) can be reversed by natural soil development over an unknown period. Reclamation efforts would expedite those processes. Loss of vegetation productivity as a result of impacts to soil and land uses could be reversed within 5 to 10 years after reclamation.

UPLAND VEGETATION

AFFECTED ENVIRONMENT

The Study Area for vegetation resources is the proposed mine permit area. Dominant vegetation is characterized by big sagebrush and grassland communities and juniper woodlands (Westech 2004a). Eleven vegetation communities were identified in the Study Area. In addition, springs and seeps provide limited riparian habitat that support a diversity of species not found on drier upland sites. Following fire, non-native cheatgrass has become invasive on some sites, and is a dominant herbaceous species on many sites. **Figure 3-10** is a vegetation map of the proposed mine area. A list of common and scientific plant names identified in the Study Area are presented in **Appendix D**.



Vegetation Data Source: Westech 2004a.

U.S. Department of the Interior
Bureau of Land Management
Elko District Office
Elko, Nevada

Upland Vegetation
Emigrant Project
Elko County, Nevada
FIGURE 3-10

Low Sagebrush Community

The low sagebrush community occupies 340 acres and is a common type scattered throughout the Study Area. It occurs on shallow, rocky soil of variable aspect, frequently on ridges, and on convex to straight topography with gentle to moderate slope (up to 30%).

Because of low vegetation cover, large areas of bare ground (average 49 percent), and rock cover (30 percent), wildfires have not burned some low sagebrush stands and these stands occur as isolated islands of unburned vegetation within burned areas.

Total vegetation cover averages 35 percent. Low sagebrush dominates the type with cover between 15 and 25 percent; averaging about 22 percent. Other shrubs are generally not present in this type except for an occasional green rabbitbrush. Perennial grasses average 11 percent cover of which Sandberg's bluegrass is dominant. On drier, lower elevation sites, bottlebrush squirreltail and bluebunch wheatgrass are common associates. On upper elevation sites with northerly or easterly aspects, Idaho fescue is present.

Perennial forbs average about 5 percent cover with Stansbury phlox, western hawksbeard and Douglas draba being common. Annual grasses and annual/biennial forbs are not a conspicuous component of low sagebrush vegetation type.

Burned Low Sagebrush Community

The burned low sagebrush community (145 acres) occupies sites similar to the unburned counterpart, primarily convex to straight ridges and slopes with shallow, rocky soil. Since the low sagebrush type occurs interspersed with the mountain big sagebrush type and, to a lesser extent, with the basin big sagebrush type, mapping type boundaries where the area has burned is difficult and the burned low sagebrush type was frequently mapped as a mosaic of two burned sagebrush types.

Total vegetation cover at 33 percent is similar to the unburned low sagebrush type at 35 percent; however, cover by morphological class varies between burned and unburned stands. Shrub cover is 3 percent on burned sites compared to 22 percent on unburned areas. Low sagebrush and mountain big sagebrush each represent 1 percent cover in the burned plot sampled. Mountain big sagebrush appears to be a seral species occupying burned low sagebrush sites apparently establishing more rapidly than low sagebrush.

Grass cover is higher on burned sites at 25 percent, compared to 11 percent on unburned sites. Dominant grasses include Sandberg's bluegrass (15 percent), bottlebrush squirreltail (8 percent), and bluebunch wheatgrass (2 percent). Perennial forb cover is slightly higher on burned sites at 8 percent compared to 5 percent on unburned areas. Stansbury phlox is the dominant forb.

In contrast to other burned sagebrush types, annual grasses and annual/biennial forbs are not a conspicuous component of the burned low sagebrush type. This is likely due to the minor presence of these increaser species in the unburned low sagebrush type.

Mountain Big Sagebrush Community

The unburned mountain big sagebrush community (138 acres) is a minor type community in the western and northern portions of the Study Area, primarily because most of the type has been burned. It is found on shallow to deep soil on variable aspects and slope configurations. It occurs on moderately steep, to steep slopes.

Total vegetation cover is about 42 percent of which shrubs represent 25 percent. Mountain big sagebrush provides 20 percent cover with green rabbitbrush at 5 percent cover. Perennial grass and forb cover varies considerably depending on slope, aspect and soil. The site sampled has 10 percent cover of perennial grasses and 11 percent cover of perennial forbs. Moister sites on northerly and easterly aspects have higher herbaceous cover.

Dominant grasses on drier sites include Sandberg's bluegrass and bluebunch wheatgrass, while moister sites have higher cover of Idaho fescue. Common forbs include spurred lupine and Stansbury phlox.

Burned Mountain Big Sagebrush Community

The burned mountain big sagebrush community (636 acres) covers expansive areas in the western portion of the Study Area. It frequently occurs with the burned low sagebrush vegetation type and is often mapped as a mosaic of the two types.

Total vegetation cover averages 29 percent compared to 42 percent for unburned sites. Shrub cover is low at 9 percent compared to 25 percent cover in an unburned stand. Green rabbitbrush is the dominant shrub in most burned mountain big sagebrush areas because of its ability to resprout following fire and, in some areas, is abundant enough to constitute a green rabbitbrush seral community. Mountain big sagebrush is present in most burned areas although cover is generally low.

Perennial grass cover is 8 percent, slightly lower than the 10 percent recorded in an unburned stand. Dominant grasses include Sandburg's bluegrass, bluebunch wheatgrass, Idaho fescue, and bottlebrush squirreltail. Perennial forb cover is also slightly lower in burned stands at 8 percent compared to 11 percent in the unburned plot. Annual grass and annual/biennial forb cover totals 6 percent compared to less than 1 percent in the unburned plot. Species that have increased following fire include cheatgrass, autumn willow-herb, tumblemustard, prairie pepperweed, and fireweed fiddleneck.

Basin Big Sagebrush Community

The basin big sagebrush community is the dominant unburned vegetation type occupying (540 acres) in the southern portion of the Study Area. It occurs in valley bottoms and on terraces, benches, and gentle to moderately steep slopes generally on deeper soil. Elevation ranges from 5,640 to 6,500 feet although the type extends to higher elevations (6,800 feet) in swales with deeper soil and increased moisture. Configuration is generally straight or concave and aspect is variable.

Total vegetation cover of this community is 50 percent. Basin big sagebrush dominates with 35 percent cover. In valley bottoms with deeper soil, shrub height averages 4 to 6 feet; on less productive sites, shrub height decreases to 3 to 4 feet. Scattered Utah juniper is present in some stands.

Common understory species include bottlebrush squirreltail, Sandberg's bluegrass, basin wildrye, Thurber needlegrass, and spreading phlox. Because this type occurs on gentle slopes, benches and valley bottoms easily accessible to cattle, livestock use is prevalent. Perennial grasses have low cover with corresponding increases in annual and biennial forbs and grasses. With increasing elevation the basin big sagebrush vegetation type integrates with the mountain big sagebrush vegetation type forming a zone where both species occur.

Burned Basin Big Sagebrush

The basin big sagebrush community is highly flammable and large areas of the type have burned during the past 5 to 15 years. The burned basin big sagebrush vegetation type is extensive, covering 810 acres throughout the Study Area on broad expanses in the southern portion and along drainages and moist microsites in the northern and central portions of the Study Area.

Vegetation composition is variable depending on age of burn, fire intensity and site conditions. Shrub reestablishment occurs fairly rapidly, because the basin big sagebrush type occurs on more productive sites. Total vegetation cover averages 31 percent compared to 50 percent in an unburned stand. Stands sampled have shrub cover from 5 to 19 percent averaging 13 percent. Basin big sagebrush is the dominant shrub averaging 10 percent cover, with green and rubber rabbitbrush at average cover of 2 and 1 percent, respectively. In some areas, especially older burns, green and rubber rabbitbrush have become well established, forming a seral rabbitbrush vegetation type. Dominant understory species include Sandburg's bluegrass, basin wildrye, bottlebrush squirreltail, and clasping pepperweed. Portions of the burned basin big sagebrush vegetation type were seeded with the exotic crested and intermediate wheatgrass and these species are well established in some areas of the burn.

Annual grasses and forbs are a conspicuous component of the burned type, with cheatgrass cover quite high in some areas. Other common annuals in burned basin big sagebrush include clasping pepperweed, desert alyssum, and alfilaria.

Mixed Shrub Community Type

The mixed shrub community covers 140 acres, primarily in the northern half of the Study Area, and is found at mid to upper elevations on sites with variable aspect, configuration, and soil. This type is characterized by a mix of two or more sagebrush species and green rabbitbrush. Antelope bitterbrush is a diagnostic species for the mixed shrub vegetation type and was used in mapping to differentiate mixed shrub from the floristically similar mountain big sagebrush type.

Total vegetation cover averages about 42 percent. Shrubs dominate the type with 28 percent cover. Sagebrush species are conspicuous with mountain big sagebrush at 10 percent, low sagebrush at 6 percent, and basin big sagebrush at 5 percent. Antelope bitterbrush averages 5 percent and green rabbitbrush has 3 percent cover.

Perennial grasses average about 8 percent cover with 1 to 2 percent cover provided by bottlebrush squirreltail, Sandberg's bluegrass, bluebunch wheatgrass, basin wildrye, and Idaho fescue. Perennial forbs average 6 percent cover and include western hawksbeard, arrowleaf balsamroot, and spurred lupine, each averaging 1 to 2 percent cover.

Burned Mixed Shrub Community

Burned mixed shrub is a common type, occupying 80 acres at mid to upper elevations throughout the Study Area. Floristically it is very similar to the burned mountain big sagebrush type, except that basin big sagebrush and occasionally low sagebrush are reestablishing in burned areas.

Total vegetation cover averages about 30 percent, substantially less than the 42 percent cover in the unburned counterpart. Perennial forbs and shrubs each average about 12 percent cover. Common forbs include spreading phlox, arrowleaf balsamroot, and spurred lupine. Shrubs exceeding 1 percent include green rabbitbrush, basin big sagebrush, and mountain big sagebrush. Fire has effectively eliminated antelope bitterbrush in most of this community. Annual grass and annual/biennial forb cover is not substantially different between burned and unburned sites.

Juniper Woodland Community

The juniper woodland vegetation type is common (364 acres) in the east-central portion and as smaller stands in the southern portion of the Study Area. It was more extensive prior to large fires. This community typically occurs on shallow, rocky soil generally with moderately steep-to-steep, variable-aspect slopes. On more gentle slopes with deeper soil, Utah juniper occurs as more widely spaced trees with basin big sagebrush forming a juniper/basin big sagebrush subtype.

On very steep, lower slopes above drainage bottoms, some sites are essentially barren. Total vegetation cover is 37 percent, comprised primarily of Utah juniper at 25 percent cover and singleleaf pinyon having 1 percent cover. Perennial grasses are generally sparse, averaging only 5 percent cover. Although numerous grass species were recorded in this community, only basin wildrye and Sandberg's bluegrass averaged more than 1 percent cover.

Perennial forbs averaged about 7 percent cover with composition and cover highly variable. One site on a limestone ridge has 17 percent cover by 10 species, while two sites on differing substrates have 1 to 3 percent cover with much lower diversity. Annual grasses and annual/ biennial forbs each average less than 1 percent cover.

Shrub cover is also variable among stands with essentially no shrubs in some areas, especially very steep southern exposures. On more level sites with deeper soil, basin big sagebrush is abundant. At mid to upper elevations, mountain big sagebrush and antelope bitterbrush are present although cover is generally low.

Burned Juniper Woodland Community

Large portions (492 acres) of the juniper woodland in the east central and southwestern portions of the Study Area have burned. Total vegetation cover is reduced in burned areas at 21 percent compared to 37 percent in unburned areas. The primary difference is the lack of trees in burned stands with tree cover at only about 1 percent in burned areas, while unburned areas average 26 percent tree cover. Some regeneration of Utah juniper is present, however, especially peripheral to unburned areas or where isolated, seed-producing junipers were missed by fire.

Perennial grass cover is comparable between burned and unburned stands with both averaging about 5 percent cover. Sandberg's bluegrass, bottlebrush squirreltail, basin wildrye, and bluebunch wheatgrass each average 1 to 2 percent cover in burned juniper woodland. Perennial forb cover is somewhat lower in burned areas averaging 4 percent cover compared to 7 percent cover in unburned areas. Perennial forbs averaging about 1 percent cover in burned juniper woodland include spurred lupine, pointed cryptantha, and spreading phlox.

Annual grass and annual/biennial forbs are more prevalent in burned areas totaling about 5 percent cover compared to only 1 percent cover in unburned stands. Cheatgrass is the dominant annual increaser in the burned area.

Average shrub cover also increased in burned juniper woodland to about 8 percent, while sampled unburned stands average only 2 percent cover. Basin big sagebrush and green rabbitbrush have generally increased post-burn. Shrub response, however, is variable between burned areas with some sites having low shrub cover and other sites with much higher shrub cover.

Invasive, Non-Native Species

Noxious weeds are defined under Nevada law (NRS 555.005) and the federal Noxious Weed Act of 1974, amended by Section 15 of the U.S.

Farm Bill, Management of Undesirable Plants on Federal Lands, as any species of plant that is or is likely to be detrimental or destructive and detrimental to control or eradicate. Noxious weeds are damaging to the environment and local economy, and replace desirable vegetation. Often noxious weeds proliferate where native vegetation has been removed or disturbed.

Forty-four species of noxious weeds have been identified in Nevada (NRS 555.101). Common species in Elko County include leafy spurge (*Euphorbia esula*), Scotch thistle (*Onopurdum acantheum*), tall pepperweed (*Lepidium latifolium*), musk thistle (*Carduus nutans*), spotted knapweed (*Centaurea maculosa*), Russian knapweed (*Centaurea repens*), hoary cress (*Cardaria draba*), and Dyer's woad (*Isatis tinctoria*).

Two noxious weed species were found in the Study Area: Scotch thistle and hoary cress. Scotch thistle is abundant along the Rain Mine pipeline/powerline corridor through the Study Area and along the road to Emigrant Springs. It is common along other roads, exploration trails, and drill sites. Scotch thistle is spreading into adjacent native vegetation, especially burned areas. This species was observed several hundred feet from the Emigrant Springs road and throughout the basin big sagebrush and burned basin big sagebrush vegetation types along the main drainage in the Study Area. Hoary cress was reported by EIP Associates (1997) for the Study Area based on field work conducted in 1993. Hoary cress was recorded on the drainage below Emigrant Springs just upstream from where the drainage crosses the main north/south road through the Study Area. This population was not found in August 2004. Cheatgrass is present in small amounts in the Study Area.

Special Status Plant Species

The Study Area for Special Status Plants is the proposed mine permit area. There are no plants listed as threatened or endangered under the Endangered Species Act of 1973 known or with potential to be present in the Study Area (Cedar Creek Associates 1997); however habitat for nine plants listed as sensitive by BLM may be present in the Study Area (**Table 3-18**).

Searches of the Study Area found no sensitive species (Westech 2004a). Four cactus populations were found during the survey. Two populations are *Pediocactus simpsonii* var. *simpsonii* and two are *Opuntia erinacea* var. *erinacea*. A Nevada Native Species Site Survey Report was completed and submitted for these populations. All cacti are protected by Nevada state law (NRS 527.060-.120).

Habitat for wooly fleabane and Lewis buckwheat may be present at the highest elevations of the Study Area. Habitat for Elko rockcress, Osgood Mountain milkvetch, grimy mousetail, and Leiberg clover may be present on rock outcrops and gravelly deposits. Habitat for Owyhee prickly phlox may be present on steep cliffs and canyon walls. Habitat for Meadow Pussytoes and least phacelia may be present around seeps and springs. These species were not identified during surveys of the Study Area (Cedar Creek Associates 1997; Westech 2004a).

TABLE 3-18 Sensitive Plants with Suitable Habitat in Emigrant Project Area		
Common Name	**Scientific Name**	**Habitat**
Meadow Pussytoes	*Antennaria arcuata*	Sparsely vegetated seasonally dry seeps, springs and parts of moist alkaline meadows.
Elko rockcress	*Arabis falcifructa*	Dry, densely vegetated, relatively undisturbed soils with soil crust, in sagebrush communities; 5300-6100 feet elevation.
Osgood Mountains milkvetch	*Astragalus yoder-williamsii*	Dry, open granodiorite soils in sagebrush communities; 5660-7300 feet elevation
Wooly fleabane	*Erigeron lanatus*	Alpine and subalpine talus slopes
Lewis buckwheat	*Eriogonum lewisii*	Dry open ridges in central Nevada at elevations 6470-9720 feet
Grimy mousetail	*Ivesia rhypara var. rhypara*	Dry, barren outcrops and badlands, cobbly riverbed deposits, and shallow gravel, 5370-6200 feet elevation
Owyhee prickly phlox	*Leptodactylon glabrum*	Crevices in steep to vertical canyon walls; 4710-5300 feet elevation.
Least phacelia	*Phacelia minutissima*	Vernally saturated, sparsely vegetated swales in sagebrush zone; 6240-8900 feet elevation
Leiberg clover	*Trifolium leibergii*	Dry, shallow, barren soils of crumbling volcanic outcrops, mostly on upper slopes at elevations of 6560-7800 feet.

DIRECT AND INDIRECT IMPACTS

Proposed Action

The Proposed Action would directly affect about 1,400 acres of upland plant communities as a result of excavation of mine pits, and construction of waste rock disposal, heap leach, and other ancillary facilities (**Table 3-19**). Most of the vegetation disturbed by proposed mine development would be dominated by sagebrush (1,064 acres) of which 510 acres have been burned in recent fires. Other plant communities that would be removed by the Proposed Action include juniper woodlands and mixed shrub communities.

Dust from roads and mining activities could coat vegetation in areas adjacent to or downwind from dust sources. Dust on vegetation predisposes some species to insect infestation. Typically, communities of big sagebrush have proven difficult to re-establish on reclaimed land (Schuman and Booth 1998; Vicklund *et al*. 2004). Control of fugitive dust on roads through use of water and chemical binders would reduce the amount of dust that would settle on vegetation.

Concurrent revegetation during and after mining would likely re-establish permanent and stable vegetation cover within 5 to 10 years, with the exception of areas revegetated with big sagebrush; assuming livestock use in the area is deferred and noxious weeds are controlled. Reclaimed plant communities would likely differ in species composition from native pre-mining communities. Reclaimed areas would be dominated by grasses with low densities of native forbs, shrubs, and trees. Big sagebrush, a dominant shrub in the Study Area, would likely be present at lower densities following mining.

Invasive, Non-Native Species

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

Noxious weed control methods associated with the Proposed Action would control the invasion of weeds onto the mine area and reduce the potential for the mine area to be a source of noxious weed seed for adjacent, uninfested areas. Successful reclamation of the mine site would result in a vegetation community that would be less susceptible to weed invasion.

TABLE 3-19
Plant Communities Affected by Proposed Action
Emigrant Mine Project

Community Type[1]	Area Affected (acres)	Percent Cover Type Affected
Low Sagebrush (LS)	211	62
Burned Low Sagebrush (LS-B; LS-B/LS; LS/LS-B)	58	40
Mountain Big Sagebrush (MBS; MBS/MBS-B)	30	22
Burned Mountain Big Sagebrush (MBS-B; MBS-B/BBS-B; MBS-B/LS-B; MBS/LS)	139	22
Basin Big Sagebrush (BBS; BBS/MSB)	313	58
Burned Basin Big Sagebrush (BBS-B; BBS-B/BBS; BBS-B/JW-B; BBS-B/MBS-B; BBS/BBS-B)	313	39
Mixed Shrub (MS)	126	90
Burned Mixed Shrub (MS-B)	41	51
Juniper Woodland (JW; CC; JW/BBS; JW/MS; MS/JW)	136	37
Burned Juniper Woodland (JW-B)	45	9
Total Acres	**1,412**	**38**

Note: LS = Low Sagebrush; LS-B = Low Sagebrush Burned; MBS = Mountain Big Sagebrush; MSB-B = Mountain Big Sagebrush – Burned; BBS = Big Basin Sagebrush; BBS-B = Big Basin Sagebrush – Burned; MS = Mixed Shrub; MS-B = Mixed Shrub – Burned; JW = Juniper Woodland; JW-B = Juniper Woodland – Burned; CC = Chokecherry.
[1] Specific acreage for community types are contained in the Vegetation Report (Westech 2004a).

Special Status Plant Species

No special status plant species would be affected by the Proposed Action; however, populations of cactus protected under Nevada law would be removed during proposed mine development (Westech 2004a), after obtaining the appropriate state permit. A State permit may only be required if the cactus is to be sold.

No Action Alternative

Vegetation resources in the Study Area would not be impacted by implementation of the No Action alternative since no ground disturbance associated with mining activities would occur.

Invasive, Non-Native Species

Invasive, non-native species would likely spread from existing infestations in the Project area as a result of the No Action alternative.

Special Status Plant Species

Special status plant species would not be affected by implementation of the No Action alternative since no ground disturbance associated with mining activities would occur. Impacts to vegetation associated with other ground disturbing activities in the area, including livestock grazing, would continue.

POTENTIAL MONITORING AND MITIGATION MEASURES

Mitigation

- Reclamation measures would be implemented that favor establishment of big sagebrush on portions of the site. These measures would decrease the time required to establish sagebrush communities that are comparable to pre-mining levels. These measures could include application of mulch, inoculation with arbusucular mychorrizae, reduced competition with herbaceous species (lower seeding rate of grasses and forbs), and direct-placement of topsoil during salvage.

- Special measures, such as planting small patches of sagebrush among areas seeded with rapidly growing forbs and grasses, would be coordinated with BLM and the Nevada Department of Wildlife (NDOW) to control soil loss associated with the slow establishment of big sagebrush after planting.

- Best management practices would be implemented so that atomizers used to disperse heap leach drain-down fluids would not be used during periods of high wind in order to keep solutions within areas designed for containment to avoid affecting surrounding vegetation.

Invasive, Non-Native Species

Eradicate Scotch thistle in and adjacent to Project area prior to commencing construction.

Special Status Plant Species

No monitoring or mitigation measures for special status plant species have been identified by BLM.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

Approximately 98 acres of the Phase VIII mining sequence would be partially backfilled. Reclamation would include grading backfill material to drain, placing growth media, and revegetation. A highwall would remain along the east and north portions of the pit offering habitat for bats and raptors.

When reclamation is completed, no irreversible or irretrievable loss of vegetation productivity is expected in areas that would be reclaimed; however, species composition of reclaimed areas would likely differ from pre-mining communities.

Invasive, Non-Native Species

Where weed infestations occur, they represent an irretrievable commitment of range productivity. Control of noxious weeds during reclamation would avoid loss of range productivity.

Special Status Plant Species

There would be no irreversible or irretrievable commitments of resources to special status plants.

RESIDUAL EFFECTS

Post-mining plant communities likely would differ in species composition from native plant communities for several decades (*i.e.*, higher density of grasses and reduced densities of native forbs, shrubs, and trees). Though increased density and productivity of grasses would benefit livestock and wildlife with affinities for grassland habitat, it would be detrimental to species dependent on shrub and tree habitats.

Invasive, Non-native Species

No residual effects to the existing native plant community beyond the current conditions resulting from invasive, non-native species have been identified**.**

Special Status Plant Species

No residual effects to special status plants have been identified.

WETLAND AND RIPARIAN AREAS

AFFECTED ENVIRONMENT

The Study Area for Wetland/Riparian Areas includes the proposed mine permit area and portions of ephemeral drainages west of the permit boundary that flow through the mine permit area as shown on **Figure 3-11**.

Wetland and Non-Wetland Waters

Wetlands are regulated under Section 404 of the Clean Water Act as a subset of Waters of the U.S. Wetlands are defined as areas that are inundated or saturated by surface water or groundwater at frequency and duration sufficient to support, and under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions (U.S. Army Corps of Engineers 1987). Jurisdictional wetlands are wetlands that are contiguous with interstate waters (i.e., not isolated). Isolated wetlands not connected with interstate waters are not jurisdictional.

Wetlands in the Study Area are associated with springs/seeps and perennial and intermittent drainages. Wetland surveys delineated 3.9 acres of jurisdictional wetland and 3.0 acres of non-wetland Waters of the U.S. in the Study Area (**Figure 3-11**) (Westech 2004b). Eight springs or seeps were identified within the Study Area. Springs and seeps discharge to three ephemeral drainages that drain the east flank of the Piñon Range, cross the Study Area, and eventually are confluent with Dixie Creek. The northern-most two drainages converge into a single channel near the western side of the proposed disturbance boundary. Portions of these two channels have perennial flow due to discharge from several springs and seeps near the western permit boundary (**Figure 3-4** and **Figure 3-11**).

Herbaceous wetland vegetation is associated with springs/seeps and larger drainages where seasonal flow is augmented by upstream springs. Drainages supporting wetland vegetation are flooded or saturated during spring runoff through the middle of the growing season. Wetlands are restricted to the banks and lowest stream terraces and are generally only a few feet wide. With increasing distance below the springs, wetland vegetation becomes intermittent and disappears as stream flow enters alluvium.

Dominant wetland and/or riparian plants include Baltic rush, dagger-leaf rush, Nebraska sedge, redtop, Kentucky bluegrass, cow clover, Rocky Mountain buttercup, curly dock, common dandelion, and common plantain. Vegetation along drainages downstream from the herbaceous wetlands is composed mostly of upland species, usually basin big sagebrush.

The two northern-most drainages along the west side of the Study Area contain the most wetlands. The primary source of water for these wetlands is several springs/seeps in the drainage bottoms (springs/seeps SP-4, SP-5, SP-6, SP-7, & SP-8; **Figure 3-11**). These wetlands support cattails, bulrush, and other species adapted to saturated soil conditions. Woody vegetation such as willows and wild rose are sparse. Shrubs exist where cattle have been fenced out of the wetland area around Emigrant Spring (spring SP-6; **Figure 3-11**). Livestock use has limited development of woody wetland vegetation (EIP Associates 1997; Cedar Creek Associates 1997).

Riparian Areas

Riparian areas are the vegetated areas bordering springs, streams, and other bodies of water and include wetlands, stream channels, and vegetation adapted to soil and moisture conditions transitional between uplands and wetlands. The extent to which riparian areas perform ecological functions is determined by hydrologic, vegetation, and erosion features of a riparian system such as flood frequency, sinuosity, width/depth ratios, gradient, and riparian zone width. Vegetation attributes include composition, age structure, indicator species, root masses, bank cover, vigor, and woody debris recruitment potential. Erosion attributes include floodplain and channel characteristics, point bar cover, lateral stream movement, stability, and water/sediment balance.

Riparian areas in the Study Area are generally grazed by livestock and exhibit the following indications that they are not functioning optimally:

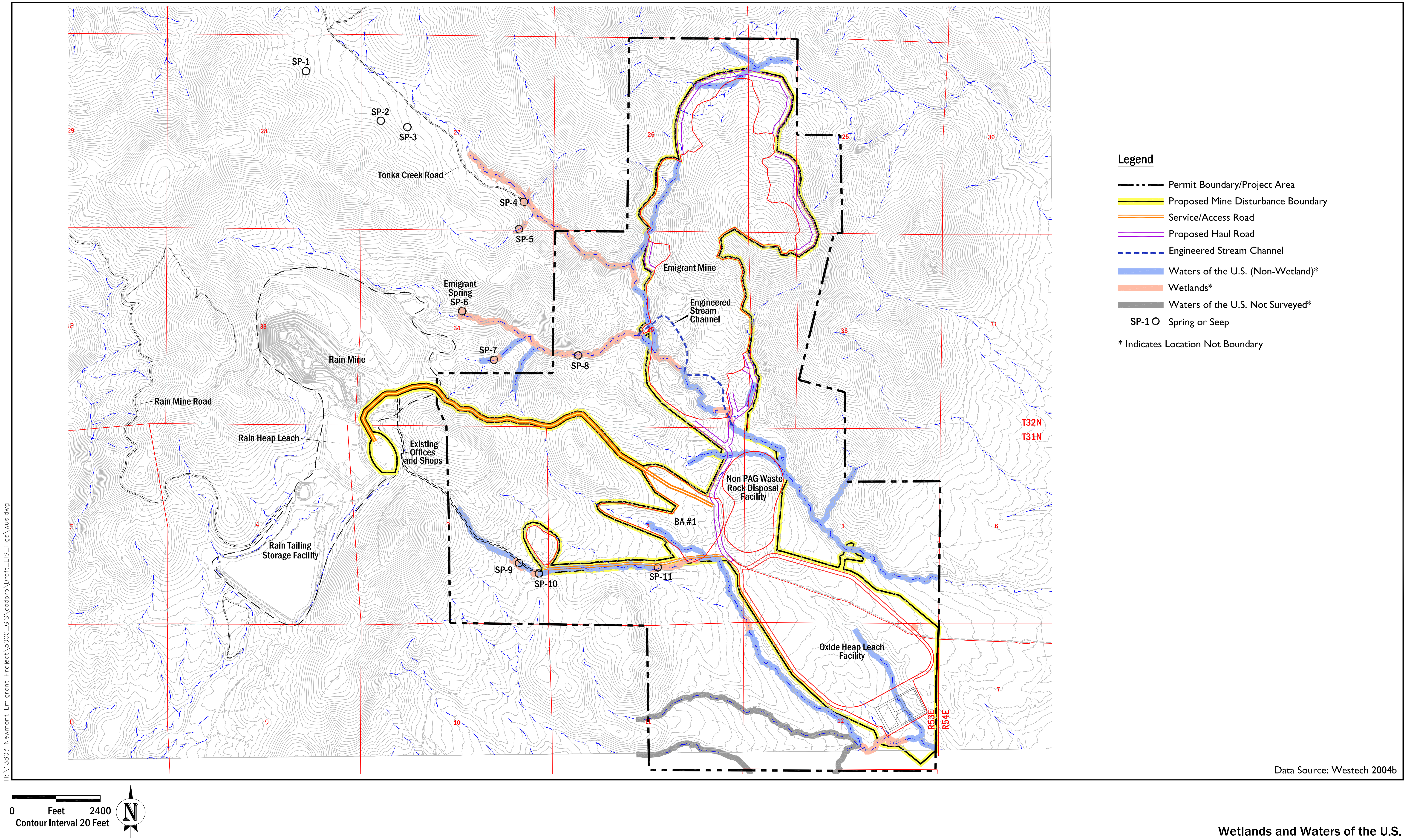
- High stream flows cause erosion and elevated sediment load;
- Inadequate riparian vegetation to capture bedload and contribute to floodplain development;
- Inadequate vegetation to improve flood-water retention and groundwater recharge;
- Inadequate root masses to stabilize stream banks;
- Noxious weeds proliferating along some riparian reaches;
- Large unstable sediment deposits in the channel bottom; and
- Unstable and poorly vegetated stream banks.

DIRECT AND INDIRECT IMPACTS

Proposed Action

Total area of wetlands and non-wetland Waters of the U.S. that would be permanently disturbed in the northern portion by proposed mine operations is 0.15 acre (2,381 lineal feet) and 0.88 acre (13,142 lineal feet), respectively (**Figure 3-11**). Total area of non-wetland waters in the southern portion that would be permanently filled by the heap leach facility is 0.13 acre; no wetlands are located in this area. Jurisdictional determination of Waters of the U.S. is based on the presence of bed and bank. Borrow Area #1 would permanently remove approximately 0.12 acre of non-wetland Waters of the U.S. from the Project site.

The proposed replacement channel would be constructed as a 5,000-ft long engineered stream channel excavated in bedrock. A detailed description of the engineered stream channel is included in Chapter 2 – *Proposed Action*.



U.S. Department of the Interior
Bureau of Land Management
Elko District Office
Elko, Nevada

Wetlands and Waters of the U.S.
Emigrant Project
Elko County, Nevada
FIGURE 3-11

A slurry cut-off wall would be constructed in the alluvium at the upstream end of the new engineered stream channel to prevent dewatering of the alluvium upstream of the mine pit (see Chapter 2 – *Proposed Action*). This would be accomplished by trenching down to bedrock across the alluvium at the head of the engineered stream channel and installing a slurry cut-off wall that would cause groundwater in the alluvium to rise to the surface at that point. This water would help create wetland and riparian habitat. The transition from the alluvium-filled valley upstream to the engineered stream channel downstream would be designed to control alluvial flow and reduce or eliminate seepage of water into the mine pit.

Wetland and riparian plant species are expected to increase in the Emigrant drainage as a result of the new engineered stream channel. The existing natural channel is degraded as a result of livestock grazing practices and a lack of perennial flow. The new engineered stream channel includes placement of rock weirs and step pools which would pond water and support increased retention and flow of water. Planted and naturally colonizing riparian species including willows are expected to trap sediment, increasing the ability of the system to support vegetation and store and capture water from runoff.

No Action Alternative

Implementation of the No Action alternative would result in no additional impacts to wetland/riparian areas in the proposed Project area. Impacts to wetland/riparian areas associated with other ground disturbing activities in the area would continue.

POTENTIAL MONITORING AND MITIGATION MEASURES

Mitigation

Local ranchers currently use springs in the area for livestock watering, which has caused degradation of riparian areas. Degradation of these areas would be reduced if exclosures were constructed allowing natural recovery of the springs. Fencing wetland and riparian areas adjacent to proposed mine-disturbance areas would reduce effects of livestock on vegetation and stream banks. These sites include springs at the following locations as shown on **Figure 3-11**:

- NE¼ of Section 28, Township 32 North, Range 53 East
- SW¼NW¼ of Section 27, Township 32 North, Range 53 East
- SW¼NW¼ of Section 27, Township 32 North, Range 53 East.

The Emigrant Spring exclosure would be reconstructed/maintained using wildlife friendly pipe rail fencing. Ongoing weed control would be conducted in the Emigrant Spring exclosure.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

The Proposed Action would result in removing or filling approximately 0.15 acre of wetlands and 0.88 acre of non-wetland Waters of the U.S. Loss of riparian and wetland habitat associated with removal of the natural stream channel would be offset by proper construction of the engineered stream channel to achieve natural conditions including re-establishment of riparian vegetation. If stable riparian habitat does not develop, Newmont would be required to implement plans to restore riparian areas in the engineered stream channel. Newmont is seeking a Section 404 Permit (pursuant to the Clean Water Act) from the U.S. Army Corps of Engineers to address potential loss of jurisdictional wetlands.

RESIDUAL EFFECTS

If stated design and mitigation efforts are successful, there would be no residual effects to wetland or riparian areas.

FISHERIES AND AQUATIC RESOURCES

AFFECTED ENVIRONMENT

The Study Area for fisheries and aquatic resources includes the proposed Project area, drainages immediately adjacent to and flowing through the proposed Project area, and lower Dixie Creek to its confluence with South Fork Humboldt River (**Figure 3-4**).

Most of the Emigrant Project area is drained by two channels that extend eastward from the Piñon Range through the proposed Project area and eventually join Dixie Creek approximately 5 miles east of the Project area (**Figure 2-2**). The northern tributary channel trends through the proposed mine pit area, whereas the southern channel is located immediately west and south of the proposed heap leach facility.

Both channels west of the proposed mine pit area contain flow most of the year owing to the presence of several seeps and springs in the drainage bottoms, the most prominent of which is Emigrant Spring, located in the upper end of a tributary channel west of the proposed mine pit area (**Figure 3-11**). Flow in the drainages often disappears a short distance below the springs and seeps except during periods of snowmelt and major rain events. Both drainages trending through the Project area eventually join the lower reach of Dixie Creek. This reach of Dixie Creek is typified by discontinuous flow to its confluence with South Fork Humboldt River. Dixie Creek exhibits continuous flow seasonally during snowmelt or runoff events.

Previous Surveys

Recent (1996 and 2004) fish population surveys were conducted in the vicinity of the Emigrant Project by NDOW. These studies assessed fisheries in the South Fork Humboldt River and Dixie Creek. SWCA (2004) conducted a survey of approximately 7 miles of Dixie Creek upstream from the confluence of South Fork Humboldt River. Maxim (2004b) conducted a fisheries survey of the northern tributary channel in the Project area. A summary of these surveys and previous surveys identifying fish presence in the vicinity of the Emigrant Project is presented in **Table 3-20**.

Project Area Drainages

Until 2004, indications were that fish were not present in the northern tributaries transecting the Project area. Maxim (2004b) identified two fish species present in this northern drainage in a one-mile reach of stream from below Emigrant Spring to below the confluence of the two forks comprising the northern drainage system (**Figure 3-4**). Lahontan speckled dace and Lahontan redside shiner were collected at eight locations within this area. The channel below this area was dry at the time of field observation, as was the southern drainage within and near the Project area.

Lower Dixie Creek

SWCA (2004) completed a survey that concentrated on searching for cutthroat trout and/or nonnative salmonids entering lower Dixie Creek from South Fork Humboldt River as nonnative salmonids could threaten the pure Lahontan cutthroat trout population in Upper Dixie Creek. During this study, investigators identified several fish species in a reach of the stream between its confluence with South Fork Humboldt River to a point approximately 7 miles upstream.

Identified species included Lahontan speckled dace, Lahontan redside shiner, and Tahoe sucker. Juveniles of all three species were found, indicating that lower Dixie Creek supports self-sustaining populations of these native fish. Although not documented, Elliott (2004) suggests Lahontan cutthroat trout could enter Lower Dixie Creek from South Fork Humboldt River by an individual drifting down from the South Fork Humboldt River dam or as the result of downstream drift from Upper Dixie Creek during periods when flow is present throughout the Dixie Creek drainage.

TABLE 3-20
Results of Fish Surveys in Aquatic Resources Study Area
Emigrant Mine Project

Stream	Agency/Entity	Year	Species Present
South Fork Humboldt River	NDOW	1996 1999 2003	Smallmouth bass (Micropterus dolomieu) Brown trout (Salmo trutta) Rainbow/cutthroat hybrids Lahontan cutthroat trout (Onorhynchus clarki henshawi)[1] Rainbow trout (Oncorhynchus mykiss) Lahontan speckled dace (Rhinichthys osculus) Lahontan redside shiner (Richardsonius egregious) Lahontan mountain sucker (Catostomus platyrhynchus) Tahoe sucker (Catostomus tahoensis) Tui Chub (Gila bicolor)
Lower Dixie Creek	NDOW	1997	Lahontan mountain sucker Tahoe sucker Lahontan speckled dace
Lower Dixie Creek	SWCA	2004	Lahontan speckled dace Lahontan redside shiner Tahoe sucker
Permit Boundary Area Drainage Tributary to Dixie Creek	Maxim Technologies	2004	Lahontan speckled dace Lahontan redside shiner

[1] Lahontan cutthroat trout present in the South Fork Humboldt River were hatchery stock planted in South Fork Reservoir for sport fishing. Stocking no longer occurs and this population is not targeted for recovery under the 1995 Lahontan Cutthroat Trout Recovery Plan.
Note: NDOW – Nevada Department of Wildlife

The USGS hydrograph from 1989-1996 (**Figure 3-5**) shows that lower Dixie Creek becomes intermittent in late summer, which limits trout habitat (see *Water Quantity and Quality* section). In addition, SWCA (2004) indicated there was no recent evidence of spawning by trout in lower Dixie Creek, presumably because of the stream's intermittent nature. However, resting and feeding habitats were identified by SWCA, beginning about 3 miles upstream from the confluence of Dixie Creek and South Fork Humboldt River. In this location, which is approximately 5 miles upstream, BLM has fenced Dixie Creek to restrict cattle access and has reduced the frequency and duration of hot season livestock grazing in the area. This action has revegetated the riparian area and is providing water quality benefits such as lower stream temperatures and sediment retention (Evans 2004). Additionally, perennial reaches in this area allows for year-round presence of aquatic life (fish, macroinvertebrates and periphyton), small mammals, birds, reptiles and amphibians, and a variety of other species that use riparian habitats.

Macroinvertebrates

Limited data are available concerning macroinvertebrates in and around the Project area. In conjunction with the fisheries survey conducted by Maxim (2004b), aquatic macroinvertbrate samples were collected at three locations in the channel below Emigrant Spring near the proposed mine site using the EPA Rapid Bioassessment Macroinvertebrate Protocol described in Barbour *et al*. (1999). Macroinvertebrate samples were collected for laboratory analysis to identify species, relative abundance, number of taxa, dominant taxa, and percent dominant taxa. Further analyses were performed to calculate biotic integrity indices, ratios of functional groups (scraper, shredder, and filtering taxa), ratios of Ephemeroptera (mayflies), Plecoptera (stoneflies), Trichoptera (caddisfly), and Chironomidae (midges) taxa (EPT), tolerance quotients, tolerance values, and community similarity indices (Maxim 2004b).

Results of the macroinvertebrate survey (**Table 3-21**) indicate poor or stressed water quality conditions are present at all sites sampled within the channel that contains Emigrant Spring. The Shannon-Weaver index, which evaluates effects of stress on aquatic communities of invertebrates (Klemm *et al.* 1990), displayed scores below 1.0 at all sites. This index generally has values ranging from 0 to 4.0, with values less than 1.0 indicating severe stress, and values greater than 2.5 indicating a healthy invertebrate population. The low scores likely reflect degraded stream and riparian habitat conditions.

TABLE 3-21
Macroinvertebrate Data Summary
Emigrant Mine Project

Site	Corrected Abundance (# ind/m2)	Dominant Community Composition (% Order)	Dominant EPT Taxa (% Order)	Richness (# species)	Shannon-Weaver Index (H')	Dominant FFG (% FFG)
Emigrant Spring Creek 1	1776	5.07 Diptera	2.70 Ephemeroptera	15	0.27	94.82 Gatherers
Emigrant Spring Creek 2	596	35.57 Diptera	1.17 Ephemeroptera	16	0.67	81.88 Gatherers
Emigrant Spring Creek 3	1617	42.8 Diptera	4.02 Ephemeroptera	26	0.81	61.41 Gatherers

Source: Maxim 2004b.
Notes: #ind/m^2 = number of individuals per square mile; EPT = Ephemeroptera-Plecoptera-Trichoptera; FFG = Functional Feeding Group.

Habitat

Habitat surveys were conducted at three locations on the northern tributary channel within and near the Project area where fish were observed and captured (Maxim 2004b). The habitat surveys conducted were primarily qualitative and included an assessment of channel dimensions, riparian condition, and pool conditions. Results of the surveys are summarized in **Table 3-22**.

Habitat in the drainage hosting Emigrant Spring has been created by variable seasonal flow. The G4 channel type (Rosgen 1996) consisted of boulders, cobbles, gravel, and silt. In general, the reaches evaluated were determined to consist of stable meanders with low-gradient riffle-pool morphology. Pools were typically of the straight or lateral scour type, the later formed by the influence of boulders present within the bankfull-width of the channel. Large woody debris recruitment potential was observed to be low to nonexistent. This drainage exhibits a degraded channel subject to variable seasonal flows with erodible streambanks. Outside of the fenced livestock enclosure around Emigrant Spring, there is potential for increased erosion rates.

Riparian vegetation consists of various shrubs and grasses within the enclosure (Reach 1), which provides cover for aquatic life. Vegetation outside of the enclosure is dominated by shrub/scrub (sagebrush and chokecherry) with little herbaceous vegetation in evidence due to the presence of livestock.

TABLE 3-22
Summary of Stream Channel Habitat Conditions
Emigrant Mine Project

Site ID	Reach 1	Reach 2	Reach 3
Width/Depth Ratio	7.46	4.94	4.65
Wetted Width (cm)	72.64	82.80	60.34
Bankfull Width (cm)	371.35	219.96	173.73
Streambank Condition[1]	36.67	67.50	51.67
Channel Characteristics[2]	G4	G4	G4
Bed-form Type	Alluvial Pool, Riffle	Alluvial Pool, Riffle	Alluvial Pool, Riffle

Source: Maxim 2004b.
[1] Estimates percent (%) of lineal distance eroding at the active channel height on both sides of a transect.
[2] According to Rosgen (1996).
Note: Reach 1 is within a fenced enclosure around Emigrant Spring, Reaches 2 and 3 are outside and downstream of the enclosure.

Recent observations (Evans 2008) as well as habitat surveys conducted by BLM (1995) on lower Dixie Creek show development of improved stream and riparian habitat conditions along a 5-mile reach below its confluence with drainages from the Project area in response to changes in livestock management initiated in 1990. Streambanks within this area are stable and well vegetated and exhibit willows and herbaceous riparian species. The floodplain in this area has become saturated and is effective at capturing sediment and dissipating flow while wet meadow/ beaver dam complexes provide habitat conditions for wildlife. Conditions are poor on the intermittently flowing 2-mile stretch of lower Dixie Creek below the restoration area and immediately upstream of the confluence with South Fork Humboldt River.

DIRECT AND INDIRECT IMPACTS

Proposed Action

Aquatic resources (i.e., Lahontan speckled dace, Lahontan redside shiner, and aquatic invertebrates) and their habitat would be removed from a portion of a tributary stream channel in the northern portion of the Project area.

Approximately 5,000 feet of a natural drainage channel would be removed by the proposed mine pit and replaced with an engineered stream channel that incorporates natural features (e.g., riffles, pools, and meanders). Approximately 1,000 lineal feet of the existing channel (0.15 acre) that would be removed supports aquatic habitat. Additional aquatic habitat would remain upstream (west) of the undisturbed portion of the drainage. These undisturbed stream channels are fed by several small springs and seeps (including Emigrant Spring) and would not be affected by proposed mine development.

Construction of a new channel that incorporates natural features (*e.g*., step pools, roughness features, and substrate development) would replace aquatic habitat removed by mine development. A detailed description of the engineered stream channel is included in Chapter 2 – *Proposed Action*. The proposed channel design would allow establishment of aquatic life and riparian vegetation. Design features would provide hiding cover and an environment conducive to production of benthic invertebrates (*e.g*., aquatic insects and snails), the primary food of many fish. Benthic invertebrate production is dependent on suitable aquatic vegetation and streambed substrate.

Stream channel segments upstream from the proposed mine disturbance that typically contain year-round flow would be temporarily isolated from downstream portions of the drainage that extend to Dixie Creek during periods of construction. Seasonal or long-term isolation of the tributary drainage upstream from the mine area would increase the probability that speckled dace and redside shiner could be extirpated from the drainage by climatic factors (i.e., drought or ice formation to the bottom of pools). Habitat in tributary channels west of the Project area (including the fenced Emigrant Spring exclosure) appears to be marginal for fish and likely subject to periodic fish die-offs during dry times in summer and cold periods in winter. During the life-of-mine, the proposed Project could limit potential for fish from downstream areas (originating in Dixie Creek) to move upstream through the new engineered stream channel, and to upstream drainages west of the Project area. The channel design incorporates features that are intended to restore fish movement. Reconstruction of the Emigrant Exclosure would improve habitat for fish and macroinvertebrates and may offset impacts to these resources resulting from relocation of the natural drainage.

No Action Alternative

Potential impacts to fisheries and aquatic resources that would result from development of the Emigrant Project would not occur under the No Action alternative. Impacts to fisheries and aquatic resources associated with other ground disturbing activities (*i.e*., grazing) in the area would continue.

POTENTIAL MONITORING AND MITIGATION MEASURES

Newmont would review status of native fish and macroinvertebrate populations in the Emigrant drainage and engineered stream channel with BLM and NDOW every 5 years. Fish and/or macroinvertebrate populations would be re-introduced into the channel as necessary or warranted. Reconstruction of the Emigrant Exclosure would improve habitat for fish and macroinvertebrates and may offset impacts to these resources resulting from relocation of the natural drainage.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

Aquatic resources (fish, macroinvertebrates, periphyton, vegetation) are generally considered renewable; however, loss of aquatic habitat resulting from mine pit development could temporarily reduce the ability of the area to support fish and other aquatic organisms at levels that existed prior to development. The engineered stream channel is designed to restore aquatic habitat and fish movement and reestablish riparian habitat lost to mine development.

RESIDUAL EFFECTS

No residual effects to fisheries/aquatic resources have been identified by BLM.

TERRESTRIAL WILDLIFE

AFFECTED ENVIRONMENT

The Study Area for terrestrial and special status wildlife species encompasses an area extending 1 to 3 miles from the proposed Project area.

Mammals

BLM's list of mammals recorded in the Elko District totals 76 species, including five shrews, 33 rodents, 15 carnivores, 12 bats, five rabbits and hares, and six ungulates. Of this total, 60 species could be expected to occur in the Study Area.

Wildlife species occupying the Study Area are typically associated with sagebrush and grassland communities and juniper woodlands, often in relatively steep terrain. Springs, seeps, and riparian areas provide important foraging for wide-ranging upland species. Large mammals that inhabit the Study Area include mule deer, pronghorn antelope, coyote, mountain lion, bobcat, and badger. Common small mammals include black-tailed jackrabbit, Townsend's ground squirrel, deer mice, kangaroo rat, northern pocket gopher, bushy-tailed woodrat, and least chipmunk (Cedar Creek Associates 1997).

The Study Area is year-around habitat for mule deer, which are present at low densities, most often in sagebrush and juniper habitats. During fall and winter, mule deer also migrate through the Study Area from the north and west; however, no critical deer habitat has been documented by NDOW in the Study Area.

The Study Area provides habitat for pronghorn antelope, which are present year-around. Sagebrush habitats are critical browse sources for pronghorn in winter; however, the steepness of terrain limits use by pronghorns in portions of the Study Area.

Seven species of bats have been documented in the Study Area. Bats forage over upland and riparian habitats and roost in trees and rock crevices (see *Special Status Wildlife Species* in this section).

Birds

Birds in the Study Area include game species (*i.e.*, sage grouse, chukar, and mourning doves), raptors (golden eagle, turkey vulture, red-tailed hawk, prairie falcon, Swainson's hawk, northern harrier, kestrel, great horned owl, and long-eared owl), and numerous passerine birds associated with grassland, sagebrush, and riparian habitats. Habitat in the Study Area is used by raptors for foraging; however, no raptor nesting territories have been documented (Westech 2004c). Although not reported for the Study Area, Herron *et al.* (1985) indicate that the Study Area is part of a larger area near Carlin, supporting relatively high nesting densities of barn owls and prairie falcons.

Chukars are an introduced game bird that occupies steep terrain near perennial seeps and springs. Mourning doves nest in tall shrubs and trees, often in association with intermittent drainages. Common birds in the Study Area include western kingbird, Say's phoebe, horned lark, lark sparrow, western meadowlark, sage sparrow, and sage thrasher. Additional species that may also be present in the Study Area are listed in a breeding bird survey conducted in 2004 along Dixie Creek and is hereby incorporated by reference (Bradley 2004).

Migratory Birds

Migratory birds in the Study Area that nest and forage in sagebrush, grassland and juniper woodland habitats include the species listed in the previous section.

Amphibians and Reptiles

Amphibians and reptiles observed in the Study Area include Pacific tree frog, western fence lizard, and western rattlesnake (Maxim 2004b). Pacific tree frogs were present in the wetlands and drainages originating from Emigrant Spring. Based on distribution maps (Stebbins 1985), the following species also could be present in the Study Area: northern desert horned lizard, western terrestrial garter snake, Great Basin collared lizard, Great Basin whiptail, long-nosed leopard lizard, Nevada side-blotched lizard, Basin spadefoot, western toad, northern leopard frog, sagebrush lizard, western skink, western whiptail, rubber boa, striped whipsnake, western yellow-bellied racer, gopher snake, long-nosed snake, ground snake, and night snake.

Special Status Wildlife Species

Special Status species include wildlife listed as threatened, endangered, or candidate species under the Endangered Species Act of 1973 and those species listed by BLM as sensitive. Federally-listed and BLM sensitive species known or with potential to occur on or near the Study Area, or having suitable habitat present, are listed in **Table 3-23**. Only species with suitable habitat in or near the Study Area or where direct or indirect effects from the proposed Project are likely to occur are addressed in this EIS.

Threatened and Endangered Species

Lahontan Cutthroat Trout (Threatened)

The Lahontan cutthroat trout is an inland subspecies of cutthroat trout endemic to the physiographic Lahontan basin of northern Nevada, eastern California, and southern Oregon and was listed by the USFWS as endangered in 1970 (Federal Register Vol. 35, p. 13520). This species was subsequently reclassified as threatened in 1975 to facilitate management and allow regulated angling (Federal Register, Vol. 40, p. 29864). There is no designated critical habitat. The species has

TABLE 3-23
Special Status Species with Potential to Occur In or Near
Emigrant Project Study Area

Species	Status	Habitat
Species Documented in the Study Area		
Sage grouse (*Centrocercus urophasianus*)	BLM sensitive; Present in the mine permit area.	Sagebrush habitat and wet meadows and riparian areas for brood rearing
White-faced ibis (*Plegadis chihi*)	BLM sensitive; nesting and foraging habitat present along Dixie Creek.	Wetlands and riparian areas with emergent vegetation
Pallid bat (*Antrozous pallidus*)	BLM sensitive; present in the mine permit area.	Roosts in caves, mineshafts, buildings, under bridges and in trees; forages in woodlands over water and desert washes.
Big brown bat (*Eptesicus fuscus*)	BLM sensitive; present in the mine permit area.	Roosts in caves, mineshafts, trees, buildings, under bridges; forages over water and in woodlands.
Western red bat (*Lasiurus blossevillii*)	BLM sensitive; present in the mine permit area.	Roosts in trees; forages over water and in woodlands
Hoary bat (*Lasiurus cinereus*)	BLM sensitive; present in the mine permit area.	Roosts in trees, cliffs, mines, caves, and talus; forages over water and in woodlands.
Western small-footed myotis (*Myotis ciliolabrum*)	BLM sensitive; present in the mine permit area.	Forages along cliffs, rocky slopes and sometimes over water. Roosts/breeds in rock crevices, talus, caves, mine adits, abandoned buildings,
Western long-eared myotis (*Myotis evotis*)	BLM sensitive; present in the mine permit area.	Roosts in trees, caves, crevices, buildings, and under bridges; forages over water and in woodlands.
Long-legged myotis (*Myotis volans*)	BLM sensitive; present in the mine permit area.	Conifer forests and piñon-juniper woodlands. Roosts under loose tree bark, in buildings, caves, rock crevices and mines
California floater (*Anodonta californiensis*)	BLM sensitive; present in South Fork Humboldt River; shells found in Dixie Creek, but live specimens not documented.	Rivers with fish including South Fork Humboldt River and possibly Dixie Creek.
Lahontan cutthroat trout (*Orthorynchus clarki henshawi*)	Threatened; native population present in upper Dixie Creek.	Cool relatively pristine streams and lakes
Species Not Documented but with Suitable Habitat and within Range of Occurrence		
Bald eagle (*Haliaeetus leucocephalus)*	BLM sensitive, may occasionally be present in Study Area during winter.	Periodic seasonal migrant in winter, present near open water where favored prey (waterfowl and fish) are present or where carrion is available.
Northern goshawk (*Accipiter gentilis*)	BLM sensitive, not known to nest in Study Area; suitable nesting habitat is present.	Nests in aspen stands, usually near streams
Ferruginous hawk (*Buteo regalis*)	BLM sensitive, not known to nest in Study Area; suitable nesting habitat is present.	Prefers to nest at interface of piñon -juniper zone and desert shrub communities
Swainson's hawk (*Buteo swainsoni*)	BLM sensitive, not known to nest in Study Area.	Nests in deciduous trees and shrubs in riparian areas or around springs
Burrowing owl (*Athene cunicularia hypugaea*)	BLM sensitive, not known to nest in Study Area, but habitat is present	Nests in grasslands and shrublands, often in association with ground squirrels and badgers, which excavate burrows it uses for nesting
Yuma myotis (*Myotis yumanensis*)	BLM sensitive, not documented in Study Area, but suitable foraging habitat may be present	Forages in riparian areas near forest edges, roosts and breeds in buildings, caves, mines, and under bridges
Spotted bat (*Euderma maculatum*)	BLM sensitive, not documented but suitable habitat present at Emigrant Spring and un-named drainages	Low deserts to montane forests with rock outcrops and cliffs. Forages over water and among trees

TABLE 3-23
Special Status Species with Potential to Occur In or Near Emigrant Project Study Area

Species	Status	Habitat
Preble's shrew (*Sorex preblei*)	BLM sensitive, not documented in Study Area, but suitable habitat is present in Elko County	Sagebrush, grassland, riparian habitats and marshy areas
Pygmy rabbit (*Brachylagus idahoensis*)	BLM sensitive, uncertain if present in Study Area, but suitable habitat is present and it has been found locally.	Relatively tall, dense big sagebrush communities with deep soils suitable for establishing burrows
Little brown myotis (*Myotis lucifugus*)	BLM sensitive, not documented in Study Area, caves, mines, and buildings not present.	Prefers to forage over water. Usually hibernates in caves and mines, often roosts and breeds in buildings.
Western pipistrelle (*Pipistrellus hesperus*)	BLM sensitive.	Roosts in trees, caves, buildings, and under bridges; forages over water, desert washes, and in woodlands.
Silver-haired bat (*Lasionycteris noctivagans*)	BLM sensitive.	Roosts in trees, caves, mines, buildings, and under bridges; forages over water and in woodlands.
Brazilian free-tailed bat (*Tadarida braziliensis*)	BLM sensitive.	Roosts in trees, caves, buildings, and under bridges; forages over water and desert washes and in woodlands.
Fringed myotis (*Myotis thysanodes*)	BLM sensitive; documented in Elko County.	Breeds and roosts in mines, buildings, rock crevices, caves, and under tree bark; forages in desert scrub and juniper woodlands.
Townsend's big-eared bat (*Corynorhinus townsendii*)	BLM sensitive, not documented in Study Area. foraging habitat; unlikely to be present.	Roosts and breeds mines, caves, and under bridges; returns yearly to same roost sites.
Nevada viceroy (*Limenitis archippus lahontani*)	BLM sensitive, suitable willow habitat is lacking in the Study Area but is present along Dixie Creek and South Fork Humboldt River.	Riparian habitats in association with willow and cottonwoods, host plants for larvae of this species.

Source: Harvey *et al.* 1999; Erhlich *et al.* 1988; Sibley 2001; Herron *et al.* 1985; Nevada Natural Heritage Program 2004a; Cedar Creek Associates 1997; Nevada Bat Working Group 2002; Lamp 2004; Maxim 2004b.

been introduced into habitats outside its native range, primarily for recreational fishing purposes (USFWS 1995).

Based on geographic, ecological, behavioral, and genetic factors, the USFWS determined that three distinct vertebrate population segments of Lahontan cutthroat trout exist including the Western Lahontan basin, Northwestern Lahontan basin, and the Humboldt River Basin. Genetic and morphometric differentiation of Lahontan cutthroat trout native to the Humboldt River basin warrants formal recognition and classification as a unique subspecies of cutthroat trout (USFWS 1995).

Historically, Lahontan cutthroat trout occupied streams throughout the Humboldt River watershed. Habitat degradation, water development projects, and introduction of non-native trout have eliminated this species over much of its historic range. Stream surveys within the South Fork Humboldt River drainages have identified 20 streams with approximately 58 miles of occupied habitat (USFWS 1995).

Upper Dixie Creek supports a small population of Lahontan cutthroat trout with an average of approximately 80 fish per mile (BLM 1998). The existing population of Lahontan cutthroat trout is located approximately 15 miles upstream of the confluence of Dixie Creek and the unnamed tributary within the Study Area. The upper reaches of Dixie Creek provide better habitat than the lower reaches with the exception of about 5 miles of restored habitat located on public land below the confluence of the Emigrant drainages, which currently are not occupied by Lahontan cutthroat trout. Since

1990, BLM has worked with local livestock interests to restore the aforementioned 5 miles of Dixie Creek on public land. The upper reaches are improving in response to management actions initiated through the Agreement for Management of the El Jiggs (Dixie Creek) Allotment issued in 1998. BLM is improving habitat to potentially sustain populations of Lahontan cutthroat trout throughout the creek, not just the headwaters.

Much of the remaining habitat on lower Dixie Creek is located on private land and is limited by impacts from grazing, degraded physical habitat, and flow. Dixie Creek could be accessed by nonnative salmonids including brown and rainbow trout from South Fork Humboldt River. However, there is no evidence of recent spawning by trout in the lower reaches of Dixie Creek (SWCA 2004), and a fish barrier to preclude access to the stream by nonnative salmonids is scheduled to be constructed just above the confluence of Dixie Creek with the South Fork Humboldt River in 2008.

Sensitive Species

Bats

Most bat species listed in **Table 3-23** have potential to use habitat in the Study Area for foraging, roosting, and breeding. Seven bat species were documented in the Study Area during an August 2004 survey (Butts 2004). Wetlands and surface water associated with springs and seeps, sagebrush grasslands, juniper woodlands, and rocky outcrops may provide habitat for some or all bat species listed as sensitive in **Table 3-23**. Rock crevices may provide roosting habitat and marginal breeding habitat. Caves, mines, and abandoned buildings optimum for roosting and breeding for colonies of bats have not been documented in the Study Area.

Three species, Western small-footed myotis, long-legged myotis, and Western long-eared myotis, were captured in mist nets. These species were also most common, based upon acoustic recordings. Four species, big brown bat, pallid bat, hoary bat, and Western red bat, were documented acoustically. A number of other bat species may occur in the Study Area, but were not documented. These species include little brown, Yuma myotis, fringed myotis, spotted, western pipistrelle, Townsend's big-eared, Brazilian free-tailed, and silver-haired bats.

Water sources are critical to bats because they drink from open water and insects are more abundant around wetlands and open water. Studies in desert habitats have found that bat activity is 40 times greater near wetlands and riparian areas than in upland areas (Nevada Bat Working Group 2002). Even high-elevation tree roosting bats fly to open water, wetlands, and riparian areas to drink and forage.

Species of bats with potential to occupy habitat in the Study Area vary in the degree to which their populations and habitats are at risk. According to the Nevada Bat Working Group (2002), species at high risk are the fringed myotis, Western red bat, and Townsend's big-eared bat.

Preble's Shrew

The ecology, life history, and habitat characteristics of Preble's shrew are not well known (Foresman 2001; Clark and Stromberg 1987); however, it has been found mostly in sagebrush and grassland habitats and occasionally in coniferous forest, marshes, and riparian areas. Suitable habitat appears to be present in the Study Area and the species has been documented to be present in Elko County (Nevada Natural Heritage Program 2004b).

Pygmy Rabbit

Pygmy rabbits prefer areas of relatively tall, dense sagebrush with deep soil suitable for excavating burrows. Sagebrush is the primary food of pygmy rabbits, but they also eat grasses and forbs depending on the seasonal availability. In Nevada, pygmy rabbits are generally found in sagebrush-dominated broad valley floors, stream banks, alluvial fans, and other areas with friable soil. There have been individual sightings of pygmy rabbits at higher elevations and within juniper woodland habitat (Burton 2008). Searches of the Study Area for pygmy rabbits, did not visually document the presence of pygmy rabbits; however, burrows, and fecal deposits which could be evidence of pygmy rabbits were observed (Westech 2004c; Geomatrix 2008b). Small fecal pellets, typical of pygmy rabbits, were observed mixed with larger pellets from cottontail rabbits. Numerous cottontail rabbits were observed, including juveniles. Small fecal pellets from immature cottontail rabbits cannot be reliably discriminated visually from pygmy rabbit pellets.

Bald Eagle

On June 28, 2007, the Secretary of the Interior announced that the bald eagle was being removed from the federal list of threatened and endangered species. The final rule delisting the bald eagle was published on July 9, 2007, and became effective on August 8, 2007 (72 FR 37346). After delisting, bald eagles will continue to be protected under the Bald and Golden Eagle Protection Act and the Migratory Bird Treaty Act. Since August 2007, BLM policy considers the bald eagle as a BLM Sensitive Species.

Bald eagles usually winter near bodies of water because fish and waterfowl are common prey. In the absence of waterfowl and fish, bald eagles eat carrion or prey upon small mammals such as black-tailed jackrabbits (BLM 2002a). Bald eagles winter along the Humboldt River and possibly forage in the Project area (Lamp 2008).

Sage Grouse

Sage grouse forage, nest, and winter in the Study Area; however, there are no known traditional breeding grounds ("leks"). The closest lek is 1.25 miles southwest of the Rain Mine, and seven other leks are within 6 miles of the Study Area. Sage grouse are obligately linked to sagebrush, which is their primary food in fall and winter. In spring and summer, sage grouse also feed on herbaceous vegetation and insects. Wetland and riparian areas are important brood-rearing areas for sage grouse. Female sage grouse with broods were observed in 1995 and 2004 at Emigrant Spring (Westech 2004c). Fires over the past few years have reduced the spatial extent and quality of large acreages of sagebrush habitat locally and regionally.

Swainson's Hawk

Swainson's hawks are seasonal residents and nesters in the Study Area, migrating to South and Central America in winter (Ryser 1985). This hawk nests in clumps of trees, often in agricultural and riparian areas or near springs. Swainson's hawks feed mostly on large insects and small mammals; however, they also take bats, birds, and amphibians. This hawk may forage in the Study Area, but is not known to nest in the Study Area.

Burrowing Owl

Burrowing owls nest in underground burrows excavated by ground squirrels, badgers, and other mammals, but are also able to excavate their own burrows. They usually occupy sagebrush and grassland habitats and often use the same nesting burrow for a number of years. Although burrowing owls can often be seen perched on or near their burrow during the day, they forage at night for nocturnal small mammals, spadefoot toads, and insects. Burrowing owls usually migrate south from Nevada in winter, but there are records of them over wintering in their burrows in a state of torpor (Ryser 1985). Burrowing owls have not been observed in the Study Area but have been identified near Tonka Creek (Spence 2004).

Ferruginous Hawk

Ferruginous hawks nest in scattered juniper trees at the interface of the piñon-juniper zone and desert shrub communities overlooking broad open valleys (Herron *et al.* 1985). The ferruginous hawk preys mostly on rodents and rabbits, but will also take birds and reptiles. Ferruginous hawks may forage in the Study Area, but there are no known nests (Lamp 2004; Westech 2004c).

California Floater

The California floater is a freshwater mussel that lives in shallow areas of lakes, ponds, and rivers. They burrow into soft, silty substrates and feed on bacteria, plankton, and detritus, which it strains from the water with its gills. The life cycle of this mussel includes a parasitic larval stage, during which it is dependent on upon host fish, usually native minnows. The decline of freshwater mussels has been attributed to declines in native host fish species, increases in sedimentation, predation by introduced fishes, and effects of dams. Live California floaters are present in South Fork Humboldt River and shells have been found in Dixie Creek (Evans 2004).

White-faced Ibis

The white-faced ibis is a wading bird of freshwater marshes, ponds, and rivers, where it feeds on insects, aquatic invertebrates, amphibians, and fish. During the nesting season, they are colonial, constructing nests among aquatic plants or floating mats of vegetation. The white-faced ibis has been documented in wetlands along Dixie Creek (Bradley 2004).

Nevada Viceroy

This butterfly inhabits moist open or shrub areas such as riparian wetlands, willow thickets, and wet meadows. Host plants for the caterpillar of the Nevada viceroy are trees and shrubs such as willow and cottonwood. Early in the season when few flowers are available, viceroys feed on aphid honeydew, carrion, dung, and decaying fungi. Later in the season they feed on nectar from flowers, favoring species of the sunflower family. Habitat for this species is present along Dixie Creek and South Fork Humboldt River.

DIRECT AND INDIRECT IMPACTS

Proposed Action

The Proposed Action would result in direct loss of approximately 1,400 acres of upland habitat and approximately 0.15 acre (2,381 lineal feet) of riparian and wetland habitat, until such habitat is reclaimed or replaced (in the case of the engineered stream channel). Habitat removed would include sagebrush communities (1,064 acres), juniper woodlands (181 acres), and mixed shrub communities (167 acres). Reclamation of riparian habitat is contingent on the proposed mitigation of using a natural design for the drainage adequately facilitating reestablishment of riparian vegetation. Loss of habitat would reduce local availability of forage, security, and breeding cover for wildlife inhabiting the area. All species dependent on these disturbed sites would be killed or displaced. Displaced animals may be incorporated into adjacent populations, depending on variables such as species behavior, density, and habitat quality. Adjacent populations may experience increased mortality, decreased reproductive rates, or other compensatory or additive responses.

There would be a loss of habitat from mine development until reclamation is successful; consequently, the capacity of the Study Area to support current levels of wildlife would be reduced until suitable habitat (including sage brush, other shrubs, and trees) has re-established. Vegetation on reclaimed areas would likely be dominated by grasses with low densities of native forbs, shrubs, and trees. Sagebrush and other shrubs, typically, are difficult to re-establish on mined lands (see *Upland Vegetation* section in this chapter) and areas burned by wildfire (Vicklund *et al.* 2004; Schuman and Booth 1998; NDOW 2003).

Species that would experience the greatest impacts from loss of sagebrush habitats include black-tailed jackrabbit, mountain cottontail, sage grouse, mule deer, and pronghorn antelope. These species depend on sagebrush and other shrubs for food and cover, especially in winter. During spring and early summer when newly planted grasses and forbs on reclaimed areas are succulent and rapidly growing, mule deer, pronghorn, rabbits and other small mammals would be attracted to reclaimed areas because of the seasonably abundant forage. During late summer, fall, and winter reclaimed areas would become desiccated and provide little forage or cover for most wildlife species, other than mice, voles, and other small mammals. The availability of adequate shrub-dominated habitat in winter is critical to survival of mule deer, pronghorns, sage grouse, and rabbits.

Mule deer and antelope using the Study Area for year-round and wintering habitat would be displaced. Migration of mule deer through the Study Area likely would be impeded by the mine, ancillary facilities, and service road between the Rain Mine and Emigrant Project area; however, mule deer would not be entirely prevented from migratory movements. The access road from the Rain Mine to the Emigrant Project would have sporadic traffic and be constructed to a width of 70 feet and have berms with breaks. Mule deer are seen around the Project area and movement across roads occurs. Traffic on the haul road from the mine pit to the heap leach pad would pose a mortality risk to deer and other wildlife.

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

Raptors that forage over sagebrush and grassland habitats would experience a reduced prey base due to a reduction in sagebrush/grassland and juniper woodland habitats until vegetation is established. Raptors would also be affected by loss of potential nesting habitat in juniper woodlands. Typically, reclaimed land is rapidly invaded by small mammals, often within 1 to 2 years following the start of reclamation (Hingtgen and Clark 1984a, 1984b). Populations of small mammals on reclaimed land would provide a prey base for raptors, even during early stages of reclamation. No known raptor nests would be directly affected by the Proposed Action. Some chukar habitat (steep, rocky slopes) would be lost, but this loss would be a relatively small incremental effect when compared with habitat availability in the region. Loss of sagebrush habitats would also have potential to impact chukar nesting, brooding, and winter cover habitat (BAER 1999).

Mourning doves would be affected by loss of nesting habitat with removal of 181 acres of juniper woodland. Removal of riparian vegetation associated with the drainage from Emigrant Spring would reduce foraging opportunities for mourning doves. The Proposed Action would result in a reduced capacity of the Study Area to support mourning doves. This loss would be an incremental effect that would have minor effects on regional populations of mourning doves.

Stipulations associated with the Industrial Artificial Pond Permit program administered by NDOW specify that wildlife access to lethal solutions must be precluded. Daily monitoring and reporting of wildlife mortality from heap leach facilities would be required under this permit.

Noise levels associated with the Proposed Action would increase, displacing some animals an unknown distance from the noise source. Some individuals would likely abandon habitat near high levels of noise and human disturbance; whereas, others would become accustomed to noise and associated human activity and resume their use of otherwise unaffected habitat.

Migratory birds would experience losses of foraging and nesting habitats in sagebrush-grasslands and juniper woodlands.

Depending on its configuration, the engineered stream channel constructed through the mine pit area could potentially affect wildlife by inhibiting movement and increasing the mortality risk to small mammals. Small mammals, reptiles, and amphibians could also be inhibited from crossing the channel if the sides are too steep. Construction of the channel with slopes of variable steepness and width would allow animals that enter the channel to escape.

Special Status Wildlife Species

Lahontan Cutthroat Trout (Threatened)

While Lahontan cutthroat trout (LCT) could drift downstream into Lower Dixie Creek from headwater areas, the area in question is currently considered unoccupied and there is no indication that the Proposed Action may affect LCT. All known occupied habitat is located approximately 15 miles upstream from the Project area. LCT were not found during surveys of Lower Dixie Creek in 1997 or 2004 (surveys were conducted during runoff conditions when LCT would most likely be present). LCT would not be affected by the Proposed Action, however, opportunities to establish cutthroat in lower Dixie Creek may be reduced if increased sediment or other water quality impacts from the proposed Emigrant Project affect Dixie Creek. Incorporation of natural habitat features including riparian vegetation and surface water control structures would prevent sediment from leaving the proposed Project area, thereby reducing potential for impacts to water quality in Dixie Creek and South Fork Humboldt River.

Bats (Sensitive)

Seven species of bats would experience reduced habitat quality through the removal of juniper trees and fractured rock faces. Bats would lose roosting habitat (*e.g.*, trees and fractured rock faces) and foraging areas over upland and wetland habitats removed by proposed mine development. With the exception of the big brown bat and long-legged myotis, potentially affected species would be at moderate to high risk. The Western red bat, a species whose populations and habitat are at high risk, would have the greatest potential to be affected by a loss of foraging and roosting habitat (Nevada Bat Working Group 2002). The Western red bat is dependent on trees for nesting and breeding. Aspen and cottonwoods are generally thought to be favored by the Western red bat. Over the life of the mine, bat diversity and density in the Study Area would decrease as bats currently using the Project area would be displaced. The pit highwall that would remain at the end of mining and closure of the Project would create a fractured rock face that could support roosting habitat for some species of bats.

The Industrial Artificial Pond Permit program administered by NDOW specifies that lethal levels of cyanide solutions not be accessible to bats, birds, and other wildlife. No caves, mine adits, or abandoned buildings, often used as nursery colonies or hibernation sites for some bat species, would be affected by the Proposed Action. Removal of wetlands would reduce the drinking water availability and foraging area for bats.

Riparian habitat is disproportionately important to wildlife, particularly in arid environments (Thomas *et al.* 1979). Increased productivity and structural complexity of riparian areas fosters increased abundance and richness of insect species for foraging bats. Removal of upland, wetland, and riparian habitat would reduce bat foraging opportunities until reclamation is successful. Additional mitigation is proposed that involves fencing wetlands and riparian areas within and adjacent to the proposed mine disturbance area to allow for recovery of streambanks and vegetation impacted by livestock. Such mitigation would also improve bat foraging habitat and help offset the lost riparian habitat in other areas.

Pygmy Rabbit (Sensitive)

Pygmy rabbit habitat along the tributary drainage from Emigrant Spring would be removed under the Proposed Action; however, it is uncertain if pygmy rabbits are present in the Study Area. Fecal pellets from rabbits and burrows are present, but there has not been visual confirmation that pygmy rabbits are present (Geomatrix 2008b). Proposed reclamation would not likely establish sagebrush communities with densities similar to pre-mining conditions; therefore there would be a decrease in quality of pygmy rabbit habitat in the Study Area. The loss of sagebrush habitat would be a small incremental reduction locally. This should not affect the viability of this species.

Preble's Shrew (Sensitive)

Potential habitat for Preble's shrew would be removed by the Proposed Action. It is not known if the Preble's shrew is present on the Study Area; if present, proposed mine development could result in direct mortality through excavation and other construction activities. No monitoring or additional studies for Preble's Shrew are anticipated.

Burrowing Owl (Sensitive)

Potential habitat for the burrowing owl includes sagebrush and grassland habitats in the Study Area with sufficient friable soil for burrows to be constructed for nesting. Mine development would remove potential nesting and foraging habitat until reclamation is achieved. The degree to which nesting habitat would be suitable in reclaimed areas would depend on vegetation characteristics, soil texture, and degree of compaction. Loss of nesting and foraging habitat during mining would have negligible effects on burrowing owls because they are not known to be present in the Study Area.

Swainson's and Ferruginous Hawks (Sensitive)

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

Bald Eagle (Sensitive)

Bald eagles are primarily associated with aquatic habitats due to the presence of fish and waterfowl, their favored winter prey, but also forage over upland sites for rodents and carrion. The Proposed Action would not affect bald eagles because they have not been documented in the Study Area and no nesting habitat is present.

Sage Grouse (Sensitive)

No known sage grouse courtship sites (leks) would be affected by the Proposed Action; however, sagebrush, grassland, and riparian habitats that would be removed do provide nesting, brood rearing, and wintering habitat. The reduction in density and extent of sagebrush could reduce the capability of the Study Area to support sage grouse, because sage grouse are dependent exclusively on sagebrush as a winter food source. The Proposed Action would likely result in the long-term (20 to 50 years) reduction of habitat quality for sage grouse. Fencing springs, reclamation of sagebrush on the remainder of the post mine area, and mitigation involving sagebrush enhancement within and adjacent to the proposed mine disturbance area would improve sage grouse habitat and offset the reduced sagebrush density in other areas.

White-faced Ibis (Sensitive)

Impacts to the white-faced ibis could result if the Proposed Action increases sediment delivery to Dixie Creek and South Fork Humboldt River. Removal of vegetation and soil disturbance associated with construction and operation of proposed mine development would have potential to increase sediment levels in ephemeral drainages that discharge to Dixie Creek and the South Fork Humboldt River via Dixie Creek. Increased sediment levels could reduce food sources (aquatic invertebrates, amphibians, and fish), reduce foraging efficiency, and adversely affect vegetation providing hiding and nesting cover for the ibis. Effects of possible increased sediment delivery from the Project area would depend on the timing and magnitude of sediment increases. Sediment increases would have the greatest potential to affect the white-faced ibis during nesting and brood-rearing periods. Design of the engineered stream channel to incorporate riparian vegetation, surface water control structures, and other BMP measures would reduce potential for impacts to water quality in Dixie Creek and South Fork Humboldt River (see *Proposed Action* in Chapter 2).

California Floater (Sensitive)

Impacts to the California floater could result if the Proposed Action increases sediment delivery to the South Fork Humboldt River. Removal of vegetation and soil disturbance associated with construction and operation of proposed mine development would have potential to increase sediment levels in ephemeral drainages that discharge to Dixie Creek and ultimately to the South Fork Humboldt River. Sediment could impair feeding behavior and the ability of this mussel to strain food from the water. Prolonged increased sediment levels could also adversely affect populations of native minnows, the host for mussel larvae. Magnitude and duration of potential water quality impacts would depend on levels of sediment that the proposed Project would contribute to Dixie Creek and South Fork Humboldt River. Sediment retention measures would be designed and constructed to control soil movement from the mine area and reduce potential for impacts to water quality in Dixie Creek and South Fork Humboldt River (see *Proposed Action* in Chapter 2).

Nevada Viceroy (Sensitive)

The Proposed Action would not affect the Nevada viceroy or its habitat.

No Action Alternative

Under the No Action alternative, potential impacts to terrestrial wildlife and special status wildlife species from development of the Project would not be realized. Impacts from previously authorized activities would continue under the No Action alternative.

POTENTIAL MONITORING AND MITIGATION MEASURES

Monitoring

- The scope, frequency, and intensity of further wildlife monitoring will be identified in the final monitoring plan developed by BLM in consultation with NDOW, and in the Mitigation and Monitoring section of the FEIS and the Record of Decision.

Mitigation

- Construct rock piles and drill or blast holes for bat roosting in highwalls and other rock faces.

- Implement reclamation measures that favor establishment of big sagebrush in portions of the site. Special measures would be coordinated with BLM and NDOW to control soil loss associated with the slow establishment of big sagebrush after planting.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

Irreversible and irretrievable loss of wildlife (including special status wildlife species) habitat from post-mine highwalls would result in a loss of habitat for some species (*e.g.*, mule deer, small mammals); however, the highwall could provide habitat for other species such as bats and raptors. The change in habitat represented by the pit highwall is not expected to permanently reduce the potential of the Study Area to support the diversity of wildlife species that it currently supports. Densities of species dependent on shrub and tree habitats may decline if reclamation does not re-establish plant communities dominated by sagebrush, juniper, and pinyon pine to pre-mine levels.

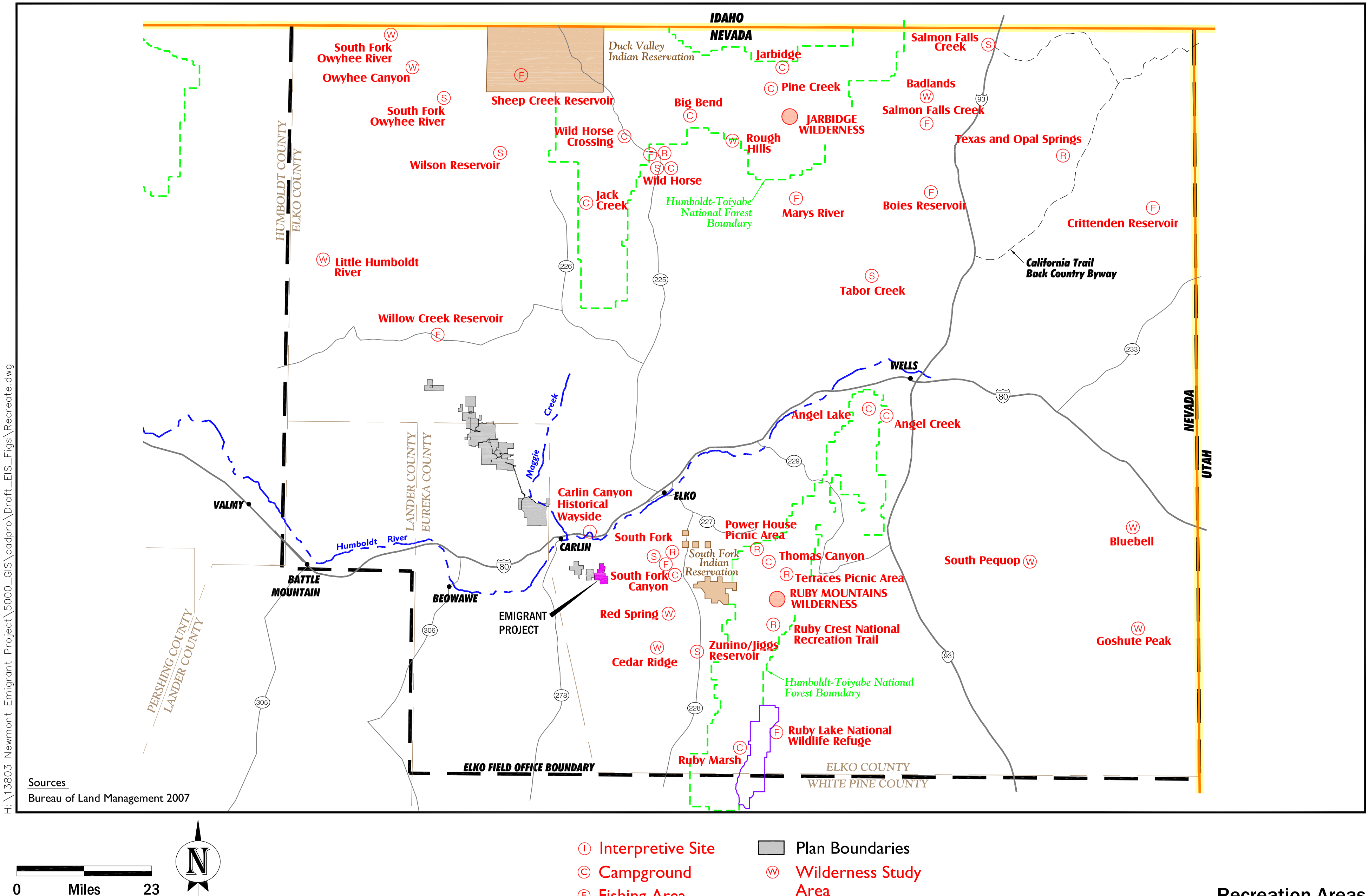
RESIDUAL EFFECTS

Impacts of mitigation measures described above would generally be positive. Species composition and structure associated with reclaimed habitat may be sub-optimal for wildlife species dependent on sagebrush and other shrubs over the long-term (decades) because of reduced densities of big sagebrush and other shrubs. These species may take longer to mature and attain maximum productivity and vigor than herbaceous species.

RECREATION

AFFECTED ENVIRONMENT

The Study Area for recreation is shown on **Figure 3-12** and consists of the BLM Elko District (which includes Elko County and northern portions of Eureka and Lander counties). The Elko District extends over 12 million acres, about one-sixth of Nevada's total area. BLM administers approximately 7.5 million acres of public land in the district that consists primarily of high desert and mountainous areas.



U.S. Department of the Interior
Bureau of Land Management
Elko District Office
Elko, Nevada

Recreation Areas
Emigrant Project
Elko County, Nevada
FIGURE 3-12

Outdoor recreational areas and facilities in the Study Area include those managed by BLM, Nevada Division of Forestry, Nevada Division of State Parks, U. S. Forest Service (USFS), United States Fish and Wildlife Service, Bureau of Indian Affairs (BIA), and private operators (**Figure 3-12**). Public land within these areas provide diverse recreational activities, including fishing, sightseeing, hunting, cross-country skiing, horseback riding, mountain biking, white water rafting, photography, rockhounding, and off-highway vehicle use (BLM 2007a).

BLM has designated six Special Recreation Management Areas which warrant intensified management. The nearest resource management area to the proposed Emigrant Project is South Fork Canyon, approximately 12 miles east of the Project area. South Fork Canyon encompasses 3,360 acres and has no developed facilities. The Zunino/Jiggs Reservoir Special Resource Management Area is approximately 20 miles southeast of the Project area and has a restroom, picnic tables, barbecues, and campground. The Wilson Reservoir Special Resource Management Area is 85 miles north of the Emigrant Project and includes a boat ramp, restrooms, campground, and drinking water source. Wild Horse Special Resource Management Area, located approximately 85 miles northeast of the Project area, includes a BLM campground. Campgrounds and boat ramps are also located on BIA-administered land at Wild Horse State Recreation Area at Wild Horse Reservoir. The South Fork Owyhee River Special Resource Management Area is located 90 miles north of the Project area and has a narrow corridor along the river, which is eligible for Wild and Scenic River designation. Salmon Falls Creek Special Resource Management Area is approximately 100 miles from the Project area near the town of Jackpot, Nevada.

The BLM Back Country Byways Program identifies historical and scenic routes on public land. The program is designed to encourage use of existing back roads through greater public awareness. In the northeast corner of the Elko District Office area, the California Trail Back Country Byway provides over 80 miles of scenic travel paralleling the original California Trail. The trail was a major route used by pioneers traveling from the midwest to California and Oregon. The Carlin Canyon Historical Wayside includes interpretative signs describing the geology and history of the area.

BLM is currently building a California Trail interpretive center located at the Hunter exit on Interstate 80, about 6 miles west of Elko. The center will encompass 40 acres and include a building, access road, interpretive plaza, 65-car parking lot, 1.5-mile walking trail, amphitheater, and day use area. BLM estimates approximately 65,000 people/year will visit the center once all exhibits are in place by 2010 (Jamiel 2007).

The USFS has three ranger districts in Elko County: Ruby Mountains, Mountain City, and Jarbidge. Of the three districts, Ruby Mountains Ranger District experiences the heaviest recreational use. Located within 20 miles of Elko and Interstate 80, the Ruby Mountains Ranger District has 121 campsites in four campgrounds, two picnic areas, and two wilderness areas. The Lamoille Canyon Scenic Byway provides 12 miles of paved access in the Ruby Mountains with three pullouts and interpretive signs. At the end of the scenic byway, a trailhead provides access to the 40-mile-long Ruby Crest National Recreation Trail (USDA/HTNF 2007).

The Mountain City Ranger District has three campgrounds. The Jarbidge Ranger District has two campgrounds and one wilderness area. Both districts experience recreational use on weekends (USDA/HTNF 2007).

Willow Creek Reservoir, in Elko County is approximately 50 miles northwest of the Emigrant Project. Willow Creek Reservoir is owned by Barrick Goldstrike Mining Company and is open to the public. NDOW manages the reservoir as a warm water fishery and periodically stocks it with crappie and channel catfish. Camping is allowed at the reservoir; however there are no developed facilities (Lamp 2004).

The South Fork State Recreation Area is 15 miles east of the proposed Project area adjacent to BLM's South Fork Canyon Special Resource Management Area. Facilities at the South Fork Reservoir include a boat ramp, campground, and administrative facility. The 80-acre Wild Horse State Recreation Area is approximately 85 miles northeast of the Project area and is located on the northeast shore of Wild Horse Reservoir just off Nevada Highway 225. Amenities include a campground and restrooms.

The communities of Carlin and Elko (including Spring Creek) have a number of recreational facilities. Carlin has an archery range, three baseball fields, a park and playground area, a moto-cross track, a tennis court, and a volleyball court. Elko has numerous baseball fields, a BMX track, two bowling alleys, fairgrounds, five gyms, two golf courses (one of which is operated by the county), an indoor horse arena, movie theaters, five parks, rifle and pistol range, several soccer complexes and tennis courts, trap and skeet range, and a swimming pool (ECEDA 2007). Snobowl Ski and Winter Recreational Area is located 6 miles north of Elko and provides opportunity for alpine and cross-county skiing, sledding, tubing, and snowmobiling. According to the Preliminary Draft Parks, Recreation, and Open Space Plan, additional acreage within the city limits has been set aside to meet community demands for parks, open space, and recreational facilities beyond 2010 (City of Elko 2007).

DIRECT AND INDIRECT IMPACTS

Proposed Action

The Emigrant Project would result in incremental withdrawal of up to 3,883 acres from recreational access and dispersed use.

This area would be within the boundary fence shown on **Figure 2-2**. This area would not be available for recreation until mining and reclamation are completed. Consequently, public access would be restricted for safety and security reasons. Land within the proposed Project vicinity does not offer unique outdoor recreation opportunities. Portions of the Study Area outside the Carlin Trend active mining district, including land within BLM's Elko District contains large areas of similar land available to the public for dispersed recreation.

Regional recreation opportunities, including campgrounds and other facilities, would be minimally impacted. The Project would bisect the Tonka Creek road precluding continuous or "loop" travel through the area during active mining operations. Upon completion of mining the road segment would be reconstructed and relocated to connect with the existing route and re-establish "loop" travel through the area. During the life of the Emigrant Project and prior to completion of reclamation, the area within the fenced boundary of the mine site would not be available for hunting.

No Action Alternative

Under the No Action alternative, no additional disturbance to private or public land or direct impacts to recreation resources would occur. Impacts from previously authorized activities would continue under the No Action alternative.

POTENTIAL MONITORING AND MITIGATION MEASURES

No monitoring measures for recreation uses have been identified by BLM. Newmont would provide funding for interpretive signs to be placed at the South Fork Special Recreation Management Area.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

No irretrievable or irreversible impacts to recreational uses within the Study Area are expected as a result of the Proposed Action.

RESIDUAL EFFECTS

There would be no residual effects to recreational opportunities as a result of the Proposed Action.

GRAZING MANAGEMENT

AFFECTED ENVIRONMENT

Grazing allotments are areas of public and unfenced private land used by permittees for livestock grazing. Grazing within these allotments is permitted and administered by BLM.

The Project area lies within the Emigrant Springs Grazing Allotment #5417 and Tonka Allotment #5468 (Maggie Creek and Tomera Ranches). Stonehouse Division of Tomera Ranches, Inc. is the permittee for the Emigrant Springs Allotment. The Emigrant Springs Allotment encompasses 26,766 acres (13,520 private/13,246 public) and is comprised of six pastures supporting a total of 1,286 Animal Unit Months (AUMs). An AUM is the amount of forage required to sustain one cow and calf for one month. Approximately 100 acres of the proposed mine permit area lies within Tonka Allotment # 5468.

The Crawford Mountain, Scott Seeding Federal Fenced Range, and Brush Corral Federal Fenced Range (FFR) pastures would be affected by proposed mine development. Range improvements, AUMs, and seasonal restrictions, are shown in **Table 3-24** and **Figure 3-13**. Grazing restrictions in the allotment include 50 percent utilization on grass species during the grazing season.

The Emigrant Springs Grazing Allotment contains five vegetation enclosures, four of which are outside the proposed mine permit boundary. The Emigrant Spring enclosure lies within the Crawford Mountain pasture in Sections 34 and 35, Township 32 North, Range 53 East, between the Rain Mine and proposed Project area.

TABLE 3-24
Emigrant Springs Grazing Allotment
Emigrant Mine Project

Pasture	Acres		Animal Unit Months (AUMs)	Range Improvements	Season of Use
	Public	Private			
Crawford Mountain	5,046	1,034	537	Cattle guard, Section 12, T31N, R53E	April 16 – Nov. 30
Scott Seeding (North)	480	1,120	47		April 1 – Nov. 30
Brush Corral FFR	80	4,320	13		April 1 – Nov. 30

Source: Scheetz 2008. FFR = Federal Fenced Range

DIRECT AND INDIRECT IMPACTS

Proposed Action

Grazing capacity would be reduced by incremental withdrawal of up to 3,466 acres from the Emigrant Springs Allotment No. 5417 and 100 acres from Tonka Allotment No. 5468. Withdrawal of these areas would likely occur in two phases corresponding to relocation of the mine perimeter fence as shown on **Figure 2-2**. Areas withdrawn from allotments and pastures affected by development of the Emigrant Project are shown in **Table 3-25**.

Grazing capacity would be reduced by withdrawal of 3,466 acres representing 306 AUMs in Emigrant Springs Allotment No. 5417. No reduction of AUMs in Tonka Allotment No 5468 would occur. Carrying capacity of the Emigrant Springs Allotment would be reduced until reclamation is complete and vegetation re-established on disturbed areas. Implementation of the Proposed Action would result in withdrawal of 2,647 acres of public land from the Crawford Mountain pasture and 701 acres (public land) in the North Scott Seeding Federal Fenced Range pasture. There is no public land or AUMs in the Brush Corral FFR that would be affected by the proposed Project.

No Action Alternative

Implementation of the No Action alternative would not affect current grazing management practices or range resources in the Project area. No additional disturbance to soil or vegetation would occur and current stocking rates would continue as permitted. Impacts from previously authorized activities would continue under the No Action alternative.

POTENTIAL MONITORING AND MITIGATION MEASURES

No monitoring or mitigation measures for grazing management have been identified by BLM. Fencing of springs, construction of pipelines and troughs, and maintenance of an east side corridor for movement of cattle in the vicinity of the proposed Project are discussed in *Reasonably Foreseeable Future Activities* in the *Grazing* section of Chapter 4 – *Cumulative Effects.*

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

Grazing capacity on mine-related disturbance areas would be lost until reclamation is completed and vegetation becomes established.

RESIDUAL EFFECTS

Residual effects to grazing management would be the post-mine highwall, which would not be reclaimed for an end use of livestock grazing.

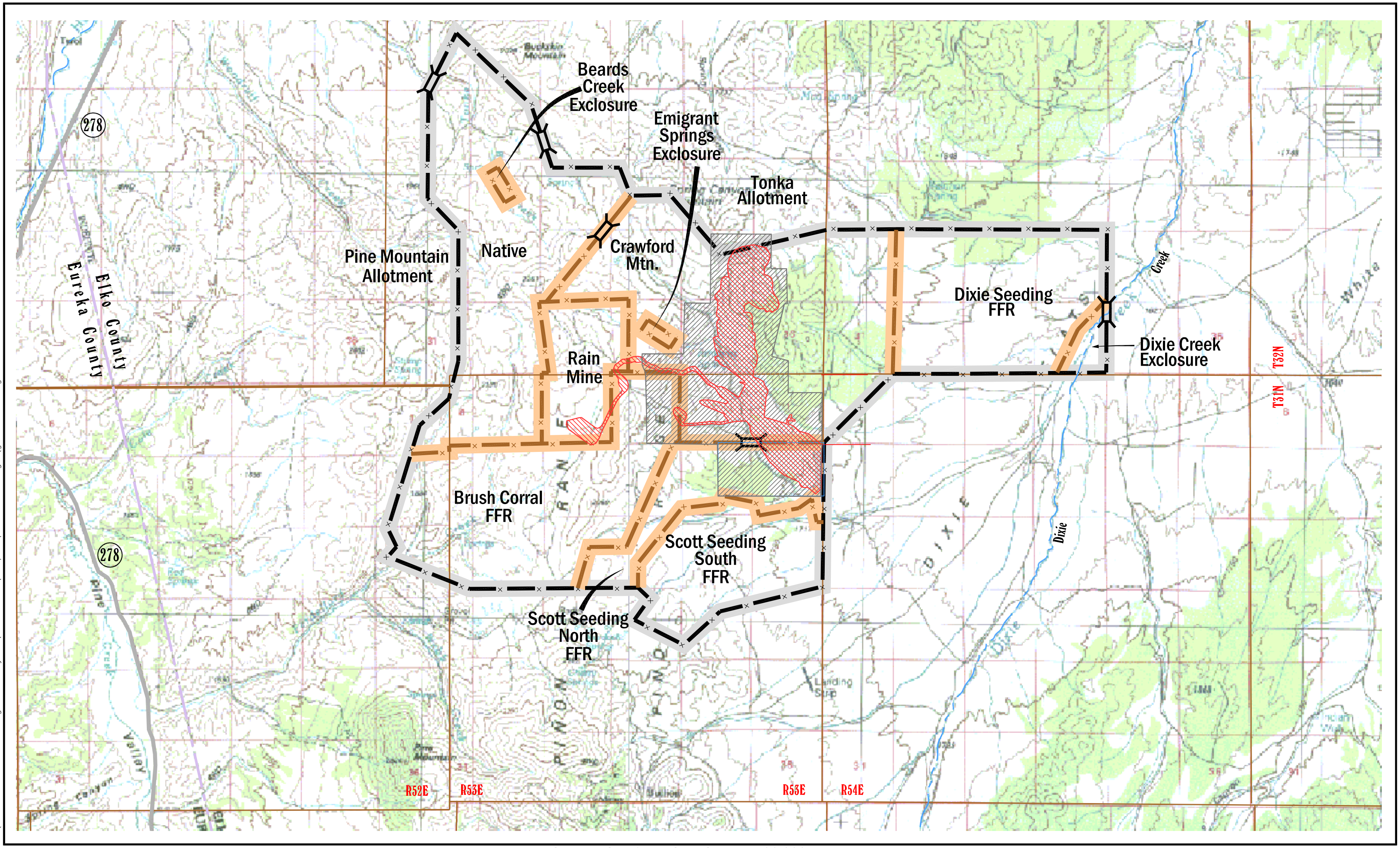
ACCESS AND LAND USE

AFFECTED ENVIRONMENT

The Study Area for access and land use is the Emigrant Project area (**Figure 2-2**).

Access

The proposed Emigrant Mine Project is located approximately 10 miles southeast of Carlin and is accessed via the Rain Mine road from Highway 278 south of Carlin. The Tonka Creek road, which passes through the Project area extends from the Newmont Rain road through the proposed mine area into Dixie Creek and provides continuous or "loop" travel through the area (**Figure 2-2**). Numerous two-track roads provide access throughout the area to support livestock grazing operations and public access for recreational purposes.



Basemap Source: Sure!MAPS RASTER 1:100,000 Nevada Map

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	Emigrant Springs Allotment Fence
	Pasture Fence
	Cattle Guard
FFR =	Federal Fenced Range
	Emigrant Mine Permit Boundary/Project Area
	Emigrant Mine Proposed Disturbance Boundary

U.S. Department of the Interior
Bureau of Land Management
Elko District Office
Elko, Nevada

Grazing Allotment
Emigrant Project
Elko County, Nevada
FIGURE 3-13

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TABLE 3-25
Grazing Allotments Affected by Proposed Permit Boundary
Emigrant Mine Project

Pasture	Phase I		Phase II		Total	
	Acres	Public AUMs	Acres	Public AUMs	Acres	Public AUMs
Emigrant Springs Allotment No. 5417						
Crawford Mtn Pasture	2,143	194	504	65	2,647	259
Scott Seeding North[1]	701	47	-0-	-0-	701	47
Brush Corral FFR[2]	118	-0-	-0-	-0-	118	-0-
Subtotal	**2,962**	**241**	**504**	**65**	**3,466**	**306**
Tonka Allotment No. 5468						
Tonka Pasture	-0-	-0-	100	-0-	100	-0-
Total	**2,962**	**241**	**604**	**65**	**3,566**	**306**

[1] Includes all AUMs on public land in this pasture.
[2] No public land or AUMs in this pasture affected by the proposed Project.
Source: Scheetz 2008. FFR = Federal Fenced Range; AUM = animal unit month.

BLM has issued two rights-of-way to Newmont in the Project area. Right-of-way N-47282 was issued for a water well, buried water pipeline, overhead powerline, and access road. Two water supply production wells (RPW-1 and RPW-2) were installed by Newmont during 1988 along Dixie Creek to provide water for the Rain Mine. Water from these production wells is transported 6 miles to the Rain Mine by a 12-inch diameter buried pipeline located within the right-of-way. Right-of-way N-47290 was issued for a communication site and access road.

Land Use

Dominant land uses in the Project area include mining, livestock grazing, and outdoor recreation. Although mining has occurred in the area throughout the last century, the only major mine development in the portion of the Carlin Trend located south of Interstate-80 is the Rain Mine where mining operations were initiated in 1987. The Rain Mine lies immediately west of the proposed Emigrant Mine and is currently in closure (**Figure 2-2**).

DIRECT AND INDIRECT IMPACTS

Proposed Action

Access

Development of the Emigrant Project would bisect the Tonka Creek road, which passes through the Project area. This route extends from the Newmont Rain road through the proposed mine area into the Dixie Creek drainage basin and would effectively preclude continuous or "loop" travel through the area during mining operations. Use of some two-track roads throughout the area to support livestock grazing operations and public access for recreational purposes would not be allowed within the mine permit boundary area.

A 12-inch diameter water pipeline, overhead powerline, and access road associate with right-of-way N-47282 would be relocated around the proposed heap leach facility in portions of Sections 1, 2 and 12, Township 31 North, Range 53 East. Right-of-way N-47290 would not be affected by proposed mine operations.

Land Use

Potential impacts to Land Use would be the same as those described under the Recreation and Grazing Management sections.

No Action Alternative

The No Action alternative would result in no additional impacts to land use and access. Impacts from previously authorized activities would continue under the No Action alternative.

POTENTIAL MONITORING AND MITIGATION MEASURES

No monitoring or mitigation measures have been identified for access and land use issues by BLM.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

There would be no irreversible or irretrievable commitment of access and land use associated with implementation of the Proposed Action. Pre-mine land uses including wildlife habitat, dispersed recreation, and grazing, are expected to resume following mine reclamation.

RESIDUAL EFFECTS

There would be no residual effects to access and land use from implementation of the Proposed Action.

SOLID AND HAZARDOUS WASTES

AFFECTED ENVIRONMENT

The Study Area for Solid and Hazardous Wastes is the proposed Emigrant Project Area. No solid or hazardous wastes are currently located in the Project Area.

DIRECT AND INDIRECT IMPACTS

Proposed Action

Implementation of the Emigrant Project would result in the transportation, storage, and disposal of solid and hazardous wastes. A detailed description of the types and volumes of hazardous wastes that would be used in the proposed Project Area are described in the *Proposed Action* section of Chapter 2.

No direct or indirect impacts have been identified that would result from the transportation, storage, and disposal of solid and hazardous wastes associated with the Proposed Action. Implementation of management and spill response measures described in Chapter 2 for these materials would eliminate or reduce the effects of release of wastes to the environment.

No Action Alternative

Under the No Action alternative, solid and hazardous wastes would not be transported, stored, or disposed in the Project Area.

POTENTIAL MONITORING AND MITIGATION MEASURES

No monitoring measures or mitigation measures beyond those included in Newmont's Plan of Operations for the proposed Emigrant Project for management of solid and hazardous wastes have been identified by BLM.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

No irretrievable or irreversible commitment of resources resulting from the transportation, storage, or disposal of solid and hazardous wastes have been identified.

RESIDUAL EFFECTS

No residual effects resulting from management of solid and hazardous wastes have been identified.

VISUAL RESOURCES

AFFECTED ENVIRONMENT

The Project is located on the eastern slopes of the Piñon Range in the Dixie Creek Basin. The visual resources of the area include views of steep mountains giving way to gentle slopes and rolling hills bisected by several drainages. Vegetation consists of sagebrush, rabbitbrush, single leaf piñon, and various grasses that color the hills in shades of green, gold, and brown. Grey, brown, and black indicate areas of sparse vegetation, bare soil, and rocks.

The Project area is located in a steep canyon not readily visible from any major roadway or recreation area. The prominent view of the mine would be from the main access road, making the primary viewers mine employees and/or mine service contractors. Occasionally, recreationalists and hunters may catch a view of the mine as they pass by.

Visual resources are identified through BLM's Visual Resource Management (VRM) inventory. This inventory consists of a scenic quality evaluation, sensitivity level analysis, and delineation of distance zones. Based on these factors, BLM-administered land is placed into four visual resource inventory classes: VRM Classes I, II, III, and IV. Classes I and II are the most valued, Class III represents a moderate value and Class IV is of the least value. VRM classes serve two purposes: (1) as an inventory tool that portrays the relative value of visual resources in the area, and (2) as a management tool that provides an objective for managing visual resources.

The Project area is located in Visual Resource Management Class IV (BLM 1986). The Class IV VRM objective is to allow for management activities which involve major modification of the existing character of the landscape. The level of contrast can be high, dominating the landscape and the focus of viewer attention. However, every attempt should be make to minimize the impact of these activities through careful location, minimal disturbance, and repeating the basic elements of the characteristic landscape.

DIRECT AND INDIRECT IMPACTS

Proposed Action

Major changes in the landscape would accompany mining practices at the proposed Emigrant Project. Terraced, flat-topped waste rock disposal facility and rock faces would present moderate to strong contrasts with the existing landform and line of steep canyons and gentle slopes. Moderate to strong form contrasts would impact visual resources in a localized manner. Views of most mining activity would be hidden by canyon walls and higher ridge land forms to the south and east. The color and texture of the reclaimed area would be a moderate contrast to the existing landscape. The disturbed soil associated with mining activity is not expected to be highly contrasted with the undisturbed soil color. Reclamation activities would include shaping the edges of the disturbance areas to blend with the surrounding land forms and revegetation. Class IV VRM objectives would be met by the proposed reclamation.

No Action Alternative

Under the No Action alternative, no visual impacts would occur at the Emigrant Project beyond those already present.

POTENTIAL MONITORING AND MITIGATION MEASURES

No monitoring or mitigation measures for visual resources have been identified by BLM.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

An irretrievable commitment of visual resources would occur during construction and active mining period until reclamation is successful. Impacts on visual resources would be reduced through implementation of reclamation and mitigation measures. Unreclaimed rock faces would represent an irreversible commitment of visual resources as compared to the existing landscape.

RESIDUAL EFFECTS

Following reclamation, the non-PAG waste rock disposal facility, heap leach pad, and pit highwall would be the most noticeable residual effect of the Proposed Action. Weak contrasts in form, line and color could remain. Weak contrasts would result from the prismoidal forms and straight lines of the reclaimed non-PAG waste rock disposal and heap leach facilities. Finer and more uniform soil in this area would also create weak contrasts in texture with the existing landscape.

CULTURAL RESOURCES

AFFECTED ENVIRONMENT

Cultural resources are locations of past human activity, occupation, or use. Prehistoric resources reflect activities that occurred prior to introduction of written records. Since written documentation is absent, archaeological sites are the only source of data concerning prehistoric societies. Historic resources reflect Euro-American and Asian-American occupation. The scientific value of these resources relates to their potential to inform on how human societies operate and change. In addition to their scientific value, cultural resources may have aesthetic and cultural value. Aesthetic values may be expressed in rock art sites, or in standing structures of architectural significance. Historic sites may have cultural value if they link a living community to a place that conveys a sense of cultural identity.

Prehistoric Overview

James (1981), Elston and Budy (1990), Elston and Drews (1992), Schroedl (1995), Hockett and Morgenstein (2003), and McGuire *et al.* (2004) provide regional overviews of prehistory. Schroedl (1995) divides regional prehistory into six chronological periods. The Pre-Archaic Period (12,250 to 8,000 B.C.) was a period marked by cool, moist conditions. Originally thought to represent an adaptation to pluvial lakeshore environments, Pre-Archaic sites have been recognized in other settings.

Subsistence revolved around lakeshore-marsh resources and taking of large game. Population density was low, and groups were mobile. Sites in this period have not been identified in or adjacent to the proposed Project area.

Environmental conditions changed toward the end of the Pre-Archaic as temperatures increased and available surface water decreased. The Early Archaic Period (8000 to 4500 B.C.) appears to have been a time of limited occupation in the north-central Great Basin. Period sites are few and not common regionally. The appearance of ground stone implements is evidence of subsistence diversification brought on by the reduced carrying capacity of local environments. Variety of site types encountered increased during this period, again suggesting diversity in resource procurement strategies.

The Middle Archaic Period (4500 to 850 B.C.) corresponds to the onset of a cooler period when increased precipitation caused expansion of some resources associated with lakes and marshes. Local manifestations of the Middle Archaic are referred to as the South Fork Phase. Trends during the period include population increases and broadening economic activities. While hunting was an important subsistence focus, the processing of plant foods took on greater importance as evidenced by the abundance of ground stone artifacts and increased use of upland resources.

The Late Archaic Period (850 B.C. to A.D. 700) corresponds with the James Creek Phase. Technologically, this period is marked by increased diversification in ground stone artifacts and a greater emphasis on the use of small flake tools. Subsistence and settlement changes appear to reflect increased local and regional population. This prompted an intensification and diversification in localized subsistence practices. Resources seldom used during earlier periods were added to the diet. Regional use of piñon became pronounced during this period.

The Late Prehistoric Period is divided into two sub-periods. The early sub-period (A.D. 700 to A.D. 1300) corresponds with the Maggie Creek Phase and exhibits a general continuity with the previous era. Occupation levels were consistent with or higher than previous periods. The appearance of smaller Rosegate series projectile points suggests that the bow and arrow was introduced during this period. A general emphasis on smaller tools may evidence the gradual diminishment of quality lithics and/or a burgeoning population that forced an increased reliance upon the taking of smaller animals.

The latter sub-period of the Late Prehistoric (from A.D. 1300 to historic times) corresponds with the Eagle Rock Phase. Occupational levels appear to have declined during this period; assemblages are small and lack evidence of much diversity. Local materials are not abundant suggesting a mobile subsistence practice. This period saw expansion of Numic groups throughout most of the Great Basin from a homeland in the southwest. While there is little dispute that this event occurred, there is disagreement over its mechanics and timing.

Historical Overview

Patterson *et al*. (1969) and Vlasich (1981) represent sources that address local history. Topical references of relevance include Cline (1963) on early exploration; Cline (1974) on Peter Ogden; Goodwin (1965) on emigration; Myrick (1962) on railroads; Lincoln and Horton (1966), Elliot (1966), and Hill (1918) on mining; and Vestrom and Mason (1944), Sawyer (1971), and Young and Sparks (1985) on ranching and agriculture.

Economic interests fostered early exploration of the region. Acting on behalf of the Hudson's Bay Company, Peter Skene Ogden made several incursions into the Great Basin during the 1820s and 1830s. Others exploring the general Humboldt region included John Work and Joseph Walker. Exploration of a different sort occurred during the 1840s through the 1860s, when military expeditions traversed the region in search of scientific information or transportation routes. Leaders of these expeditions included Captain John C. Fremont, Lieutenant E. Beckwith, Captain James Simpson, Clarence King, and Lieutenant George Wheeler.

Beginning in the 1840s, Euro-Americans moved through Nevada on their way to Oregon and California. The number of people moving along these trails swelled in the 1850s and 1860s after the discovery of gold in California and then Nevada. The first Euro-American settlers in Nevada were traders that established posts along emigrant trails. Farmers, ranchers, and miners moved from these posts into the hinterlands. Construction of the transcontinental railroad in the 1860s saw establishment of new population centers and incentives for local and regional development. Nearby Carlin was established as a location for major railroad facilities.

Ready access to the railroad spurred development of the livestock industry throughout the state, but especially in northeast Nevada. Access to regional and national markets prompted an increased demand for extensive rangeland. Ranching operations in northeast Nevada came to depend on the ready availability of this land for both summer and winter pasture. This pattern continued into the 1890s, after which the character of ranching shifted due to changes in federal land management, regional and national economics, and private land ownership patterns.

Mining has played a major role in the history of Nevada. While evidence of this industry is fairly ubiquitous across the state, there are specific areas where major ore bodies were discovered, prompting substantial levels of development. The Railroad Mining District, located south of the proposed Emigrant Project, was the nearest area that experienced a pronounced level of development. The district was organized in 1869, shortly after the discovery of silver ore. The towns of Highlands Camp and Bullion City were soon established. Similar to mineral deposits in the Eureka area, ore from the Railroad District required smelting. The first smelter was erected in 1870 and upgraded smelters began operation in 1872. The district produced regularly through the 1870s and early 1880s, yielding more than $3 million in silver, lead, copper, and gold (Paher 1970). The mines were reopened in 1904 and produced intermittently through the 1910s (Emmons 1910; Lincoln and Horton 1966; Couch and Carpenter 1943).

Cultural Resources in Area of Potential Effect

Compliance with regulations affecting cultural resources requires definition of an Area of Potential Effect. For the proposed Emigrant Project, the Area of Potential Effect is defined as the permit boundary as shown on **Figure 2-2**. This area is further divided into areas that would be subject to direct impacts (the proposed disturbance boundary) and areas that could be subject to indirect impacts (outside the proposed disturbance boundary but within the permit boundary). Certain classes of cultural resources could be subject to impact even if located outside the permit boundary.

For example, resources eligible to the National Register based on criteria A, B, or C may be impacted due to the introduction of visual or audible intrusions. Also, increased access and visibility may result in increased vandalism.

Archival data were collected to determine the location and nature of prehistoric, historic, and architectural resources present within both the direct and indirect impact areas of the Area of Potential Effect. Project and site records maintained by BLM were examined. **Table 3-26** lists the 16 intensive (Class III) inventories conducted within or overlapping some portion of the Area of Potential Effect. The entire Area of Potential Effect has been examined for the presence of cultural resources.

TABLE 3-26
Previous Cultural Resource Studies Conducted in Area of Potential Effect
Emigrant Mine Project

BLM Report Number	Author	Date	General Project Area
1-337	Nelson	1980	Tram Line
1-408	Rieger	1981	Emigrant Gravel Pit
1-447	Ellis and Tullis	1981	Seismic Lines
1-1026	Clay and Furnis	1986	Rain Project Area
1-1121	Burke	1987	Utility Corridor, Rain Project
1-1613	Newsome	1997	East of Emigrant Springs
1-1627	Newsome and Schroedl	1992	Emigrant Parcel
1-1706	Deitz	1992	Fire Rehabilitation Fence
1-1769	Tipps and Newsome	1993	Emigrant Parcel Addition
1-1774	Dillingham and Hockett	2000	Emigrant Springs Probing
1-1862	Whisenhunt	1994	Emigrant Aspen Enclosure
1-1920	Newsome	1994	Emigrant Springs Area
1-2067	Wiseman and Braley		Mud Springs Fence
1-2157	Schroedl	2001	Emigrant Springs Data Recovery
1-2324	Birnie	2003	Emigrant Parcels
1-2376	Birnie, Knoll, Tipps, and Field	2004	Emigrant Addition

Cultural resources within the proposed disturbance boundary are listed in **Table 3-27.** Forty-two sites and isolates have been recorded, of which 22 are prehistoric period sites, and 20 are prehistoric period isolates. No historic period sites or isolates have been recorded within this portion of the Area of Potential Effect. Of the prehistoric sites, one contains a component that can be assigned to a specific period. That component represented the Proto-historic period. BLM, in consultation with the Nevada State Historic Preservation Office, has determined that three of the identified sites (CrNV-12-13259, 13261, and 13272) are eligible for listing on the National Register of Historic Places. As noted in a state protocol agreement between BLM and the Nevada State Historic Preservation Office, isolated artifacts and features are categorically ineligible for listing on the National Register.

Cultural resources outside the proposed disturbance boundary but within the permit boundary are listed in **Table 3-28**. Forty-seven sites and isolates have been recorded in this area. Of those, 28 are prehistoric period sites, 18 are prehistoric period isolates, and one is a historic period isolate. Of the prehistoric period sites, eight sites contain one or more components that can be assigned to a specific period. Periods represented by components include the Middle and Late Archaic, and the Proto-historic. BLM, in consultation with the Nevada State Historic Preservation Office, has determined that nine of the identified sites (CrNV-12-11043, 13254, 13255, 13258, 13260, 13264, 13265, 13269, and 13270) are eligible for listing on the National Register of Historic Places.

TABLE 3-27
Previously Identified Cultural Resources Within Proposed Disturbance Boundary
Emigrant Mine Project

Site Number (CrNV-12-)	Site Period	Site Type	Report Reference	National Register Eligibility
6226	Prehistoric	Lithic Scatter	BLM1-1121 & 1-1627	Not Eligible
11022	Prehistoric	Lithic Scatter	BLM 1-1627	Not Eligible
11026	Prehistoric	Lithic Scatter	BLM 1-1627	Not Eligible
11028	Prehistoric	Lithic Scatter	BLM 1-1627	Not Eligible
11029	Prehistoric	Lithic Scatter	BLM 1-1627	Not Eligible
11040	Prehistoric	Lithic Scatter	BLM 1-1627	Not Eligible
11042	Prehistoric	Lithic Scatter	BLM 1-1627	Not Eligible
11044	Prehistoric	Lithic Scatter with Ground Stone	BLM 1-1627	Not Eligible
11045	Prehistoric	Lithic Scatter	BLM 1-1627	Not Eligible
11046	Prehistoric	Lithic Scatter	BLM 1-1627	Not Eligible
11047	Prehistoric	Lithic Scatter	BLM 1-1627	Not Eligible
11048	Prehistoric	Lithic Scatter	BLM 1-1627	Not Eligible
11049	Prehistoric	Lithic Scatter	BLM 1-1627	Not Eligible
11060	Prehistoric	Lithic Scatter	BLM 1-1627	Not Eligible
11542	Prehistoric	Lithic Scatter	BLM 1-1769	Not Eligible
11543	Prehistoric	Lithic Scatter	BLM 1-1769	Not Eligible
11941	Prehistoric	Lithic Scatter with Ground Stone	BLM 1-1920	Not Eligible
11942	Prehistoric	Lithic Scatter	BLM 1-1920	Not Eligible
13256	Prehistoric	Lithic Scatter	BLM 1-2376	Not Eligible
13259	Prehistoric	Lithic Scatter	BLM 1-2376	Eligible (d)
13261	Prehistoric	Lithic Scatter with Ground Stone	BLM 1-2376	Eligible (d)
13272	Prehistoric – Proto-historic	Lithic Scatter	BLM 1-2376	Eligible (d)
Isolates				
EIF – 1226	Prehistoric	Debitage	BLM 1-1627	Not Eligible
EIF – 1227	Prehistoric	Debitage	BLM 1-1627	Not Eligible
EIF – 1242	Prehistoric – Elko	Projectile Point	BLM 1-1627	Not Eligible
EIF – 1243	Prehistoric	Biface Fragment	BLM 1-1627	Not Eligible
EIF – 1244	Prehistoric	Core	BLM 1-1627	Not Eligible
EIF – 1247	Prehistoric	Biface Fragment	BLM 1-1627	Not Eligible
EIF – 1248	Prehistoric	Biface Fragment	BLM 1-1627	Not Eligible
EIF – 1249	Prehistoric	Debitage	BLM 1-1627	Not Eligible
EIF – 1260	Prehistoric	Core	BLM 1-1627	Not Eligible
EIF – 1262	Prehistoric – Elko	Projectile Point	BLM 1-1627	Not Eligible
EIF – 1263	Prehistoric	Biface Fragment	BLM 1-1627	Not Eligible
EIF – 1265	Prehistoric	Debitage	BLM 1-1627	Not Eligible
EIF – 1692	Prehistoric	Point Fragment	BLM 1-1613	Not Eligible
EIF – 1725	Prehistoric	Debitage	BLM 1-1769	Not Eligible
EIF – 4679	Prehistoric	Debitage	BLM 1-2376	Not Eligible
EIF – 4680	Prehistoric	Debitage	BLM 1-2376	Not Eligible
EIF – 4681	Prehistoric	Modified Flake	BLM 1-2376	Not Eligible
EIF – 4682	Prehistoric	Modified Flake	BLM 1-2376	Not Eligible
EIF – 4683	Prehistoric – Elko	Projectile Point	BLM 1-2376	Not Eligible
EIF – 4690	Prehistoric	Debitage	BLM 1-2376	Not Eligible

TABLE 3-28
Previously Identified Cultural Resources Outside Disturbance Boundary, But Within Permit Boundary
Emigrant Mine Project

Site Number (CrNV-12-)	Site Period	Site Type	Report Reference	National Register Eligibility
5404	Prehistoric – Middle & Late Archaic	Large Lithic Scatter	BLM 1-1026	Not Eligible
5440	Prehistoric	Lithic Scatter	BLM 1-1026	Not Eligible
6227	Prehistoric – James Creek	Lithic Scatter with Ground Stone	BLM 1-1121 & 1-1627	Not Eligible
11023	Prehistoric	Lithic Scatter	BLM 1-1627	Not Eligible
11024	Prehistoric	Lithic Scatter	BLM 1-1627	Not Eligible
11025	Prehistoric	Lithic Scatter	BLM 1-1627	Not Eligible
11027	Prehistoric	Lithic Scatter	BLM 1-1627	Not Eligible
11041	Prehistoric – Late Archaic	Lithic Scatter	BLM 1-1627	Not Eligible
11043	Prehistoric	Lithic Scatter	BLM 1-1627	Eligible (d)
11061	Prehistoric – Late Archaic	Lithic Scatter	BLM 1-1627	Not Eligible
11062	Prehistoric	Lithic Scatter	BLM 1-1627	Not Eligible
11269	Prehistoric	Lithic Scatter	BLM 1-1706	Not Eligible
11269	Prehistoric	Lithic Scatter	BLM 1-1920	Not Eligible
13254	Prehistoric	Lithic Scatter with Ground Stone	BLM 1-2376	Eligible (d)
13255	Prehistoric	Lithic Scatter with Ground Stone	BLM 1-2376	Eligible (d)
13257	Prehistoric	Lithic Scatter	BLM 1-2376	Not Eligible
13258	Prehistoric	Lithic Scatter with Ground Stone	BLM 1-2376	Eligible (d)
13260	Prehistoric – Middle Archaic	Lithic Scatter	BLM 1-2376	Eligible (d)
13262	Prehistoric	Lithic Scatter	BLM 1-2376	Not Eligible
13263	Prehistoric	Lithic Scatter	BLM 1-2376	Not Eligible
13264	Prehistoric	Lithic Scatter	BLM 1-2376	Eligible (d)
13265	Prehistoric – Late Prehistoric	Lithic Scatter	BLM 1-2376	Eligible (d)
13266	Prehistoric	Lithic Scatter	BLM 1-2376	Not Eligible
13268	Prehistoric	Lithic Scatter	BLM 1-2376	Not Eligible
13269	Prehistoric – Proto-historic	Lithic Scatter	BLM 1-2376	Eligible (d)
13270	Prehistoric – Late Archaic, Proto-historic	Lithic Scatter with Pottery	BLM 1-2376	Eligible (d)
13271	Prehistoric	Lithic Scatter with Ground Stone	BLM 1-2376	Not Eligible
13273	Prehistoric	Lithic Scatter	BLM 1-2376	Not Eligible
Isolates				
EIF-1225	Prehistoric	Debitage	BLM 1-1627	Not Eligible
EIF-1228	Prehistoric	Scraper	BLM 1-1627	Not Eligible
EIF-1229	Prehistoric – Gypsum	Projectile Point	BLM 1-1627	Not Eligible
EIF-1240	Prehistoric	Debitage	BLM 1-1627	Not Eligible
EIF-1241	Prehistoric	Debitage	BLM 1-1627	Not Eligible

TABLE 3-28
Previously Identified Cultural Resources Outside Disturbance Boundary, But Within Permit Boundary
Emigrant Mine Project

Site Number (CrNV-12-)	Site Period	Site Type	Report Reference	National Register Eligibility
EIF-1245	Prehistoric	Debitage	BLM 1-1627	Not Eligible
EIF-1246	Prehistoric	Debitage	BLM 1-1627	Not Eligible
EIF-1261	Prehistoric – Elko	Projectile Point	BLM 1-1627	Not Eligible
EIF-1264	Prehistoric	Debitage	BLM 1-1627	Not Eligible
EIF-1726	Prehistoric	Debitage	BLM 1-1769	Not Eligible
EIF-2344	Prehistoric - Gatecliff	Projectile Point	BLM 1-1920	Not Eligible
EIF-4684	Prehistoric	Stone Tool	BLM 1-2376	Not Eligible
EIF-4685	Prehistoric	Debitage	BLM 1-2376	Not Eligible
EIF-4686	Prehistoric	Ceramic	BLM 1-2376	Not Eligible
EIF-4687	Prehistoric	Debitage	BLM 1-2376	Not Eligible
EIF-4688	Prehistoric	Debitage	BLM 1-2376	Not Eligible
EIF-4689	Prehistoric	Debitage	BLM 1-2376	Not Eligible
EIF-4691	Historic	Hole-in-cap can	BLM 1-2376	Not Eligible
EIF-4692	Prehistoric - Humboldt	Projectile Point	BLM 1-2376	Not Eligible

One resource within the proposed permit boundary has been the subject of detailed study. Site CrNV-12-11043 was first recorded by Newsome and Schroedl (1992) and subsequently tested by Dillingham and Hockett (2000). The site is National Register eligible and a treatment plan was prepared by Tipps and Bright (2000) and implemented by Schroedl (2001).

Clay and Furnis (1986) located sites CrNV-12-5404 and 5440 in the area now occupied by the Rain Tailing Storage Facility, and in proposed Borrow Area #3. Those sites, determined not to be National Register eligible, were eradicated during development of the storage facility. Although listed in **Table 3-28**, these resources are no longer of management concern.

DIRECT AND INDIRECT IMPACTS

Proposed Action

Identified cultural resources present within the Proposed Disturbance Boundary are shown in **Table 3-27.** Forty-two cultural resources are located within the APE. Of these, three prehistoric period resources (CrNV-12-13259, 13261, and 13272) have been determined eligible to the National Register based on Criterion D. All three resources are located within the proposed heap leach facility and would be impacted during construction of that facility. As a result, a data recovery plan was prepared and approved by BLM in consultation with the Nevada SHPO (Varley 2005). The data recovery plan was implemented in 2005, and scientific excavations occurred at CrNV-12-13259, -13261 and -13272 (Schmitt *et al*. 2005) In a letter dated January 5, 2006, the Nevada SHPO concurred with BLM's determination that the latter document recovered the National Register values of these three historic properties, As a result, the Emigrant Project would have no adverse effect on historic properties.

Resources present outside the Proposed Disturbance Boundary but within the Permit Boundary are listed in **Table 3-28.** Of the 47 recorded in this area, nine (CrNV-12-11043, 13254, 13255, 13258, 13260, 13264, 13265, 13269, and 13270) are eligible for listing on the National Register of Historic Places. Because these resources are eligible based on Criterion D, therefore, it is unlikely that they would be impacted due to the introduction of visual or audible intrusions. They may be subject to indirect impacts due to increased access and visibility may result in increased vandalism.

No Action Alternative

There would be no direct effect on National Register eligible sites under the No Action alternative.

POTENTIAL MONITORING AND MITIGATION MEASURES

No monitoring or mitigation measures for cultural resources have been identified by BLM.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

The Proposed Action would result in the loss of cultural resources that are ineligible for listing on the National Register. Loss of these sites would constitute an irreversible and an irretrievable commitment of a resource. These sites have been recorded to current BLM standards and the site information has been integrated into agency and statewide data repositories.

Impacts to National Register eligible properties have been reduced through preparation and implementation of data recovery and/or mitigation plans. However, their information potential cannot be retrieved fully. As a result, post-treatment impacts to these properties as a result of the Proposed Action would result in an irreversible and an irretrievable commitment of a resource. Several of the proposed Project elements are fenced. This would limit human activity outside the immediate activity area. This would serve to protect eligible resources located near the proposed facilities. Distance and difficulty of access would serve to protect others.

RESIDUAL EFFECTS

Data recovery activities have occurred at three National Register eligible, prehistoric properties. Even after implementation of data recovery activities, non-renewable resources would have been expended. This represents a direct and a residual effect of the Proposed Action.

NATIVE AMERICAN CONCERNS

AFFECTED ENVIRONMENT

In accordance with Federal legislation and executive orders, Federal agencies must consider the impacts their actions may have to Native American traditions and religious practices. Consequently, BLM must take steps to identify locations having traditional/cultural or religious values to Native Americans and insure that its actions do not unduly or unnecessarily burden the pursuit of traditional religion or traditional life-ways.

The National Historic Preservation Act (P.L. 89-665), the National Environmental Policy Act (P.L. 91-190), the Federal Land Policy and Management Act (P. L.94-579), the American Indian Religious Freedom Act (P.L. 95-341), the Native American Graves Protection and Repatriation Act (P.L. 101-601) and Executive Order 13007 require that BLM provide tribes opportunities to actively participate in the decision making process.

The proposed Emigrant Project lies within the traditional territory of the Western Shoshone. However, BLM has limited information regarding any specific spiritual/cultural/traditional activities and sites or Traditional Cultural Properties within or in close proximity to the Project boundary. Ethnographic sources that discuss Western Shoshone in broad terms, but do not include ethnographic information tied specifically to the Project area include: Chamberlain (1911), Steward (1937, 1938, 1941, and 1943), and Harris (1940). Murphy and Murphy (1960), the Inter-Tribal Council of Nevada (1976), Janetski (1981), Thomas *et al*. (1986), and Crum (1994) provide recent ethnographic reviews. Information on world view and religious beliefs is contained in Miller (1983a, 1983b), Hultkrantz (1986), Clemmer (1990), and Rusco and Raven (1992).

Ethnographic Background

Members of the Western Shoshone Uto-Aztecan linguistic family inhabited an area extending from southeast California into northwest Utah. Their territory was bordered to the north by the Northern Shoshone, to the east by the Ute, to the south by the Southern Paiute, and to the west by the Northern Paiute.

The nuclear family was the basic unit of Shoshone society. Nuclear families conducted most subsistence activities and were largely self-sufficient. Three to 10 families jointly occupied semi-permanent camps during the winter months and foraged together for parts of the year. The Shoshone joined into larger groups only when resources were sufficiently concentrated to allow cooperative harvests. These gatherings were often the occasion for fandangos, festivals that provided an opportunity for courtship, socializing, and dancing.

The Shoshone used a flexible subsistence and settlement system, one based on the scheduling of activities according to the seasonal availability of food. In the spring, Shoshone dispersed in family groups each of which foraged for greens and roots on valley floors. Small mammals were an important meat source that could be hunted with bow and arrow, snares, or deadfalls. In some cases, burrows were flooded or animals were dug out.

Summer gathering strategies focused on ripening grass seeds. These became available on valley bottoms first and then upslope as the season progressed. Seeds were harvested either by knocking them into burden baskets or by cutting seed heads from stalks. Seeds were winnowed, ground, and either prepared for consumption or stored. Berries and roots were gathered in late summer and early fall. Small animals continued to be an important resource through out the summer. Small groups ambushed mountain sheep from blinds, while individual hunters often stalked deer.

The character of the subsistence pattern changed in the fall. Multiple families assembled to procure large amounts of food for storage at winter base camps. Piñon was an important plant resource in the fall. Long hooked poles were used to shake cones from trees, while other cones could be picked from the ground. As necessary, cones were roasted to release the seeds. Cones often were stored in aboveground caches or open pits, while nuts were stored in sealed underground pits. Groups often traveled long distances to secure the seeds, which were then transported back to winter village sites. After the piñon harvest, people sometimes gathered for antelope and jackrabbit drives on valley bottoms. Jackrabbits were driven into nets where they were clubbed. Antelope were driven into large corrals and then dispatched by archers. Western Shoshone also made occasional forays to the Snake River to fish for salmon during the fall spawning run.

The Shoshone depended on stored food during winter months. Piñon and other stored seeds could be supplemented by collecting cactus and the roots of marsh plants such as cattails and bulrush. Mountain sheep could be hunted at lower elevations in the winter and ice fishing sometimes occurred along the Humboldt River.

World View

The Western Shoshone trace their occupation of the Great Basin back to when "animals were people" (Miller 1983a). The coyote and wolf figure in creation stories, with prominent mountain peaks honored as sacred places connected with their creation.

The belief that supernatural power (*Puha*) has permeated the earth since its creation is a central feature in Western Shoshone religious beliefs. Religious behavior revolves around the acquisition of *Puha*. Sources of *Puha* are numerous, including sources of water, prominent mountain peaks, and caves. Animals and, to a lesser extent, plants have power and this power can be conveyed to people by supernatural spirits who control individual species. Power is attracted to life, and therefore, remains present in places where people have lived, particularly around graves. Power sources are associated with spirits. As noted, animal and plant species have spirits, and fixed places such as water sources, mountains, caves, are viewed as power spots. Other forms of spirits include guardian spirits, little men and water babies.

Religious expression takes several primary forms: ceremonies; individual prayer to the spirits of plants, animals, water, power spots, and little men; and use of power spots for vision questing (acquisition of a guardian spirit); curing; and doctoring. The most frequent form is the individual prayer. Prayer is especially important in connection with places where spirits may live, or that are regarded as power spots. Individuals who exhibit discipline and strength may obtain special power. Most people participated in a variety of rituals associated with hunting, gathering, attending a birth, or burying and mourning the dead.

Power also may be used for non-legitimate, malevolent, purposes. Also, certain spirits may, in some circumstances, act in a malevolent manner. For example, little men can be benevolent or malevolent, depending on how they are treated. Correcting neglected or abused relationships between humans and spirits is a major aspect of Western Shoshone religion. Many rituals are directed at controlling and use of power and balancing the potentially dangerous spiritual powers that pervade nature. Shoshone religion depends on maintaining the integrity of power spots, maintaining the presence of little men, maintaining their relationship with the owner-spirits of plants and animals, and maintaining life-giving forces such as the sun, earth, and water.

Consultation Activities

The BLM Elko District Office initiated formal Native American consultation by sending a notification letter to the following groups: Te-Moak Tribe of Western Shoshone Tribal Chair and Environmental Department, Battle Mountain Band Chair and Environmental Department, Elko Band Chair and Environmental Department, South Fork Band Chair and Environmental Department, Wells Band Chair and Environmental Department, Duck Valley Sho-Pai Tribe Chair and Cultural Resources Department, and the Dann Family. A field tour to the Project site, with participating tribal entities, was also conducted on June 7, 2004. Since that time, the South Fork, Wells, Elko, and Battle Mountain Bands remained the most active via phone, email, informal meeting, and field tour communication. Detailed Tribal coordination and communication files are on file at the BLM Elko District Office and are considered confidential.

To date, formal and informal consultation efforts have not identified any specific Western Shoshone Traditional Cultural Properties within or in close proximity to the Emigrant Project boundary. However, participating tribal entities have expressed concern regarding the proposed diversion of a stream to allow for mining activities within the Emigrant Mine pit. Since the stream intermittently flows into Dixie Creek, which is a tributary of lower South Fork Humboldt River, water quality concerns are shared by all parties.

South Fork Band of the Te-Moak Tribe of the Western Shoshone Environmental Department hand-delivered their comments regarding the Emigrant Project to BLM on October 18, 2004 (see **Table 1-2**).

DIRECT AND INDIRECT IMPACTS

Proposed Action

Collection of information from Native Americans is ongoing. Based on comments received to date, the Proposed Action could have the following impact, identified as an area of Native American concern:

An un-named intermittent stream course would be relocated to accommodate construction of the proposed Emigrant Mine pit. Quality of water (increased sediment and/or temperature) in the engineered stream channel could be affected. Information contained in the EIS allows BLM to address this concern. Protective measures proposed by Newmont (compliance with all applicable state and federal design parameters; implementation of Best Management Practices) are expected to reduce impacts resulting from the Proposed Action.

As more resource information becomes available (through the on-going consultation process), and given comments received during public and agency review of the Draft EIS, it may be possible to further refine this discussion. Any such modifications would be contained in the Final EIS and would be subject to Section 106 consultation.

No Action Alternative

The No Action alternative would result in no further direct or indirect impacts on Native American religious or traditional values, practices, properties, human remains, or cultural items that may occur or be associated with the proposed Project area.

POTENTIAL MONITORING AND MITIGATION MEASURES

No monitoring or mitigation measures for Native American Concerns have been identified by BLM. However, if impacts to any unknown (prior to any authorized mining activity) Traditional Cultural Properties or sites of cultural/spiritual/traditional use occur, mitigation and monitoring measures would be addressed on a site specific basis.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

No irreversible or irretrievable commitment of resources associated with Native American Concerns would occur as a result of the Proposed Action.

RESIDUAL EFFECTS

No residual impacts to Native American Concerns would occur as a result of the Proposed Action.

SOCIAL AND ECONOMIC RESOURCES

AFFECTED ENVIRONMENT

The Study Area for socioeconomic effects encompasses Elko County, the cities of Elko, Carlin, and the Spring Creek residential area, The Study Area is defined as the geographical area in which the potential direct and indirect socio-economic effects of the Proposed Action and Alternative for the Emigrant Project are likely to occur. The purpose of documenting the socio-economic setting of the Study Area is to provide an understanding of the social and economic forces that have shaped the area and to provide a frame of reference necessary to estimate the social and economic effects of the Proposed Action and alternatives.

Social Life

The socioeconomic character and cultural diversity of Elko County and surrounding northeastern Nevada reflects a history of occupations and nomadic use by Native Americans followed by the advancement of the railroad and an influx of explorers and settlers. An important change in the Elko economy came with Nevada's legalization of casino gambling in 1931. Gaming and entertainment in Elko County casinos are highly visible social and economic institutions.

Mining has been a source of income in Elko County since the 1850s. Mining and related development in the 1980s and 1990s caused rapid population growth in the cities of Elko and Carlin and was a dominant force in shaping the socioeconomic character of the area. The in-migration of new residents has created changes in some aspects of daily life, such as increased traffic, overcrowded parks, and higher crime rates. Low unemployment rates, greater diversity of services, and increased business opportunities were also a result of increased economic development.

With a population greater than 47,000, Elko County, located in the northeastern corner of Nevada, is a growing area with a high quality of life. It contains the cities of Carlin, Elko, Wells, and West Wendover, as well as the unincorporated communities of Spring Creek, Jackpot, Montello, and Mountain City. The area has a sense of community and the citizens enjoy a four-season climate, moderate cost of living, 120 acres of public parks, education and health care facilities, and economic growth.

Elko is the largest urban area and center of commerce and government in northeastern and north central Nevada. The town serves as the county seat for Elko County, the sixth largest county in the country (ECEDA 2007).

Carlin is the gateway to the Carlin Trend gold mining district, the most productive district in the western hemisphere. Mining became a major employment base in the early 1960s. The mining area boasts two of the largest open pit gold mines in the world, Newmont's Gold Quarry Mine and Barrick's Betze/Post Mine.

Spring Creek Valley is an unincorporated area south of Elko which had over 10,000 residents in 2000. Following a review of the Spring Creek Lamoille Master Plan by the Elko County Planning and Zoning Director in 2006, it was estimated approximately 14,000 people lived in this area. The Plan estimates that potential population in this area could reach between 35,000 - 40,000 people based on the number of parcels from 2½ to 10 acres in size. In March of 2006 the County Zoning Director indicated that the Spring Creek Subdivision contained 6,400 lots, of which 4,480 (70 percent) have already been developed. Another 1,920 lots remain to be developed in the 120 square mile development area (Elko County Planning Commission 2006).

The Elko Band Colony of the of the Te-Moak Tribe of Western Shoshone is also located in Elko County in the high desert of northeastern Nevada, near the Humboldt River. The reservation encompasses 192.80 noncontiguous acres adjacent to the City of Elko. The Elko Colony was established by Executive Order on March 25, 1918, which reserved 160 acres for Shoshone and Paiute Indians living near the town of Elko. Today, 192.8 acres are in federal trust.

Social stratification in Elko County is often defined by income, length of residence, educational background, and ethnicity. Local residents earning high incomes are considered to be influential in the community. Groups viewed by residents as making decisions about the area's future include federal and state government, county commissioners, environmental organizations, and large corporations (BLM 2002a).

Population Trends and Demographic Characteristics

The population of Nevada has grown almost 25 percent over the last decade, and is one of the fastest growing states (U.S. Bureau of the Census 2004). Similar to the state, the population of Elko County has increased from 33,530 in 1990 to 45,291 in 2000, a 35 percent increase. Elko County has increased an estimated 4.0 percent from 2000 to 2006 to 47,114 residents (**Table 3-29**).

The City of Elko experienced growth of 13 percent in population between 1990 (14,736) and 2000 (16,708). The City of Elko has not experienced growth over the last several years, and in fact, has decreased in population to an estimated 16,148 residents in 2003. Population estimates for the City of Elko for 2005 indicate a weakening in the historically declining trend with 16,685 residents. Population in Carlin, the community closest to the mine site, decreased by 3 percent from 2,220 in 1990 to 2,161 in 2000 and was estimated to be 2,061 residents in July 2003. This trend appears to continue at a rate over 3.5 percent given the 2005 estimate of 2,083 residents (U.S. Bureau of the Census 2001; Nevada State Demographer's Office 2004).

TABLE 3-29
Population Estimates for Elko County and State of Nevada
Emigrant Mine Project

Characteristic	Elko County	City of Elko	City of Carlin	Spring Creek Valley	State of Nevada
Total population (2006 estimate - Cities of Carlin and Elko 2005)	47,114	16,685	2,083	14,000	2,495,529
Percent Population change (April 1, 2000 to July 1, 2006 - Cities of Carlin and Elko July 1, 2005)	4.0	-0.1	-3.6	32.7	24.9
Total population (2003 estimate)	44,129	16,148	2,061	NA	2,207,574
Total population (2000 Census)	45,291	16,708	2,161	10,548	1,998,257
Total population (1990 Census)	33,530	14,736	2,220	5,866	1.201.833

Source: U.S. Bureau of the Census 2001; Nevada State Demographer's Office 2004: City of Elko 2007: City of Carlin 2007: Elko County Planning Commission 2006).

Spring Creek Valley, designated as a Census Designated Place (CDP), has steadily increased population since 1990, nearly doubling in size by 2000. Comparison of the 2000 population estimate of 10,548 and the Elko County Zoning Director's estimated population of 14,000 residents in 2006 represents a growth rate of over 32 percent. The U.S. Bureau of the Census does not estimate population during intercensal years for CDPs, but subdivision growth in the area indicates increasing populations.

Demographics of Elko County differ from the state (**Table 3-30**) with respect to gender (a higher percent of males than females live in the county than in the state); age (a higher population of residents less than 18 years of age live in the county than in the state); and ethnicity (higher percent of Caucasian and Native American populations live in the county than in the state). The percentage of people who speak a language other than English and the percentage of high school graduates among people over 25 are approximately the same (U.S. Bureau of the Census 2007).

The Elko Band Colony estimates that 1,143 people are enrolled members of which 729 live on the Colony (64 percent) in 2000. Almost 55 percent of the population is female. Almost nine percent of the population living on the Colony is under 5 years of age; over 21 percent of the population is under 18 years of age. The working population, persons between 19 and 64 living on the Colony, is estimated to be 62 percent while less than 5 percent of the population living on the Colony is over 65 years of age (U.S. Bureau of the Census 2000).

Twenty-six percent of the Colony speaks a language other than English in their homes and 42 percent of the population over the age of 25 has a high school diploma or the equivalent (U.S. Bureau of the Census 2004)

TABLE 3-30
Demographic Estimates for Elko County and the State of Nevada
Emigrant Mine Project

Demographic	Elko County	Percent in Elko County	Nevada	Percent in Nevada
Gender, 2005				
Male	23,830	51.7%	1,163,371	50.9%
Female	21,975	48.3%	1,127,065	49.1%
Age, 2005				
Persons under 5 Years of Age	3,075	6.7	173,918	7.2%
Persons 6 to 18 Years of Age	10,432	23.7%	447,262	17.9%
Persons19 to 64 Years of Age	27,209	61.8%	1,424,496	67%
Persons 65 Years of Age and Over	3,323	7.3%	273,136	11.3%
Language other than English spoken at Home, percent age 5 and over, 2000		20.0%		23.1%
High School graduates, percent of persons age 25+, 2000		79.1		80.7
White persons, not Hispanic, percent 2005		70.9		60.0
Persons of Hispanic or Latino origin, percent, 2005		21.7		23.5
American Indian and Alaska Native persons, percent, 2005		5.6		1.4
Black persons, percent 2005		0.9		7.7

Source: U.S. Bureau of the Census 2007

Housing

In 2000, there were 18,456 housing units in Elko County; 85 percent were occupied, and 15 percent were vacant. Of the occupied housing units, 70 percent were owner-occupied and 30 percent renter-occupied. In 2005 estimates for Elko County included 19,066 housing units, of which 70 percent were owner-occupied (U.S. Bureau of the Census 2007). The median value of owner-occupied housing units was $123,100 (U.S. Bureau of the Census 2007).

Community Service Providers

Education

The Elko County School District operates 13 schools in the socioeconomic Study Area. Seven elementary schools provide education to students enrolled in kindergarten through grade 5 or 6. Elko Junior High School serves grades 7 and 8, and Spring Creek Middle School serve grades 6 through 8, while Elko High School and Spring Creek High school serve grades 9 through 12 (Greatschools 2004). The Carlin Combined School provides education to students in kindergarten through grade 12.

Education of children in kindergarten through grade 12 from the Elko Band Colony is provided through the Elko County School District via the local school system. A Head Start Program is housed and operated at the Colony for children aged 3 through 5. Under contract with the Bureau of Indian Affairs, the Elko Band Council provides higher education and an adult vocational program at the Colony.

Great Basin College offers 4-year baccalaureate degrees in agricultural management, Digital Information Technology, Instrumentation, Land Surveying/Geomatics, and Management in Technology; Nursing and Social Work; Post baccalaureate teacher certificates in elementary and secondary education; and a wide variety of Associate degrees and Certificate Programs.

Law Enforcement

The Nevada Highway Patrol, Elko County Sheriff's Department, Elko City Police, Carlin City Police, and Bureau of Indian Affairs Police provide law enforcement services to community residents. The Highway Patrol is responsible for law enforcement activities on state highway systems. The Sheriff's Department is accountable for Elko County including the unincorporated towns (17,135 square miles) and is aided in search and rescue operations and emergency situations by the Sheriff's Posse and Reserves. The Elko County Jail, operated by Elko County Sheriff's Department, is located in Elko (BLM 2002a).

The Elko and Carlin City Police are restricted to the city limits (Approximately 14 square miles and 9 square miles, respectively). The BIA Police is accountable for law enforcement on the Elko Band Colony (192.8 acres).

Fire Protection

Fire protection in the cities of Elko and Carlin is provided by the Elko City Fire Department, Carlin City Volunteer Fire Department (a combined fire, ambulance, and rescue unit), BLM, USFS, and Northeastern Fire Protection Department of the Nevada Division of Forestry. The Elko and Carlin fire departments primarily serve residents within their city limits and the Elko Band Colony; however, both departments maintain mutual aid/cooperative agreements with other firefighting agencies in the area. The BLM is primarily responsible for fighting wildfires (BLM 2002a).

Ambulance Services

Ambulance services are available in Elko and Carlin for ground transportation of patients. Fixed-wing ambulance aircraft and a helicopter are also available at the Elko Airport and Northeastern Nevada Regional Hospital, respectively.

Health Care

The Northeastern Nevada Regional Hospital opened in September 2001. The hospital is situated on a 50-acre campus in the City of Elko. Services at the hospital include 24-hour emergency care, physical therapy, full-service laboratory, intensive care unit, pediatric unit, inpatient pharmacy, obstetrics and gynecology, 24-hour radiology, MRI and CAT Scan, nuclear medicine, mammography, ultrasound, chemotherapy, neurology, sleep medicine program, inpatient and outpatient surgery, cardio-pulmonary therapy, pulmonary function testing, stress treadmill testing, and nutrition counseling (Northeastern Nevada Regional Hospital 2004).

The hospital, under contract with the Indian Health Service (IHS), provides medical care and emergency services to Native Americans. In addition, comprehensive medical care through IHS is provided at the Elko Band Colony by the Health Center which opened in July 1992. The Center houses a pharmacy, dental rooms with a laboratory, and other support services.

Public Assistance

Public assistance in Elko County is provided by Elko County Social Services and the Nevada State Welfare Department. Other smaller organizations provide temporary assistance to residents suffering hardships. The Elko Band Council, under contract with the BIA, provide eligible Native Americans with general welfare assistance, adult institutional care, Indian child welfare (including foster care and institutional placements), indigent burial assistance, counseling services, and assistance with Social Security, disability, and death benefits, and state Medicare and Medicaid benefits (BLM 2002a).

Water Supply

Elko City water is provided from 18 deep-water wells. Water is stored in 10 tanks with a total capacity of 25 million gallons. A deep well and natural springs provide Carlin with water. Water is stored in a 2-million-gallon tank. Residents in outlying areas depend on private wells for domestic water supply.

Wastewater Treatment Facilities

Both Elko and Carlin have wastewater treatment facilities. Many Spring Valley subdivision residents have access to wastewater treatment facilities from a private utility; homeowners on larger lots use individual septic systems.

Solid Waste

The regional landfill in the City of Elko is the only landfill in the county. The estimated life of the landfill, at 1,000 tons of solid waste per day, is approximately 94 years. Currently, the landfill is accepting approximately 110 tons of solid waste per day (NDEP 2004b).

Energy Generation and Distribution Systems

Sierra Pacific Power Company provides electrical service. Natural gas is provided by Southwest Gas Corporation.

Employment

In 2003, employment in Nevada was dominated by service industries (50 percent) and specifically the leisure and hospitality industries with 29 percent of the workforce in the sector. The gaming industry drives Nevada's economy. Gaming, hotel, and recreation areas employ the largest numbers of workers in the state (303,680). The next largest employment sector is trade, transportation, and utilities with 18 percent of the jobs statewide. Approximately one percent of jobs statewide were in the natural resource and mining industries (Nevada Department of Employment, Training, and Rehabilitation 2004).

Mining has always been and continues to be important to the economic well-being of Nevada. Mining sector employment is shown in **Table 3-31.** Nevada has led the nation in the production of gold, silver, and barite. The average number of mining jobs in 2003 for the state of Nevada was 10,893 and the average number of mining jobs in Elko County was 1,421 (10 percent of the total average employment in Elko County).

Employees of mining companies do not necessarily live in the closest community to their employment nor do they live in the local governmental unit which receives increased tax revenues as a result of the facility. According to Sonoran Institute 2007, commuting data suggest that Elko County is a bedroom community where 15.5 percent of the total income in the county is derived from people commuting to jobs out of the county. The majority of workers commuting to work may be going to Eureka County, which the Sonoran Institute (2007) considers to be an employment hub. In Eureka County income is derived from people commuting into the county that exceeds the income from people commuting out of the county. The net difference represents 603.2 percent of total income in the county.

The Elko Band is not directly involved with ownership or operation of mines in the Elko area. However, the tribal community relies upon the employment opportunities provided by the mining industry.

Income

Jobs associated with the mining industry are some of the highest paying jobs in the state while jobs associated with the service industry average approximately $19,000 annually. In 2003, the annual average wage in the mining industry was $56,116 in Elko County (Nevada Department of Employment, Training and Rehabilitation 2007). Per capita personal income in Nevada in 2005 was $35,744, compared with $30,127 for Elko County (U.S. Bureau of the Census 2007) (**Table 3-32**). The average salary for Newmont employees, including overtime, was $58,200 in 2006 in Northern Nevada (Pettit 2007).

TABLE 3-31
Mining Sector Employment
Elko County and Nevada

Characteristic	Elko County	State of Nevada
Total employment, all industries, 2003	14,532	949,334
Natural Resources and Mining , number of jobs, 2003	1,421	10,893
Natural Resources and Mining, percent of total, 2003	9.8%	1.1%
Newmont employment, 2006[1]	218	3,526
Newmont employment, percent of Natural Resources and Mining	15.3%	32.4%

Source: Sonoran Institute 2007; [1] Pettit, 2007.

TABLE 3-32
Average Income Elko County and Nevada

Characteristic	Elko County	State of Nevada
Mean household income, 2004[1]	$52,202	$47,231
Average Annual Wages, all industries, 2003[2]	$29,128	$34,320
Average Annual Wages, Natural Resources & Mining, 2003[2]	$56,116	$55,345

Source: [1] U.S. Bureau of the Census Bureau 2007; [2] Sonoran Institute 2007; [3]Nevada Department of Employment, Training, and Rehabilitation 2007.

Supplies and Services

As a large company in Northern Nevada, Newmont procures work and services from various contractors and suppliers. Newmont's total expenditure in Northern Nevada on services and supplies in 2004 included $294.5 million, which represented 47 percent of total spending. Newmont spent $83.3 million in North-Central Nevada, which represented 28.3 percent of total Northern Nevada spending. In 2006, Newmont spent approximately $900,000 for supplies in Nevada and approximately $151million for contract labor. The company averaged 600 contractors for the year although the number varies seasonally (Pettit 2007).

Government and Public Finance

Residents of the Study Area are governed by elected Elko County commissioners and City of Elko and Carlin councils if they live within municipal boundaries. Residents also elect the trustees of the Elko County School District. Residents in the Spring Valley Association elect a Board of Directors to manage the area.

The Elko Community Council, composed of seven popularly elected members, handles tribal business. The council is led by a chairman, and members serve three-year terms. Council candidates must belong to the Te-Moak Tribe, be 21years of age, have a minimum one-fourth Shoshone blood, and have lived on the reservation for one year. The council governs the colony, contracting with county, municipal, and federal agencies to provide social services and economic development programs. The Elko Band also elects two representatives to serve on the Te-Moak Council and the Inter-Tribal Council of Nevada.

The state of Nevada collects taxes on a multitude of items, including gaming, sales, and use taxes. Mining is one of the highest taxed industries in the state and the only industry that pays taxes to state and local governments on the basis of "net proceeds," a classification in which proceeds from non-metal mining production is taxed. Mineral operations are allowed to deduct direct costs of production, such as mining and milling, and are taxed on the net amount.

Table 3-33 presents the amount of the net proceeds tax which is distributed to Elko and Eureka counties for the past seven years. Mining activity has consistently increased in Eureka County, and has fluctuated, but decreased in Elko County over the time period. This is common in the Study Area as mines play out and go into closure and new mines are constructed and operated. In FY 1999-2000, mining in the Study Area contributed over 88 percent of net proceeds in the state, by FY 2006, mining contributed only 65 percent of the net proceeds in the state.

TABLE 3-33
Net Proceeds Tax Distributed to Elko and Eureka Counties

Fiscal Year	Elko	Eureka	State of Nevada/Total County Distribution
1999-2000	$3,189,780	$1,911,738	$14,525,017
2000-2001	2,891,062	2,968,354	14,114,324
2001-2002	1,264,908	1,278,428	11,425.034
2002-2003	1,561,131	1,222,059	13,756,888
2004	2,049,505	3,331,918	19,093,251
2005	2,003,547	3,356,887	21,886,103
2006	2,044,142	5,272,665	23,357,518
Percent change 2000-2006	-35.9%	175.8%	150.8%

Source: Nevada Department of Taxation 2007.

In addition to the New Proceeds Tax for Operating, mining generates tax revenue for government in various ways:

- Net Proceeds Tax on Royalties, based on royalties received if one company owns the mineral rights of land that is mined by another company.
- Property Tax, based on personal property (such as equipment) and real property (buildings) and paid to a city or county.
- Sales Tax, based on goods and services purchased from Nevada registered vendors and paid where goods and services are delivered.
- Use Tax, based on purchases from non-Nevada registered vendors, paid at point of final destination.
- Excise Tax, based on purchases of specific commodities such as diesel and paid as part of the bill for the product.
- Payroll Tax, based on direct employee payroll and paid to relevant government agencies.

Federal income tax based on an individual company's corporate-wide profits and filed and paid in a consolidated global return to the US Treasury.

Approximately 37 percent of FY 2000 revenues for Elko County came from inter-governmental revenues, while property taxes provided about 24.5 percent of revenue. Net proceeds accounted for $2,572,000 in FY 2000 revenue for Elko County. Newmont paid approximately $92,364 in taxes on net proceeds in Fiscal Year (FY) 2000 to Elko County (Nevada Department of Taxation 2004). The majority of expenditures were for public safety (36.6 percent), general government (27 percent), judicial (24.9 percent), operating transfers out (5.0 percent), and public works (3.3 percent). Revenues exceeded expenditures in FY 2000 by $1,855,365 (Nevada Department of Taxation 2004).

Newmont was among the ten highest property tax payers in the state of Nevada and was the highest among mining companies in 2000. Their secured assessed value in 2000 was $369,772,350 (Nevada Department of Taxation 2004).

DIRECT AND INDIRECT IMPACTS

Proposed Action

In 2006, Newmont employed 218 people in Elko County and would employ approximately 180 people at the Emigrant Project, when operational. Most of the work force for the Project would be from existing mine-related work forces in the Carlin Trend, including people who work in Eureka County but live in Elko County. The initial construction work force for the Emigrant Project would be approximately 100 people decreasing to about five employees at the end of construction. Construction and development are expected to require approximately 12 months. The Proposed Action, together with other Newmont activities, would provide for long-term operations in the area, with potential for stable employment levels for approximately 15 years. Since it is expected that few new employees from outside the area would be needed for the construction and operation activities, few people are expected to move into the area. Therefore, impacts on socioeconomic resources would be minimal.

During the operational phases of the Project, economic impacts would include continued employment in the mining industry and secondary jobs in retail and service sectors. Property taxes and net proceeds of mining taxes, as well as sales taxes would be paid to Elko County. Continued mine employment at the Emigrant Project would maintain quality-of-life for workers and their families.

No Action Alternative

Under the No Action alternative, the Emigrant Project would not be approved. Since most of the work force for the Project would come from the existing mine-related work force in the Carlin Trend, impacts under the No Action alternative would include increased unemployment, reduced wages spent in the local economy, decreased revenue to local and state jurisdictions, increased stress on public assistance programs, and decreased quality-of-life for some residents.

It is not possible to quantify the extent of economic and social affect that would result from implementation of the No Action Alternative. Ongoing mineral exploration and development throughout northern Nevada may offer employment opportunities in the region thereby offsetting the effect of the No Action Alternative.

POTENTIAL MONITORING AND MITIGATION MEASURES

Potential economic impacts have been identified as being minimal. No mitigation or monitoring measures have been identified by BLM for social and economic resources.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

No irreversible and irretrievable commitment of socioeconomic resources has been identified as a result of the Emigrant Project.

RESIDUAL EFFECTS

No residual effects to social and economic resources are expected as a result of the Proposed Action.

ENVIRONMENTAL JUSTICE

AFFECTED ENVIRONMENT

The Study Area for environmental justice encompasses Elko County, including the cities of Elko and Carlin, and the Elko Band Colony of the Te-Moak Tribe of Western Shoshone Indians.

Identification of Minority and Low Income Populations

The Council on Environmental Quality identifies groups as environmental justice populations when either (1) the minority or low-income population of the affected area exceeds 50 percent, or (2) the minority or low-income population percentage in the affected area is meaningfully greater than the minority population percentage in the general population or appropriate unit of geographical analysis. In order to be classified meaningfully greater, a formula describing the environmental justice threshold as being 10 percent above the State of Nevada rate for Elko County and 10 percent above Elko County rate for communities within the county rate is applied to local minority and low-income rates. For purposes of this section, minority and low-income populations are defined as follows:

Minority populations are persons of Hispanic or Latino origin of any race, Blacks or African Americans, American Indians or Alaska Natives, Asians, and Native Hawaiian and other Pacific Islanders.

Low-income populations are persons living below the poverty level. In 2000, the poverty weighted average threshold for a family of four was $17,603 and $8,794 for an unrelated individual (U.S. Bureau of the Census 2002).

Estimates of these two populations were then developed to determine if environmental justice populations exist in the Study Area.

The Proposed Action is located in Block Group 1 of Census Tract 9516. Interstate Highway 80 (I-80) defines the north edge of the block group. The east edge extends circuitously from I-80 south along Dixie Creek. The west edge follows Nevada State Route 278 (SR 278) through Pine Valley. The Emigrant Project is located approximately in the center of the block group. Portions of the community of Carlin located south of I-80 are included in this block group. The Proposed Action extends into two census blocks (1190 and 1229). Twenty other census blocks are located in the area immediately surrounding the Emigrant Project (1088, 1184, 1189, 1190 through 1194, 1205 through 1210, 1225 through 1228, and 1230 through 1233). Review of the 2000 census revealed that of 22 census tract blocks located within the immediate vicinity of the Emigrant Project, none are populated. As a result, Block Group 1 of Census Tract 9516 will be reviewed as the potentially impacted population.

Minority Composition

Information regarding the ethnic composition of populations located within Block Group 1 is provided in **Table 3-34**. Comparative information is also provided for the cities of Elko and Carlin and the State of Nevada.

Elko County is representative of the State of Nevada with exception of American Indians (5 percent for the county as compared to 1 percent for the state – see below for a full description). When compared to Elko County data, Census Tract 9516 and Block Group 1 are less diverse ethnically. Whites are predominant (90 percent within the tract and the block group, as compared to 82 percent for Elko County).

The community of Carlin is located partially within Block Group 1 of Census Tract 9516. The town, identified in the census as a "census designated place," was summarized separately (**Table 3-34**) to determine if disproportionately large ethnic populations are present there. Review of that data indicates that ethnic populations are under-represented when compared to the census tract or Elko County. As a result, for the purpose of screening for environmental justice concerns, non-White populations in Carlin do not represent minority populations.

Economic Data

The second element of environmental justice is the potential for disproportionate impacts to populations living below the poverty level. Poverty data provided by the Census Bureau characterize only a portion of the overall population. Groups not included in the poverty data are unrelated individuals under the age of 15; individuals living in group quarters such as correctional centers, institutions, college dorms, or military barracks; or individuals in living institutions without conventional housing. Data on persons living below poverty level in and adjacent to the assessment area are presented in **Table 3-34**.

TABLE 3-34
Minority and Low-income Populations,
Jurisdictions in the Study Area and the State of Nevada, 2000
Emigrant Mine Project

Jurisdiction	Total Population	Percent Minority	Percent Below Poverty (1999)
Elko County	47,114	28	8
Elko	16,708	27	6
Carlin	2,161	8	8
Census Tract 9516	2,347	10	8
Block Group 1	1,048	10	6
State of Nevada	2,495,529	40	11

Source: U.S. Bureau of the Census 2007.

As noted previously, census blocks located in and around the Emigrant Project are not populated; they do not contain representatives of this population that are living below the poverty level. As a result, the Proposed Action would not have potential to disproportionately impact a low-income population located elsewhere in the block group.

Elko Band Colony

In Elko County, members of the Elko Band Colony of the Te-Moak Western Shoshone tribe meet the description of environmental justice populations for both minority and poverty status **(Table 3-35**). The percent of minority persons and percent of people below the poverty level are more than 10 percent above Elko County and State of Nevada rates.

Impacts due to construction and operation of the Proposed Action to this tribe are evaluated, as described in the *Native American Concerns* section of this chapter.

TABLE 3-35
Minority and Low-income Populations
Elko Band Colony, 2000

Band	Total Population	Percent Minority	Percent Below Poverty (1999)
Elko Band Colony[1]	730	86%	23%
Elko County	16,708	27%	6%
State of Nevada[2]	2,495,529	40%	11%

Source: [1]Sonoran Institute 2007; [2]U.S. Bureau of the Census 2007.

DIRECT AND INDIRECT IMPACTS

Proposed Action

Direct and indirect impacts associated with the Proposed Action would not have a disproportionate affect on minority or low income populations in the Study Area.

Census data for 2000 were reviewed to determine if disproportionately high minority and low income populations are present within an assessment area defined to surround the location of the Proposed Action. Review of Census Tract 9516 indicates that census blocks located in and around the Emigrant Project are not populated and do not contain representatives of a minority population or a population living below the poverty level. As a result, the Proposed Action would not have potential to disproportionately impact a minority or low income population.

No Action Alternative

Impacts relating to environmental justice would not occur under the No Action alternative. Impacts from previously authorized activities would continue under the No Action alternative.

POTENTIAL MONITORING AND MITIGATION MEASURES

Monitoring and mitigation measures for environmental justice have not been identified by BLM.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

There would be no irreversible or irretrievable environmental justice impacts as a result of the Proposed Action.

RESIDUAL EFFECTS

Implementation of the Proposed Action would not result in residual environmental justice effects.

CHAPTER 4
CUMULATIVE EFFECTS

INTRODUCTION

The Elko District Office is responsible for administering a variety of programs for management and conservation of resources on 12.5 million surface acres. This chapter summarizes past, present, and reasonably foreseeable activities in the Dixie Creek basin, which forms the basis for discussion of cumulative effects. Information contained in this chapter includes summaries of changes and/or progress made for activities within the Cumulative Effects Study Area (Study Area).

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

"Cumulative impact 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" (40 CFR 1508.7).

Past, present, and reasonably foreseeable land uses (*e.g.*, grazing and recreation), activities (mining), and natural phenomena (wildfire) cumulatively affect resources to various degrees over a given area. The general cumulative effects Study Area (encompassing all resources except socio-economic and recreation) is shown on **Figure 4-1**. Cumulative effects are described on a resource by resource basis in this Chapter. Resource-specific Study Areas for cumulative effects are also described and the rationale used to designate the Study Areas. Where appropriate, figures are provided in each resource description in this Chapter delineating the Study Area.

With the exception of some species of terrestrial wildlife, livestock grazing, and socio-economic resources, the geographic area for which past, present, and reasonably foreseeable future activities are described generally encompasses the Dixie Creek drainage basin.

PAST, PRESENT AND REASONABLY FORESEEABLE FUTURE ACTIVITIES

Land uses in the Study Area are primarily related to livestock grazing, off-highway vehicle use, dispersed recreation (hunting), and mining and mineral exploration. These uses of land in the vicinity of the Emigrant Project are described in Chapter 3 - *Affected Environment and Environmental Consequences*.

GRAZING

Past and Present Activities

Livestock grazing has been and continues to be the dominant land use in the Study Area. Multiple grazing allotments have been permitted and administered by BLM over several decades. All or portions of nine grazing allotments authorized to Tomera Ranches, Stonehouse Division exist within the Study Area encompassing 463,151 acres and active grazing privileges of 11,958 animal unit months (AUMs). Some of the allotments have been cross-fenced and subdivided into pastures. Capacity of these allotments has been adjusted over the years in response to mine development, drought, wildfires, and availability of stock water.

An allotment management plan (AMP) was developed and implemented for the Thomas Creek Allotment and prescribes the manner, and extent to which livestock grazing is conducted and managed to meet multiple use, sustained yield, economic, and other objectives as determined through the land planning process. The grazing permits for the remaining eight allotments describe the numbers and kinds of livestock authorized, periods of use, and the total AUMs of use available for licensing on an annual basis; however, formal allotment management plans have not yet been developed. Although formal allotment management plans have not yet been implemented on the remaining eight allotments, Tomera Ranches, Stonehouse Division has informally been incorporating grazing practices designed to improve the health of some riparian and uplands areas by periodically delaying grazing until after the critical growing season of upland grasses, and minimizing use during the hot summer season to allow riparian conditions to improve.

Surface water sources that support livestock grazing and agriculture within the area include the Humboldt River, perennially flowing creeks, springs, and seeps. Improved water sources include developed springs, stock wells, stock ponds, water pipelines, and troughs. Livestock generally congregate near these water sources. Cow-calf pairs, heifers, steers, and cows graze on residual forage and rangeland within the Study Area.

Reasonably Foreseeable Future Activities

Land uses related to livestock grazing would continue in the future although grazing of some portions of existing allotments would become temporarily restricted due to mine development. Livestock grazing is expected to continue at levels established on the various grazing allotments included in the Study Area. Short-term (typically 2 to 4 years) adjustments to livestock numbers are expected in response to range fires which have impacted forage levels. Livestock water supplies affected by mine activities would be replaced in accordance with permit conditions for each mining operation.

The following project is proposed as part of the on-going livestock management program for the BLM Elko District Office, separate from mining-related activities:

- Pine Mountain Allotment – Evan Flat well or pipeline to provide livestock water on the uplands to improve distribution of grazing use and provide opportunities to reduce use on nearby riparian areas.

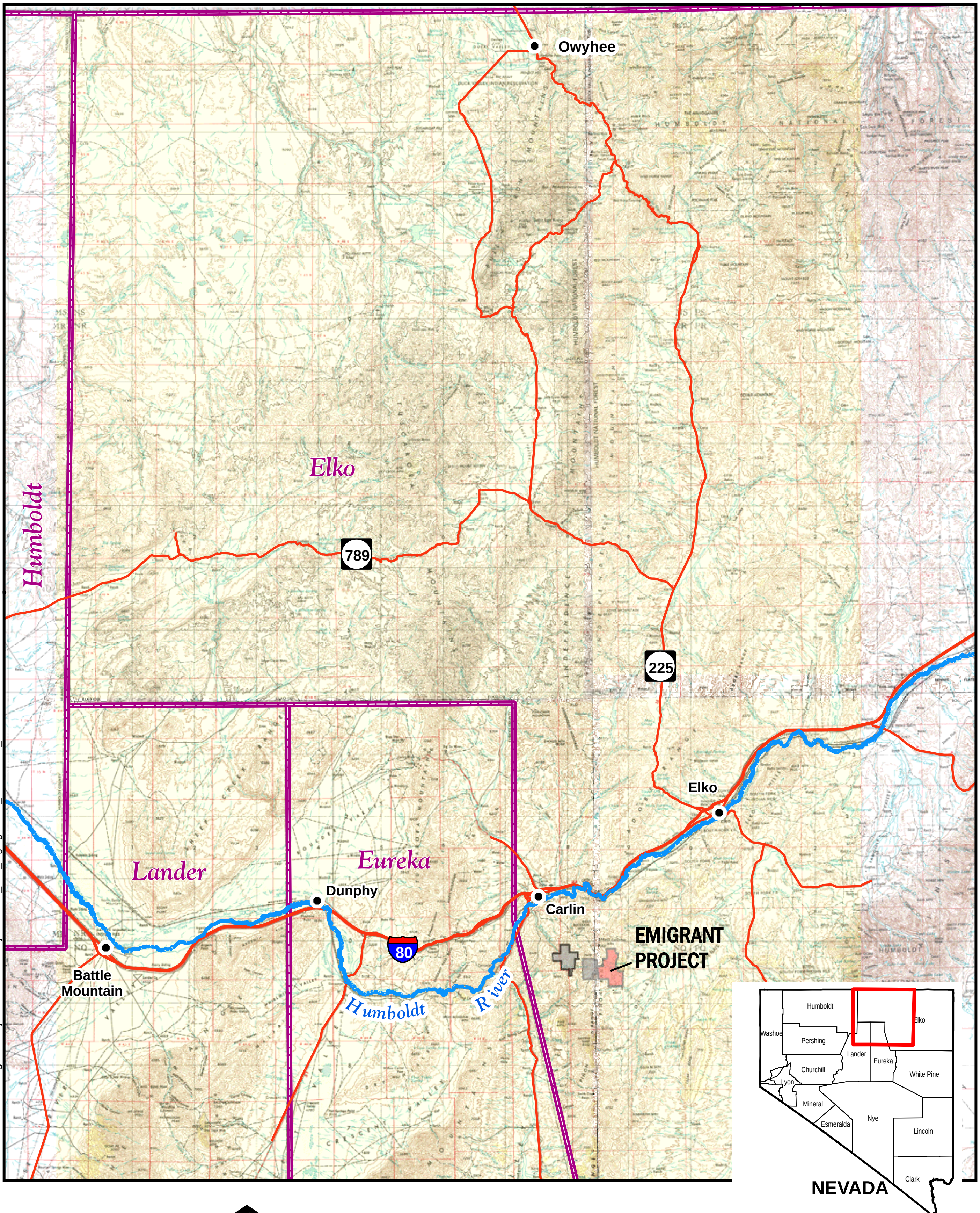
The following reasonably foreseeable actions have been identified through current scoping and/or planning to be considered and evaluated:

- Evaluation of rangeland health for all subject grazing allotments is planned over the next 5 years in conjunction with development and implementation of allotment management plans designed to attain standards for rangeland health and land use plan objectives.

Newmont would establish a program for developing water sources for livestock use in the vicinity of the Emigrant Project. These projects would be developed in conjunction with local grazing operators and the Elko District Office and include:

- Development of two springs (specific locations to be determined) including installation of a fence enclosure and piping a portion of the water to a nearby point outside the enclosure;

- Construct trough and pipeline system east of the proposed Project (specific site to be determined); and



h:\13803 Newmont Emigrant Project\5000 GIS\Projects\Draft_EIS_Figs\general_cumulative_effects.mxd

U.S. Department of the Interior
Bureau of Land Management
Elko District Office
Elko, Nevada

General Cumulative Effects Study Area
Emigrant Project
Elko County, Nevada
FIGURE 4-1

- Construct (fence) a cattle corridor east of the proposed Project to facilitate movement of cattle by different operators.

Water development and fencing projects would be located and constructed in accordance with BLM *Standard Operating Procedures and Resource Protection Measures Common to Public Land Grazing Management Projects* and are hereby incorporated by reference. Maintenance of water developments would be the responsibility of the livestock permittee. Implementation of these measures would allow improved livestock control and enhance progress towards attaining the Standards and Guidelines for Rangeland Health and allotment specific multiple use objectives.

WILDFIRES AND RESEEDING

Past and Present Activities

Over the last decade, the BLM Elko District Office averaged 150 fires per season that burned approximately 1,000,000 acres. **Figure 4-2** depicts cumulative burned areas for the period 1999 to through 2007. Effects of wildfire on environmental resources are described within the context of a defined Study Area for the respective resource.

A Fire Management Plan was developed by the BLM Elko District Office in 1998. The Plan addresses all potential wildfire occurrences and includes a full range of fire management actions, uses new knowledge and monitoring results to revise fire management goals, objectives, and actions, and is linked closely to land and resource management plans. In 2003, BLM issued a proposed Fire Management Amendment to the Elko Resource Management Plan which was intended to reduce adverse impacts through reduction of hazardous fuel loads and provide resource-focused response strategies and new procedural guidelines. The amendment identified fire prevention actions such as, vegetation manipulation, fuels reduction, green strips, fuel breaks, and thinning that should be maximized through use of prescribed burning, mechanical, chemical, and biological (including grazing) treatments to reduce wildfire fuel hazards.

Following each wildfire event, BLM evaluates and develops appropriate Burned Area Rehabilitation plans to address specific resource concerns. The extent to which a burned area is reseeded is governed by variables which are evaluated on site specific basis, such as burn intensity, soil stability, and pre-burn conditions. Since 1999, wildfires have burned over 1.4 million acres in the Study Area of which 471,000 have been reseeded. Site evaluations following wildfire events determined that the remaining (unseeded) areas could rehabilitate naturally due to pre-fire vegetative conditions, elevation, precipitation zone, and site potentials. Areas that have been reseeded are shown on **Figure 4-3**.

Since 1992, public and private entities have worked to restore range habitat for wildlife and livestock on areas affected by wildfire. Restoration work during 2006 by BLM and Nevada Department of Wildlife (NDOW) included fencing burned areas to preclude livestock grazing and reseeding within the Study Area.

According the 2007 Fire Management Report as prepared by the Nevada Division of Forestry (NDF) - Western Region, 2007 represented the fourth largest fire season on record with 888 fires burning more than 890,000 acres of Nevada forest and rangelands (NDF 2008). The fire season of 2006 was the second worst fire season of record with over 1,254 fires burning more than 1.3 million acres (NDF 2007).

The BLM Elko District has fire suppression responsibility on 7.5 million acres. Assistance is also provided by numerous cooperating agencies such as the Nevada Division of Forestry, U.S. Forest Service, U.S. Fish and Wildlife Service, Bureau of Indian Affairs, and county, tribal, and municipal governments.

The Elko District Office's fire suppression organization currently employs approximately 70 employees, and consists of four stations (Elko, Carlin, Wells, and Midas), ten 4x4 heavy engines, three Fire Operations Supervisors, an Interagency Hotshot crew, an Air Attack plane, and a type 3 helicopter with Helitack crew. In addition to these suppression resources, the Elko Interagency Dispatch Center handles all-risk dispatch duties for five agencies, and an aggressive fuels management program implements both hazard fuels reduction and projects for resource benefit each year.

The organization is also responsible for all fire management activities for the Eastern Nevada Agency (ENA) of the Bureau of Indian Affairs. The ENA program supports several type 2 handcrews and camp support crews, and includes completion of vegetation management projects on Tribal and BIA lands in the area.

Reasonably Foreseeable Future Activities

Fire (prescribed burns and wildfire) will continue to be an important component of land management for public and private landowners. Prescribed burns will be used to reduce fuel load in selected areas of public land. Wildfires are expected to continue in the Study Area. Some of this acreage would likely include burning of areas previously burned and seeded.

STABILIZATION AND REHABILITATION PROGRAMS

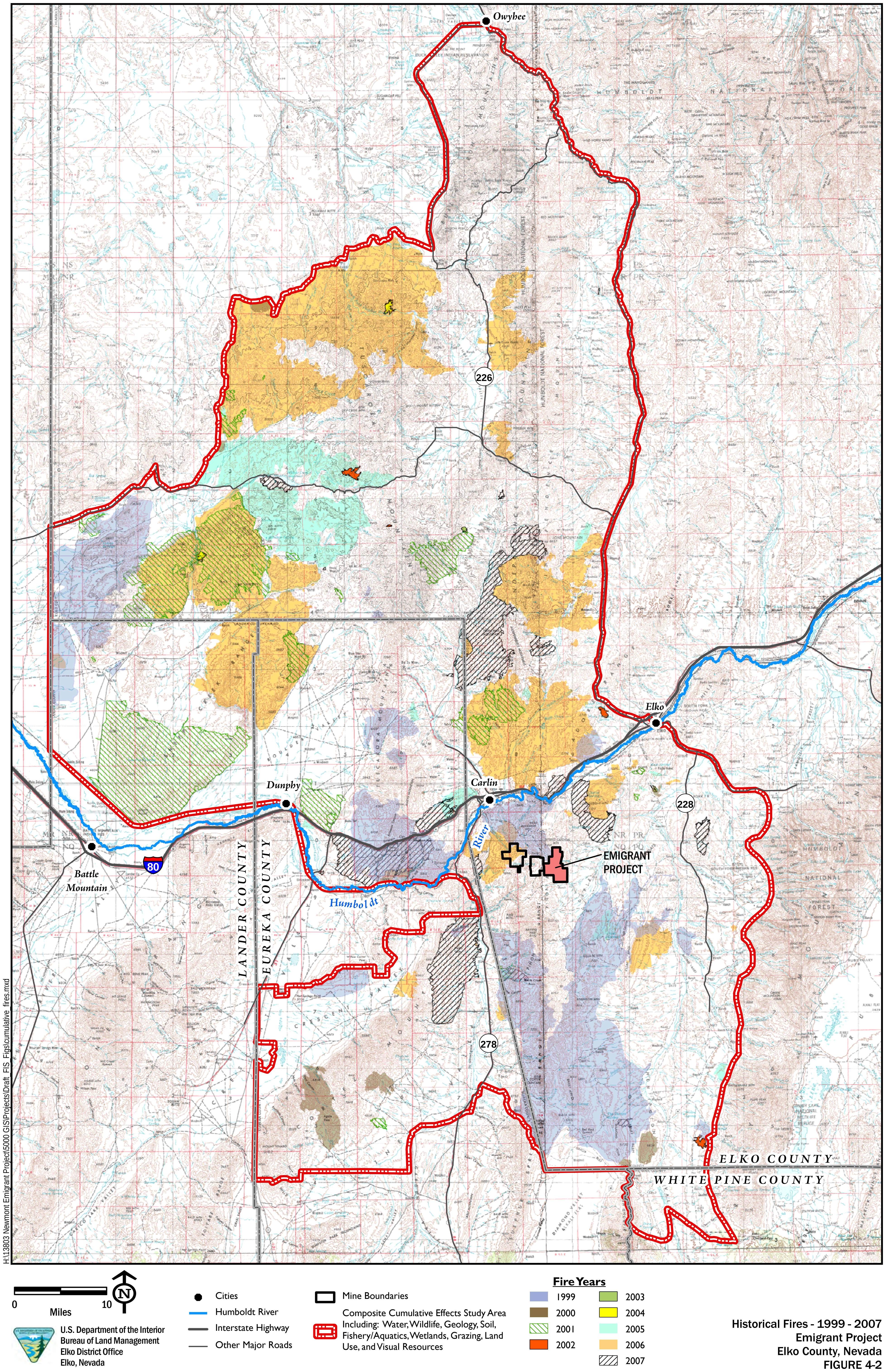
Past and Present Activities

Habitat restoration projects implemented by BLM in the Dixie Creek drainage include a livestock grazing management plan in headwater reaches and riparian pasture and exclosure fencing in the lower reaches. The El Jiggs Agreement for Livestock Management implemented in 1998 provided improved grazing management on about seven stream miles of public and private land in the upper portion of the Dixie Creek drainage, while a combination of exclosure and riparian pasture fencing in 1990 allowed improved management of approximately five miles of perennial stream on public land in downstream areas. Stream and riparian habitat conditions in managed areas along Dixie Creek are characterized by mostly stable streambanks and well established woody and herbaceous riparian plant communities. Beaver are also increasing in these areas, resulting in formation of quality pool habitat and increased retention and storage of water.

The Emigrant exclosure, constructed in the late 1980s, has resulted in some improvement of the spring and the associated riparian zone. However, problems with fence maintenance and subsequent use by livestock have affected the level of recovery.

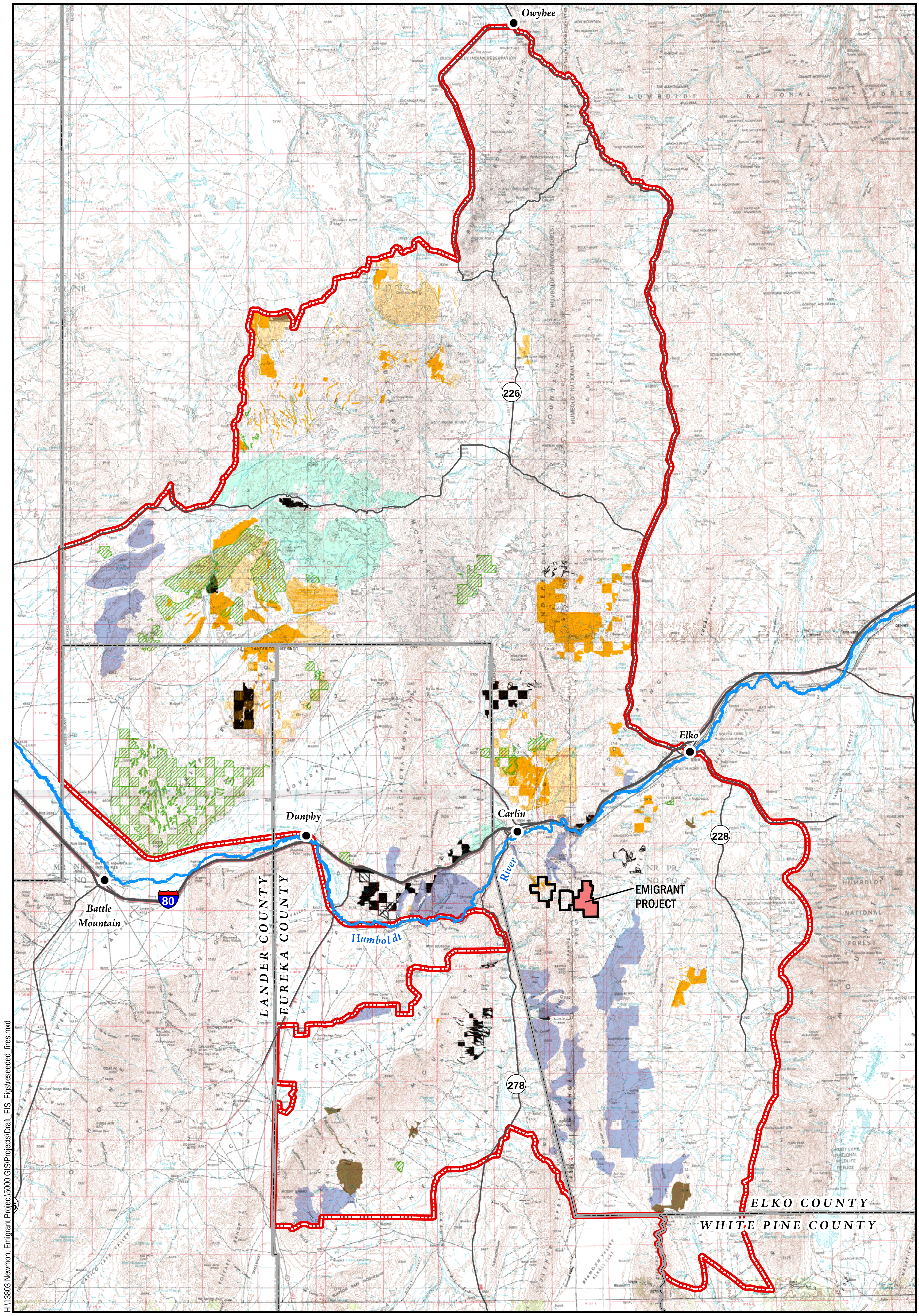
Several springs, meadows, cottonwood and aspen stands have also been protected by fencing in the headwaters of the Dixie Creek drainage in the El Jiggs Allotment. Four projects, constructed since 2005 have resulted in improved riparian habitat conditions as well as regeneration of mature cottonwood and aspen stands.

A fish barrier on Dixie Creek, above the confluence with the South Fork of the Humboldt River, is scheduled for construction in 2008. The barrier would preclude all fish and aquatic life, including non-native salmonids, from accessing the LCT population in the headwaters of Dixie Creek. Non-native trout have the potential to jeopardize the native cutthroat population though hybridization and/or competition.



U.S. Department of the Interior
Bureau of Land Management
Elko District Office
Elko, Nevada

Historical Fires - 1999 - 2007
Emigrant Project
Elko County, Nevada
FIGURE 4-2



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Cities
Humboldt River
Interstate Highway
Other Major Roads

Mine Boundaries
Composite Cumulative Effects Study Area Including: Water, Wildlife, Geology, Soil, Fishery/Aquatics, Wetlands, Grazing, Land Use, and Visual Resources

Years Reseeded

1999
2000
2001
2003
2005
2006
2007

U.S. Department of the Interior
Bureau of Land Management
Elko District Office
Elko, Nevada

Reseeded Areas - 1999 To 2007
Emigrant Project
Elko County, Nevada
FIGURE 4-3

Reasonably Foreseeable Future Activities

There are no reasonably foreseeable future stabilization and rehabilitation projects planned by BLM within the Dixie Creek watershed.

MINING AND MINERAL DEVELOPMENT

The Carlin Trend is a mineralized zone approximately 50-miles-long by 5-miles-wide in north central Nevada where multiple mining operations have been developed. Some activities described in this chapter are located proximal to the mining operations, and other activities are located in adjacent areas (**Figure 4-4**).

Past and Present Activities

Carlin Trend

Newmont initiated its mining activities in the North Operations Area at the Carlin open pit mine in 1965. The North Operations Area includes the North Area Leach Pad, and the Bootstrap, Blue Star/Genesis, Lantern, Carlin Pit, Pete Mine, and Bullion Monarch open pit mines, and the Leeville underground mine.

Activities in the South Operations Area have expanded periodically since production began in 1985. Facilities include the Gold Quarry open pit mine, waste rock disposal facilities, tailing impoundments, dewatering wells, and ancillary facilities. The North-South Haul Road connecting the North Operations Area with the South Operations Area was approved in 1993.

Polar Resources began mining operations at the Betze/Post Mine in 1974; the mine was acquired by American Barrick Resources in 1986 and subsequently became the Betze/Post open pit mine (McFarlane 1991). Barrick began development of the Meikle underground mine in 1995, with processing occurring at the Betze/Post operation.

Ore processing in the Carlin Trend has included installation and operation of cyanide heap leach facilities, carbon-in-leach systems, milling of ore, and disposal of tailing. In addition, exploration projects involving drilling, trenching, and sampling are ongoing.

Changes in exploration and mining activity include advancement of exploration projects to active mining level (Barrick's Goldbug and Storm Projects, and Newmont's Pete and Chuckar Projects). Expansions have been made to the Known Deposit Areas (Newmont's Genesis, North Lantern, and Lantern #3 and Barrick's Dee Mine area).

Disturbance associated with mine development in the Carlin Trend is listed in **Table 4-1** and shown on **Figure 4-4**.

Emigrant and Rain Mines

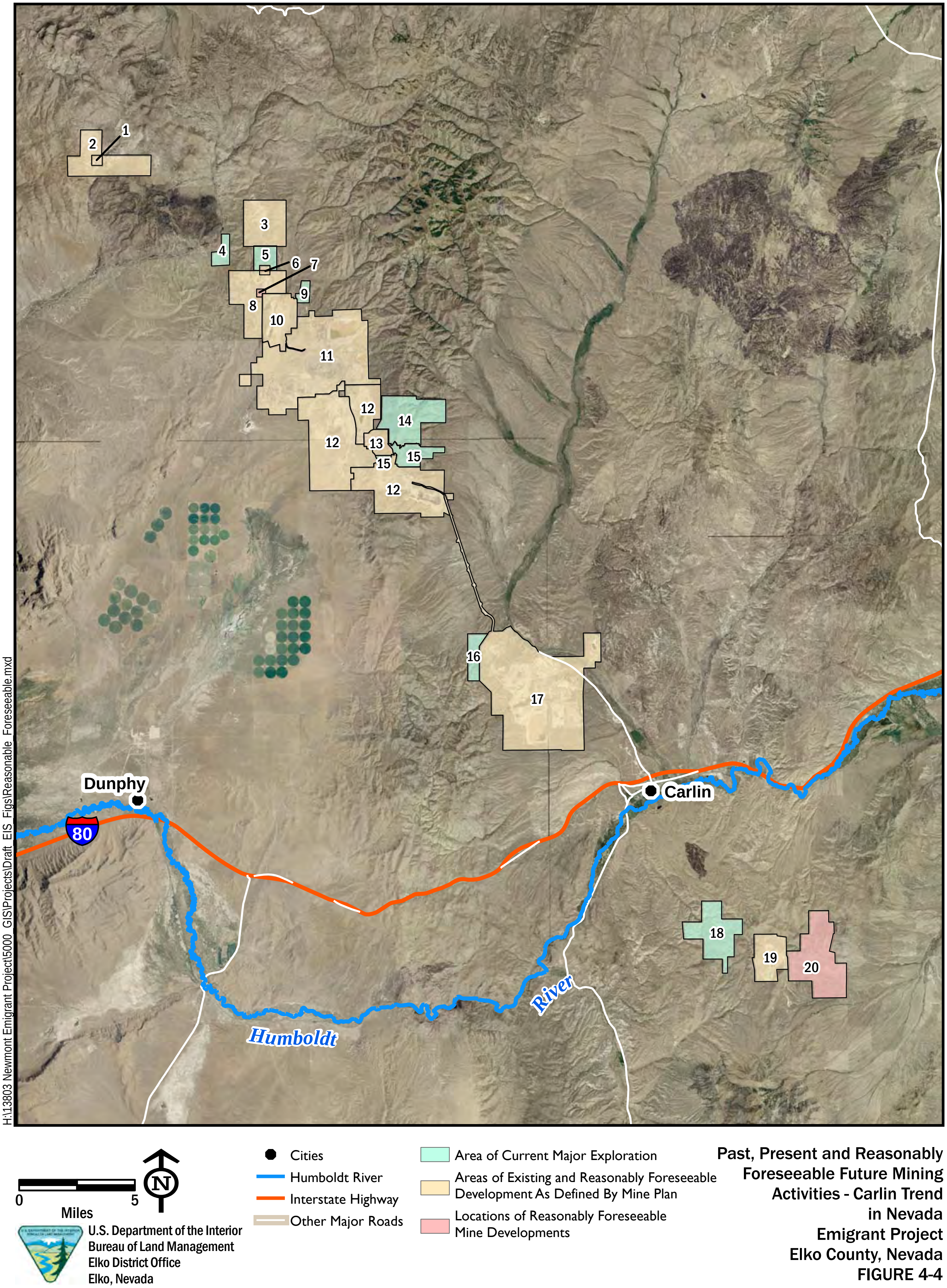
Mining and mineral development activities have been ongoing in the Study Area including exploration, mining, and closure of the Rain deposit, exploration activity associated with the proposed Emigrant Project, and exploration activity at the Woodruff Project site (**Figure 4-4**).

Development of the Rain Mine began in 1988 and included an open pit, waste rock disposal site, tailing impoundment, mill facility, and heap leach pad. Total disturbance area for the Rain Mine is 961 acres. Mining operations ceased in 1998; leaching of ore placed on the leach pad is currently ongoing and will continue until economic recovery of gold ceases (estimated at five years). Reclamation has been initiated on the waste rock disposal facility, tailing impoundment, and portions of the ancillary facilities.

TABLE 4-1
Past, Present, and Reasonably Foreseeable Future Mining Activity in the Carlin Trend

Map[1] Reference No.	Facility	Existing Disturbance[2]		Future Activity[3]	Comment
		Exploration	Mining		
1	Newmont/Great Basin Gold-Hollister/Ivanhoe	15	268	100	Foreseeable underground mine and facilities. Same location as Hollister Development Block Project and would go from underground exploration to underground mining operation.
2	Hecla-Hollister Development Block	51	-	-	
3	Halliburton-Rossi	-	408	300	Rossi mine expansion of Queen Lode and Sage Hen areas and may include expansion of exploration, open pits, and waste rock dumps.
4	Trio-Gold Corp. – Rodeo creek	42	-	-	
5	Barrick-Meridian JV-Rossi	51	-	-	
6	Barrick-Storm Underground	-	185	-	
7	Barrick – Arturo	-	-	100	Foreseeable future open pit gold mine. Development of a new open pit mine at the existing Dee Gold Mine.
8	Marigold – Dee Mine	-	1,315		
9	Centerra-Ren	30	-	100	Foreseeable underground mine.
10	Newmont-Bootstrap	-	1,900	-	
11	Barrick-Betze/Post , Meikle, Rodeo,Goldbug, (Mill & TSF transferred from Newmont)	233	7,882	1,180	Expansion includes enlargement of Betze/Post open pit and construction of tailing impoundment.
12	Newmont-Blue Star/Genesis, Section 36, Deep Star, Lantern, North Lantern, Bullion Monarch		2,958	43	Continued mining of the Genesis Area. Project includes open pit mining, sequential backfill and increased height of existing external waste rock facilities.
	Newmont-North Area Leach		1,426	100	Expansion of North Area Leach pad
	Newmont-Carlin Mine/Mill 1, Pete	255	3,673	-	
13	Newmont-Leeville	-	566	-	
14	Newmont Chevas	168	-	-	
15	Newmont – High Desert	164	-	-	
16	Newmont – Mike	48	-	100	Foreseeable future gold mine project
17	Newmont – South Operations Area	-	9,961	100	Expansion of Non-property Leach Pad and construction of Property Pad 2 in Section 18.
18	Newmont – Woodruff Creek	66	-	-	
19	Newmont - Rain	-	961	-	
20	Newmont - Emigrant	155	-	1,418	Proposed open pit mine, sequential backfilling, heap leach pad facility and waste rock dump; permitting in progress.
TOTAL		**1,278**	**31,503**	**3,541**	

[1] See **Figure 4-4** for disturbance sites.
[2] Projects permitted by BLM as of April 2007
[3] Reasonably foreseeable assumes 100 acres disturbance per plan or plan amendment. Actual disturbance will vary as plans are developed.
Source: BLM 2008.



Past, Present and Reasonably Foreseeable Future Mining Activities - Carlin Trend in Nevada
Emigrant Project
Elko County, Nevada
FIGURE 4-4

Exploration activity at the Emigrant Project has included drilling and trenching used to investigate the ore body. Permitted disturbance for exploration activities totals 155 acres and includes access roads, drill pads, trenches, and soil stockpiles/berms. Portions of the disturbance area have been reclaimed including contouring roads and drill pads and replacement of soil followed by seeding.

Activity at the Woodruff Exploration Project includes road building, drilling, and trenching. Total permitted disturbance acreage is 66 acres. The Woodruff Exploration Project is an ongoing exploration project.

A Plan of Operations for the proposed Piñon Project was submitted to BLM and NDEP in 2006 by Royal Standard Minerals, Inc. In 2007, BLM determined that the application was incomplete and would need to be resubmitted. Two technical reviews of the Plan of Operations were conducted by NDEP with no response from the applicant. Subsequently, NDEP voided the application.

Sand and Gravel Operations

Approximately 395 acres of private land have been disturbed by sand and gravel operations in the Carlin area. These operations generally lie adjacent to major transportation routes (Interstate 80 and State Highway 766) in the area and have been used to support construction and maintenance of area roads over an extended period of time (Newmont 2007c).

Reasonably Foreseeable Future Activities

Mine development and exploration projects are expected to continue in the foreseeable future in the Carlin Trend. Two of the larger operations include Barrick's Betze/Post pit and Newmont's Emigrant Project. Expansion of Barrick's Betze/Post pit would involve enlarging the existing open pit, continuation of dewatering activities through 2015, and construction of a tailing storage facility. Newmont's proposed Emigrant Mine Project would include an open pit mine, heap leach facility, waste rock dumps, and ancillary facilities located about 20 miles south of Carlin. Newmont has also proposed expansion of the Genesis open mine pit and development of the Bluestar Ridge open mine pit in the Genesis-Bluestar Operations Area. Reasonably foreseeable mining operations in the Carlin Trend from 2008 through 2020 are shown on **Figure 4-4** and detailed in **Table 4-1**.

In addition to development of the proposed Emigrant Project, future mine development could include the Woodruff project which is currently in exploration phases. The components and extent of mining activity at this site is unknown at this time; it is assumed that mining would result in an open pit, waste rock disposal and heap leach facilities, and ancillary facilities to support development.

Closure activities at the Rain Mine would continue. Mining ceased at the Rain Mine in 2002 and only solution collection and disposal is ongoing. Remaining reclamation activities include evaporation of treated process solution, and regrading and revegetating the tailing impoundment. Final reclamation of the Rain Mine is expected to be completed by 2030.

RECREATION

Past and Present Activities

Outdoor recreational areas and facilities in the Project area include those managed by BLM that provide diverse recreational activities, including sightseeing, hunting, cross-country skiing, horseback riding, photography, cross-country motorcycle racing, rock hounding, and off-highway vehicle use. No developed recreation sites exist within the general Project area or

Study Area. Primary use of public land is associated with hunting and off-highway vehicle (OHV) recreation.

Reasonably Foreseeable Future Activities

The two primary recreational activities occurring in the Study Area are off-highway vehicle use and hunting. These activities would likely continue at current levels through the foreseeable future although access to areas within the immediate vicinity of the proposed Emigrant Project would be limited.

BLM is currently building a California trail interpretive center located at the Hunter exit on Interstate 80, about 6 miles west of the town of Elko. The center will encompass 40 acres and include a building, access road, interpretive plaza, 65-car parking lot, 1.5-mile walking trail, amphitheater, and day use area. BLM estimates approximately 65,000 people/year will visit the center once all exhibits are in place by 2010 (Jamiel 2007).

LAND DEVELOPMENT – URBANIZATION

Past and Present Activities

Platting of residential subdivisions in Elko County has primarily occurred through subdivision of land previously used for agricultural purposes. Numerous subdivisions platted in the 1960's, prior to N.R.S. subdivision law, did not provide legal access, roads, or utilities. Many of these subdivisions to date have not been developed or are developing at a slower rate. Most residential development has occurred within the incorporated boundaries of Elko and the surrounding areas, such as Spring Creek, South Fork, Lamoille, areas directly adjacent to the City of Elko, or along the Interstate 80 corridor (Elko County Nevada Water Resource Management Plan 2007).

Approximately 565 acres have been platted for development in the vicinity of Carlin. The majority of platted area lies between Interstate 80 and the Humboldt River in and adjoining the town of Carlin. Other development is occurring east of Highway 766 near its intersection with Interstate 80 (Newmont 2007c).

Approximately 23 acres have been platted at Palisades, midway between Carlin and Dunphy. Development in the Dunphy area consists of approximately 6 acres (Newmont 2007c). Information concerning the level and stages of these developments is not available.

Reasonably Foreseeable Future Activities

Land development in the Carlin-Dunphy area would likely continue commensurate with population and employment increases in the area.

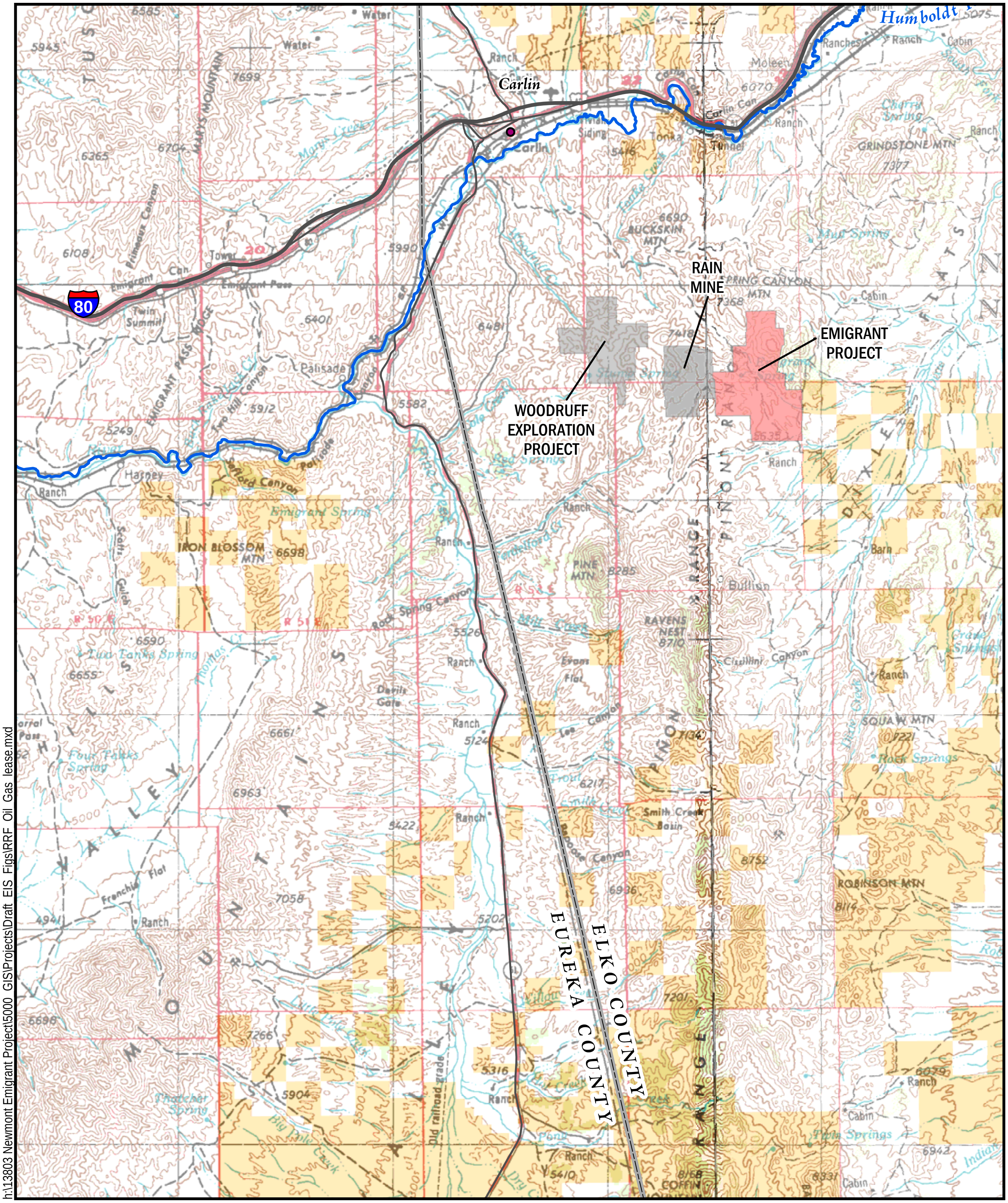
OIL, GAS, AND GEOTHERMAL LEASES

Past and Present Activities

Elko District Competitive Oil and Gas Lease sales are conducted quarterly, in March, June, September, and December. Parcels proposed for lease are posted on the Nevada BLM website (www.nv.blm.gov) 45 days prior to the sale date. The last geophysical survey for oil and gas in the Study Area occurred in 2006. Tracts currently leased for oil and gas in the vicinity of the proposed Emigrant Project are shown on **Figure 4-5.**

Reasonably Foreseeable Future Activities

Leasing parcels for oil and gas is expected to continue in the future as energy demand continues to increase. No exploration or development permit applications for projects in the Study Area have been submitted to BLM.



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Oil and Gas Leases

U.S. Department of the Interior
Bureau of Land Management
Elko District Office
Elko, Nevada

Oil, Gas, and Geothermal Lease Areas
Emigrant Project
Elko County, Nevada
FIGURE 4-5

Future oil and gas development may create surface disturbance, which will be analyzed when a lessee submits plans for the action (BLM 2006).

HAZARDOUS / SOLID WASTE AND HAZARDOUS MATERIALS

Past and Present Activities

Hazardous Waste

The SOAPA and Barrick/Betze projects currently operate as Large Quantity Generators of hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA). These facilities generate more than 1,000 kilograms per month of RCRA-regulated hazardous waste (40 CFR Part 260-270). All hazardous wastes currently generated at the mines are managed according to existing, approved permits or are disposed of according to local, state, or federal regulations.

Hazardous waste streams associated with mining and ore processing in the Carlin Trend are shown in **Table 4-2**. These wastes are accumulated and stored at designated sites at each mine operation and periodically transported to one of two Clean Harbors Treatment, Storage, and Disposal (TSD) facilities in Utah. All hazardous wastes are stored, packaged, and manifested in compliance with applicable federal and state regulations.

Solid Waste

All non-hazardous solid waste generated through operations in the Carlin Trend is disposed in NDEP approved Class III waivered landfills established at the mine sites.

TABLE 4-2
Hazardous Waste Stream
Carlin Trend Operations

Stream	Generator	EPA Hazardous Waste Code	Treatment, Storage, Disposal Facility	Generation Rate
Newmont Operations				
Paint-related material	Mill 6	D001, F003	Clean Harbors by Incineration	1,100 gals
Mercury PPE/debris	Mill 6	D009	Clean Harbors by HW Landfill	31,600 lbs
Spent MIBK	Assay Lab	D001, D002	Clean Harbors by Incineration	350 lbs
Mercuric/Mercurous chloride	Mill 6	D009, D002	Air Pollution Control on Roaster in HW Landfill	42,000 lbs
Mercury Solids	Mill 6	D009	Clean Harbors by HW Landfill	4,000 lbs
Solvents	Mills, Leach	D001, F003	Clean Harbors by Incineration	1,100 gals
Hydrochloric, Sulfuric acid	Mills, refinery	D002	Clean Harbors by Incineration	5,000 lbs
Caustic solutions	Mills	D002	Clean Harbors by HW Landfill	2,000 lbs
Lab packs	Mills, Lab	Varies	Clean Harbors/varies	500 lbs
Lead-bearing waste	Assay Lab	D008	Clean Harbors by HW Landfill	25,000 lbs

TABLE 4-2
Hazardous Waste Stream
Carlin Trend Operations

Stream	Generator	EPA Hazardous Waste Code	Treatment, Storage, Disposal Facility	Generation Rate
Halogenated oil	Mills	F002	Clean Harbors by Incineration	3,000 gals.
Vanadium pentoxide catalyst	Mill 6	D009	Clean Harbors by Incineration	28,500 lbs
Barrick Operations				
Aerosol can waste, filters, paint filters	Property wide	D001,D005, D008, D018, D029,D035, D039, D040, F002, F003, F005	Clean Harbors by Incineration	1,440 lbs
Waste paint and related material	Property wide	D001,D004, D007, D008, D009,D039, F002, F003, F005	Clean Harbors by Incineration	1,120 lbs
Debris contaminated with used oil and tetrachloroethyne	Property wide	D039	Clean Harbors by Incineration	240 lbs
Inorganic lab waste	Lab	D008	Clean Harbors by Incineration	92.82 tons
Computer equipment	Property wide	D008	Clean Harbors/Metal recovery including retorting, smelting, chemical	17.11 tons
Baghouse dust from assay lab	Lab	D008	Clean Harbors by HW Landfill	5.07 tons
Brick, mortar , and soil	Autoclave	D008	Clean Harbors by HW Landfill	9.59 tons
HEPA filters and debris	Processing and Refining	D008	Clean Harbors by HW Landfill	7.12 tons
Used oil	Property wide	D039, D040	Clean Harbors by Incineration	17.5 tons
Used solvent	Property wide	D001	Clean Harbors by Incineration	440 lbs
Waste lead/acid batteries	Property wide	D002, D008	Clean Harbors by other treatment	400 lbs
Lead contaminated sandblast grit	Property wide	D008	Clean Harbors by HW Landfill	4.5 tons

EPA - Environmental Protection Agency; TSDF = Treatment, Storage, or Disposal Facility; gals = gallons; lbs = pounds; PPE = Personal Protection Equipment; HW = Hazardous Waste; MIBK = Methyl Isobutyl Ketone.
[1] Laboratory Clean-out Chemical Wastes
Source: BLM 2002a; BGMi 2006; Newmont 2007d.

Hazardous Materials

A compilation of hazardous materials stored in the Carlin Trend was obtained from the Nevada Fire Marshall's office and is contained in the SOAPA Draft Supplemental EIS (BLM 2007b). The records included are for individual facilities in the Carlin Trend and represent the annual maximum volume of these materials that can be stored. Hazardous materials used and stored on-site in the Carlin Trend are shown in **Table 4-3**.

Reasonably Foreseeable Future Activities

Solid and Hazardous Waste

Reasonably foreseeable projects in the Carlin Trend would result in similar volumes of solid and hazardous wastes stored on site, transported on state and federal highways, and disposed of at approved sites. The volumes of solid and hazardous wastes transported are expected to remain at current levels (see *Past and Present Activities*).

Production levels for mills and heap leach operations are expected to be optimized for the foreseeable mine expansions and developments. As a consequence, the volume of hazardous materials transported, stored, consumed, and disposed would remain at current levels. Portions of Gold Quarry operations that remain to be built would not result in a change in the volume or type of solid or hazardous materials currently being used in SOAPA operations.

Hazardous materials and waste associated with Great Basin Gold's Hollister Development Block have not been determined. Mine planning is ongoing and the amount of hazardous materials that would be used in this development is contingent upon the options selected for processing ore including location, and ore processing method (mill, heap leach, custom processing).

Expansion of Barrick's Betze operations would extend the life-of-mine. Production of ore and use of hazardous materials would remain at current levels.

TABLE 4-3
Hazardous Materials Used and Stored
Carlin Trend

Substance	Newmont		Barrick		Hecla Ventures Corp.	
	Annual Use	Stored On-site(s)	Annual Use	Stored On-site(s)	Annual Use	Stored On-site(s)
Diesel Fuel	19,409,502 gal.	84,000 gal.	16,599,189 gal	85,000 gal.	20,000 gal.	30,000 gal.
Gasoline	560,360 gal.	20,000 gal.	376,539 gal.	10,500 gal.	1,000 gal.	NA
Hydraulic Oil	571 gal.	3,000 gal.	NA	NA	NA	NA
Motor Oil	483 gal.	1,500 gal.	41,000 gal.	NA	NA	NA
Antifreeze	1,537 gal.	480 gal.	45,000 gal.	27,000 gal.	NA	NA
Explosives	-	25,000 lb.	NA	NA	30,290 lb.	NA
Prill	12,437 tons	495 tons	18,731 tons	217 tons	NA	NA
Propane	340,423 gal.	200,075 gal.	17,521,843 gal.	2,705,854 gal.	220 gal.	NA
Grease	-	2,400 lbs	NA	NA	NA	NA
Cyanide	18,224,795 gal.	75,000 gal.	10,508,640 lb.	580,010 lb.	NA	NA
Lime	112,354 tons	1,502 tons	290,657 tons	4,150 tons	NA	NA

gal. = gallons; lb. = pounds; NA = Not Available
Source: Newmont 2007e; BGMI 2007.

RESOURCES AND RESOURCE USES

GEOLOGY AND MINERALS

Effects of mining on geology, paleontology, and mineral resources include the excavation and relocation of rock materials from the natural setting. Ore rock is processed in mill facilities or placed on heap leach pads, and waste rock is placed in disposal facilities. In some cases, waste rock is used in construction of roads, leach pad foundations, ditch systems, stockpile areas, and backfill. Movement and disposition of rock materials (volume and location) varies by mine operation. Paleontological resources also could be impacted cumulatively if such resources occur in the Study Area. Formation of acidic leachate and subsequent release of trace metals could result in additive or cumulative effects on groundwater or surface water if conditions conducive to these phenomena are present.

Cumulative Effects Study Area

The Cumulative Effects Study Area (Study Area) for geology and mineral resources incorporates existing and reasonably foreseeable mining activity in the Carlin Trend through 2020. The Study Area includes the proposed Emigrant Mine, existing Rain Mine, and exploration activities at the Woodruff site located in the southern extent of the Carlin Trend and extending to the Hollister Development Block in the northern end of the Carlin Trend (see **Figure 4-4**).

Cumulative Effects

Ongoing and future mine development would result in expansion to and creation of open pits, waste rock disposal areas, heap leach pads, tailing storage facilities, and/or ore processing facilities. Future exploration may also result in delineation of more refractory ore zones that may require greater mining depths to recover ore. The total volume of ore, waste materials, and gold that could be economically excavated in the future is not quantifiable as the price of gold and individual ore body characteristics dictate whether any particular mineralized zone could be economically mined.

Potential for acid generation and release of trace metals are the primary issues associated with excavation and disposal of rock material in the mining process. Early mining activity in the Carlin Trend focused on excavation of oxidized rock (rock with low sulfide content). These rocks exhibit low potential to generate acid and release trace metals because most of the sulfide minerals have been leached out of the rock. Later stages of mining in some operations have resulted in excavation and processing of refractory or sulfidic ore and waste rock. These rock materials have a greater potential to generate acid and release trace metals to the environment. As a consequence, specific mining methods, rock handling procedures, ore processing methods, and mitigation measures, have been implemented to manage potential acid generation and release of trace metals from these rock types to the enviornment. When these mitigation measures are successful, adverse impacts are minimal and localized, resulting in little or no cumulative effects. If acid conditions and/or increased metal loading occur to groundwater or surface water, cumulative effects could result.

Characteristics of rocks that would be excavated at any mine development are site specific. Since no mine plan has been accepted for the Piñon Project, it is not possible to quantify the potential trace metal or sediment release contribution of mine development at this project site (see *Water Quantity and Quality* section in this Chapter).

The Woodruff Project is an ongoing exploration project. Information is not available to characterize impacts from geological resources from this project at this time.

The nearby Rain Mine has the following percentages of waste rock types: oxidized Webb siltstone = 75 percent; oxidized Devils Gate limestone = 10 percent; and unoxidized Chainman/Fresh Webb siltstone = 15 percent (Harris 2005). The amount of unoxidized potentially acid generating waste rock at the Rain Mine (15 percent) is greater than what is expected for the Emigrant Mine (1 percent); the amount of Devils Gate limestone waste rock at Rain (10 percent) is less than what is expected at Emigrant (32 percent). As a result, some acid drainage has occurred from the Rain Mine Waste Rock Dump. Overall mineralogical and lithological composition of the rock types at Rain Mine is similar to Emigrant, with the exception of higher barite content at Rain (Harris 2005).

Potential cumulative effects associated with excavation, processing, and disposal of rock as a result of mining operations are primarily changes in water quality in groundwater and/or surface water that would receive trace metals released from rock. Cumulative effects of mining on water quality are described in the *Water Quantity and Quality* section of this Chapter. Cumulative effects of mining on water resources in the Carlin Trend are described in the SOAPA Draft Supplemental EIS (BLM 2007b) and Leeville Draft Supplemental EIS (BLM 2007c).

Visual resources and wildlife resources are also cumulatively affected by mining. Construction of haul roads, waste rock disposal facilities, heap leach pads, mine pits, and ancillary mine facilities affect these resources. See *Visual Resources* and *Wildlife Resources* for a description of the potential cumulative effects on these resources.

If paleontological resources are discovered at the Emigrant Project site, project activities would cease until a program can be implemented to recover or record the discovery. For those resources that are inadvertently damaged during mining, impacts could be cumulative with respect to other possible impacts from mine-related activities in the Study Area. The cumulative effect of mining in the Carlin Trend is not expected to result in loss or destruction of fossils; this region of Nevada is not known for paleontological resources.

AIR QUALITY

Air pollutant sources within the Study Area include existing mine closure operations and other background sources. Emissions from mine closure activities include criteria air pollutants such as particulate matter less than 10 microns (PM_{10}), particulate matter less than 2.5 microns ($PM_{2.5}$), and gaseous emissions (nitrogen oxides, sulfur dioxide and carbon monoxide). Background emission sources include traffic on unpaved roads, windblown dust, and agricultural activities.

Cumulative Effects Study Area

The State of Nevada has divided the state into 250 air quality planning areas based on hydrographic basins. The Cumulative Effects Study Area (Study Area) for air resources focuses on the Dixie Creek watershed portion of the Dixie Creek – Tenmile Creek Air Quality Basin No. 48, Elko Segment Air Basin No. 49, and the northern portion of Pine Valley Air Basin #53. The proposed Emigrant Project lies entirely within Basin No. 48 (see *Water Quantity and Quality* section of Chapter 3 for a description of the hydrographic basins).

Rationale for selecting the aforementioned Air Basins for the cumulative effects investigation is based on previous air quality modeling for regulated air pollutant sources conducted for the NDEP air quality permit process at the existing Rain and proposed Emigrant mines. Air modeling has shown that air pollutant concentrations are localized near project boundaries, and modeled air pollutant concentrations diminish rapidly with distance from project boundaries. There are no air pollutant emission sources located closer than 7 kilometers (km) from the outer boundary of the air quality basin. Based on previous air pollutant modeling, 7 km was judged to be sufficiently large that only other past, present, and reasonably foreseeable future emission sources in an air quality basin needed to be modeled to determine potential for cumulative air quality impacts (BLM 2007b).

Cumulative Effects

No other potential air pollutant sources are located within the Pine Valley and Elko Segment Air Quality basins, and the Dixie Creek watershed portion of Air Quality Basin No. 48. Cumulative effects to air resources are limited to those previously discussed under the Proposed Action.

Processing of metal laden carbon containing gold from the Emigrant Project would be conducted at Newmont's South Operations Area facilities. Mercury emissions associated with that facility are described in Chapter 3 – *Air Quality*. The potential cumulative effects of mercury emissions from sources within the Carlin Trend have been disclosed in the SOAPA Project Draft Supplemental EIS (BLM 2007b) and Leeville Project Draft Supplemental EIS (BLM 2007c). Newmont is *compliant with all requirements of the Nevada Mercury Air Emission Control Program* at its facilities in the Carlin Trend. Air modeling completed for the SOAPA and Leeville Draft Supplemental EISs indicated that there is little to no overlap or combination of air quality impact from sources within the Carlin Trend and therefore, cumulative impacts are sufficiently small as to be below measurement thresholds. No ambient air quality standard has been adopted for mercury.

WATER QUANTITY AND QUALITY

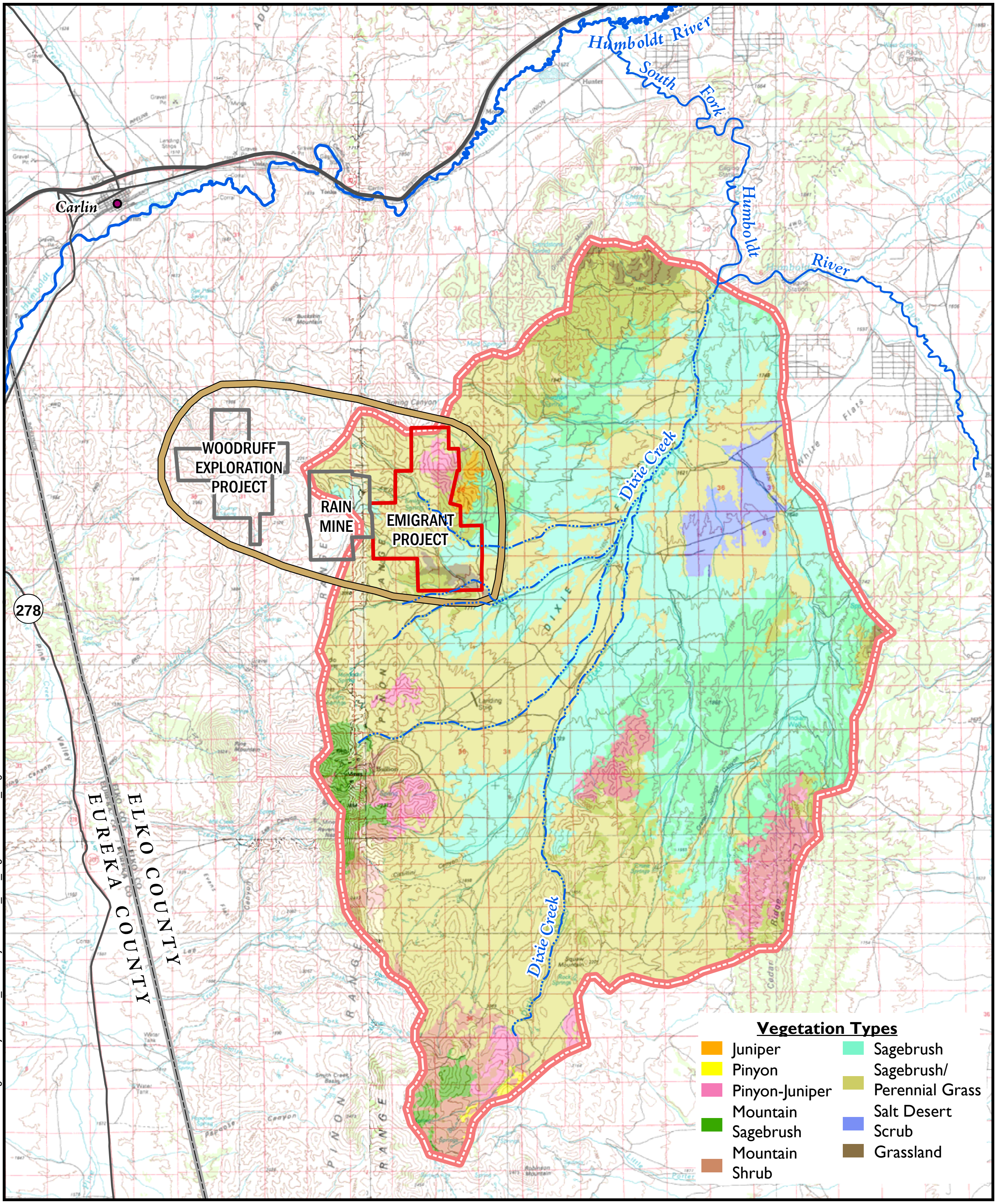
Cumulative effects on water resources can occur from mining and mineral development, grazing, wildfires, recreation, and other land development activities. Contribution of sediment from disturbed land to streams, and potential acid generation and/or release of trace metals from newly exposed rock could occur as a cumulative effect if conditions conducive to these phenomena are present in the Cumulative Effects Study Area.

Cumulative Effects Study Area

The Cumulative Effects Study Area (Study Area) for water quantity and quality encompasses surface water and groundwater in the Dixie Creek watershed portion of the Dixie Creek – Tenmile Creek Hydrographic Basin No. 48 as shown on **Figure 4-6**. The Study Area includes the proposed Emigrant Mine, a portion of the Rain Mine (waste rock pile adjacent to mine pit), and exploration activities at the Woodruff site located in the southern extent of the Carlin Trend. The proposed Emigrant Project lies entirely within Basin No. 48, with groundwater and surface water moving within this watershed from the Emigrant Project site.

Cumulative Effects

Future mine development in the Study Area could result in creation of open pits, waste rock disposal areas, heap leach pads, tailing storage facilities, and/or ore processing facilities. Potential impacts to groundwater and surface water quantity, including springs, are not predicted for the Emigrant Project, primarily due to depth to groundwater and the intermittent/ephemeral nature of surface water h:\13803 Newmont Emigrant Project\5000_GIS\Projects\Draft_EIS_Figs\cumulative_veg.mxd



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Cumulative Effects Study Area for Air, Water, Soil, and Upland Vegetation, Wetland/ Riparian Areas, Selected Wildlife, Access and Land Use, Visual, Native American Concerns

Cumulative Effects Study Area for Cultural Resources

U.S. Department of the Interior
Bureau of Land Management
Elko District Office
Elko, Nevada

Selected Resources
Cumulative Effects Study Area
Emigrant Project
Elko County, Nevada
FIGURE 4-6

flow in the area. As stated previously, current data are insufficient to predict potential effects that the Woodruff Exploration project would have on groundwater and surface water quantity because mine plans have not been submitted for this property.

Mine-related activities would affect topography, which in turn, may result in increased erosion and sedimentation. Total extent of mining-related activities in the future is not quantifiable as the price of gold and individual ore body characteristics dictate whether any particular ore body could be economically mined and how it would be mined. The Emigrant Mine would incrementally add to alteration of topography associated with the Rain Mine and other potential future mining and mineral development projects within the Study Area (*e.g.*, Woodruff Exploration Project).

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

Wildfires and flooding have resulted in impacts to some riparian areas of the Dixie Creek drainage. These conditions generally result in increased erosion and sedimentation to the nearby surface water drainages. However, livestock grazing (particularly during the hot season on an annual basis) represents the single most important factor affecting water quality in the Dixie Creek drainage. Surface water quality impairments are specified in Nevada's 303(d) List.

Impacts to water quality within the Study Area also occur as a result of agricultural use. Grazing along stream corridors can result in a loss of bank stability, erosion, and sedimentation. Impacts to water quality include increasing suspended solids and turbidity, increasing temperature, decreasing riparian vegetation, and a variety of other effects. Diversion of water for irrigation also potentially impacts water quality by increasing water temperature, as well as introducing a number of agricultural contaminants via return flow. There are insufficient data to quantify non-point sources of potential water quality impacts, but often are addressed in the state's Section 303(d) water quality impairment program, including restoration of disturbed areas.

Other non-mining land uses such as recreation and transportation also contribute cumulatively to water quality impacts. These activities can add to surface disturbance which increases potential of erosion and sedimentation to surface water resources.

Water quality improvements due to stream and habitat restoration efforts are documented in monitoring programs and reports for the Study Area. Improvements, fencing, and expansion of riparian/wetland areas in the Dixie Creek drainage has occurred. An exclosure also has been constructed around Emigrant Spring; however, lack of maintenance has allowed access by livestock. Development of healthy, well-developed riparian zones typically has the benefit of slowing water movement and dissipating erosive energy during periods of high flow. This condition results in capture of sediment, development of floodplains, and overall habitat improvement.

Potential release of trace metals and sediment from development of ore bodies in the Dixie Creek watershed could result in additive effects to surface water and groundwater quality in the drainage. Mine-related facilities include waste rock piles, leach pads, tailing impoundments, and process ponds. To date, a portion of one existing mine facility (reclaimed waste rock dump at the Rain Mine) could contribute trace metals to groundwater and/or surface water in the Dixie Creek drainage.

The Woodruff Exploration Project site is located outside of the Dixie Creek drainage and therefore is not expected to contribute effects to surface water resources in Dixie Creek. It is unknown whether any future development of the Woodruff Project would affect groundwater resources in Dixie Creek.

To date, with the exception of a waste rock disposal facility at the Rain Mine, none of the water monitoring stations in the Study Area has reported evidence of acid-rock drainage or elevated levels of metals. Conditions that create acid drainage typically are addressed through a combination of improved surface water control measures, and reclamation and re-contouring to maximize evapotranspiration and shedding of meteoric water.

The amount of unoxidized potentially acid generating waste rock at the Rain Mine (15%) is greater than what is expected for the Emigrant Mine (1%); and the amount of Devils Gate limestone waste rock at Rain (10%) is less than what is expected at Emigrant (32%). Overall mineralogical composition of the rock types at Rain Mine is similar to Emigrant, with the exception of higher barite content at Rain (Harris 2005).

Concentrations of total dissolved solids, sulfate, nitrate, and some metals may be elevated, at least in the short-term, for water that comes into contact with some mine pit walls. These water quality conditions can be quite variable, depending on local conditions, including rock type, mineral composition, exposure to weathering, amount of rock submerged below the water surface, presence of potentially acid-generating rock, chemical equilibrium conditions, and pit lake turn-over (if present). For the Study Area, inflowing groundwater and/or surface water to mine pits typically have sufficient alkalinity to maintain neutral pH conditions for the long-term (*i.e.*, high buffering capacity). These conditions would be verified through ongoing groundwater and surface water monitoring in the vicinity of each mine site.

In the Dixie Creek Valley, existing production wells (previously used as makeup water supply to the Rain Mine) would be used to supply water for the Emigrant Project. Pumping rates for these wells are described in Chapter 2 - *Proposed Action*. Impacts to groundwater rights associated with wells may occur where water levels decline such that water yield is reduced or a pump must be lowered to keep it in water. Surface water rights can also be affected where groundwater is interconnected with surface water. Makeup water pumping rates for the proposed Emigrant Project would not exceed the rate of pumping used to support the Rain Mine. There is insufficient data to predict the level of potential cumulative effects to water rights that could occur from potential development of the Woodruff project. Water rights are administered by the State Engineer.

SOIL RESOURCES

Information on soil resources in the Study Area is developed on a project specific basis through soil surveys. Surveys include various levels of intensity depending on whether a specific tract of land is to be disturbed by proposed mine development. Soil survey information is described in Plan of Operations submitted by mine applicants and includes the texture of the soil, depth or thickness, chemistry (including organic matter content), coarse fragment content, aerial extent of each soil type (map), and suitability rating of the soil for reclamation.

Cumulative Effects Study Area

The Cumulative Effects Study Area (Study Area) for soil resources encompasses the Dixie Creek watershed portion of the Dixie Creek – Tenmile Creek Hydrographic Basin No. 48. This Study Area is based on natural and manmade impacts to soil resources that result in soil movement or loss, soil fertility and productivity, and areas where additive effects of soil movement could impact other resources (*e.g.*, surface water). The Study Area for Soil Resources is shown on **Figure 4-6**.

Cumulative Effects

Soil resources are cumulatively impacted through disturbance and/or removal by mining, fire, agriculture, recreation, and a variety of other natural and man-caused activities within the Study Area. Cumulative effects to soil resources from past, present, and reasonably foreseeable future activities in the Study Area include reclamation activities at the Rain Mine, construction and development of the proposed Emigrant project, mineral exploration at the Woodruff site, wildfires, and continued livestock grazing.

Mining and livestock grazing are expected to continue as major activities in the Study Area. Impacts from these activities include loss of soil productivity due to changes in soil physical properties, soil fertility, soil movement in response to water and wind erosion, and loss of soil structure due to compaction.

In addition to mining and grazing activities in the Study Area, wildfires create impacts to soil. Burned areas with damaged or destroyed vegetation are susceptible to soil erosion by wind and water. Emergency and remedial seeding has taken place in order to minimize soil erosion and stabilize surfaces. An undetermined amount of soil has eroded into drainages and waterways as a result of fire. Movement of soil from burn areas is dependent on weather conditions, duration of exposure, and success of seeding efforts to re-establish vegetative cover.

Mine construction and development practices in the Study Area include salvage and stockpile of soil for use in reclamation. Topsoil stripping occurs immediately following clearing and grubbing of the surface area and therefore, the time period between exposure of bare mineral soil to wind and water erosion is minimized. Soil movement is most evident from stockpiles of soil prior to establishment of cover crops. Once cover crops are established, soil movement from the surface of stockpiles is minimized. Also, BMPs are used (including installation of berms at the toe of each stockpile) to collect soil that may move from the face of the stockpile. This soil is captured and is returned to the stockpile; resulting in minimal loss of soil.

Similarly, redistribution of soil during reclamation is a period of time where wind and water erosion can initiate soil movement. This time period is prior to establishment of vegetation on the reclaimed area. Standard practice in the mining industry is to use BMPs to control and minimize sediment movement until vegetation is established. Best management practices allow soil to be captured and returned to the reclaimed area minimizing soil loss.

Reclamation associated with past mining disturbance and future restoration activities would mitigate soil movement and productivity loss. Soil salvaged and used in reclamation would become viable and is expected to return to pre-mining productivity once vegetation is established. Seeding and revegetation of areas that have been burned will reduce soil movement and loss.

Data that quantify cumulative soil movement that result in soil loss in the Study Area from all land surfaces (mine areas, burn areas, grazing areas) are not available. As described above, soil movement in response to any of the land disturbing activities or natural phenomena (wildfire) are site specific, weather dependent, and subject to response to the timing and success of rehabilitation efforts.

UPLAND VEGETATION

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

Cumulative Effects Study Area

The Cumulative Effects Study Area (Study Area) for vegetation encompasses the Dixie Creek watershed portion of the Dixie Creek – Tenmile Creek Hydrographic Basin No. 48. (**Figure 4-6**). Impacts to vegetation (removal, wildfire, grazing) associated with land use activities in the Dixie Creek drainage could result in exposure of bare mineral soil which can be mobilized through water and wind erosion.

Cumulative Effects

Potential cumulative effects associated with loss or removal of vegetation within the Study Area is similar to those described for *Soil Resources* in this Chapter. The general effect in some areas of recent fires has been conversion of primarily sagebrush habitat to expanses of cheatgrass, which form a persistent, non-native, monoculture that dominates some burned areas. The continued establishment of cheatgrass will increase the likelihood of wildfire, and could change the fire regime, community composition, and structure of plant communities indefinitely. Locally and regionally, wildfires have reduced the density of shrubs and trees. Many of the woody species in the area are slow growing, requiring 15 to 20 years to re-establish.

Reseeding programs within the Study Area will improve vegetation structure and composition in burned areas and benefit wildlife by providing forage, cover, and nesting habitat. Large areas affected by fire may take years to re-establish native vegetation. Completed and planned sagebrush and forage planting in burned areas will benefit a diversity of wildlife species including mule deer, pronghorn, sage grouse, and pygmy rabbit by providing forage, cover, and breeding habitat.

Livestock grazing has and will continue to influence vegetation composition and structure throughout the Study Area. Potential for overgrazing may increase as land is converted to mining and transportation uses or temporarily lost to wildfire; however, adjustment of stocking rates to account for changes in land use ensures vegetation communities are not overgrazed. Within the Study Area, reductions in permitted grazing use has and will continue to occur as a result of mine development and wildfires; however, these impacts will be short term as subsequent reclamation of mined areas and restoration of burned sites will allow for stocking rates to return to near pre-mining/pre-burn levels.

Invasive, Non-native Species

Cumulative effects on invasive and non-native species result from wildfire, livestock use, and mining disturbance in the area. Disturbed sites and recently seeded areas are candidates for invasion by undesirable species such as noxious weeds and cheatgrass. Aggressive revegetation and weed control programs are being implemented to prevent establishment of weed infestations on reclaimed sites.

Special Status Plant Species

No plants listed as threatened or endangered under the Endangered Species Act of 1973 are known or have potential to occur in the Study Area (Cedar Creek Associates 1997). Habitat for nine sensitive plant species may be present in the Study Area. None of these species was documented in the Study Area during previous surveys (Cedar Creek Associates 1997; Westech 2004a). Based on the baseline information compiled to date, no cumulative effects on special status plants have been identified.

WETLAND AND RIPARIAN AREAS

The cumulative effects discussion for wetland and riparian areas focuses on sediment retention, habitat diversity for aquatic and terrestrial wildlife, and streambank stability.

Cumulative Effects Study Area

The Cumulative Effects Study Area (Study Area) for wetland and riparian resources encompasses the Dixie Creek watershed portion of the Dixie Creek – Tenmile Creek Hydrographic Basin No. 48 (**Figure 4-6**).

Cumulative Effects

Sediment resulting from livestock grazing, fires, roads, and other factors of surface disturbance would increase sediment discharge to surface water drainages. Past, present, and future mine development would also reduce vegetation cover in wetlands, riparian areas, and on uplands. Although approximately 12 miles of stream and riparian habitat along Dixie Creek have been improved through changes in livestock grazing practices (refer to the discussion under *Stabilization and Rehabilitation Programs* in this chapter), about 15 miles on private land remain in poor condition. Cumulatively, these factors degrade wetland and riparian areas, and lead to destabilization of streambanks. Restored areas along Dixie Creek, are characterized by highly functioning wetland and riparian communities that help reduce sediment load in the stream and amount of sediment reaching the South Fork Humboldt River.

Proposed sediment control actions that would be implemented at the onset of ground disturbance, including installation of surface water control structures, establishment of riparian vegetation in the engineered stream channel, and other BMPs, would reduce contribution of sediment from proposed mine development. These sediment control features would be maintained to ensure sediment loads from mine development would be minimized and not transported downstream to Dixie Creek and South Fork Humboldt River. Sediment control systems to be implemented at the Emigrant Project would also trap sediment from sources upstream of the proposed Emigrant Mine site; thus reducing the contribution from any existing sources upstream.

Historically, disturbances in wetland and riparian areas included fire and grazing and early mineral exploration and mining. These factors will continue to shape riparian communities in the Study Area. Riparian and wetland vegetation typically recover faster following fire than upland vegetation and therefore receives greater wildlife and livestock use while upland vegetation is recovering. Increased use in these areas can lead to overgrazing and introduction of invasive species.

Grazing will continue in the area despite changes in land use to mining operations. Local ranchers currently use springs for livestock watering. This has caused degradation of the riparian areas, which would be reduced if exclosures are constructed, allowing natural recovery of the enclosed areas.

FISHERIES AND AQUATIC RESOURCES

Numerous impacts have been identified that can concurrently affect fisheries and other aquatic resources and riparian/wetland habitats. A number of the cumulative impact discussions presented in the *Terrestrial Wildlife* and *Wetland/Riparian Areas* sections also impact fisheries and other aquatic resources. The reader is referred to those sections in this chapter.

Cumulative Effects Study Area

The Cumulative Effects Study Area (Study Area) for fisheries and aquatic resources encompasses the Dixie Creek watershed portion of the Dixie Creek – Tenmile Creek Hydrographic Basin No. 48 (**Figure 4-6**). The geographic representation of this Study Area is based on the potential impacts that could result from the Proposed Action including changes in water quantity and habitat due to water diversion and water quality due to soil movement. Potential increases in sediment load to tributaries of Dixie Creek and Dixie Creek represent the geographic area to be analyzed for the Proposed Action and other land uses or natural phenomena that could impact water quality and therefore fisheries and aquatic resources.

Cumulative Effects

Potential reduction or loss of available water and long-term effects to the riparian and aquatic community in drainages in the Study Area would result in a loss of breeding, foraging and cover habitats; increased species mortalities; a reduction in overall biological diversity; possible genetic isolation; and possible long-term impacts to population numbers of some species. Recovery of shallow groundwater and surface water sources would likely be gradual. Incremental habitat loss could affect fish and other aquatic resources. If reclamation and/or mitigation measures do not reproduce the pre-mine aquatic and riparian habitats, a net loss to the original aquatic resources would be expected. Depending on the post-mining reestablishment of shallow groundwater levels, surface water and aquatic habitats (*e.g.*, seeps and springs) and land use, it is also possible to provide a net gain to fish and aquatic resources.

Sedimentation from roads, livestock grazing issues, and wildfire would act cumulatively with the Proposed Action to reduce stream shading, increase water temperature, and increase sediment delivery to Dixie Creek, its tributary channels, and possibly South Fork Humboldt River during periods of stream flow. For most of these drainages, flow occurs only during snowmelt runoff and major rain events. Exceptions include South Fork Humboldt River and a five-mile restored portion of lower Dixie Creek. Grazing and trampling in the drainage downstream from the proposed Emigrant Project could result in decreased aquatic habitat throughout its reach to the confluence with Dixie Creek and points farther downstream. Planned construction of a fish barrier in lower Dixie Creek to prevent upstream movement of nonnative salmonids from the South Fork Humboldt River would act cumulatively with short- or long-term changes in the Emigrant drainage which could disrupt fish movement and further isolate native fish populations in the Dixie Creek drainage.

Changes in water quality (increased temperature and sedimentation) could affect the aquatic community in several ways. Although the majority of fish species (non-game and warm water species) have adapted to periods of high sedimentation and warm temperatures, high sediment levels and increased temperatures for long durations may cause some fish to avoid these areas. Most salmonids, as well as many other aquatic species, require habitat with little sediment. Suspended sediment can directly affect respiration of these species and an increase in embeddedness can reduce potential spawning habitat. Sediment increases can also negatively affect prey species (macroinvertebrates). Loss or reduction in populations of these prey-base species can be amplified through other species higher up the food chain.

TERRESTRIAL WILDLIFE

The cumulative effects discussion for wildlife emphasizes potential effects to mule deer and pronghorn antelope (important big-game animals) and special status species (*e.g.*, threatened, endangered, candidate, and sensitive species) for which reductions in important habitats (primarily sagebrush-grassland) have affected populations within the Study Area. Other terrestrial species associated with sagebrush-grasslands that occur within the Study Area include small mammals, passerine birds, waterfowl, and raptors, as well as amphibians, reptiles, and invertebrates.

Cumulative Effects Study Areas

Mule Deer

The Cumulative Effects Study Area (Study Area) for mule deer encompasses Big Game Management Units 062, 064, 065, 067, and 068 all within NDOW Wildlife Management Area 6 as depicted in **Figure 4-7**. The Study Area was determined by BLM and NDOW and includes a contiguous area that provides crucial seasonal habitat for mule deer, a species of concern because of habitat losses associated with wildfires and mining. The Study Area extends from the northern end of the Independence Range in the North to the southern extent of Hunting Area 065 lying south of the Humboldt River.

Pronghorn Antelope

The Study Area for antelope only includes Big Game Management Unit 065 which encompasses the proposed Emigrant Project (**Figure 4-8**). Antelope do not cross the interstate highway with the frequency that mule deer do; consequently, the habitat available in Unit 065 is representative of the geographic area that NDOW considers to be the area of cumulative impact.

Special-Status Species

Special-status species are identified as those listed or proposed for listing as threatened or endangered under the Endangered Species Act of 1973 (ESA), species that are candidates for listing under the ESA, species that are on BLM's list of Sensitive Species and State of Nevada Listed Species. Nevada BLM policy is to provide Nevada BLM Sensitive Species and State of Nevada Listed Species with the same level of protection as is provided for candidate species in BLM Manual 6840.06C.

The Study Area for most special-status species and other terrestrial wildlife includes the Dixie Creek watershed portion of the Dixie Creek – Tenmile Creek Hydrographic Basin No. 48 (**Figure 4-6**). The Study Area for sage grouse encompasses over 725,000 acres in the western portion of the South Fork Population Management Unit as shown on **Figure 4-9**.

Cumulative Effects

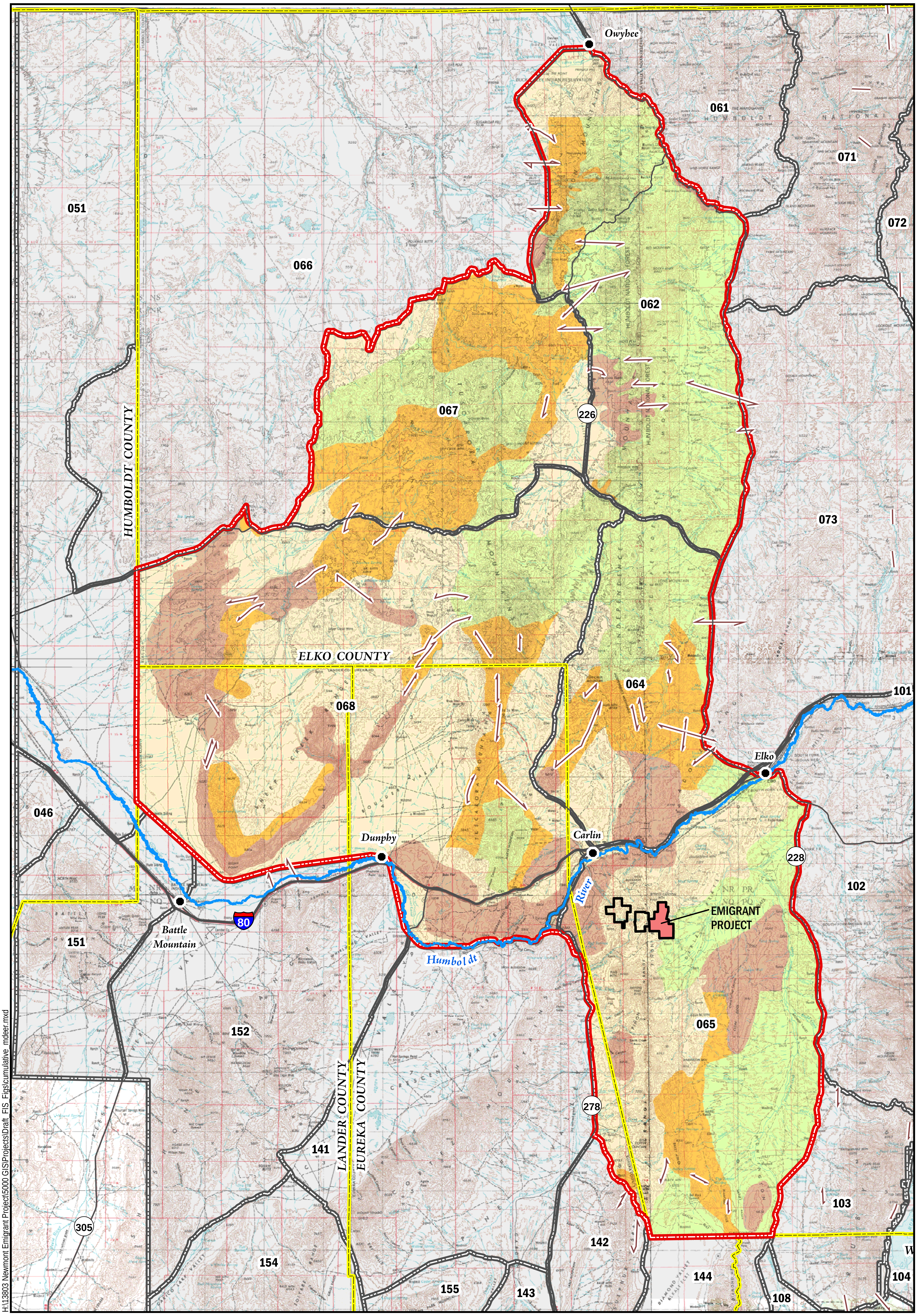
Wildlife habitat affected by wildfire, mining, urbanization, and areas reseeded are shown in **Table 4-4**. Cumulative effects of these mine projects include a loss of habitat associated with disturbance of mine facilities and reduction or loss of flow in springs and seeps. In regard to nesting, breeding and/or foraging habitats for wildlife species that establish territories on intact areas, most habitats are already at their respective carrying capacities and would not support any additional animals (BLM 2008b). Displaced individual or groups of animals would be lost from the population until habitat that provides seasonal use areas are rehabilitated, restored or mitigated, and allows population expansions in to affected areas. The remaining wildlife species that do not establish territories would be concentrated within smaller intact habitat areas; habitat would be lost on those areas that are not eventually rehabilitated, restored, or mitigated.

TABLE 4-4
Wildlife Habitat Affected by Fire, Mining and Areas Reseeded (acres)

Habitat Type	Habitat Available	Area Affected by Wildfire[1]	Area Included in Plan Boundaries [2]	Percent of Total (Wildfire/Mining)	Areas Reseeded
Mule Deer[3]					
Crucial Winter	386,589	267,057	1,097	69/0.3	108,190
Intermediate	544,078	295,200	11,030	54/2.0	112,155
Low Density Use	1,061,856	415,338	47,352	39/4.5	160,026
Summer	994,862	191,633	695	19.3/0.07	54,666
Subtotal	**2,987,385**	**1,169,228**	**60,174**	**39/2.0**	**435,037**
Pronghorn Antelope[4]					
All Year	323,076	142,955	8,110	44/2.5	64,820
Crucial Winter	14,494	1,884	-	13/-	853
Low Density Use	24,184	8,028	-	33/-	623
Summer	266,705	107,322	12	40/-	35,408
Subtotal	**628,459**	**260,189**	**8,122**	**41/1.3**	**101,704**
Sage Grouse[5]					
Nesting/Brood Rearing	518,256	167,654	4,808	23/0.6	78,403
Other	208,314	67,207	765	9.2/0.1	16,812
Subtotal	**726,570**	**234,861**	**5573**	**32.3/0.7**	**94,855**
Community Type	**Other Wildlife Species[6]**				
Sagebrush/grassland	**102,955**	**38,446**	**4,163**	**37/4.0**	**15,176**

[1] For period of 1999 through 2007; [2]Includes past, present, and reasonably foreseeable future mining activity; [3] As shown on **Figure 4-7;** [4] As shown on **Figure 4-8**; [5] As shown on **Figure 4-9;** [6] As shown on **Figure 4-6.**

Successful reclamation of all mine related disturbances in the Carlin Trend area would result in a mosaic that would differ from pre-mining conditions, including undisturbed pre-mining habitats and a variety of reclaimed habitats (BLM 1993). Reclamation of areas disturbed by the Proposed Action would result in rehabilitation of wildlife habitat. The degree to which reclamation would replace habitats affected by mining would depend on species composition and structure of post-mining habitats. Reclaimed habitats likely would have a higher density of grasses than pre-mining habitats. Reclaimed habitats for different sites would provide variable topography, combinations of native and introduced plants, younger age class of shrubs and patches of vegetation that were not present before mining but would be beneficial to wildlife.



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U.S. Department of the Interior
Bureau of Land Management
Elko District Office
Elko, Nevada

Cities

Humboldt River

Interstate Highway

Other Major Roads

Deer Migration Corridor

Cumulative Effects Study Area

NDOW Unit Boundaries

Mine Boundaries

Mule Deer Habitat

Summer

Intermediate

Crucial Winter

Low Density

Mule Deer Habitat
Cumulative Effects Study Area
Emigrant Project
Elko County, Nevada
FIGURE 4-7

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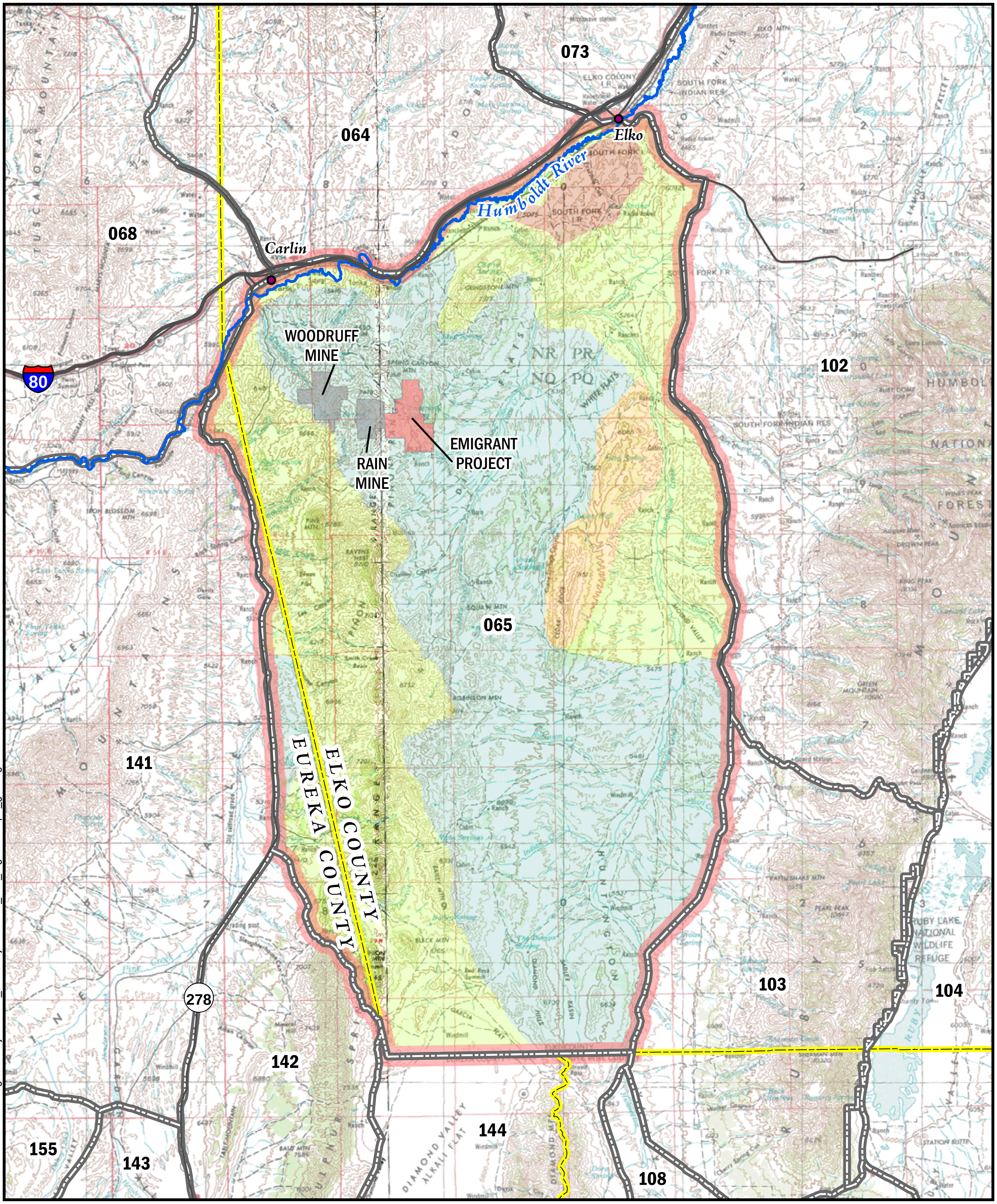

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NDOW Unit Boundaries

Cumulative Effects Study Area

Antelope Habitat

- All Year
- Crucial Winter
- Summer
- Low Density

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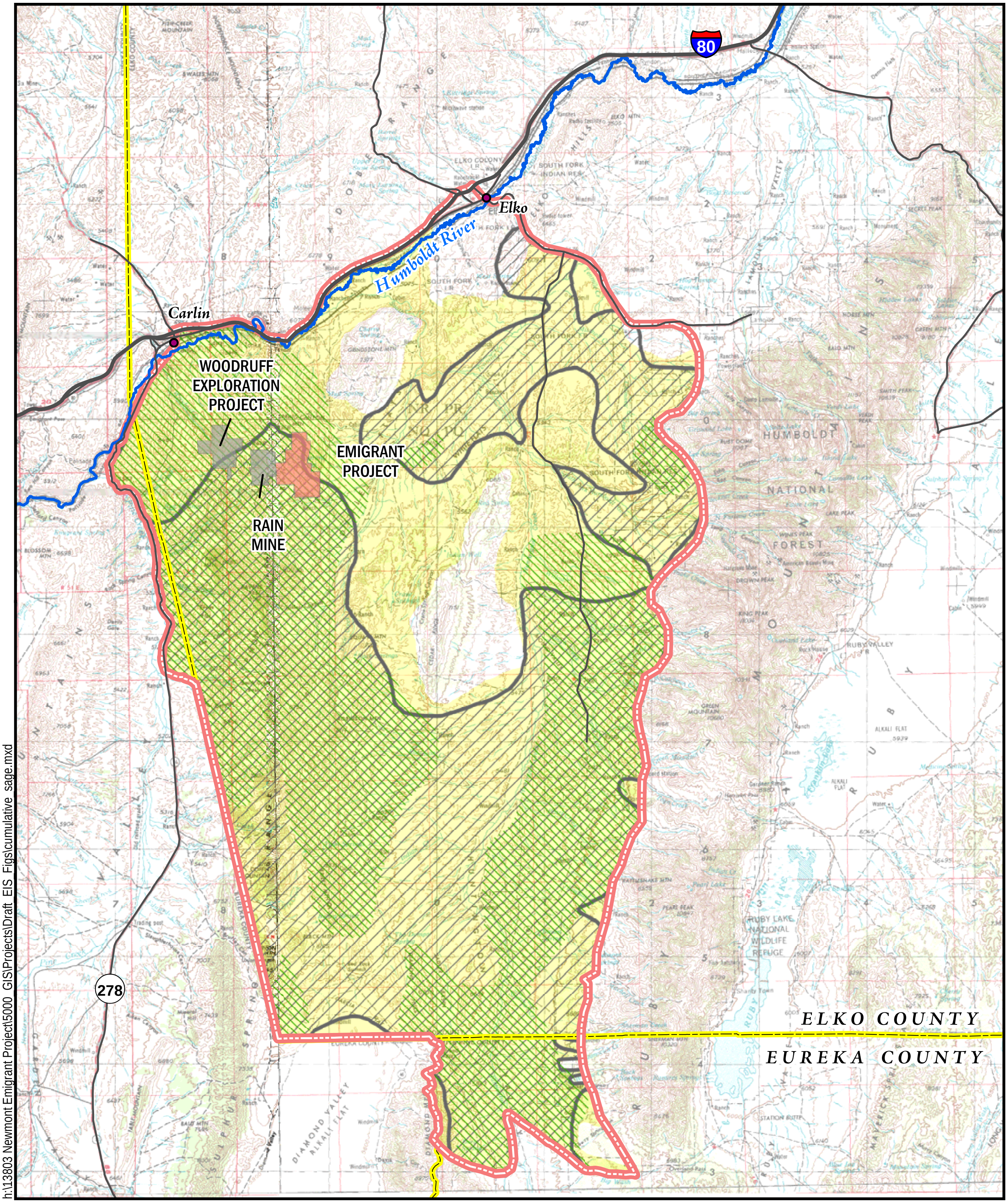
Elko District Office
Elko, Nevada

Pronghorn Antelope Habitat
Cumulative Effects Study Area
Emigrant Project
Elko County, Nevada
FIGURE 4-8



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Elko, Nevada

Sage Grouse Habitat

Cumulative Effects Study Area

Winter Habitat

Nesting and Early Brood Habitat

Late Summer Habitat

Sage Grouse Habitat
Cumulative Effects Study Area
Emigrant Project
Elko County, Nevada
FIGURE 4-9

Mule Deer

Many of the predictions for impacts associated with mining activities that were presented in previous EIS documents within the Carlin Trend (*e.g.*, BLM 2000, 2002a, 2002b) remain viable since final reclamation, existing/future dewatering activities, and other mitigation measures have not been completed. For example, continued, long-term cumulative dewatering impacts are currently uncertain for surface water, even though impacts to date have been minimal. Short-term mitigation measures have been successful in reducing impacts and resulting in improvements (*e.g*., riparian enhancements that improve associated wildlife habitat availability and stream stabilization/sediment reduction in some area streams), and continued improvements to ongoing and planned mitigation and monitoring programs will help to minimize long-term impacts.

Pronghorn Antelope

Big Game Management Unit 065 encompasses approximately 628,000 acres. Cumulative effects to antelope and associated habitat in this area have resulted primarily from past wildfires, mineral exploration and mining activities, ranching operations such as livestock grazing, drought and seeding of native range by introduced herbaceous species.

Habitat losses resulting from operations at the Rain Mine and proposed Emigrant Project would reduce capacity of the Study Area to support pronghorn and other species dependent on habitats that are difficult to re-establish through reclamation (*e.g.,* juniper, big sagebrush, and other shrubs). Quality of winter range for antelope is determined by the composition of sagebrush and other shrub species.

Sage Grouse

Cumulative effects to sage grouse and associated habitat have resulted primarily from past wildfires, ranching activities such as livestock grazing, drought, and seeding of native range with introduced herbaceous species (*e.g*., crested wheatgrass).

Over the past two years an estimated 76 sage grouse leks have been lost in northern Nevada due to fires. From 1999 through 2007, wildfires in the Study Area (Population Management Unit) area altered over 32 percent (about 235,000 acres) of sage grouse habitat, substantially reducing amounts of sagebrush and other species sensitive to effects of burning. About 168,000 acres (23 %) of areas burned within the Study Area during that period was important nesting and brood rearing habitat. The quality of sage grouse habitat is determined by the density and age of big sagebrush.

Data describing population trends for sage grouse in the Study Area are limited but show increases in the number of known and active leks from 2005 to 2006 (**Table 4-5**). Information from the Nevada Sage Grouse Conservation Project however, states that population estimates derived from lek counts conducted in 2007 show declines within the South Fork Population Management Unit, but no data are available to support this statement (NDOW 2008).

TABLE 4-5 Sage Grouse Population Trends South Fork Population Management Unit				
Year	Known Leks	Active Leks	Population Estimates	
			Low Estimate	High Estimate
2004[1]	-	-	2,288	2,745
2005[2]	46	23	4,324	5,189
2006[2]	57	35	6,507	7,809

Source: [1] Northeastern Nevada Stewardship Group, Inc. 2004; [2] NDOW 2008.

Other Special Status Wildlife Species

Pygmy Rabbit (Sensitive Species)

Pygmy rabbits are sagebrush obligates that prefer areas of relatively tall, dense sagebrush with deep soil suitable for excavating burrows. Sagebrush is the primary food of pygmy rabbits, but they also eat grasses and forbs depending on the seasonal availability. In Nevada, pygmy rabbits are generally found in sagebrush-dominated broad valley floors, stream banks, alluvial fans, and other areas with friable soil.

Preble's Shrew (Sensitive Species)

Preble's shrews occupy a diversity of habitats including wetland and marshy habitats with emergent vegetation and woody species. Mine dewatering could cause springs to dry or become smaller, which could reduce potential habitat for Preble's shrew. Widespread wildfires have altered and would continue to alter habitat for this species.

The following Sensitive Species are reliant on water sources for direct life support and/or prey base:

- Bald eagle;
- Preble's Shrew;
- Swainson's Hawk;
- White-faced Ibis and Black Tern;
- Ferruginous Hawk;
- Northern Goshawk;
- Burrowing Owl;
- Bats;
- Logger Head Shrike; and
- Nevada Viceroy.

Details regarding the type of habitats and prey base for these species are described in Chapter 3. Cumulative effects to these species are not anticipated as water sources in the Study Area would not be affected.

Other Terrestrial Wildlife

Habitat in the Dixie Creek watershed (Study Area) is dominated (90%) by sagebrush/grassland habitats. Wildfires in the watershed have altered 38,446 acres (34%) of wildlife habitat. These fires have resulted in loss or alteration of forage, foraging areas, and cover for wildlife. Wildlife in the area may be displaced, avoiding areas once inhabited due to the loss or alteration of forage and cover. In addition, starvation or other negative effects associated with the lack of forage and cover may occur, especially during winter months (BLM 2007b).

Mineral Exploration and Mining Activities

The expanded use of cyanide leaching operations could result in the potential for increased mortality of species such as birds and small mammals. Cumulative impact concerns with exposure to cyanide solutions would involve such events as regional impacts on migratory birds and other rare or uncommon species. However, impacts to wildlife are minimized through access control or rendering potential toxic materials harmless to wildlife. Over the years, NDOW and the mining industry have coordinated efforts to reduce direct mortality of wildlife at mine sites, especially losses resulting from cyanide or other types of chemical poisoning. The mine operators and NDOW have worked together since 1990 to implement a regulatory program to prevent wildlife mortality at heap leach ponds and mine tailings (*e.g.*, Industrial Artificial Pond permit program). Industrial Artificial Pond Permits required for facilities such as heap leach facilities required controls such as: a) fencing to preclude access by terrestrial wildlife; covering/containment for bodies of water containing a potentially lethal chemical in order to preclude access by birds and bats; and chemical neutralization or isolation of any chemical-laden fluids in a pond too large to cover or contain, in order to render the fluids non-lethal to wildlife.

Successful reclamation of mining related disturbances will result in a mosaic that would differ from pre-mining conditions, including undisturbed pre-mining habitats and a variety of reclaimed habitats (BLM 1993). The degree to which reclamation would replace habitats destroyed by mining would depend on species composition and structure of post-mining habitats. Reclaimed habitats likely would have a higher density of grasses than premining habitats. Reclaimed habitats for different sites will provide variable topography, combinations of native and introduced plants, younger age class of shrubs, and patches of vegetation that were not present before mining.

Some wildlife species may not regain their pre-mining distribution and density, while others (present in limited numbers and distribution before mining) may benefit from reclaimed habitat. However, successful mitigation measures and BLM/NDOW and private entity monitoring and mitigation activities in the region (*e.g.*, grazing allotment and wildlife enhancement projects), would minimize short- and long-term impacts. Depending on the post-mining land use, it is possible to provide a net gain to wildlife if reclamation is successful.

Livestock Grazing and Land Alterations

Impacts from livestock grazing, in combination with wildfire and vegetation conversion (crested wheatgrass seedings) have adversely affected wildlife habitat in the respective resource Study Areas. NDOW has focused its efforts on areas prioritized for wildlife values. Restorative efforts including seedings, weed treatments, greenstrips, reforestations and control of grazing in riparian areas have improved wildlife habitat (Burton and Lamp 2005).

Critical areas for wildlife have and are being reseeded using a variety of methods. Such land would be reseeded with forbs, grasses and shrubs that can compete with invasive grasses such as cheatgrass, which is prevalent in northern Nevada. Cheatgrass chokes out native vegetation, matures and dries out early in the summer, fuels wildfires and continues the cycle of habitat destruction.

Wildfires

Habitat in the Study Area is dominated (>80 percent) by sagebrush/grassland habitats (Burton and Lamp 2005). Wildfires have resulted in impacts to wildlife such as loss or alteration of forage, foraging areas and cover. Wildlife in the area may be displaced, avoiding areas once inhabited due to the loss or alteration of forage and cover. Migration routes may have shifted. In addition, starvation or other negative effects associated with the lack of vegetation for forage and cover may occur especially during the winter months (BLM 2007b).

Fires have negatively impacted sagebrush-associated species' habitat in the short to mid-term (5-15 years), due to loss of sagebrush canopy cover and vertical structure for nesting and cover. Diversity of forb and grass communities on cheatgrass dominated areas remains limited which also negatively impacts sagebrush obligates and associated species. Conversion of extensive areas of shrub steppe in the Study Area by fire to large expanses of burned area, dominated by exotic grass species, has reduced the prey base and nesting habitat for numerous sagebrush associated species. Seeding projects have reestablished forage for certain species; however, in some cases, reseeded areas have burned in later years after vegetation had become established.

RECREATION

Cumulative Effects Study Area

The Cumulative Effects Study Area (Study Area) for recreation covers the administrative area of the Elko District Office as shown on **Figure 3-12**. The administrative area of the Elko District Office encompasses communities where most of the population resides that use recreation facilities in the area.

Cumulative Effects

Dispersed recreation opportunities including off-highway vehicle use, hunting, hiking, and sightseeing in the vicinity of the Carlin Trend have been restricted since the early 1980s because of intensified mining and exploration activities in the Carlin Trend. Recent wildfires have further reduced the opportunity for recreation in northeast Nevada.

The gradual but continuous expansion of mining activities in the Carlin Trend would result in less area available for dispersed recreation activity during operation and after cessation of mining until reclamation is complete. Any increase in population associated with mine development would result in more demand for recreation on public land.

To date, recreational use of approximately 34,000 acres in the vicinity of the Carlin Trend has been restricted due to mine development. Reasonably foreseeable mine development from 2007 to 2020 in the Carlin Trend would affect approximately 4,000 additional acres. Public access to these areas would be restricted to maintain safety and security during mine operations. Upon reclamation and closure these areas would be available for dispersed recreational use.

The overall changes in cumulative impact to recreation and hunting from past, present, and reasonably foreseeable mining related activities is likely to remain minimal, in part because of access restrictions related to mining areas currently exist and unrestricted areas adjacent to the Carlin Trend area remain available for dispersed recreational use.

Employment associated with mine operations, construction activity, and general population growth associated with employment in the Elko area affects the usage of recreational facilities throughout the Study Area. Downturns in employment result in an out migration of workers which in turn reduces the amount of usage of these areas.

Wildfires have limited the desirability of approximately 2,000,000 acres for recreational uses such as hunting and other activities.

GRAZING MANAGEMENT

Cumulative Effects Study Area

The Cumulative Effects Study Area for grazing is shown on **Figure 4-10** and includes all grazing allotments authorized to Tomera Ranches, Stonehouse Division. The rationale for this area is that the direct impacts of the Proposed Action affects only the Emigrant Spring Allotment, which is authorized to Tomera Ranches and would cumulatively affect their grazing operation.

Cumulative Effects

Cumulative effects on grazing resources result from wildfire, livestock grazing, introduction of noxious weeds and past, present, and reasonably foreseeable future mining activity. Locally and regionally, wildfires have reduced the density of shrubs and trees (*i.e.*, sagebrush, juniper, and pinyon pine). Many of the woody species in the area are slow growing, in some cases requiring 15 to 20 years to reestablish.

Mine development in the Study Area has converted approximately 693 acres (Rain Mine) from livestock grazing in the Emigrant Spring Allotment to mining and related activities. Adjustment to the term grazing permit on the Emigrant Spring Allotment as a result of the Rain Mine Project has already been made. Reasonably foreseeable mine development in the Study Area between 2008 and 2025 would affect 3,466 acres representing 306 AUMs in the Emigrant Springs Grazing Allotment.

The loss of 306 AUMs to grazing as a result of the Emigrant Project adds incrementally to the regional loss in AUMs as land use shifts from grazing to mining. The reduction in land base for grazing is short term, lasting the life of the mine in most cases. Following reclamation, the majority of mine sites are made available for grazing. In addition, these site are often more productive than adjacent native sites as native cultivars are used for reclamation and competition is limited to only those few species in the seed mixture.

Reclamation of mine related disturbances in the Study Area will be incremental as various operations reach the end of active mining and begin closure activities. Approximately 172 acres would remain as an open pit at the Rain Mine. Approximately 4,000 acres would be reclaimed to provide livestock grazing.

From 1999 through 2007 about 15 percent (approximately 68,000 acres) encompassed by the 9 allotments comprising the Study Area have been affected by wildfire. Stocking rates and seasons of use are periodically reviewed and adjusted by BLM in response to the severity of burns in the various allotments affected. Restoration and reseeding efforts to mitigate losses from wildfire have had varying degrees of success. Some areas seeded during the first appropriate season following a fire (fall or winter) exhibited successful seedling establishment, while other areas became infested with cheatgrass (a non-native annual grass), re-burned within a year or two, or did not respond, possibly due to drought or other climatic conditions. Some areas had adequate native perennial grasses and did not require herbaceous reseeding following wildfires.

Other restoration projects have included fencing burned areas to allow vegetation to recover and adjusting stocking rates and seasonal use to reflect available forage in the various pastures within each effected allotment.

Conversion of native shrub and woodlands to non-native annual grasslands and introduced noxious weed communities as a result of wildfire or disturbance associated with mining decreases available forage for livestock, reducing AUMs. While the majority of mining disturbance is reclaimed with herbaceous species suitable for livestock grazing, and noxious weeds are controlled for the life of the mine, introduction of weed species and annual grasses could result in long-term range deterioration.

ACCESS AND LAND USE

Cumulative Effects Study Area

The Cumulative Effects Study Area (Study Area) for access and transportation includes Interstate 80, State Secondary Route 766, Union Pacific Railroad, and areas adjacent to past, present, and reasonably foreseeable mining operations. These are the primary transportation routes for goods and services in the Carlin Trend and areas where access may be affected by existing and future operations.

The Cumulative Effects Study Area evaluated for land use and access encompasses roads and public land access in and adjacent to the proposed Emigrant Project.

Cumulative Effects

Access

Foreseeable mine development would result in access restrictions in the vicinity of the Emigrant Mine. Other routes exist in this area that would allow public access to locations blocked by this proposed development.

Numerous two-track roads provide access throughout the Study Area to support livestock grazing operations and public access for recreational purposes. Future mining operations could preclude use of these routes.

Land Use

Reclamation of mining disturbances to post-mining land uses would eventually result in reestablishing land use and access similar to pre-mining levels.

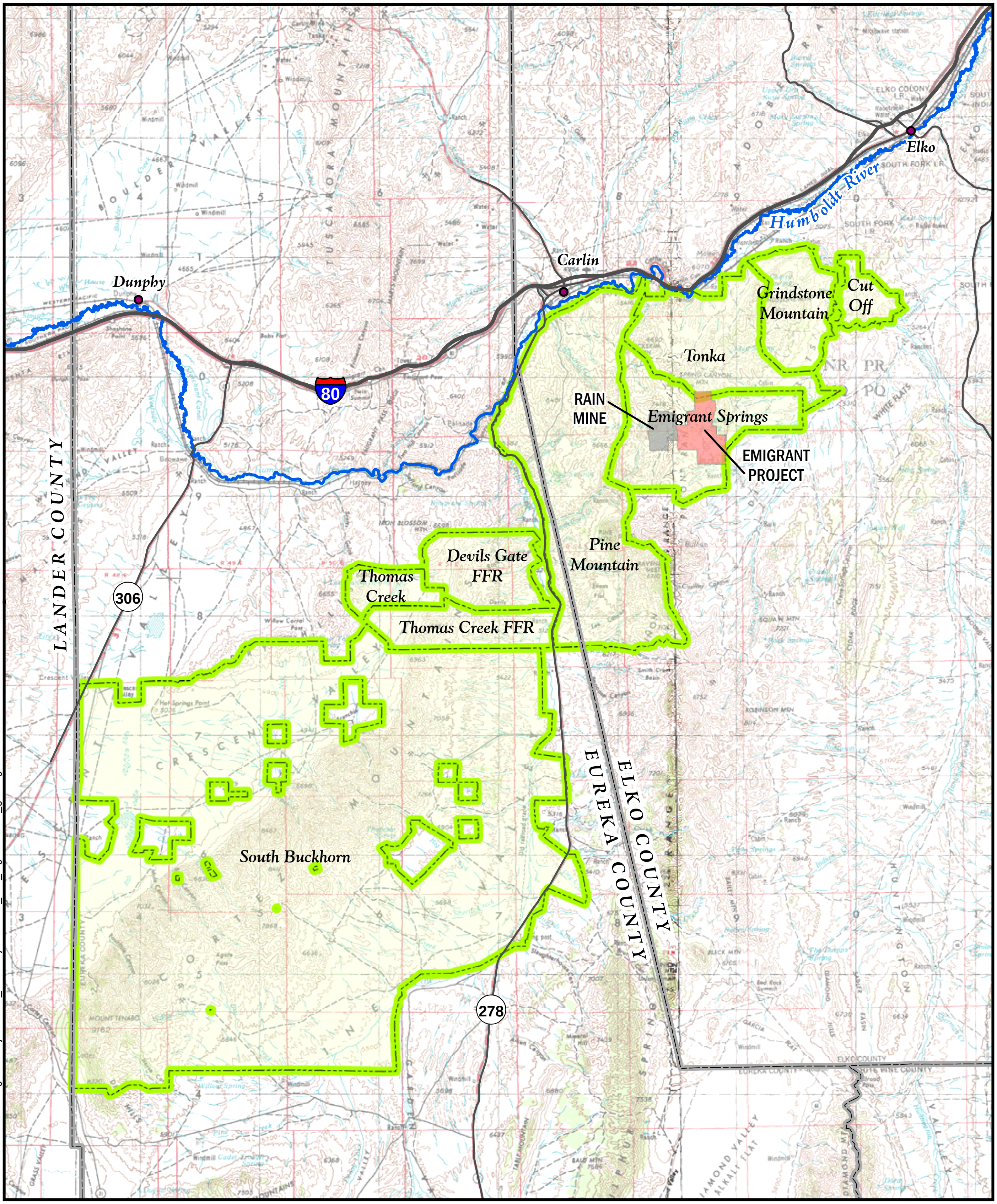
VISUAL RESOURCES

Cumulative Effects Study Area

The Cumulative Effects Study Area for visual quality incorporates existing and reasonably foreseeable mining activity through 2025.

Cumulative Effects

Reclamation measures are required and would occur on current and future mining activities in the Carlin Trend. However, major elements of certain mining facilities would remain, including local segments of pit highwalls and earth-fill structures (such as heap leach and waste rock disposal facilities). Although pits are proposed to be backfilled for the most part, and heap leach and waste rock piles recontoured, soiled and vegetated, visual contrasts in form, line, and color of soil and vegetation would remain in the post-mining landscape. VRM Class IV allows management activities that result in major modification to the character of the landscape. Impacts on visual resources from reasonably foreseeable mining activities can be minimized, but not eliminated, through reclamation measures. To continue to meet VRM Class IV objectives, all feasible measures should be taken to minimize visual impacts.



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Grazing Allotments

U.S. Department of the Interior
Bureau of Land Management
Elko District Office
Elko, Nevada

Cumulative Effects Study Area - Grazing Management
Emigrant Project
Elko County, Nevada
FIGURE 4-10

Topography of the Study Area would be modified as a result of mine excavation, waste rock disposal, and reclamation. The Emigrant Mine would incrementally add to the alteration of topography and removal of mineral resources within the Study Area. However, the unusually shallow, tabular, side-hill geometry of the Emigrant deposit affords the opportunity to backfill previously mined-out pits with waste rock from on-going operations. Backfilling and reclamation would restore site topography in the mine pit area to near pre-mining configuration.

Development of the Woodruff Project could modify the natural landscape with construction of waste rock dumps, leach piles, and mine pit excavations. Mine development plans have not been submitted for this project site.

CULTURAL RESOURCES

Cumulative Effects Study Area

The Cumulative Effects Study Area (Study Area) for cultural resources encompasses the proposed Emigrant Project permit area, Rain Mine site, and the Woodruff Project area (**Figure 4-6**). The Study Area is defined by the Area of Potential Affect and the areas that lie between each of these project boundaries. Rationale for this Study Area is based on differences in the intensity of prehistoric occupation north and south of the Humboldt River. The Emigrant study area south of the Humboldt River has less evidence of prehistoric occupation and use, therefore the Study Area encompasses the zone of the most intensive cultural surveys within this region.

Cumulative Effects

Compliance with Section 106 of the National Historic Preservation Act has minimized impacts to cultural resources in the Study Area as a result of mining disturbance. Cultural resource inventories are completed by professional archaeologists that meet requirements set forth by the Secretary of the Interior. Resource inventories are completed prior to any mining-related disturbance. Contractor's reports of surveys to BLM include recommendations of site eligibility and potential project effects to significant cultural resources.

These reports are on file at the BLM Elko District Office. BLM reviews the contractor recommendations when making final determinations of site eligibility and potential project effects. These survey reports, along with BLM's final determinations, are submitted to the Nevada State Historic Preservation Office (SHPO) for inclusion into the Statewide Inventory. Formal consultation with SHPO may or may not occur, based on guidelines set forth in the Programmatic Agreement between Nevada BLM and SHPO.

Avoidance of sites determined eligible for the National Register of Historic Places is the preferred mitigation measure when sites are located within proposed project areas. When possible, mining-related facilities are redesigned to avoid eligible sites or specific cultural resources; however, avoidance is not always possible. In such cases, excavation and/or additional recordation of eligible sites by archaeologists is undertaken to mitigate potential adverse effects. Archaeologists prepare mitigation plans including a scope of work and specific scientific issues to be addressed as a result of the excavation and/or recordation for submittal to BLM. Plans are approved by BLM in consultation with SHPO. Upon final approval by BLM, excavation and field work commence in accordance with the approved plan.

Analysis of artifacts recovered from site investigations are contained in reports to BLM, who then provides SHPO copies of the approved report for inclusion in the Statewide

Inventory. In some cases, sites initially avoided have been subsequently damaged during mining related activities. In such instances, mining companies cease operations in the area, inform appropriate BLM authorities, and develop a treatment plan for submittal to BLM and SHPO. Field and archival research completed for the site is compiled in a final report to BLM and SHPO.

Some loss to archaeological resources may occur due to mining related disturbance within the Study Area to sites determined not eligible for the National Register. All sites represent nonrenewable pieces of America's prehistoric or historic past. Recordation of these sites preserves a written record of their existence to be used by future researchers interested in understanding Nevada's past. Mitigation of cultural resources preserves a picture of the past through scientific archaeological research.

Cultural resources identified in the Study Area are shown in **Table 4-6**. A total of 195 sites have been identified in the Study Area., of which 18 were determined eligible for listing on the National Register. Three historic properties at the Emigrant Project were located within the proposed disturbance boundary for the heap leach facility and would have been impacted during construction of that facility. A data recovery plan was prepared and approved by BLM in consultation with the Nevada SHPO, and implemented in 2005. A total of eight historic properties remain within the proposed Emigrant permit boundary and would be avoided. One additional eligible site located within the Study Area was mitigated in 2001. Six other eligible sites are located in the Study Area within the Woodruff Creek permit boundary. Of the 18 historic properties located within the Study Area, four have been mitigated and 14 remain unmitigated and eligible for the National Register.

TABLE 4-6
Cultural Resources in Cumulative Effects Study Area

Project	Prehistoric		Historic		Total No. of Resources	Sites Eligible for NRHP
	Sites	Isolates	Sites	Isolates		
Rain Mine	11	34	-0-	2	47	None
Woodruff Creek Exploration	5	5	1	0	11	None (Surveys prior to 1996)
	19[1]	27	11[1]	6	58	6 (P-III Associates Survey 1997)
Emigrant Project	12	20	-0-	-0-	32	Recovery Plans developed and implemented for 4 sites within the Study Area.
	28	18	1	-0-	47	8 sites located outside proposed disturbance boundary but within permit boundary.
TOTAL	75	104	13	8	195	

NRHP = National Register of Historic Places
1 Contains 5 sites listed as both Prehistoric and Historic.
Source: Archaeological Research Services 1986, 1987; P-III Associates 1997, 2001, 2003, 2004; Varley 2005; Schmitt *et al.* 2005

Both historic and prehistoric properties have been recorded in the Study Area. Historic sites comprise about 8 percent of the total cultural resources identified and typically consist of scattered domestic trash dating to the early twentieth century. These scatters are likely associated with historic ranching and mining activities, and assigning such properties to a specific historic context or theme is difficult without the presence of diagnostic features or artifacts.

Prehistoric sites in the area are composed of lithic artifacts, primarily chipped stone debitage and tools, as well as ceramics. Few pieces of groundstone have been identified, and no surface features or fire-cracked rock were found during inventory surveys. Most heavily occupied prehistoric sites tend to be adjacent to perennial water sources such as streams and springs, while the smaller sites were located on saddles, ridges, valley edges, and valley interiors away from perennial water sources. Steep terrain and paucity of perennial water sources in the Study Area likely precluded long-term, residential occupation. Overall, prehistoric site density is much lower than areas along and north of the Humboldt River.

Cultural resource investigations conducted in the northern portion of the Piñon Range have provided valuable information on the settlement and subsistence activities of the Archaic, Late Prehistoric, and Proto-historic people of this area. This data base contains information on the spatial distribution and relationship of inferred site types to one another and to the upland landscape. The cultural resources recorded in the Study Area are important, and can be used to support regional archaeological research designs in future areal studies of the area.

Archaeological sites do not remain intact forever. The paleo-environmental record of Nevada exhibits evidence of natural erosive forces that eradicate previous traces of human presence. These erosive forces continue to the present day. As a result, recovery of scientific information from sites within the Study Area reveals knowledge that would otherwise be lost.

While some loss of archaeological values has occurred due to mining-related activities within the Study Area from a cumulative perspective, this loss has been minimal. Reasonably foreseeable future actions include potential impacts to the 14 eligible sites that remain within the Emigrant and Woodruff Creek permit boundaries. However, the recordation and mitigation processes that are in place mitigate direct and cumulative adverse effects which ultimately lead to increased information regarding Nevada's past cultural heritage.

NATIVE AMERICAN CONCERNS

Cumulative Effects Study Area

The Cumulative Effects Study Area (Study Area) for Native American Religious Concerns includes the Dixie Creek portion of the Dixie Creek-Tenmile Creek hydrographic basin no. 48 as shown on **Figure 4-6**. The rationale for the geographic area of cumulative effects is based on the importance of water sources to Newe/Western Shoshone traditionalists and land disturbance as it relates to loss of edible/medicinal plants, minerals, wildlife, potential loss of artifacts viewed as sacred objects and potential impacts to traditional/cultural/spiritual use sites and associated activities.

Cumulative Effects

Some Western Shoshone have expressed a concern that cumulative impacts may occur to their spiritual life and cosmology. The Proposed Action would potentially impact stream flow, vegetation patterns and wildlife distribution.

Such changes, individually and collectively, could impact the integrity of power spots, disrupt the flow of spiritual power (Puha), and cause the displacement of spirits (e.g., little men and water babies). Any such impact would limit the potential for Western Shoshone to participate in traditional religious activities.

Given that specific religious or traditional values, practices, human remains, or cultural items were not identified by the Western Shoshone in the project area, BLM has determined the potential for a cumulative impact to Native American traditional values is minimal.

SOCIAL AND ECONOMIC RESOURCES

Cumulative Effects Study Area

The Cumulative Effects Study Area (Study Area) for social and economic resources encompasses Elko, Eureka, Lander, and Humboldt counties (**Figure 4-11**). The rationale for selection of this Study Area is outlined below:

- Residential patterns of mining company employees determine where they are likely to spend their salaries. Employees of mining companies do not necessarily live in the closest community to their employment nor do they live in the local governmental unit which receives increased tax revenues as a result of the facility. According to Sonoran Institute (2007), commuting data suggest that:
    - Elko County is a bedroom community (income derived from people commuting out of the county exceeds the income from people commuting into the county.) The net difference represents 15.5 percent of total income in the county.
    - Lander County is a bedroom community (income derived from people commuting out of the county exceeds the income from people commuting into the county.) The net difference represents 8.2 percent of total income in the county.
    - Eureka County is an employment hub (income derived from people commuting into the county exceeds the income from people commuting out of the county.) The net difference represents approximately 600 percent of total income in the county.
    - Humboldt County is an employment hub (income derived from people commuting into the county exceeds the income from people commuting out of the county.) The net difference represents 5.6 percent of total income in the county.

- Availability of local shopping opportunities determines where people are likely to spend their disposal income in the four-county Study Area. The majority of shopping opportunities, including availability of medical, financial, and personal services, are located in Elko (Elko County) and Winnemucca (Humboldt County). Dollars from Carlin and Battle Mountain "bleed" out of Eureka and Lander counties to Winnemucca and Elko.

- Most communities within the four-county area have a distinct sense of being a "local community" while sharing basic values and beliefs. Towns in the Study Area are remote from the rest of the state, connected by Interstate 80.

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U.S. Department of the Interior
Bureau of Land Management
Elko District Office
Elko, Nevada

- Cities
- Humboldt River
- Interstate Highway
- Other Major Roads
- Cumulative Effects Study Area

Socioeconomic Resources
Cumulative Effects Study Area
Emigrant Project
Elko County, Nevada
FIGURE 4-11

Cumulative Effects

Characteristics of the socioeconomic environment that could have cumulative impacts from the remaining development associated with the Emigrant Project and other reasonably foreseeable projects in the area include population variations, availability of housing, public infrastructure and services, employment levels, and tax revenues. The *Past, Present, and Reasonably Foreseeable Future Activities* sections of this chapter describe land uses that affect socioeconomic resources.

Population Trends and Demographic Characteristic

The Cumulative Effects Study Area contains predominantly white communities, with Hispanic, Basque, and American Indian (mostly members of the Te-Moak Tribe of Western Shoshone) populations. Nevada is one of the fastest growing states in the U.S. (24.9% since 2000 Census). The two largest counties (Elko and Humboldt) have shown modest growth, while the two smallest counties (Lander and Eureka) lost population during the same period (**Table 4-7**). The towns of Elko (Elko County) and Winnemucca (Humboldt County) are well-developed and growing communities on either side of the Study Area, with smaller communities of Carlin and Battle Mountain in between Elko and Winnemucca.

TABLE 4-7
General Demographic Information

Characteristic	Elko County	Eureka County	Lander County	Humboldt County	State of Nevada
Total population (2006 estimate)	47,114	1,480	5,272	17,446	2,495,529
Percent Population change (April 1, 2000 to July 1, 2006)	4.0	-10.4	-9.0	8.3	24.9
Percent White, not Latino (2005)	70.9	83.2	77.5	73.2	60.0
Percent Latino (2005)	21.7	12.7	16.9	20.1	23.5
Percent Black (2005)	0.9	0.4	0.5	0.6	7.7
Percent American Indian and Alaska Native persons, percent, 2005	5.6	1.0	4.7	5.0	1.4

Source: U.S. Bureau of the Census 2007.

The number and variety of reasonably foreseeable projects planned in the Study Area would not likely result in additional workers moving into the area.

Transient workers are often involved in the construction of mines and related facilities. These workers are less likely to become part of the community through activities or socializing and they face a stigma for not being long time members of the community.

Prostitution is legal and regulated by the State in the Study Area. The Battle Mountain Social Impact Assessment (Newmont 2005c) reported that prostitution does not seem to have a significant impact on social cohesion as it was not identified during discussions in the Battle

Mountain community. Prostitution is impacted by the mining industry mainly through influx of contractors during construction phases of large-scale projects. These contractors are generally single men, or men who have left their families temporarily for work. These men tend to frequent local bars and gaming establishments.

Housing

Long-term housing impacts generated by development of the Emigrant Project combined with other reasonably foreseeable projects in the Study Area depend in large part on where people (construction and operational workers) choose to live. The majority of workers in the Study Area live in Elko and Humboldt counties and commute to work in Eureka and Lander counties. There is sufficient capacity in the Spring Creek Lamoille area to accommodate all housing needs which might arise from development of the Emigrant Project.

The Battle Mountain Social Impact Assessment (Newmont 2005c) indicates real estate markets and property values are determined by the quantity and perception of supply and demand. Perception in Battle Mountain in early 2005 was that the community was going through a boom and new, temporary, and permanent residents to the town required housing. The effect is often an increase in property values of existing structures and an added impetus for adding housing units. However, unrealistic speculation about home prices on the part of sellers and an overall trend of rising property values can price some people out, negatively affecting the availability and affordability of housing. In addition, previous experience throughout the Study Area is that property values dropped precipitously when mines have closed, with many owners choosing to abandon their properties and allow foreclosure given an inability to sell homes even at depreciated values (Newmont 2005c).

Public Infrastructure and Services

Rapid population growth and loss (boom/bust cycles) also place a burden on fire, police, and Emergency Medical Services response to public safety incidents. Government agencies throughout the Study Area struggle with recruiting and retaining qualified personnel as many are drawn by the comparatively high wages of the mines.

The influx/loss of school-aged children into local school districts is also a major concern for local planners. With a state mandate of class sizes of 16 in elementary and middle schools, the addition of several new students could necessitate hiring additional teachers. Funding for the school districts is awarded on "two-year hold harmless," which compensates districts for either their actual student population or the student population in either of the two previous years, whichever is higher. The Nevada legislature is currently considering legislation to revise it to a "one year hold harmless."

Employment

The economic multiplier from mining has been estimated to be 1.7, although there is support for a range of 1.5 to 1.9 in some literature (Harrington 2005). In addition to future mine development in the Carlin Trend, the new TS Power Plant near Dunphy, and rail terminals in Elko and Winnemucca, will provide additional employment. These private sector investments will result in substantial contributions to employment levels in the Study Area.

Cumulative impacts on employment and income in the Study Area are dependent on timing of job openings, because job losses may be offset or at least mitigated by new projects. However, there is no guarantee the closure of one project and the construction/operation of another project will be offset in sequence or in number of jobs and economic opportunities. If any of the existing projects were to close without one of the reasonably foreseeable projects coming online, communities in the Study Area would be impacted as some people would lose their jobs and incomes.

Goods and Services

Sustainable development begins with contractors and suppliers because they have the freedom to sell to others while maintaining a reliable contract with a known client. Although Newmont has proactively procured supplies and services from some local contractors (*e.g.*, 3D Concrete, through negotiation of Newmont's contractor insurance requirements) and has proactively incubated some regional businesses (*e.g.*, trucking contract with the Duckwater tribe, through flexible financing and payment arrangements), these success stories could be replicated by improving the transparency and consistency of Newmont's disclosure of procurement opportunities (Newmont 2005c).

Tax Revenues

In addition to employment taxes, net proceeds taxes paid by mineral development are a primary tax revenue source. Net proceeds taxes are generated for the state of Nevada in the county where the ore is mined, not the county where employees live. Companies pay property and sales taxes, and employees and supply chain contractors who reside locally generate tax revenue through their property and local purchases. For example, net proceeds are generated in Eureka County by the multitude of mining activities but the majority of employees live in Elko County. Net proceeds tax is a vital part of county revenue. Counties that have mining benefit, counties that house and provide services to miners must find the money to provide those services from other sources. Operation of the Emigrant Project would generate net proceeds taxes paid and spent in Elko County, which would lessen somewhat the current situation.

Mining activity (and resulting net proceeds tax revenues) has consistently increased in Eureka and Humboldt counties, and has fluctuated, but decreased in Elko and Lander counties between FY 1999 - 2006. This is common in the Study Area as older mines go into closure and new mines are developed. The fluctuation in revenue stream has led to uncertainty about revenues into county budgets and the ability to fund public projects (Newmont 2005c).

Elko County Economy

Within a county economy, there are numerous economic sectors performing different tasks. All sectors are dependent upon each other to some degree. A change in economic activity by one sector will impact either directly or indirectly and induced affect the activity and viability of other sectors in the economy. In order to show these interdependencies and interventions between economic sectors, a county-wide input–output model IMPLAN (Minnesota IMPLAN Group, Inc., 2006), was used to derive economic linkages for Elko County in 2004. Estimates of the economic, employment, and labor income impacts of the Hard Rock Mining Sector on the Elko County economy are shown in **Table 4-8.**

Economic benefits of extending mining operations in the Carlin Trend would help maintain the status quo of the Hard Rock Mining Sector influence on the economy of Elko County. Mineral resources however, are finite and at some point in the future mining operations will cease and employment numbers, labor income, and indirect benefits to the regional economy could be reduced.

TABLE 4-8 Economic, Employment, and Labor Income of the Hard Rock Mining Sector in the Elko County Economy, 2004			
Category of Impacts	**Direct Effects**	**Indirect and Induced Effects**	**Total Effects**
Economic	$365,006,000	$119,288,860	$484,294,860
Employment	1,003	983	1,986
Labor Income	$93,966,000	$36,053,020	$130,019,020

Source: Minnesota IMPLAN Group, Inc. "IMPLAN Pro Data for Elko County, 2004" Minnesota IMPLAN Group, Inc. Stillwater, Minnesota, 2006.

ENVIRONMENTAL JUSTICE

Cumulative Effects Study Area

The Cumulative Effects Study Area (Study Area) for environmental justice encompasses the area between Elko and Winnemucca on Interstate 80, including Elko (including the Elko Band Colony), Eureka, Lander (including the Battle Mountain Band), and Humboldt counties. Both bands are part of the Te-Moak Tribe of Western Shoshone Indians. These bands represent minority populations within the vicinity of the Carlin Trend.

Cumulative Effects

There would be no cumulative effects to environmental justice as a result of the Proposed Action.

Identification of Minority and Low Income Populations

Minority populations are persons of Hispanic or Latino origin of any race, Blacks or African Americans, American Indians or Alaska Natives, Asians, and Native Hawaiian and other Pacific Islanders. *Low-income populations* are persons living below the poverty level. In 2000, the poverty weighted average threshold for a family of four was $17,603 and $8,794 for an unrelated individual (U.S. Bureau of the Census 2002). Estimates of these two populations were then developed to determine if environmental justice populations exist in the Study Area.

The Council on Environmental Quality identifies these groups as environmental justice populations when either (1) the minority or low-income population of the affected area exceeds 50 percent or (2) the minority or low-income population percentage in the affected area is meaningfully greater than the minority population percentage in the general population or appropriate unit of geographical analysis. In order to be classified meaningfully greater, a formula describing the environmental justice threshold as being 10 percent above the State of Nevada rate is applied to local minority and low-income rates.

In 2006, the Study Area contained 71,312 persons, of which approximately 19,821 (28%) were minorities and approximately 6,443 (9%) were living below the poverty level. Minority and low-income populations were consistently lower in each of the counties in the Study Area than for the State of Nevada (**Table 4-9**). The Elko Band Colony in Elko County and the Battle Mountain Band of the Te-Moak Western Shoshone tribe in Lander County meet the description of environmental justice populations, both because of minority and poverty status (**Table 4-9**). For each Band the percent of minority persons and the percent of people below the poverty level are more than 10 percent above the State of Nevada rate.

Cumulative impacts due to construction and operation of reasonably foreseeable mine projects, combined with past and present activities in the Carlin Trend to these tribes, were evaluated and described in the *Native American Religious Concerns* section of this chapter.

TABLE 4-9
Minority and Low-Income Populations - 2000

Location	Total Population	Percent Minority	Percent Below Poverty (1999)
Elko County[1]	47,114	29.1	8.7
Elko Band Colony [2]	*730*	*86%*	*23.0*
Eureka County[1]	1,480	16.8	9.0
Lander County[1]	17,446	26.8	9.8
Battle Mountain Band [2]	*124*	*90.0*	*28%*
Humboldt County[1]	5,272	22.5	9.5
State of Nevada[1]	2,495,529	40.0	11.1

Source: [1] U.S. Bureau of the Census 2007; [2] Sonoran Institute 2007.

CHAPTER 5
CONSULTATION, COORDINATION, AND PREPARATION

PUBLIC PARTICIPATION

Public participation specific to the Emigrant Project (Project) is summarized in this chapter. The summary indicates how the public has been involved, identifies persons and organizations to be contacted for feedback, and specifies time frames for accomplishing goals in accordance with 40 CFR 1506.6.

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

Public participation in the EIS process is required by NEPA at four specific points: the scoping period, review of Draft EIS, review of Final EIS, and receipt of the Records of Decision.

1. **Scoping:** The public was provided a 30-day scoping period to disclose potential issues and concerns associated with the Proposed Action. Information obtained by the agencies during public scoping and comments received on the 2005 Emigrant Project Draft EIS were combined with issues identified by the agencies to form the scope of this EIS.

2. **Draft EIS Review:** A 45-day Draft EIS review period is initiated by publication of the Notice of Availability for the Draft EIS in the Federal Register. A public hearing will be held in Elko, Nevada during the 45-day comment period.

3. **Final EIS Review:** A 30-day Final EIS review period is initiated by publication of the Notice of Availability for the Final EIS in the Federal Register.

4. **Record of Decision:** Subsequent to the 30-day review period for the Final EIS, a Record of Decision would be prepared.

TRIBAL COMMUNICATION AND COORDINATION

Communication and coordination with local tribes is addressed in the *Native American Concerns* section of Chapter 3.

IMPLEMENTATION

The public participation process for the Emigrant Project EIS is comprised of the following five components:

SCOPING

To allow an early and open process for determining the scope of issues and concerns related to the Proposed Action (40 CFR 1510.7), a public scoping period was provided by BLM. A Notice of Intent to prepare the EIS was published in the Federal Register (Volume 69, Number 101 ppg. 29744-29745) on May 25, 2004, (NV-910-04-1990-EX). Publication of this notice in the Federal Register initiated a 30-day public scoping period for the Proposed Action that ended on July 7, 2004.

BLM mailed a scoping package that included a project summary and maps to individuals and organizations listed on the Elko Field Office mailing list. In addition, the scoping package was distributed at public scoping meetings. The Plan of Operations was provided on request.

Concurrent with these actions, BLM issued a news release to radio stations and news organizations with coverage in the surrounding geographical regions in Nevada, Idaho, and Utah.

A public scoping meeting was held by BLM in Elko on June 16, 2004. Separate meetings were held for the Elko and Eureka County Commissioners. Thirty-two members of the public attended, of which six submitted written comments on the Project. Written responses were received from nine individuals during the public scoping period. Six comment letters were received on the 2005 Emigrant Project Draft EIS.

DISTRIBUTION OF THE DRAFT EIS

This Draft EIS was distributed as follows:

- A Notice of Availability of the Emigrant Mine Project Draft EIS appeared in the Federal Register on November 21, 2008.

- A news release provided to all area media by BLM at the beginning of the 45-day comment period on the Draft EIS.

- The Draft EIS was distributed to interested parties identified in an updated EIS mailing list and the Draft EIS was posted on the BLM Elko Field Office website.

DISTRIBUTION OF FINAL EIS

The Final EIS will be distributed as follows:

- Notice of Availability will be published in the Federal Register;

- Copies of the Final EIS or Abbreviated Final EIS will be sent to addresses on the mailing list.

- The Final EIS will be posted on the BLM Elko Field Office website.

- A news release issued to the same news outlets used for previous Project announcements.

RECORD OF DECISION

A Record of Decision will be distributed by BLM to individuals and organizations identified on the updated Project mailing list. A news release will be provided to the news media. A notice of availability (NOA) will be published in the Federal Register.

CRITERIA AND METHODS BY WHICH PUBLIC INPUT IS EVALUATED

Letters and oral comments received by BLM on the Draft EIS will be reviewed and evaluated by the agency to determine if information provided in the comments would require a formal response or contains new data that may identify deficiencies in the EIS. Steps will then be initiated to correct such deficiencies and to incorporate information into the Final EIS.

CONSULTATION WITH OTHERS

In addition to the cooperating agencies identified in Chapter 1, the following state and federal agencies and other entities were consulted during preparation of the EIS:

- Nevada Department of Conservation and Natural Resources
- Nevada Department of Human Resources
- U.S. Environmental Protection Agency
- U.S. Fish and Wildlife Service
- Tomera Ranches
- Te-Moak Tribe Environmental Department

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MAILING LIST
EMIGRANT PROJECT

This document was mailed to approximately 100 agencies and individuals.

CHAPTER 6
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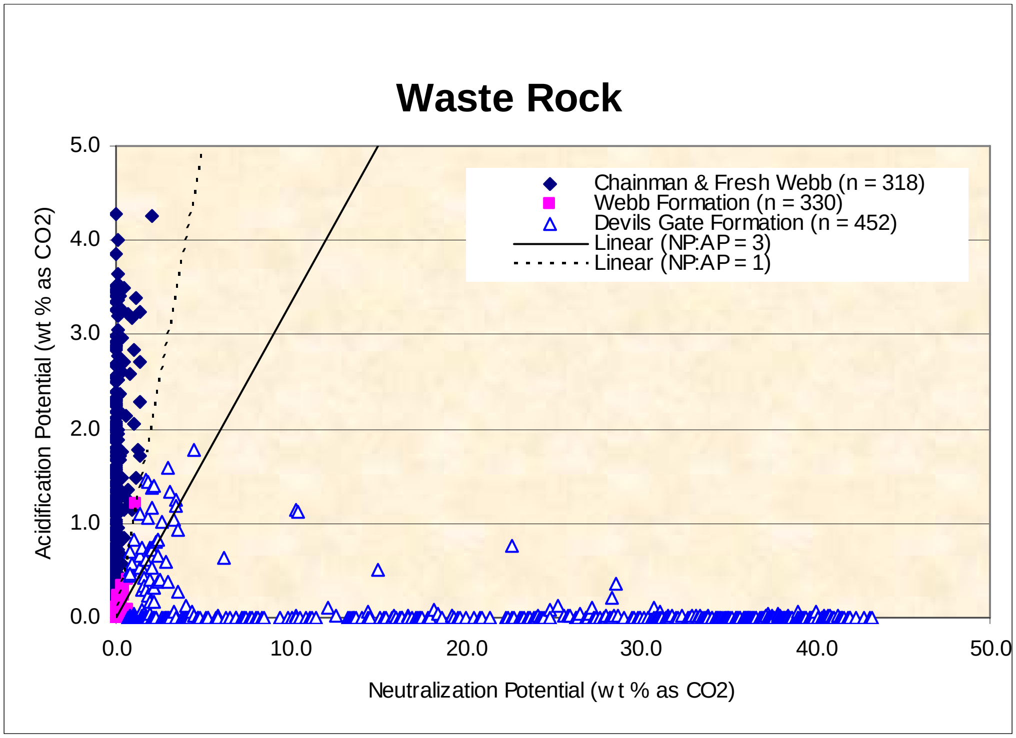
APPENDIX A

ENVIRONMENTAL GEOCHEMISTRY DATA



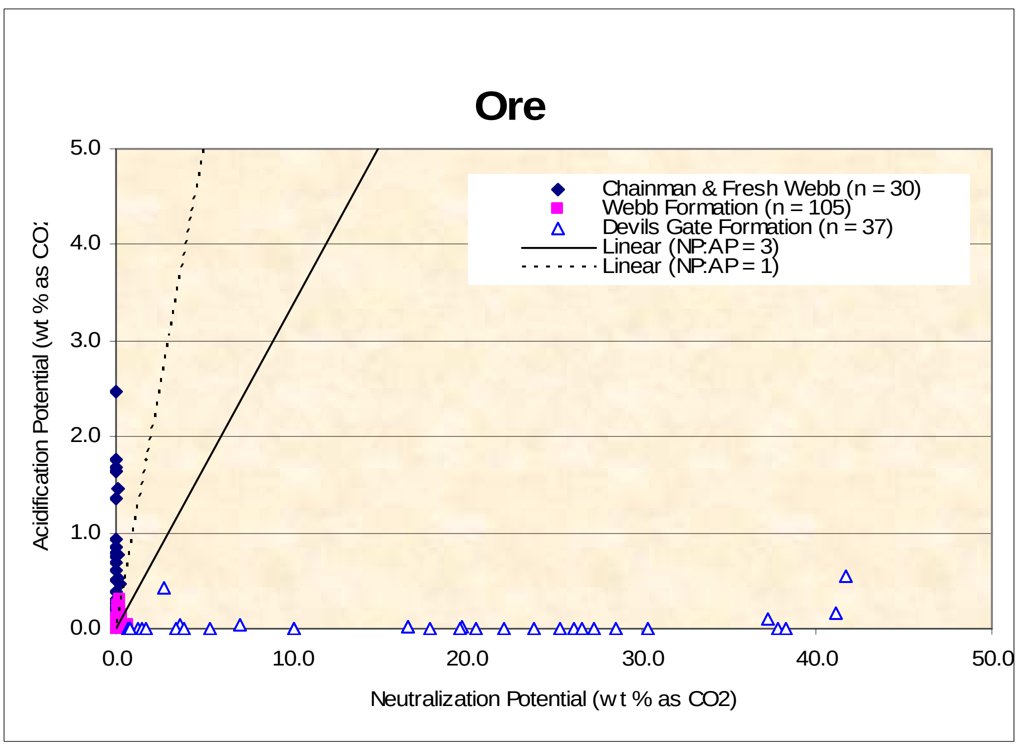


FIGURE A-1 Neutralization Potential (NP) and Acidification Potential (AP) Data for Waste Rock and Ore Samples, Emigrant Project

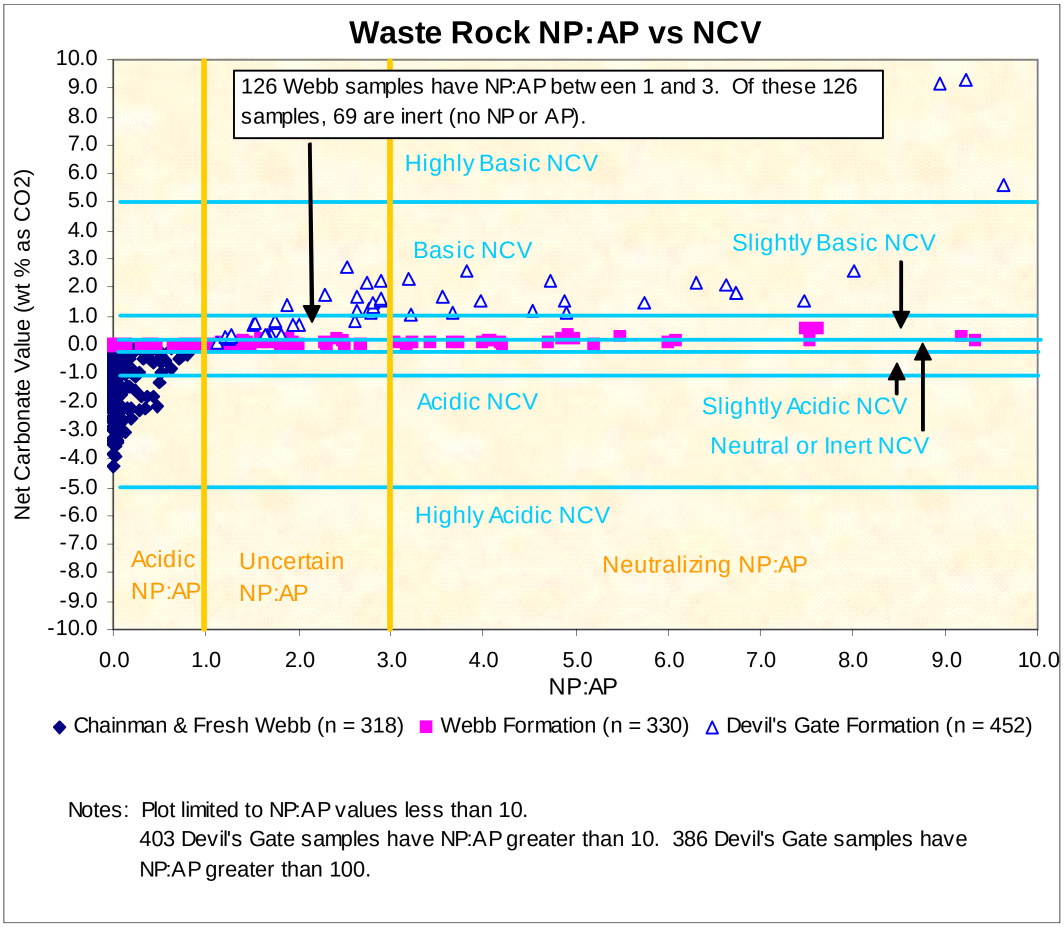


FIGURE A-2 Comparison of Waste Rock Neutralization Potential (NP) and Acidification Potential (AP) to Net Carbonate Value (NCV), Emigrant Project

APPENDIX B

WATER QUANTITY AND QUALITY DATA

TABLE B-1
Flow Measurements for Dixie Creek and Tributary Downstream of Emigrant Project Area

Station ID	Legal Location	Date	Time (hour)	Flow (ft^3/sec)
		10-12-06	1205	Dry
		11-7-06	1139	Dry
		3-19-07	1134	1.77
		4-26-07	1226	0.38
EMI-D3 (combined north & south tributaries)	T32N R54E Sec.34, NWSE	3-16-04	1320	6.91
		3-24-04	1700	7.56
DC-5 (Dixie Creek ½-mile above confluence with Project area tributaries)	T31N R54E Sec. 3, SENW	7-1-05	1045	1.14
		8-1-05	1135	0.03
		9-2-05	1137	0.03
		10-4-05	1142	0.03
		11-2-05	1237	0.04
		6-2-06	1130	7.32
		7-24-06	1126	0.14
		8-10-06	1250	0.04
		9-12-06	1242	0.02
		10-12-06	1240	0.03
		11-7-06	1207	0.04
		3-09-07	1241	3.37
		4-26-07	1307	5.46
		5-16-07	1308	2.22
Dixie Creek (lower segment; ½-mile above DC-6)	T32N R54E Sec.26, NESW	5-10-82	NR	30
		7-14-82	NR	1.7
		9-13-82	NR	1.3
		6-21-83	NR	37
		9-26-83	NR	1.5
		4-24-84	1100	45
		6-26-84	NR	22
		8-19-85	NR	2
		5-20-03	1000	15.94
		7-21-03	NR	0.34
		9-11-03	1030	0.44
		3-8-04	1306	2.85
		3-16-04	1146	33.59
		3-23-04	1000	42.13
		3-24-04	1000	38.43
		4-13-04	1930	15.45

Source: BLM 2004a; Siebert and Kiracofe 1988; Newmont 2007a.

Note: See **Figure 3-4** for station locations. ft^3/sec = cubic feet per second; T = Township; R = Range; Sec. = Section; N = north; S = south; E = east; W = west. NR = not recorded.

TABLE B-2
Water Quality Criteria and Standards for Nevada

Parameter (mg/L unless otherwise specified)	NDEP Profile I	Nevada Municipal or Domestic Supply	Nevada Aquatic Life[1]		Nevada Agriculture		Wildlife Propagation
			1-Hour Av. or Propagation	96-Hour Av. or Put & Take	Irrigation	Stock Water	
Metals							
Aluminum	0.05 – 0.2	---	---	---	---	---	---
Antimony	0.146	0.146	---	---	---	---	---
Arsenic	0.05	0.05	0.342 As(III)	0.18 As(III)	0.1	0.2	---
Barium	2.0	2.0	---	---	---	---	---
Beryllium	0.004	0	---	---	0.1	---	---
Boron	---	---	---	---	0.75	5.0	---
Cadmium	0.005	0.005	0.0053 [2]	0.0013 [2]	0.01	0.05	---
Chromium	0.1	0.1	0.015 Cr(VI)	0.010 Cr(VI)	0.1	1.0	---
Copper	1.3	---	0.0221 [2]	0.0142 [2]	0.2	0.5	---
Iron	0.3 – 0.6	---	1.0	1.0	5.0	---	---
Lead	0.015	0.05	0.0684 [2]	0.0013 [2]	5.0	0.1	---
Manganese	0.05 – 0.10	---	---	---	0.2	---	---
Mercury	0.002	0.002	0.002	0.000012	---	0.01	---
Nickel	0.1	0.0134	1.699 [2]	0.189 [2]	0.2	---	---
Selenium	0.05	0.05	0.02	0.005	0.02	0.05	---
Silver	0.1	---	0.0069 [2]	0.0069 [2]	---	---	---
Thallium	0.002	0.013	---	---	---	---	---
Zinc	5.0	---	0.140 [2]	0.127 [2]	2.0	25	---
General Parameters, Common Ions, & Nutrients							
Cyanide (WAD)	0.2	---	---	---	---	---	---
Alkalinity	---	---	<25% change	---	---	30 – 130	---
Chloride	250 - 400	250	---	---	---	1,500	1,500
Color (PCU)	---	75	---	---	---	---	---
Dissolved Oxygen	---	Aerobic	5.0	5.0	---	Aerobic	Aerobic
Fluoride	2.0 – 4.0	---	---	---	1.0	2.0	---
Nitrate as N	10	10	90(w)	90(w)	---	100	100
pH (su)	6.5 – 8.5	5.0 – 9.0	6.5 – 9.0	6.5 – 9.0	4.5 – 9.0	5.0 – 9.0	7.0 – 9.2
Sulfate	250 - 500	250	---	---	---	---	---
TDS	500 - 1000	500	---	---	---	3,000	---
TSS	---	---	25 – 80	25 – 80	---	---	---
Turbidity (NTU)	1.0						

mg/L = milligrams per liter; PCU = photoelectric color units; su = standard pH units; NTU = nephelometric turbidity units; TDS = total dissolved solids; TSS = total suspended solids; WAD = weak acid dissociable. Standards for metals are expressed as total recoverable, except those metals that are hardness-dependent where the standard applies to the dissolved fraction (see note #2 below).

[1](w) = warm water; (c) = cold water; no letter designation indicates criteria are common to both warm and cold water.

[2] Parameter dependent on hardness; see NAC 445A.144 for equations to determine concentration; values in this table calculated assuming a hardness of 150 mg/L as CaCO3. Example: cadmium 1-hour average = 0.85 exp {1.128 in (hardness) – 3.828} = 0.85 exp {1.824} = 0.85 (6.2) = 5.3 μg/L = 0.0053 mg/L.

Source: Nevada Administrative Code (NAC) 445A.144 & 199; 40 CFR Parts 141 & 143.

TABLE B-3 Water Quality Standards for Class B Streams in Nevada	
Item	**Class B Specification**
Floating Solids or Sludge Deposits	Amounts attributable to man's activities that will make the waters unsuitable as a drinking water source, injurious to fish or wildlife, or impair the waters for any beneficial use of this class.
Odor-Producing Substances	Amounts that will impair the palatability of drinking water or fish or have a deleterious effect on fish or wildlife or any beneficial uses of this class.
Sewage, Industrial Wastes, or Other Wastes	None that are not effectively treated to the satisfaction of the NDCNR
Toxic Materials, Oil, Deleterious Substances, Colored or Other Wastes	Such amounts that will render the receiving water injurious to fish or wildlife, or impair the receiving waters for beneficial uses established for this class.
Settleable Solids	See Floating Solids or Sludge Deposits
pH	Range between 6.5 and 8.5
Dissolved Oxygen	For trout water, not less than 6.0 mg/L; for nontrout water, not less than 5.0 mg/L
Temperature	Must not exceed 20° C for trout water or 24° C for nontrout water; allowable temperature increase above natural receiving water temperatures: None
Total Phosphates	Must not exceed 0.3 mg/L
Total Dissolved Solids	Must not exceed 500 mg/L or one-third above that characteristic of natural conditions (whichever is less)

Source: Nevada Administrative Code 445A.124-205.
Note: NDCNR = Nevada Department of Conservation and Natural Resources.

TABLE B-4 Water Quality Data for Lower Dixie Creek and Tributaries in Emigrant Project Area (2003-2007)									
Station No.	Date	Water Temp (˚C)	pH (su)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	Total Suspended Solids (mg/L)	Electrical Conductivity (µS/cm)	Sulfate (mg/L)	Flow Rate (ft^3/sec)
Federal Drinking Water Standard (Secondary)			6.5–8.5	None	None	None	None	250	None
EMI-D1 (north tributary near Dixie Creek)	3-8-04	7.8	7.83	---	>1000	>807	290	14	1.376
	3-16-04	13.3	8.19	---	779	547	186	---	10.874
	3-23-04	17.8	8.22	---	---	>807	172	---	12.656
	3-24-04	13.3	8.24	---	183	153	186	---	7.159
	3-31-04	17.2	8.91	---	58	60	189	---	2.633
	4-13-04	15.6	9.12	---	28	23	202	---	1.372
EMI-DI-A (south fork north tributary near upstream boundary of Project area)	6-6-05	18.1	9.15	9.10	---	---	584	144	---
	7-1-05	17.9	8.3	7.37	---	---	684	144	---
	8-1-05	24.3	8.43	8.54	---	---	686	130	---
	11-2-05	7.8	8.8	6.15	---	---	895	222	---
	5-12-06	16.8	7.75	13.15	---	---	612	170	---
	8-10-06	25.3	8.28	4.45	---	---	1045	297	---
	10-12-06	11.7	8.55	10.9	---	---	1032	310	---
	3-19-07	10.5	8.48	12.29	---	---	564	148	---
	4-26-07	15.6	8.89	11.58	---	---	591	164	---
EMI-DI-B (north fork north tributary near upstream boundary of Project area)	9-2-05	17.5	7.96	7.43	---	---	276	23	---
	11-2-05	8.9	7.97	11.5	---	---	299	32	---
	5-12-06	14.3	7.42	9.99	---	---	146.8	10	---
	8-10-06	23.2	7.94	4.87	---	---	288	27	---
	10-12-06	12.5	8.18	11.46	---	---	287	37	---
	3-19-07	9.1	8.16	11.4	---	---	164.1	22	---
	4-26-07	12.7	7.78	10.48	---	---	164.9	21	---
EMI-D1-C (north tributary below Project Area)	3-31-04	16.7	9.06	---	39	40	182	---	---
EMI-D2 (south tributary)	3-16-04	17.8	8.40	---	>1000	>807	285	---	4.066
	3-24-04	18.9	8.64	---	212	205	401	---	0.26
	6-6-05	17.0	8.48	10.11	---	---	347	53	---
	5-12-06	18.6	9.04	9.2	---	---	338	63	---
	3-19-07	11.5	9.15	9.2	---	---	359	79	---
	4-26-07	19.9	8.79	9.99	---	---	380	80	---
EMI-D3 (combined tributaries)	3-16-04	15.6	8.15	8.7	238	189	188	30.9	6.911
	3-24-04	13.3	8.22	---	---	---	191	---	7.557

TABLE B-4 Water Quality Data for Lower Dixie Creek and Tributaries in Emigrant Project Area (2003-2007)									
Station No.	Date	Water Temp (˚C)	pH (su)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	Total Suspended Solids (mg/L)	Electrical Conductivity (µS/cm)	Sulfate (mg/L)	Flow Rate (ft³/sec)
Federal Drinking Water Standard (Secondary)			6.5–8.5	None	None	None	None	250	None
Dixie Creek (lower; ½-mile above DC-6)	5-20-03	7.8	7.13	---	23	19	230	14	15.935
	7-21-03	23.9		>11	4.5	5	---	21	0.335
	9-11-03	12.2	7.14	---	233	206	550	15	0.443
	3-8-04	8.3	8.21	>11	68	68	399	29	2.847
	3-16-04	8.9	8.34	---	167	153	182	16	33.591
	3-23-04	10.0	8.63	9.5	106	103	156	31	42.127
	3-24-04	6.7	8.30	9.6	96	94	161	31	38.425
	4-13-04	9.4	8.31	10.9	45	50	192	21	15.446
DC-5 (combined tributaries above confluence with Dixie Creek)	6-6-05	15.5	8.32	9.66	---	---	209	10	---
	7-1-05	18.8	8.32	8.91	---	---	283	14	---
	8-1-05	25.2	8.42	8.06	---	---	444	25	---
	11-2-05	8.6	8.7	13.4	---	---	474	27	---
	5-12-06	17.1	7.31	9.37	---	---	172	11	---
	8-10-06	27.6	8.69	7.05	---	---	405	23	---
	10-12-06	16.2	8.65	12.3	---	---	442	28	---
	3-19-07	14.3	8.67	10.95	---	---	318	32	---
	4-26-07	21.4	8.34	8.93	---	---	275	32	---

Source: BLM 2004a, 2007. Newmont 2007.

Note: See **Figure 3-4** for station locations. ˚C = degrees Celsius; su = standard units of pH; mg/L = milligrams per liter; NTU = nephelometric turbidity units; µS/cm = microSiemens per centimeter; --- = not analyzed or reported. Samples collected in 2003-2007 were analyzed by BLM using in-house instruments.

TABLE B-4. Water Quality Data for Lower Dixie Creek and Tributaries in Emigrant Project Area (2001-2006)

Site and Sample Information						Data Collected and Quantified by BLM Personnel					
Source Name	UTM Northing	UTM Easting	Datum	Sample Date	Sample Time of day	Flow (cfs)	Meas. Method	Water Temp. (°C)	Air Temp. (°C)	pH	Dissolved Oxygen (mg/L)
EMI-D1	4495091	594079	NAD83	20040308	1135	1.376	MMB	7.78	15	7.83	
EMI-D1	4495091	594079	NAD83	20040316	1640	10.874	MMB	13.33	12.78	8.19	
EMI-D1	4495091	594079	NAD83	20040323	1530	12.656	MMB	17.78	18.89	8.22	
EMI-D1	4495091	594079	NAD83	20040324	1230	7.159	MMB	13.33	20	8.24	
EMI-D1	4495091	594079	NAD83	20040331	1400	2.633	MMB	17.22	22.78	8.91	
EMI-D1	4495091	594079	NAD83	20040413	1120	1.372	MMB	15.56	21.67	9.12	
EMI-D1	4495091	594079	NAD83	20050301	1030	0.14	MMB	-0.06	5.5		12.45
EMI-D1	4495091	594079	NAD83	20050315	930	7.19	MMB	0	3.9	8.14	13.11
EMI-D1	4495091	594079	NAD83	20050513	1100	11.4	MMB	11.08	17.2	8.33	9.87
EMI-D1	4495091	594079	NAD83	20060410	1400	30.7	MMB	10.76	14.4	8.1	9.46
EMI-D1	4495091	594079	NAD83	20060426	1230	9.82	MMB	15.1	20	8.08	8.38
EMI-D1_A	4496430	586561	NAD83	20040331	1100	1.065	MMB	16.67	20	8.96	
EMI-D1_A	4496430	586561	NAD83	20050721	1000	0.083	flume	14.33	22.2	7.65	6.52
EMI-D1_A	4496430	586561	NAD83	20060410	1100	11	MMB	8.23	6.7	7.98	9.8
EMI-D1_A	4496430	586561	NAD83	20060426	1000	3.48	MMB	9.41	18	7.78	9.5
EMI-D1_B	4496407	586596	NAD83	20040331	1130	2.72	MMB	16.11	17.78	9.6	
EMI-D1_B	4496407	586596	NAD83	20050410	1100	17.2	MMB		6.7	7.93	10.11
EMI-D1_B	4496407	586596	NAD83	20050721	1055	0.035	MMB	17.32	28.9	7.3	6.66
EMI-D1_B	4496407	586596	NAD83	20060426	1030	5.96	MMB	10.14	10	7.8	9.17
EMI-D2	4492675	589959	NAD83	20040316	1525	4.066	MMB	17.78	15.56	8.4	
EMI-D2	4492675	589959	NAD83	20040324	1450	0.26	MMB	18.89	15.56	8.64	
EMI-D2	4492675	589959	NAD83	20050315	830	0.169	MMB	0	4.4	8.25	12.85
EMI-D2	4492675	589959	NAD83	20050513	1030	3.57	MMB	11.37	14.4	8.47	9.6
EMI-D2	4492675	589959	NAD83	20060410	1300	17.8	MMB	12.9	13.3	8.3	8.86
EMI-D2	4492675	589959	NAD83	20060426	1130	1.7	MMB	14.54	19	8.95	9.43
EMI-D3	4496610	594999	NAD83	20040316	1320	6.911	MMB	15.56	18.89	8.15	8.7
EMI-D3	4496610	594999	NAD83	20040324	1700	7.557	MMB	13.33	14.44	8.22	
EMI-D3	4496610	594999	NAD83	20040331	1445	2.575	MMB	17.22	22.78	9.17	
EMI-D3	4496610	594999	NAD83	20050301	1200	7.42	MMB	4.13	7.2	8.74	12.42
EMI-D3	4496610	594999	NAD83	20050315	1030	27.4	MMB	5.33	9.2	8.06	11.46
EMI-D3	4496610	594999	NAD83	20050513	1200	156.47	MMB	9.97	20	8.15	9.93
Dixie Ck Lower (culvert)	4497965	596203.2	NAD27	20020405	1200	27.29		14.4	21.1		
Dixie Ck Lower (culvert)	4497965	596203.2	NAD27	20020730		0.252		16.11		7.55	
Dixie Ck Lower (culvert)	4497965	596203.2	NAD27	20030520	1000	15.935	MMB	7.78	24.44	7.13	
Dixie Ck Lower (culvert)	4497965	596203.2	NAD27	20030721		0.335	MMB	23.89	34.44		>11.0
Dixie Ck Lower (culvert)	4497965	596203.2	NAD27	20030911	1030	0.443	flume	12.22	21.11	7.14	
Dixie Ck Lower (culvert)	4497965	596203.2	NAD27	20040308	1306	2.847	MMB	8.33	14.44	8.21	>11.0
Dixie Ck Lower (culvert)	4497965	596203.2	NAD27	20040316	1146	33.591	MMB	8.89	20	8.34	
Dixie Ck Lower (culvert)	4497965	596203.2	NAD27	20040323	1000	42.127	MMB	10	21.11	8.63	9.5
Dixie Ck Lower (culvert)	4497965	596203.2	NAD27	20040324	1000	38.425	MMB	6.67	16.67	8.3	9.6
Dixie Ck Lower (culvert)	4497965	596203.2	NAD27	20040413	930	15.446	MMB	9.44	16.67	8.31	10.9
Dixie Ck Lower (culvert)	4497965	596203.2	NAD27	20040517	1000	6.345	MMB	14.44	16.67	8.04	7
Dixie Ck Lower (culvert)	4497965	596203.2	NAD27	20050301	1330	14.14	MMB	6.35	7.2	8.23	11.77
Dixie Ck Lower (culvert)	4497965	596203.2	NAD27	20050315	1230	37.4	MMB	6.4	6.7	7.83	11.36
Dixie Ck Lower (culvert)	4497965	596203.2	NAD27	20050513	1400			12.46		8.05	9.3
Dixie Ck Lower (culvert)	4497965	596203.2	NAD27	20050721	1230	0.393	MMB	18	26.7	8.54	11.81
Dixie Ck Lower (sec. 14)	4501570	596811	NAD83	20010530	1145	2	Estimated	19	23	9.1	8.6
Dixie Ck Lower (sec. 14)	4501570	596811	NAD83	20020405	1200	27.29		14.4	21.1		
Dixie Ck Lower (sec. 14)	4501570	596811	NAD83	20020515	0840			8.3	16.7	7.89	
Dixie Ck Lower (sec. 14)	4501570	596811	NAD83	20020730		0		20		7.53	
Dixie Ck Upper	4475177	590628	NAD27	20010530	1445	1.25		22.2		9.2	6.2
Dixie Ck Upper	4475177	590628	NAD27	20020509	1400			12.2	13.3	7.8	
Dixie Ck Upper	4475177	590628	NAD27	20020515	0825	4.094	MMB	5.6	9.4	7.84	10
Dixie Ck Upper	4475177	590628	NAD27	20020730	1000	1.65	Float chip	15.6	27.8	7.73	6.8
Dixie Ck Upper	4475177	590628	NAD27	20020924	1010	0.444	Float chip	11.1	25.6	8.07	7.9
Dixie Ck Upper	4475177	590628	NAD27	20030520							
Dixie Ck Upper	4475177	590628	NAD27	20030523	1120	3.051	MMB	15.56	27.78	7.7	6.9
Dixie Ck Upper	4475177	590628	NAD27	20030721	1030	0.092	MMB	18.89	29.44	7.8	
Dixie Ck Upper	4475177	590628	NAD27	20030828	1040	0.201	Float chip	15.56	25.56	7.81	7.8
Dixie Ck Upper	4475177	590628	NAD27	20040427	1025	4.408	MMB	11.11	17.22	7.86	9.8
Dixie Ck Upper	4475177	590628	NAD27	20041007	1025	0.069		11.11	17.22	7.39	7.45
Dixie Ck Upper	4475177	590628	NAD27	20050714	1305	0.636	MMB	19.48	30.83	7.87	6.86

TABLE B-4 - continued

Data Collected and Quantified by BLM Personnel

Turb. (NTU)	Suspended Solids (mg/L)	EC (uS/cm)	Certified Lab Used	Fecal Coliform Lab Used	Alkalinity (mg/l) CaCO3	pH	Nitrate Nitrogen (mg/L)	Nitrite Nitrogen (mg/L)	Ammonia Nitrogen (mg/L)	Total Nitrogen (as N) (mg/L)	Total Kjedahl Nitrogen
> 1000	> 807	290									
779	547	186									
Flashing	> 807	172									
183	153	186									
58.1	60	189									
27.5	23	202									
181	104	277	Wet Lab			7.93					
501	347	196	Wet Lab			7.81					
165	104	197									
541		164	Wet Lab			7.94					
47.7		206	Wet Lab			8.06					
20.8	22	299									
9.4	10	465	Wet Lab			7.65					
267		205	Wet Lab			7.85					
39.7		276	Wet Lab			7.92					
56.9	59	102									
94.2		84	Wet Lab			7.63					
6.4	10	210									
25		104	Wet Lab			7.83					
> 1000	> 807	285									
212	205	401									
119	61	443	Wet Lab			8.11					
127	101	404									
1084		314	Wet Lab			8.3					
11.5		671	Wet Lab			8.93					
238	189	188									
		191									
70.5	76	189									
306	179	248	Wet Lab			8.13					
305	164	177	Wet Lab			7.88					
401	236	157									
71.6	71										
12.8	15	140									
23.3	19	230	WET Lab	Elko City	87		<0.010	<0.010		0.37	
4.47	5										
233	206	550	WET Lab	NV State Health	220		<0.010	<0.010		0.51	
68.1	68	399									
167	153	182									
106	103	156									
96	94	161									
45.3	50	192									
50.1	60	244									
203	133	310	WET Lab			7.95					
240	158	199	WET Lab			7.79					
431	250	174									
6.1	5	371									
		320			180	8.54	<0.05	<0.01	<0.05	0.21	
71.6	71										
15.6	14	260									
		490									
		130			58	8.43	0.14	<0.01	<0.05	0.58	
19.8	14	70									
15.2	10	90	Sierra Env.			7.46	0.91	<0.05	0.1	1.3	0.4
8.33	9	140			70		0.036	<0.010	0.078	0.44	0.4
0.98	8	222					0.35	<0.010	<0.05	0.56	0.21
20.8	13		WET Lab	Elko City	32		0.55	<0.010		0.98	
20.7	17	87									
13.8	19			Elko City							
15.5	28	185	WET Lab	NV State Health	76		0.089	<0.010		0.56	
26	23	74									
18.5	11	174									
16.1	14	118	WET Lab		50	8.05	0.11	0.071	0.072	0.75	0.57

TABLE B-4 - continued

Data Collected and Quantified by BLM Personnel

Ortho-phosphate	Total Phosphorus (mg/L)	Sulfate (mg/L)	Fecal Coliform #/100ml	Total Suspended Solids (mg/L)	Turbity (NTU)	Total Dissolved Solids (mg/L)	Dissolved Oxygen (mg/l)	Chloride (mg/L)
	0.36			150				
	0.3			1300				
0.12	0.54			700	180			
	0.095			37	11			
	0.11			4	4.7			
0.13	0.39				87	330		
	0.17			26	15			
0.1	0.16			100	29			
	0.12			15	6			
	0.23			22				
0.21	1			1300	160			
	0.1			6.7	1.2			
	0.29			260				
	0.3			400				
	0.13	12	48	11	5.2	170		
	0.24	18	160	93	170	380		
	0.25			120				
	0.04		20	180				
	0.085			6	6.6	270	9.32	15
	0.2			14	9.75	110	6.67	2.7
	0.06			10	14	79		2.4
	0.16			14	11	120		3.8
	0.09			<10	3.3	130		4.3
	0.13	7	3	14	4.7	96		
			3500					
	0.17	4.9		15	15	130		
	0.13			14	9.2	100		

TABLE B-1 Flow Measurements for Dixie Creek and Tributary Downstream of Emigrant Project Area				
Station ID	Legal Location	Date	Time (hour)	Flow (ft^3/sec)
EMI-D1 (north tributary near Dixie Creek)	T31N R54E Sec.03, SWNW	3-8-04	1135	1.38
		3-16-04	1640	10.87
		3-23-04	1530	12.66
		3-24-04	1230	7.16
		3-31-04	1400	2.63
		4-13-04	1120	1.37
EMI-D1-A (Emigrant Spring tributary)	T32N R53E Sec.35, NWSE	3-31-04	1100	1.07
		5-2-05	1106	1.51
		6-5-05	1110	0.19
		7-1-05	0928	0.17
		8-1-05	1057	0.03
		9-2-05	1103	0.02
		10-4-05	1030	0.02
		11-2-05	1019	0.03
		5-12-06	1045	0.66
		6-2-06	1029	0.18
		7-24-06	1020	0.05
		8-10-06	1149	0.12
		9-12-06	1106	0.02
		10-12-06	1110	0.02
		11-7-06	1103	0.14
		3-19-07	1050	0.66
		4-26-07	1044	0.25
EMI-D1-B (northwest tributary)	T32N R53E Sec.35, NWSE	3-31-04	1130	2.72
		9-2-05	1010	0.01
		10-4-05	1114	0.03
		11-2-05	0945	0.02
		5-12-06	1000	0.88
		6-2-06	1011	0.26
		7-24-06	1026	0.03
		8-10-06	1114	0.09
		9-12-06	1039	0.09
		10-12-06	1038	0.09
		11-7-06	1118	0.19
		3-19-07	1022	0.67
		4-26-07	1020	0.80
EMI-D1-C (north tributary below Project area)	T31N R54E Sec.06, SWSW	3-31-04	1300	3.22
EMI-D2 (south tributary)	T31N R54E Sec.07, SWSE	3-16-04	1525	4.07
		3-24-04	1450	0.26
		2-5-05	1150	5.05
		6-6-05	1211	0.75
		7-1-06	1012	Dry
		8-1-05	1127	Dry
		9-2-05	1112	Dry
		10-4-05	1124	Dry
		11-2-05	1100	Dry
		12-5-05	0943	Dry
		5-12-06	1132	1.34
		6-2-06	1100	0.43
		7-24-06	1103	Dry
		8-10-06	1230	Dry
		9-12-06	1124	Dry

TABLE B-5 Statistical Summary of Water Quality Data for Emigrant Spring[1] Emigrant Mine Project							
Parameter[2]	**Number of Samples**	**NDEP Profile I Reference Values**	**Concentration in milligrams per liter (mg/L) Unless Otherwise Specified in First Column**				
			Minimum	**Maximum**	**Mean**	**Median**	**Standard Deviation**
General Parameters, Common Ions, and Nutrients							
TDS	11	500 - 1000	407	852	529	512	122
pH (su)	10	6.5 – 8.5	7.20	7.62	7.44	7.48	0.15
Alkalinity	11	---	116	289	250	262	48
Bicarbonate	6	---	229	278	258	264	21.5
Fluoride	10	2.0 - 4.0	0.2	0.6	0.44	0.45	0.11
Chloride	7	250 - 400	21	42	26	22	7.5
Sulfate	11	250 - 500	119	422	183	167	82.5
Calcium	7	---	83	153	101	94	23.6
Sodium	11	---	23	32.1	28.6	28.9	2.7
Potassium	7	---	2.8	8.0	3.9	3.1	1.89
Magnesium	7	125 - 150	32	51.8	40.2	39.5	6.63
Nitrate+Nitrite	11	10	<0.02	3.4	0.32	0.01	1.02
Cyanide, WAD	11	0.2	<0.005	0.01	0.0048	0.005	0.0008
Metals[3]							
Aluminum	11	0.05-0.2	<0.03	0.18	0.048	0.015	0.589
Antimony	7	0.146	<0.001	<0.002	0.0009	0.001	0.00035
Arsenic	11	0.05	<0.02	0.06	0.0235	0.02	0.0189
Barium	7	2.0	<0.01	0.12	0.0579	0.047	0.0288
Beryllium	7	0.004	<0.001	<0.002	0.0009	0.001	0.00024
Boron	5	---	0.1	0.12	0.1028	0.11	0.0227
Cadmium	7	0.005	<0.002	<0.004	0.0012	0.001	0.00037
Chromium	7	0.10	<0.004	0.01	0.0031	0.003	0.00125
Copper	7	1.3	<0.002	0.01	0.0021	0.0015	0.00128
Iron	11	0.3 – 0.6	0.2	13.3	2.36	1.2	3.79
Lead	7	0.015	<0.001	<0.002	0.0014	0.001	0.00079
Manganese	11	0.05 – 0.10	0.1	4.2	0.625	0.273	1.20
Mercury	7	0.002	<0.0001	<0.0002	0.0001	0.0001	1.46E-20
Nickel	7	0.1	<0.01	0.02	0.0107	0.01	0.0044
Selenium	11	0.05	<0.001	0.02	0.0092	0.005	0.0091
Silver	7	0.1	<0.002	0.01	0.0026	0.0025	0.0012
Thallium	7	0.002	<0.001	<0.001	0.0005	0.0005	0
Zinc	7	5.0	<0.004	0.08	0.0174	0.003	0.0286

Source: Newmont 2004b.

[1] Data are from water samples collected from Emigrant Spring at station RN-ESPR1 from 1994 through 2004 during Fall low flow season. Data originally reported as less than (<) the laboratory reporting limits were converted to half the "less than value" for purposes of calculating these statistics.

[2] NDEP = Nevada Division of Environmental Protection; TDS = total dissolved solids; su = standard units of pH; WAD = weak acid dissociable.

[3] Concentrations of metals are total.

APPENDIX C

SOIL RESOURCES

TABLE C-1
Soil Map Units Within Emigrant Project Study Area

Soil Map Unit	Dominant Soil Subgroup Name	Control Texture	Depth to Induration or Bedrock (Inches)	Profile Permeability Class	Surface Runoff Class
A	Xeric Haplargid	Clayey Skeletal	>60	Slow/Very slow	Very rapid
B	Lithic Xeric Haplargid	Clayey Skeletal	< 20	Slow	Rapid
C	Xeric Paleargid	Fine	>60	Very slow	Very rapid
D	Xeric Argidurid	Fine Loamy	40-60	Slow	Rapid to Very rapid
F	Lithic Xeric Haplocambid	Loamy	<20	Slow	Rapid
G	Xeric Calciargid	Fine	>60	Moderately slow	Rapid
H	Lithic Xeric Haplocambid	Loamy Skeletal	<20	Slow	Very rapid
I	Xeric Haplargid	Fine	>60	Moderately slow	Medium
J	Xeric Paleargid	Fine loamy	>60	Slow	Rapid
K	Xeric Haplargid	Clayey Skeletal	20-40	Slow	Medium to Rapid
L	Xeric Paleargid	Fine	>60	Slow	Medium to Rapid
M	Xeric Haplocambid	Fine Loamy	>60	Moderate	Slow to Medium
MC	Xeric Paleargid	Fine	> 60	Very slow	Very rapid
MD	Xeric Calciargid	Clayey Skeletal/Fine	> 60	Slow	Very rapid
ME	Xeric Calciargid	Clayey Skeletal/Fine	20-40	Slow	Rapid
MJ	RO and Lithic Xeric Haplargid	Clayey Skeletal/Loamy Skeletal	< 20	Very slow to slow	Very rapid
MK	Xeric Haplargid	Clayey Skeletal	40-60	Very slow to slow	Very rapid
ML	Xeric Haplargid	Clayey Skeletal/Fine	40-60	Very slow to slow	Very rapid
MM	Xeric Haplargid	Clayey Skeletal/Fine	20-40	Very slow to slow	Very rapid
MO	Xeric Haplargid	Clayey Skeletal	20-40	Very slow to slow	Very rapid
N	Xeric Haplodurid	Coarse Loamy	20-40	Slow	Medium
NA	Xeric Haplocalcid	Fine Loamy	20-40	Slow	Medium to Rapid
NB	Xeric Haplodurid	Coarse Loamy	20-40	Slow	Very rapid
O	Xeric Haplargid	Fine Loamy	>60	Moderately slow	Medium
P	Duric Xeric Paleargid	Fine	40-60	Very slow to slow	Very rapid
PA	Lithic Xeric Haplocalcid	Loamy Skeletal	10-20	Slow	Very Rapid
ROM	RO and Lithic Xeric Haplargid	Clayey Skeletal/Loamy Skeletal	< 20	Very slow to slow	Very rapid
ROS	RO and Lithic Xeric Haplcambid	Loamy	< 20	Slow	Very rapid
RB	Xeric Haplargid	Clayey Skeletal/Loamy Skeletal	40-60	Slow	Rapid to Very rapid
RC	Xeric Calciargid	Clayey Skeletal/Fine	40-60	Very slow to slow	Medium to Rapid
RD	Xeric Haplargid	Clayey Skeletal/Fine	40-60	Very slow to slow	Rapid to Very rapid

Source: Maxim 2004a.

TABLE C-2 Soil Salvage Potential Emigrant Project						
Soil Subgroup	**Salvage Suitability Class**	**Total Acreage**	**Percent of Map Unit**	**Estimated Acreage**	**Salvage Depth (inches)**	**Cubic Yards Available**
A Consociation						
• Xeric Haplargid and similar	NS	24.6	75	18.4	NA	0
• RO			10	2.5		
• Lithic Xeric Haplargid			10	2.5		
• Xeric Haplocambid			5	1.2		
Subtotal			100	24.6	NA	0
B Association						
• Lithic Xeric Haplargid	NS	8.1	55	4.5	NA	0
• Lithic Xeric Haplocambid			15	1.2		
• Xeric Haplocambid			15	1.2		
• RO and Fragmental			15	1.2		
Subtotal			100	8.1	NA	0
C Consociation						
• Xeric Paleargid or similar	Fair Clay % and C.F.	21.1	80	16.8	20	45,173
• Lithic Xeric Haplargid			15	3.2	6	2,541
• Rock Outcrop			5	1.1	NA	NA
Subtotal			100	21.1	NA	47,714
D Association						
• Xeric Haplargid or similar	Fair-Poor Clay % and C.F.	108.5	45	48.8	20	131,285
• Lithic Xeric Haplocambid			20	21.7	6	17,505
• Lithic Xeric Haplocambid or similar			20	21.7	6	17,505
• Xeric Argidurid or similar			15	16.3	20	43,762
Subtotal			100	108.5	NA	210,056
E Consociation						
• Xeric Haplocalcid or similar	Fair C.F.	4.6	70	3.2	24	10,164
• Xeric Calciargid or similar			20	0.9	24	2,904
• Lithic Xeric Haplocalcid			10	0.5	6	363
Subtotal			100	4.6	NA	13,431
F Consociation						
• Lithic Xeric Haplocambid	Poor C.F. and Depth	37	60	22.2	6	17,908
• Xeric Haplocambid			20	7.4	12	11,939
• Xeric Haplargid			10	3.7	12	5,969
• RO and Lithic Xeric Torriorthents			10	3.7	NA	NA
Subtotal			100	37	NA	35,816
G Consociation						
• Xeric Calciargid	Fair Clay% and C.F.	10.5	90	9.5	30	38,478
• Xeric Haplargid or similar			5	0.5	30	2,138
• Lithic Xeric Haplargid or similar			5	0.5	10	713
Subtotal			100	10.5	NA	41,328
H Association						
• Lithic Xeric Haplocambid	NS	6.4	50	3.2	NA	0
• Xeric Haplocambid			30	1.9		
• Xeric Haplargid			20	1.3		
Subtotal			100	6.4	NA	0
I Association						

TABLE C-2 Soil Salvage Potential Emigrant Project						
Soil Subgroup	**Salvage Suitability Class**	**Total Acreage**	**Percent of Map Unit**	**Estimated Acreage**	**Salvage Depth (inches)**	**Cubic Yards Available**
• Xeric Haplargid/Xeric Paleargid	Good-Fair Clay % and C.F.	4.3	90	3.9	24	12,487
• Xeric Calciargid			5	0.2	30	867
• Xeric Haplodurid			5	0.2	24	694
Suibtotal			100	4.3	NA	14,048
J Consociation						
• Xeric Paleargid/ Xeric Haplargid	Fair Clay % and C,F.	2.2	80	1.5	30	6,050
• Xeric Calciargid			15	0.5	30	1,876
• Lithic Xeric Haplargid or similar			5	0.2	12	250
Subtotal			100	2.2	NA	8,176
K Association						
• Xeric Paleargid/ Xeric Haplargid	Poor Clay C.F. and Shallow	99.4	65	64.6	16	138,983
• Lithic Xeric Haplargid or similar			25	24.9	12	40,091
• RO and very shallow phases			10	9.9	NA	NA
Subtotal				99.4	NA	179,075
L Association						
• Xeric Paleargid/ Xeric Haplargid	Poor-Fair Clay C.F. and Shallow	6.7	55	3.7	18	8,918
• Lithic Xeric Haplargid or similar			30	2.0	18	4,864
• Xeric Haplocambid			15	1.0	18	2,432
Subtotal			100	6.7	NA	16,214
M Association						
• Xeric Haplargid	Good Variable OM Clay % and C.F.	85	35	27.5	36	133,100
• Xeric Haplocambid			35	27.5	36	133,100
• Xeric Calciargid			15	15	36	72,600
• Calcic Paleargid			15	15	24	48,400
Subtotal			100	85	NA	387,200
MC Consociation						
• Xeric Paleargid/ Haplargid	Poor, C.F., Slope, and Clay	17	90	15.3	12	24,684
• Lithic soil			10	1.7	8	1,828
Subtotal			100	17	NA	26,512
MD Consociation						
• Xeric Calciargid/Haplargid	Poor Shallow Clay and C.F.	34.3	55	18.9	12	30,436
• Disturbed			20	6.9	12	11,067
• Xeric Haplargid			15	5.1	12	8,301
• Lithic Xeric Haplargid			10	3.4	NA	NA
Subtotal			100	34.3	NA	49,804
ME Consociation						
• Xeric Haplargid	Poor Shallow Clay and C.F.	60.7	60	36.4	12	58,758
• Lithic Xeric Haplargid			25	15.2	6	12,241
• Disturbed			15	9.1	6	7,345
Subtotal			100	60.7	NA	78,343
MJ Consociation						

TABLE C-2
Soil Salvage Potential
Emigrant Project

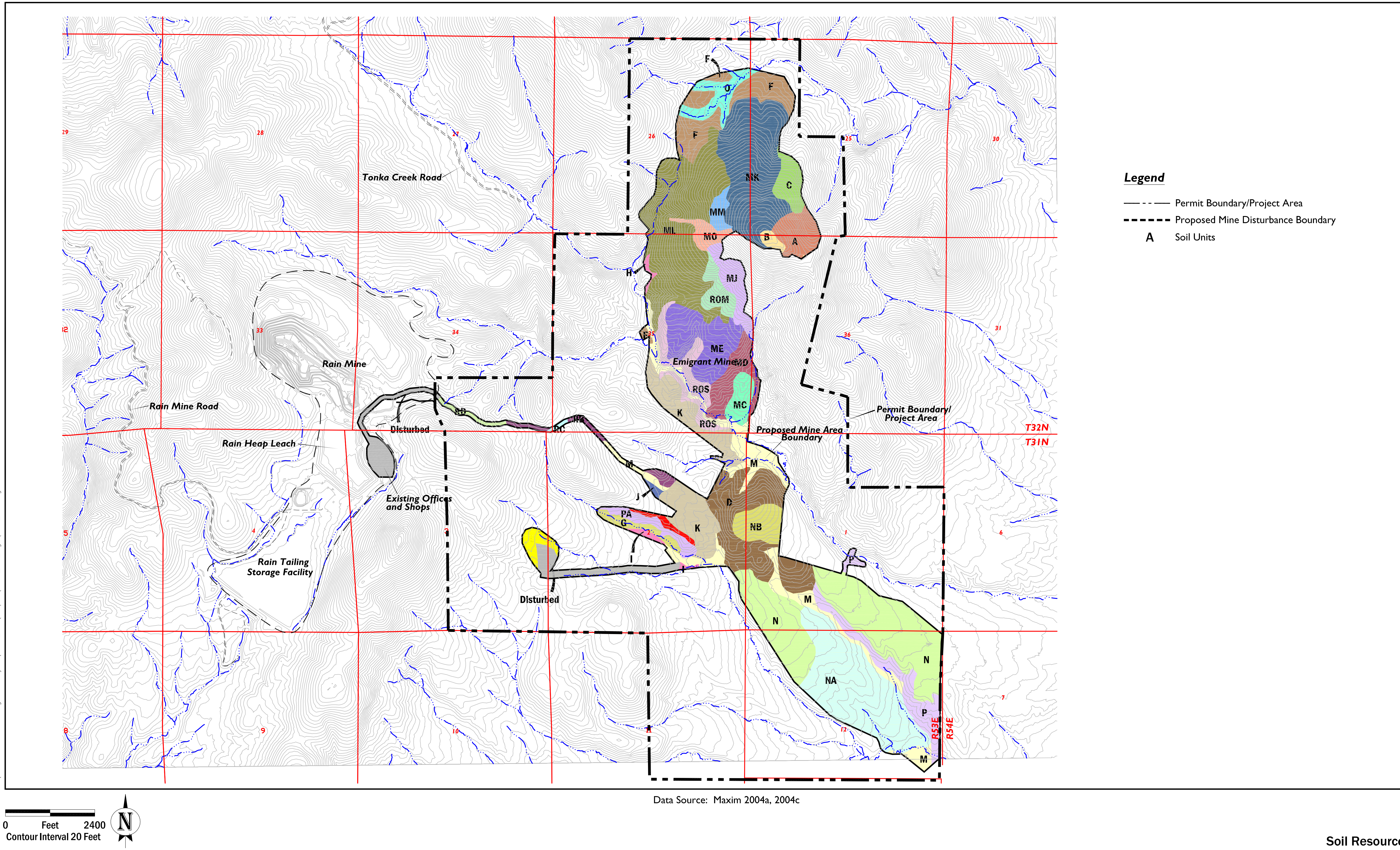
Soil Subgroup	Salvage Suitability Class	Total Acreage	Percent of Map Unit	Estimated Acreage	Salvage Depth (inches)	Cubic Yards Available
• RO and Lithic Xeric Haplargid	NS	23.6	75	17.7	NA	0
• Xeric Haplargid			20	4.7		
• Other			5	1.2		
Subtotal			100	23.6	NA	0
MK Consociation						
• Xeric Calciargid	Poor Shallow Clay, Slopes and C.F.	112.7	80	90.1	12	145,329
• RO/Lithic Xeric Haplargid			10	11.3	NA	NA
• Disturbed			10	11.3	6	9,083
Subtotal			100	112.7	NA	154,412
ML Association						
• Xeric Calciargid	Poor Shallow Clay, Slopes and C.F.	160	30	48.0	12	77,392
• Xeric Haplargid			30	48.0	12	77,392
• Lithic Xeric Haplocambid			10	16.0	NA	NA
• Lithic Xeric Haplargid			10	16.0	NA	NA
• Xeric Haplocambid			5	8.0	12	12,899
• RO			15	24.0	NA	NA
Subtotal			100	160.0	NA	167,682
MM Consociation						
• Xeric Haplargid or similar	Poor Shallow Clay, and C.F.	9.6	90	8.6	16	18,586
• Lithic Xeric Haplargid or similar			5	0.5	NA	NA
• RO			5	0.5	NA	NA
Subtotal			100	9.6	NA	18,586
MO Consociation						
• Xeric Haplargid	Poor Shallow Clay, and C.F.	13.6	80	10.8	20	29,040
• RO/very shallow soil			10	1.4	NA	NA
• Xeric Calciargid			10	1.4	20	3,630
Subtotal			100	13.6	NA	32,670
N Complex						
• Xeric Haplodurid	Fair Hardpan Occasional C.F.	176.3	65	113.7	18	275,154
• Xeric Argidurid			25	44.4	24	143,264
• Xeric Calciargid			5	9.1	24	29,250
• Xeric Haplocalcid			5	9.1	24	29,250
Subtotal			100	176.3	NA	476,917
NA Complex						
• Xeric Calciargid or similar	Fair Hardpan Occasional C.F.	133.7	50	66.7	24	215,219
• Xeric Haplocalcid			40	53.6	24	172,949
• Xeric Haplodruid			10	13.4	18	32,428
Subtotal			100	133.7	NA	420,596
NB Consociation						
• Xeric Argidurid or similar	Fair Hardpan Slopes Occasional C.F.	34	85	28.9	20	77,709
• Xeric Haplodruid or similar			10	3.4	20	9,142
• Lithic Xeric Haplargid or similar			5	1.7	6	1,371
Subtotal				34.0	NA	88,222

TABLE C-2 Soil Salvage Potential Emigrant Project						
Soil Subgroup	**Salvage Suitability Class**	**Total Acreage**	**Percent of Map Unit**	**Estimated Acreage**	**Salvage Depth (inches)**	**Cubic Yards Available**
O Consociation						
• Xeric Haplargid	Fair Isolated Occasional C.F.	12.7	85	10.8	32	46,442
• Xeric Haplocambid			10	1.3	20	3,415
• Lithic Xeric Haplocambid			5	0.6	6	512
Subtotal			100	12.7	NA	50,370
P Association						
• Duric Xeric Paleargid or similar	NS	43.4	40	17.4	24	56,144
• Xeric Calciargid or similar			20	8.6	24	27,749
• Lithic Xeric Haplocalcid			30	13.0	6	10,487
• Xeric Haplocadurid			10	4.4	6	3,549
Subtotal			100	43.4	NA	97,929
PA Complex						
• Lithic Xeric Haplocalcid	NS	14.7	65	9.6	NA	0
• Xeric Calciargid or similar			20	2.9		
• Xeric Haplocalcid			15	2.2		
Subtotal			100	14.7	NA	0
RB Complex						
• Xeric Haplargid	Fair Shallow Clay and CF	23.7	60	14.2	12	22,942
• Xeric Calciargid			25	5.9	12	9,559
• Xeric Haplocambid			10	2.4	12	3,824
• Lithics			5	1.2	6	956
Subtotal			100	23.7	NA	37,281
RC Consociation						
• Xeric Calciargid or similar	Fair Shallow Clay and CF	3.4	80	2.7	12	4,388
• Xeric Haplocambid or similar			20	0.7	12	1,097
Subtotal			100	3.4	NA	5,485
RD Consociation						
• Xeric Haplargid	Poor Slopes Clay and C.F.	13.3	80	10.6	8	11,358
• Xeric Haplocambid			15	2.0	8	2,130
• Lithics			5	0.7	6	532
Subtotal			100	13.3	NA	14,020
ROM Association						
• RO	NS	18	55	9.9	NA	0
• Xeric Haplargid or similar			25	4.5		
• Lithic Xeric Haplocambid			15	2.7		
• Lithic Xeric Haplargids			5	0.9		
Subtotal			100	18.0	NA	0
ROS Association						
• RO	NS	34.6	50	17.3	NA	0
• Lithic Xeric Haplocambid			20	6.9		
• Lithic Xeric Haplargid			20	6.9		
• Xeric Calciargid or similar			10	3.5		
Subtotal			100	34.5	NA	0
Disturbed		60	100	45.2	NA	0
TOTAL		**1417.7**				**2,671,887**

Notes:

NS = Not salvageable except for occasional opportunistic salvage; C.F. = Coarse Fragments; NA = Not Applicable; RO = Rock Outcrop.

Soil Salvage Class = Denotes class and prominent restrictive characteristic other than low organic matter content – with the exception of Map Units M and I, all map units generally have organic matter content less than three percent which keep the salvage suitability no greater than fair. In addition, the percent organic matter content in salvaged soil from Map Units M and I will likely also be below three percent unless only the top one foot is salvaged.



Data Source: Maxim 2004a, 2004c

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U.S. Department of the Interior
Bureau of Land Management
Elko Field Office
Elko, Nevada

Soil Resources
Emigrant Project
Elko County, Nevada
FIGURE C-1

APPENDIX D

VEGETATION

TABLE D-1
Vascular Plant Species
Emigrant Project

Binomial	Code	Common Name
Polypogon monspeliensis	Pol mon	Rabbitfoot polypogon
Vulpia sp.	Vul sp.	Annual fescue species
NATIVE PERENNIAL FORBS		
Achillea millefolium	Ach mil	Common yarrow
*Agastache urticifolia**	Aga urt	Nettle-leaf giant-hyssop
*Agoseris glauca***	Ago gla	Pale agoseris
*Allium hookeri***	All ???	entity unknown
Allium sp.	All sp.	Onion species
Antennaria dimorpha	Ant dim	Low pussytoes
Arabis cobrensis	Ara cob	Gray rockcress
*Argemone munita**	Arg mun	Armed prickly-poppy
Artemisia ludoviciana	Art lud	Cudweed sagewort
Asclepias speciosa	Asc spe	Showy milkweed
Aster ascendens (Aster chilensis)	Ast asc	Long-leaved aster
Aster occidentalis	Ast occ	Western aster
Astragalus lentiginosus (var. chartaceus?)	Ast len	Freckled milkvetch
Astragalus newberryi	Ast new	Newberry milkvetch
Astragalus purshii	Ast pur	Pursh's milkvetch
Balsamorhiza hookeri	Bal hoo	Hooker balsamroot
Balsamorhiza sagittata	Bal sag	Arrowleaf balsamroot
Caulanthus crassicaulis	Cau cra	Thickstem wildcabbage
*Chaenactis douglasii**	Cha dou	Douglas chaenactis
Crepis acuminate	Cre acu	Tapertip hawksbeard
Crepis occidentalis	Cre occ	Western hawksbeard
Cryptantha spiculifera	Cry spi	Pointed cryptantha
Cusickiella douglasii (Draba douglasii)	Cus dou	Douglas draba
Cymopterus sp.	Cym sp.	Spring-parsley species
*Epilobium angustifolium**	Epi ang	Fireweed
Epilobium ciliatum	Epi cil	Common willow-herb
Erigeron sp - (bloomeri/linearis?)	Eri sp.	Fleabane species
Eriogonum caespitosum	Eri cae	Mat buckwheat
Eriogonum heracleoides	Eri her	Parsnip-flower buckwheat
Eriogonum umbellatum var. umbellatum	Eri umb	Sulfur buckwheat
Eriophyllum lanatum	Eri lan	Woolly yellow daisy
Glycyrrhiza lepidota	Gly lep	American licorice
Hackelia sp.	Hac sp.	Stickseed species
*Hypericum anagalloides**	Hyp ana	Creeping St. John's-wort
Hypericum scouleri -(Hypericum formosum)	Hyp sco	Western St. John's-wort
Petradoria pumila ssp. pumila	Pet pum	Rock goldenrod
Petrophyton caespitosum	Pet cae	Rocky Mountain rockmat
Phacelia hastata	Pha has	Silverleaf phacelia
Phlox diffusa	Phl dif	Spreading phlox
Phlox hoodii	Phl hoo	Hood's phlox
Phlox longifolia	Phl lon	Long-leaf phlox
Phlox stansburyi	Phl sta	Stansbury phlox
Phoenicaulis cheiranthoides	Pho che	Daggerpod
Physaria chambersii	Phy cha	Chamber twinpod
Ranunculus cymbalaria	Ran cym	Rocky Mountain buttercup
*Scutellaria antirrhinoides**	Scu ant	Snapdragon skullcap
Senecio integerrimus	Sen int	Western groundsel
Sidalcea oregana var. nevadensis	Sid ore	Oregon checkermallow
Stenotus acaulis (Haplopappus acaulis)	Ste aca	Cushion goldenweed
Stephanomeria spinosa (Lygodesmia spinosa)	Ste spi	Thorny skeletonplant

TABLE D-1
Vascular Plant Species
Emigrant Project

Binomial	Code	Common Name
NATIVE PERENNIAL GRAMINOIDS		
Agrostis exarata	Agr exa	Spike bentgrass
Agrostis scabra	Agr sca	Rough bentgrass
Alopecurus aequalis	Alo aeq	Shortawn foxtail
Carex douglasii	Car dou	Douglas's sedge
Carex nebraskensis	Car neb	Nebraska sedge
Danthonia unispicata	Dan uni	One-spike oatgrass
Deschampsia elongata	Des elo	Slender hairgrass
Distichlis spicata - (Distichlis stricta)	Dis spi	Alkali saltgrass
Eleocharis palustris	Ele pal	Common spikesedge
Elymus elymoides (Sitanion hystrix)	Ely ely	Bottlebrush squirreltail
*Elymus lanceolatus*** - (Agropyron dasystachyum)*	Ely lan	Thickspike wheatgrass
Elymus trachycaulus (Agropyron trachycaulum)	Ely tra	Slender wheatgrass
Festuca idahoensis	Fes ida	Idaho fescue
Hordeum brachyantherum	Hor bra	Meadow barley
Hordeum jubatum	Hor jub	Foxtail barley
Juncus balticus	Jun bal	Baltic rush
Juncus ensifolius	Jun ens	Dagger-leaf rush
Juncus longistylis	Jun lon	Longstyle rush
Leymus cinereus - (Elymus cinereus)	Ley cin	Basin wildrye
Leymus triticoides - (Elymus triticoides)	Ley tri	Creeping wildrye
Melica bulbosa	Mel bul	Oniongrass
*Nassella viridula** (Stipa viridula)*	Nas vir	Green needlegrass
Oryzopsis hymenoides	Ory hym	Indian ricegrass
Pascopyrum smithii - (Agropyron smithii)	Pas smi	Western wheatgrass
Poa secunda var. nevadensis (Poa nevadensis)	Poa nev	Nevada bluegrass
Poa secunda var. secunda (Poa sandbergii)	Poa sec	Sandberg's bluegrass
Pseudelymus x saxicola - (Agrositanion saxicola)	Pse sax	Rock wheatgrass
Pseudoroegneria spicata (Agropyron spicatum)	Pse spi	Bluebunch wheatgrass
*Scirpus americanus**	Sci ame	American bulrush
Scirpus microcarpus	Sci mic	Panicled bulrush
Stipa comata	Sti com	Needle-and-thread
Stipa lettermanii	Sti let	Letterman's needlegrass
Stipa thurberiana	Sti thu	Thurber needlegrass
INTRODUCED PERENNIAL GRAMINOIDS		
*Agropyron cristatum***	Agr cri	Crested wheatgrass
Agropyron desertorum - (Agropyron cristatum)	Agr des	Desert wheatgrass
Agrostis stolonifera	Agr sto	Redtop
Elytrigia elongata - (Agropyron elongatum)*	Ely elo	Tall wheatgrass
Elytrigia intermedia -(Agropyron intermedium)	Ely int	Intermediate wheatgrass
Poa bulbosa	Poa bul	Bulbous bluegrass
Poa compressa	Poa com	Canada bluegrass
Poa palustris	Poa pal	Fowl bluegrass
Poa pratensis	Poa pra	Kentucky bluegrass
NATIVE ANNUAL GRAMINOIDS		
Deschampsia danthonioides	Des dan	Annual hairgrass
Juncus bufonius	Jun buf	Toad rush
*Muhlenbergia minutissima**	Muh min	Annual muhly
*Poa annua**	Poa ann	Annual bluegrass
INTRODUCED ANNUAL GRAMINOIDS		
*Apera interrupta**	Ape int	Italian windgrass
Bromus tectorum	Bro tec	Cheatgrass brome

TABLE D-1 Vascular Plant Species Emigrant Project		
Binomial	**Code**	**Common Name**
Trifolium wormskioldii	Tri wor	Cow clover
Typha latifolia	Typ lat	Common cattail
*Urtica dioica**	Urt dio	Stinging nettle
Veronica Americana	Ver ame	American speedwell
*Viola purpurea**	Vio pur	Goosefoot violet
*Zigadenus paniculatus***	Zig pan	Foothill death-camas
INTRODUCED PERENNIAL FORBS		
*Cardaria draba**	Car dra	Heart-podded hoarycress
Kochia prostrata	Koc pro	Prostrate summer-cypress
Plantago major	Pla maj	Common plantain
Rorippa nasturtium-aquaticum (Nasturtium officinale)	Ror nas	Water-cress
Rumex crispus	Rum cri	Curl dock
*Sanguisorba minor***	San min	Garden burnet
Taraxacum officinale	Tar off	Common dandelion
Veronica anagallis-aquatica	Ver ana	Water speedwell
NATIVE ANNUAL/BIENNIAL FORBS		
*Amaranthus sp.**	Ama sp.	Pigweed species
Amsinckia intermedia	Ams int	Fireweed fiddleneck
*Amsinckia tessellata***	Ams tes	Western fiddleneck
Arabis holboellii	Ara hol	Holboell's rockcress
Brachyactis frondosa (Aster frondosus)	Bra fro	Alkali aster
Chamaesyce serpyllifolia - (Euphorbia serpyllifolia)	Cha ser	Thyme-leaf spurge
Cirsium neomexicanum var. utahense	Cir neo	Intermountain thistle
*Cirsium scariosum**	Cir sca	Elk thistle
*Collinsia parviflora**	Col par	Blue-eyed Mary
*Collomia linearis**	Col lin	Narrow-leaf collomia
*Conyza canadensis**	Con can	Canada horseweed
*Cryptantha fendleri**	Cry fen	Fendler's cryptantha
Cryptantha sp.	Cry sp.	Cryptantha species
*Descurainia pinnata***	Des pin	Pinnate tansymustard
Epilobium brachycarpum (Epilobium paniculatum)	Epi bra	Autumn willow-herb
*Gayophytum ramosissimum***	Gay ram	Hairstem groundsmoke
Gilia aggregata var. aggregata	Gil agg	Scarlet gilia
Gnaphalium palustre	Gna pal	Lowland cudweed
Lappula occidentalis (Lappula redowskii)	Lap occ	Western stickseed
Lepidium densiflorum	Lep den	Prairie pepperweed
Machaeranthera canescens	Mac can	Hoary aster
Madia glomerata	*Mad glo*	Cluster tarweed
*Navarretia breweri**	*Nav bre*	Yellow navarretia
Navarretia intertexta var. propinqua	*Nav int*	*Great Basin navarretia*
*Nicotiana attenuata**	*Nic att*	Coyote tobacco
*Plagiobothrys scouleri**	*Pla sco*	Scouler's popcorn-flower
Polygonum aviculare	*Pol avi*	Prostrate knotweed
Polygonum polygaloides var. confertiflorum	*Pol pol*	Polygala knotweed
Ranunculus sceleratus	*Ran sce*	Celery-leaved buttercup
*Trifolium cyathiferum**	*Tri cya*	Cup clover
Trifolium variegatum	*Tri var*	White-tip clover
INTRODUCED ANNUAL/BIENNIAL FORBS		
Alyssum desertorum	Aly des	Desert alyssum
Ceratocephala testiculata (Ranunculus testiculatus)	Cer tes	Bur buttercup
*Chorispora tenella**	Cho ten	Blue mustard
Cirsium vulgare	Cir vul	Bull thistle
Descurainia Sophia	Des sop	Flixweed tansymustard

TABLE D-1
Vascular Plant Species
Emigrant Project

Binomial	Code	Common Name
Erodium cicutarium	Ero cic	Alfilaria
*Gnaphalium uliginosum**	Gna uli	Marsh cudweed
*Halogeton glomeratus**	Hal glo	Halogeton
Lactuca serriola	Lac ser	Prickly lettuce
Lepidium perfoliatum	Lep per	Clasping pepperweed
*Melilotus officinalis***	Mel off	Yellow sweetclover
Onopordum acanthium	Ono aca	Scotch thistle
Sisymbrium altissimum	Sis alt	Tumblemustard
*Thlaspi arvense**	Thl arv	Fanweed
Tragopogon dubius	Tra dub	Common salsify
*Verbascum thapsus**	Ver tha	Flannel mullein
SHRUBS		
Amelanchier alnifolia	Ame aln	Western serviceberry
Amelanchier utahensis	Ame uta	Utah serviceberry
Artemisia arbuscula	Art arb	Low sagebrush
Artemisia tridentata ssp. tridentata	Art tri	Basin big sagebrush
Artemisia tridentata ssp. vaseyana	Art vas	Mountain big sagebrush
*Artemisia tridentata ssp. wyomingensis***	Art wyo	Wyoming big sagebrush
Atriplex canescens	Atr can	Four-wing saltbush
Brickellia microphylla var. microphylla	Bri mic	Littleleaf brickellbush
Cercocarpus ledifolius	Cer led	Curly-leaf mountain mahogany
Chrysothamnus nauseosus ssp. albicaulis	Chr nau alb	Rubber rabbitbrush
Chrysothamnus nauseosus ssp. consimilis	Chr nau con	Rubber rabbitbrush
Chrysothamnus viscidiflorus ssp. puberulus	Chr vis pub	Green rabbitbrush
Chrysothamnus viscidiflorus ssp. viscidiflorus	Chr vis vis	Green rabbitbrush
Eriogonum microthecum var. laxiflorum	Eri mic	Slenderbush buckwheat
Holodiscus dumosus	Hol dum	Bush oceanspray
Leptodactylon pungens	Lep pun	Prickly phlox
*Porophyllum gracile**	Por gra	Slender poreleaf
Prunus virginiana	Pru vir	Common chokecherry
Purshia mexicana (Cowania mexicana)	Pur mex	Mexican cliffrose
Purshia tridentata	Pur tri	Antelope bitterbrush
Ribes aureum	Rib aur	Golden currant
Ribes cereum	Rib cer	Wax currant
*Ribes cuneum**	Rib ???	entity unknown
*Rosa woodsii**	Ros woo	Wood's rose
Salix exigua	Sal exi	Sandbar willow
Salix laevigata	Sal lae	Polished willow
*Sambucus mexicana**	Sam mex	Mexican elderberry
Tetradymia canescens	Tet can	Gray horsebrush
Tetradymia glabrata	Tet gla	Littleleaf horsebrush
Amelanchier alnifolia	Ame aln	Western serviceberry
Amelanchier utahensis	Ame uta	Utah serviceberry
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Chrysothamnus nauseosus ssp. consimilis	Chr nau con	Rubber rabbitbrush
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TABLE D-1
Vascular Plant Species
Emigrant Project

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Ribes cereum	Rib cer	Wax currant
*Ribes cuneum**	Rib ???	entity unknown
*Rosa woodsii**	Ros woo	Wood's rose
Salix exigua	Sal exi	Sandbar willow
Salix laevigata	Sal lae	Polished willow
*Sambucus mexicana**	Sam mex	Mexican elderberry
Tetradymia canescens	Tet can	Gray horsebrush
Tetradymia glabrata	Tet gla	Littleleaf horsebrush
TREES		
*Juniperus monosperma***	Jun mon	One-seed juniper
Juniperus osteosperma	Jun ost	Utah juniper
Pinus monophylla	Pin mon	Singleleaf pinyon
Populus tremuloides	Pop tre	Quaking aspen

Nomenclature follows Kartesz (1994). Parenthetical synonyms are from Cronquist et al. (1977-1997).
* indicates species identified by EIP Associates (1997) that were not recorded during the present (WESTECH 2004a) inventory
** indicates species identified by Cedar Creek Associates (1997) that were not recorded during the present (WESTECH 2004a) inventory
*** indicates a combination of the above.