

**FINAL
ENVIRONMENTAL IMPACT STATEMENT
INDIAN CREEK MINE EXPANSION**



J A N U A R Y 2 0 1 0



State of Montana
Department of Environmental Quality
PO Box 200901
Helena, MT 59620

U.S. Department of the Interior
Bureau of Land Management
Butte Field Office
106 North Parkmont
Butte, MT 59701

January 2010

Dear Reader:

Enclosed is the Final Environmental Impact Statement (EIS) for the Graymont Western U.S., Inc. Proposed Mine Expansion, Broadwater County, Montana.

Graymont Western U.S., Inc., operates an open pit limestone quarry west of Townsend, Montana, in the Limestone Hills. The mine operates under Operating Permit No. 00105, issued by the Montana Department of Environmental Quality (DEQ), and Plan of Operations #MTM78300, issued by the Bureau of Land Management (BLM).

Graymont Western U.S., Inc. proposes to expand the currently permitted mine to the south resulting in a continuation of Graymont's existing operations in the Limestone Hills. Graymont (formerly Continental Lime Inc.) produces calcium oxide (quicklime and lime), hydrated lime, and other lime products at the Mine. The proposed amendment would expand the existing permit boundary to encompass approximately 1,940 acres of additional public land currently administered by BLM and represents approximately 50 years of mine production including 15 years of currently permitted mine life. Proposed mine expansion would include quarry areas, mine facilities, ore storage sites, soil salvage stockpiles, haul roads, and overburden disposal areas.

The Final EIS analyzes the potential impacts of: 1) the Proposed Action 2) No Action, (existing life-of-mine permit), and 3) Alternative A, Modified Pit Backfill, which would reduce the visual effect of highwalls and create varied slope angles resulting in areas conducive to establishment of diverse habitat to support wildlife.

The Final EIS addresses issues and concerns raised during the public scoping period and the public meetings held in Helena and Townsend February 3rd and 4th, 2009, as well as public comments received during the public review period between January 2, and March 2, 2009. The operating permit is available for review at the DEQ office in Helena and at the BLM office in Butte.

DEQ and BLM have tentatively selected Alternative A, Modified Pit Backfill alternative as the preferred alternative. The final decision will be made in the Record of Decision that will be prepared no sooner than 30 days after the Notice of Availability of the Final EIS is published in the Federal register.

The Final EIS contains public comments and response and changes to the Draft EIS.

The agencies appreciate the public's involvement in preparing the Final EIS. Additional copies are available upon request from DEQ or on the DEQ web site at www.deq.mt.gov. A copy of the Record of Decision will be sent to everyone who receives the Final EIS.



Richard H. Opper, Director
State of Montana
Department of Environmental Quality



Richard M. Hotaling, Field Manager
Bureau of Land Management
Butte Field Office

**FINAL
ENVIRONMENTAL IMPACT STATEMENT
FOR
GRAYMONT WESTERN, INC. INDIAN CREEK MINE EXPANSION**

LEAD AGENCY:

**U.S. Department of the Interior
Bureau of Land Management
Butte Field Office
Butte, Montana**

CO-LEAD AGENCY:

**Montana Department of Environmental Quality
Helena, Montana**

PROJECT LOCATION:

Broadwater County, Montana

**COMMENTS ON THIS FINAL
ENVIRONMENTAL IMPACT
STATEMENT SHOULD BE
DIRECTED TO:**

**R. David Williams
Project Manager
Butte Field Office
106 North Parkmont
Butte, Montana 59701-7600**

**Greg Hallsten
Montana Department of Environmental Quality
P.O. Box 200901
Helena, MT 59620-0901**

**JANUARY 2010
ABSTRACT**

This Final Environmental Impact Statement (FEIS) analyzes potential impacts associated with the Graymont Western US, Inc. (Graymont) proposal to amend BLM Plan of Operations MTM 78300 and Montana Metal Mine Reclamation Act (MMRA) Operating Permit No. 00105. The proposed amendment is for a life-of-mine expansion of limestone and dolomite mining operations at the Indian Creek Mine (Mine) located approximately 4 miles west of Townsend, Montana. The proposed amendment would encompass approximately 1,940 acres of public land administered by BLM and represents approximately 50 years of mine production including 15 years of currently permitted mine life. The FEIS also provides responses to comments received by the agencies during the public comment period on the Draft EIS.

The proposed life-of-mine expansion would result in a continuation of Graymont's existing operations in the Limestone Hills including mine pits, mine facilities, ore storage sites, soil salvage stockpiles, haul roads, and overburden disposal areas lying within a disturbance boundary of 1,313 acres (968 acres in the South Claims Area and 345 acres in the Dolomite Claims Area). A disturbance boundary would be established within the overall proposed operating permit area. Actual surface disturbance for mine activities within the disturbance boundary would be less than the permitted disturbance to allow flexibility for mine planning. The agency preferred alternative is Alternative A – Modified Pit Backfill.

A Record of Decision will be prepared no earlier than 30 days following the date the Environmental Protection Agency publishes the Notice of Availability of the Final EIS in the Federal Register. A copy of the Record of Decision will be sent to everyone who receives the Final EIS.

SUMMARY

In February 2006, Graymont Western US, Inc. (Graymont) submitted a proposal to the U.S. Department of the Interior, Bureau of Land Management (BLM) and the Montana Department of Environmental Quality (DEQ) to amend BLM Plan of Operations MTM 78300 and Montana Metal Mine Reclamation Act Operating Permit No. 00105 to include a life-of-mine expansion of limestone and dolomite mining operations at the Indian Creek Mine (Mine) located approximately 4 miles west of Townsend, Montana (**Figure S-1**). The proposed mine expansion would result in a continuation of Graymont's existing operations in the Limestone Hills. Graymont (formerly Continental Lime, Inc.) produces calcium oxide (quicklime and lime), hydrated lime, and other lime products at the Mine.

The proposed mine expansion property is located within the boundaries of the Limestone Hills Training Area (LHTA), a military training facility operated by the Montana Army National Guard (MTARNG) under a right-of-way issued by BLM. A Memorandum of Agreement between MTARNG, Graymont, and BLM sets forth the policies and procedures agreed to by MTARNG regarding military training exercises; clearing of unexploded ordnance (UXO); exploration, mining, and reclamation activities conducted by Graymont; and, administration of public land by BLM to allow joint and compatible use of the Limestone Hills Training Area.

This Environmental Impact Statement (EIS) describes Graymont's Proposed Action, alternatives to the Proposed Action including Alternative A – Modified Pit Backfill, and the No Action Alternative. Potential direct, indirect, and cumulative effects on the environment are analyzed in this EIS. Impacts described herein

will form the basis for a BLM and DEQ decision regarding the Proposed Action, Alternative A, No Action Alternative, and selection of appropriate mitigation measures. This EIS describes potential impacts on public land and private land that could result from decisions by BLM and DEQ.

SUMMARY OF PROPOSED ACTION

The proposed amendment would expand the existing permit boundary to encompass approximately 1,940 acres of additional public land currently administered by BLM and represents approximately 50 years of mine production including 15 years of currently permitted mine life. Proposed mine expansion would include quarry areas, mine facilities, ore storage sites, soil salvage stockpiles, haul roads, and overburden disposal areas.

Graymont proposes to extend mine operations approximately 2.5 miles south beyond the existing permit boundary into the South Claims Area and eastward into the Dolomite Claims Area adjoining the northeast corner of the existing mine permit boundary. Proposed mining disturbance areas for the life-of-mine expansion lie within a disturbance boundary of 1,313 acres (968 acres in the South Claims Area and 345 acres in the Dolomite Claims Area). Actual surface disturbance for mine activities within the disturbance boundary would be less than the permitted disturbance to allow flexibility for mine planning.

MINE PITS

Mining activities would continue in the same manner as current operations. Limestone and dolomite would be removed in layers or “benches” approximately 20 feet thick. As mining progresses downward on the deposit, safety rock catch benches would be constructed to a minimum width of 20 feet. These catch benches would be established at vertical intervals ranging from 20 to 60 feet in height. Ramp roads within the quarry would connect successive benches to provide truck and loader access.

Overburden would be removed by drilling, blasting, and loading into trucks for placement in overburden disposal areas located along the west boundary of the mine, or as backfill in portions of mine pits depleted of recoverable limestone or dolomite. Overburden would be placed so as not to obstruct any major drainage outside the mine area. Final grading would re-establish contoured slopes ranging from 2.0H:1.0V to 3.0H:1.0V to provide landscape diversity. Consistent with currently permitted mining operations, up to 50 percent of the overburden would be placed as in-pit backfill.

New surface disturbance associated with proposed mine pit development would total 557 acres (343 acres in the South Claims Area and 214 acres in the Dolomite Claims Area). Overburden disposal outside of mine pits would total about 100 acres (approximately 65 acres in the South Claims Area and 35 acres in the Dolomite Claims Area).

Soil and/or growth media would be removed from proposed pit areas, areas outside existing mine pits designated for overburden disposal, and haul roads. Soil would be stockpiled and seeded for future use in reclamation. Temporary haul roads would be constructed to access overburden disposal areas as mining progresses.

REJECT ROCK

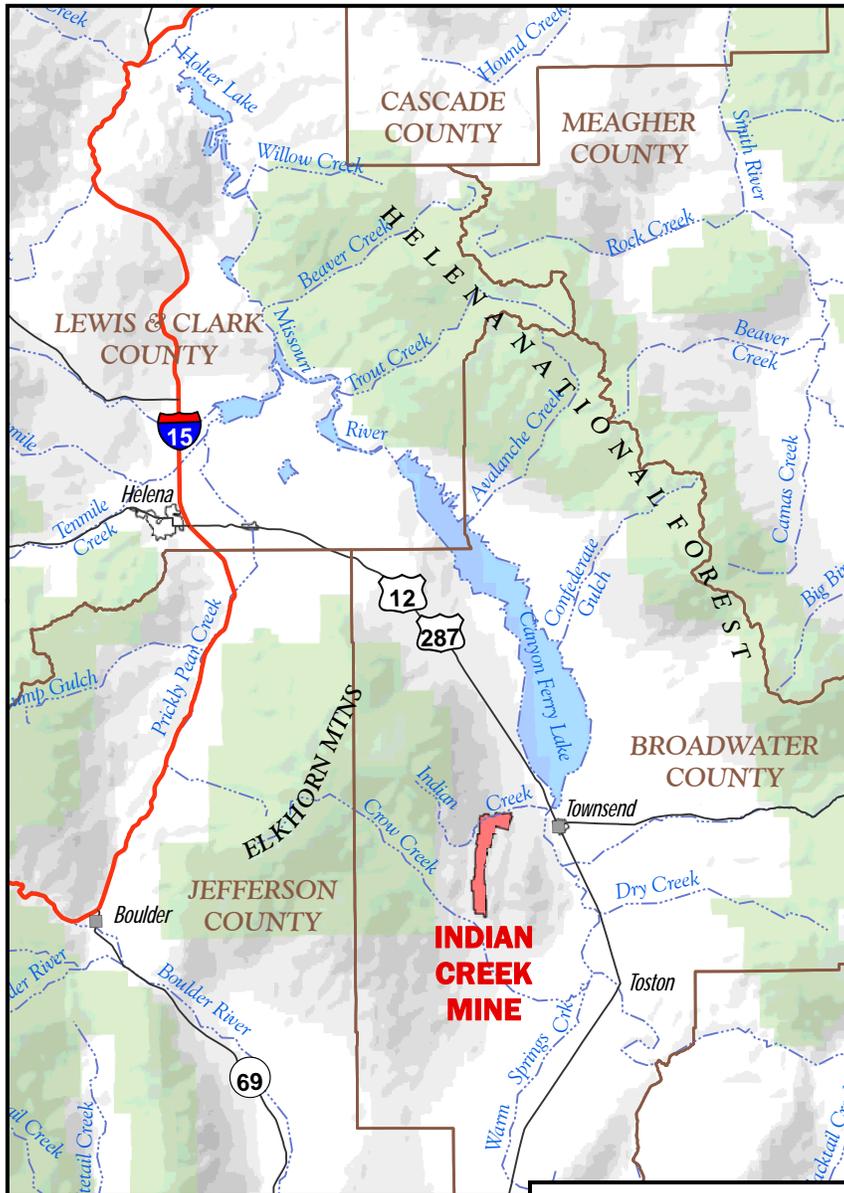
Reject rock resulting from the ore crushing operation consists of limestone or dolomite fines that pass a ½-inch screen. Reject rock created during processing of limestone mined in the South Claims Area would be placed along the west side of the mine area south of a new crusher site or in portions of mined-out pits. Reject rock from processing dolomite would be stored in the existing limestone reject pile in the North Claims Area. Approximately 5 million tons of reject rock may be placed in proposed disposal areas (outside of mine pits) over the mine life.

ORE PROCESSING

Limestone ore mined from the South Claims Area would be transported to a new crusher site constructed north of the reject rock disposal area. Crushed/screened limestone ore would be transported via haul truck to the existing crusher site and conveyed to the kilns located north of Indian Creek at the plant facility.

Limestone ore is initially heated to a temperature of about 1,800° F and fed to one of two rotary kilns where it is heated to temperatures between 2,200° and 2,500° F for a period of 2½ to 3 hours. The heating action converts the limestone (CaCO_3) to lime (CaO). After the lime reaches the discharge end of the kiln, it is cooled and conveyed to one of several storage silos. Product lime is then loaded into trucks for transport to the rail terminal or directly to consumers.

Approximately 40,000 tons of coal and 30,000 tons of coke are used annually as the energy source to heat and process lime at the Indian Creek Mine. Each kiln circuit is equipped with a baghouse to capture particulates from kiln emission exhaust, lime handling, and unloading.



H:\13532 Graymont\ EIS\5000 GIS\Projects\EIS\Fig. S-1_Summary.mxd



U.S. Department of the Interior
Bureau of Land Management
Butte Field Office
Butte, Montana

GENERAL LOCATION
Indian Creek Mine Expansion - Environmental Impact Statement
Broadwater County, Montana

FIGURE
S-1

Each kiln can produce up to 500 tons of lime (also known as quicklime) per day and requires approximately 320 tons of coal and/or coke per day. A stockpile of approximately 15,000 tons of coal/coke is maintained on-site.

KILN DUST

Kiln dust is produced during the ore processing circuit and collected in baghouses. Lime kiln dust collected in the baghouse is sold for various applications. Kiln dust is produced at an approximate rate of 7 percent of production (currently 50 tons per day/18,250 tons per year). Kiln dust is stored on-site in a 150-ton silo. At the present time, all kiln dust is sold out of the silo as it is produced.

UNEXPLODED ORDNANCE (UXO)

Most of the proposed South Claims Area is within designated Surface Danger Zones and may contain UXO. The Right-of-Way and the Memorandum of Agreement between BLM, Graymont, and MTARNG requires MTARNG to remediate UXO in the proposed joint use area. The Army has previously been able to clear about 25 acres per year. However, that rate of clearance has increased with an additional 84 acres released in early 2008. MTARNG currently estimates that UXO clearance in the existing mine permit area (North Claims Area) will be completed by 2010, if funding remains available at current levels. Expansion of mine operations into the South Claims and Dolomite Claims areas would increase the area requiring UXO remediation by about 1,300 acres. At the present time, MTARNG is unable to provide an estimate of the time and effort necessary to provide UXO clearance in these areas.

SOIL SALVAGE

Site preparation in the South Claims and Dolomite Claims areas would include UXO

clearance and clearing and grubbing vegetation from proposed disturbance areas. Prior to commencing mining activities, soil and other growth media would be salvaged and either spread over areas undergoing reclamation or placed in designated stockpile areas.

ANCILLARY FACILITIES

Existing support facilities at the Indian Creek Mine would be used over the life of the Project. The new crusher site in the South Claims Area would have an office building housing a change/lunch room and maintenance shop, a septic system, and well. An aboveground storage tank for diesel fuel would also be located on the site.

Construction of the new crusher in the South Claims Area would require installation of electrical service to the site. Graymont would construct a power line from the existing crusher site in the North Claims Area to the new crusher site in the South Claims Area along the North-South Haul Road corridor.

Other ancillary facilities would include storm water diversion ditches and sediment ponds, water fill stations, and growth media stockpiles. Growth media stockpiles would be located throughout the Project area.

RECLAMATION

Reclamation activities would include regrading overburden disposal areas, placing up to 50 percent of overburden in mined-out pit areas, 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 monitoring reclamation and surface water diversion control. Natural regrade techniques would be used to blend with surrounding topography wherever possible. The reclamation schedule

would span the period between cessation of mining through establishment of a sustainable vegetation cover. Reclamation would take place concurrently with mining operations, where possible.

SUMMARY OF IMPACTS

Analysis of potential impacts and mitigations associated with Graymont's proposed mine expansion Project is presented in Chapter 3 – *Affected Environment and Environmental Consequences*. The following is a summary of potential impacts, by resource that could result from implementation of the Proposed Action and No Action Alternative.

PROPOSED ACTION

AIR QUALITY

Mining-related activities at the Indian Creek Mine would be a source of particulate and gaseous air pollutants. Fugitive dust emissions would be generated by mining, loading, hauling, and crushing limestone, and disposal of overburden. Particulate emissions would be mitigated by minimization of drop heights during loading, dust suppression and other Best Management Practices. Gaseous pollutant emissions would result from blasting, construction and mining equipment exhaust, vehicle exhaust, and from burning coal/coke during limestone processing. These emissions would be minimized by proper equipment maintenance and operation.

CLIMATE AND CLIMATE CHANGE

Ore processing operations at the Indian Creek Mine have a nominal capacity of lime production of 365,000 tons per year. Annual greenhouse gas emissions associated with 365,000 tons of lime production would be approximately 480,000 tons (435,000 metric tons) of CO₂ equivalents (CO₂e). (CO₂e includes all

greenhouse gases except water vapor). This was estimated using the average greenhouse gas emission intensity, including both process and combustion related emissions, at Indian Creek for the period 2002 through 2008.

Lime production at nominal capacity would result in approximately 16.8 million tons (15.3 million metric tons) of CO₂e emissions over the additional 35-year mine life of the Indian Creek Mine under the Proposed Action. Annual greenhouse gas emissions over the period 2002 through 2008 have averaged 272,000 tons (247,300 metric tons) of CO₂e emissions, with 2008 emissions being approximately 342,000 tons (310,900 metric tons) of CO₂e. Continued operation at current emission levels associated with ore processing at Indian Creek Mine would equate to an average of 0.8 percent of the total anthropogenic CO₂e emissions from sources within Montana (estimated at 38.5 million metric tons per year). This volume equates to 0.004 percent of total U.S. emissions (US emissions estimated at 7.282 CO₂e billion metric tons), and 1.1 percent of CO₂e emissions associated with lime manufacture in the U.S. The lack of detailed scientific tools to predict climate change on a regional or local scale limits the ability to quantify potential future impacts that could result continued emissions associated with the Proposed Action.

GEOLOGY AND MINERALS

Proposed mining in the South Claims Area (mine expansion area) is projected to produce less overburden (geologic material considered waste that overlies the ore) compared to current mining in the North Claims Area. Exploration drilling in the South Claims Area has indicated a ratio of approximately 1:4 of overburden to ore production. Approximately 13 million tons of overburden would be removed to recover approximately 55 million tons of ore. Mining would occur on 11,500 linear feet of outcrop in the South Claims Area.

Ore and overburden production in the Dolomite Claims Area is expected to be at a 1:1 ratio – 20 million tons ore and 20 million tons overburden.

No quarries or vertebrate fossils are located in the area to be physically disturbed by the Proposed Action; therefore no impacts to paleontological resources have been identified.

WATER QUANTITY AND QUALITY

Surface Water

No surface water rights are located in the South Claims or Dolomite Claims areas.

Flow from springs in the Project area would not be affected by the Proposed Action. Five year-round or intermittent flowing springs are located at least 1,000 feet from any proposed disturbance.

Suspended sediment would be of concern in surface water run-off from the Project Area. Concentrations of metals in samples of ore and overburden were analyzed in 2004. Results for 21 trace elements showed non-detectable concentrations or concentrations within typical ranges found in soil. The ore rock is limestone and dolomite; therefore, acid mine drainage at this site and associated increased concentrations of metals are not expected.

Analysis of surface water samples indicates that Indian and Crow creeks have good water quality downstream from the Indian Creek Mine. No aquatic life standards are known to have been exceeded in surface water samples collected in the vicinity of the Indian Creek Mine site. Some iron concentrations in Crow Creek and Mud Spring have exceeded secondary (aesthetic) standards. Concentrations of arsenic, cadmium, copper, lead, mercury, and zinc have exceeded aquatic life and/or human health standards in samples from upper Indian

Creek upstream from the Indian Creek Mine. These values are influenced, in part, by abandoned or inactive mine sites (Park, St. Louis, and Diamond Hill) within the Indian Creek drainage upstream from the Indian Creek Mine.

Groundwater

Proposed mine expansion in the South Claims Area would have no adverse effect on groundwater quantity, including flow from springs. Based on exploratory drilling observations, groundwater typically is not encountered within about 500 feet of ground surface.

In the Dolomite Claims Area, the northern-most mine pit would eventually extend below the groundwater level. The pit bottom is projected to extend to an ultimate elevation of 4,067 feet, which is 155 feet below the groundwater level elevation in the nearby National Guard Well (water right no. 411 30000180) of 4,225 feet. The pit bottom is projected to be 45 feet below the total depth of this well (elevation 4,115). For the southern-most mine pit proposed in the Dolomite Claims area, the ultimate pit bottom elevation would be approximately 4,265 feet, which is about 40 feet above the water level measured in the National Guard Well.

The National Guard Well is located approximately 400 feet southwest of the northern-most mine pit and within the proposed permit boundary. The well is used for stock watering during spring, summer, and fall. The deepest part of the north mine pit in the Dolomite Claims Area would be approximately 45 feet below the bottom of the National Guard Well. Pit dewatering, if required, may adversely impact the well by lowering the groundwater level in the vicinity of the well, possibly to a depth below the current pumping level or below the bottom of the well.

The north mine pit in the Dolomite Claims Area would eventually be backfilled with overburden. Backfilling this pit would eliminate formation of a body of surface water (*i.e.*, pit lake).

SOIL

The proposed mine expansion would result in approximately 1,313 acres of surface disturbance including the mine pit and overburden disposal areas, haul roads, growth media (geologic material that is not topsoil but would support vegetation) stockpiles, 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, and reduced biological activity and soil structure. These impacts would be reduced by direct hauling growth media from active mine areas for placement over backfilled portions of previously mined areas or overburden disposal facilities, eliminating the need to stockpile growth media. Graymont would perform reclamation activities concurrently with ongoing mining operations where practicable. As mining operations progress, backfilled portions of mine pits and overburden disposal facilities would be concurrently reclaimed.

VEGETATION

The Proposed Action would result in the direct loss of vegetation in areas disturbed by mine-related activities within the South Claims and Dolomite Claims areas, and new haul road disturbances within the proposed mine expansion permit boundary. Vegetation that would be removed during mining includes mountain mahogany, woodlands, sagebrush, and grass species.

Native shrub and tree re-establishment is typically one of the most difficult aspects of reclamation in the arid and semi-arid west, and

lengthy time horizons (*e.g.*, more than 20 years) are frequently required before woody plant density and woody plant canopy cover are similar to adjacent or baseline conditions. Additional time is often required in areas with poor soil. Woody plant density on portions of the Indian Creek Mine would not be similar to baseline conditions for many years. The slow establishment of shrubs on reclaimed areas results in potential long-term impacts to growth media stability and related impacts to wildlife through loss of browse species. No indirect impacts to vegetation communities are anticipated.

Overall range condition within the reclaimed areas would initially be diminished as native species become established. Once native perennial grasses have become established on reclaimed areas, range condition would be similar to baseline conditions.

Special Status Plant Species

Up to 19 of 23 sword townsendia plant populations identified within the proposed disturbance area in the Dolomite Claims Area would be removed by mine activities. Sword townsendia is common within and adjacent to the proposed disturbance in the Dolomite Claims Area. Removal of these individuals would not likely lead to the demise of the species, or extermination of the species from the state. The sword townsendia and lesser rushy milkvetch populations located in the South Claims Area would not be affected by proposed mine disturbances. No indirect impacts to special-status plant species are anticipated.

Invasive, Non-native Species (Noxious Weeds)

Noxious weeds are more common in areas surrounding the Project area, but have invaded portions of the current mine operations and are

controlled on an annual basis. Control of noxious weeds in the proposed mine expansion areas would continue in accordance with Graymont's updated and approved Weed Management Plan.

Wetlands

Relatively small, ephemeral non-wetland Waters of the U.S. may be disturbed by the Proposed Action. The current jurisdictional status of these drainages is unknown following the 2006 U.S. Supreme Court decision "*Rapanos v. U.S.*". A Section 404 permit may be required to allow fill of these drainages if they are determined to be jurisdictional by subsequent legal proceedings.

TERRESTRIAL WILDLIFE

The Proposed Action would result in direct loss of mountain mahogany, woodlands, sagebrush, and grassland habitats. Loss of these habitats would reduce availability of forage, security, and breeding cover for wildlife inhabiting the area. Individuals of some species dependent on these disturbed sites would be killed or displaced.

The capacity of the proposed mine expansion area to support wildlife would be reduced until suitable habitat (including mountain mahogany, sagebrush, other shrubs, and trees) has been re-established. Initially, vegetation on reclaimed areas would likely be dominated by grasses, with low densities of native forbs, shrubs, and trees. Mountain mahogany, sagebrush and other shrubs, typically, are difficult to re-establish on mined land and areas burned by wildfire. Because shrubs are important forage for mule deer, bighorn sheep, and other wildlife species, low rates or delayed re-establishment of these plant species on reclaimed sites would reduce the capacity of the proposed Project to support species with affinities for shrub habitat (e.g., mule deer, Brewer's sparrow, and bighorn sheep).

Removal of 451 acres of mountain mahogany habitat (18 percent of mountain mahogany in the Limestone Hills) as a result of the Proposed Action could permanently change the existing conditions and may reduce the capacity of the proposed Project area and adjacent Elkhorn Mountains to support mule deer. The extent of reduction would depend on availability of winter forage including mountain mahogany and other browse species favored by mule deer (e.g., sagebrush, juniper, winterfat, rabbitbrush, and skunkbush sumac). Loss of 18 percent of mountain mahogany habitat would likely result in a reduction in the winter range carrying capacity for mule deer in the Limestone Hills until reclaimed sites develop vegetation characteristics roughly comparable to pre-mining conditions.

Approximately 680 acres of habitat would be revegetated with mountain mahogany seedlings at a density of 200 plants per acre, as replacement for mountain mahogany disturbed by mining. In addition to grasses and forbs, other species of tree and shrub seedlings used in revegetation of disturbed areas would include juniper types (100 plants/acre), Douglas-fir (130 plants/acre), yucca (75 plants/acre), and limber pine (25 plants/acre).

Shrub densities, canopy cover values, and biomass production are presently lower for reclaimed sites than for shrub communities on sites not affected by mining. The proposed planting density of 50 to 400 plants per acre is below the woody plant densities in shrub communities on undisturbed sites. Consequently, the capability of reclaimed areas to provide forage for mule deer and bighorn sheep is lower than for undisturbed shrub communities.

Under the Proposed Action, 1,252 acres of bighorn sheep winter range would be disturbed. Bighorn sheep are dependent on shrubs such as mountain mahogany for winter forage.

Reductions in the winter forage base could reduce the capacity of the range to support bighorn sheep, if the range is currently at its maximum carrying capacity.

Small mammals, snakes, and insects would be killed by construction activities and vehicle traffic. Small mammals and snakes seek cover underground and removal of soil and rock could result in direct mortality.

Raptors, coyotes, and other predators could experience a reduced prey base due to a reduction in available habitat until reclamation is achieved; however, reclaimed land typically is invaded by small mammals, often within 1 to 2 years following the start of reclamation.

Migratory birds would experience losses of foraging and nesting habitats. If mine construction were to take place in the nesting and brood-rearing period, young birds could be killed and eggs and nests destroyed. Surveys would be conducted and if nesting birds are found the area would be avoided or the USFWS contacted to apply appropriate protection measures. Killing or destroying migratory birds would violate the Migratory Bird Treaty Act.

Bats would experience reduced habitat quality through removal of foraging habitat. Highwalls that would result from construction of the open pits would provide fractured rock faces for roosting. Few bats have been recorded in the proposed Project Area, probably because of the limited water sources.

Special Status Wildlife Species

No federally listed or proposed endangered or threatened fish and wildlife species currently exist in the proposed mine expansion area. Implementation of the Proposed Action would not adversely affect threatened and endangered species due to the lack of suitable habitat for most listed species. No fish, amphibians or reptiles listed as sensitive by BLM would be

expected to occur in the mine expansion area. Six sensitive bird species (ferruginous hawk, golden eagle, peregrine falcon, burrowing owl, loggerhead shrike, and Brewer's sparrow) could potentially occur in the area, but only the Brewer's sparrow (which is dependent on sagebrush) is believed to currently nest there. Of four sensitive mammal species (Preble's shrew, long-eared myotis, fringed myotis, and Townsend's big-eared bat) that could occur in the area, two (long-eared myotis and Townsend's big-eared bat) have been recorded along Indian Creek, which would not be affected by the Proposed Action.

The Proposed Action would affect habitat for sensitive species, and could affect individuals; however, it would not reduce population viability over the range of occurrence in west central Montana.

LAND USE, ACCESS, AND TRANSPORTATION

Proposed expansion of mine operations into the South Claims and Dolomite Claims areas lies within the MTARNG live fire training Surface Danger Zone in the LHTA. The proposed expansion could have an impact on the "nonexclusive, nonpossessory" military use of the LHTA. The MTARNG is authorized to conduct training exercises in the LHTA during a 140-day period from April through November each year. Implementation of the Proposed Action would affect live-fire training exercises at five weapon system Surface Danger Zones located within the proposed mine expansion area. Military regulations do not allow MTARNG to conduct live-fire operations when personnel are within the bounds of a Surface Danger Zone for a respective weapon system. The level of impact mining operations in the South Claims Area would have on MTARNG training will ultimately be resolved by Congress before Graymont's operations reach the South Claims Area.

Grazing

According to the BLM MRB Survey and Allotment Tabulation Record, mine expansion would result in loss of carrying capacity on 524 acres of the Limestone Hills Grazing Allotment, 775 acres of the Dowdy Ditch Allotment, and about 11 acres in the Indian Creek Allotment. These records are available at the BLM Butte Field Office. Grazing on mine-related disturbance areas would be lost until revegetation and forage production are comparable to pre-mining levels associated with adjacent land.

Recreation and Access

The South Claims and Dolomite Claims areas lie within a portion of the LHTA closed by BLM to unescorted public access. Recreational use and public access in this area are restricted for safety and security reasons. Continued closure of the South Claims and Dolomite Claims areas would have no effect on recreation as the proposed expansion is adjacent to areas with unrestricted access that would remain available for dispersed recreational use.

NOISE

Noise generated from proposed mine expansion activities (e.g., heavy equipment and crusher) would be less than the EPA guideline at 0.25 mile from the Project area. The predicted peak blasting noise level is predicted to be less than the U.S. Army guideline for human annoyance between 0.25 and 0.5 mile from the blast.

VISUAL RESOURCES

The southeastern view of the proposed mine expansion in the Dolomite Claims Area would be viewed by travelers on U.S. Highway 287/12 and by Graymont workers, supply haulers, and recreationists traveling along the Indian Creek

Road. Mining operations in the South Claims Area would not be visible from U.S Highway 287/12 or the Indian Creek Road. Partial views of the South Claims Area operations would be visible from the Mud Springs Road along the western boundary. A small portion of the South Claims operations would be visible to residents of Radersburg looking north-northwest.

Results of the Visual Resource Management Inventory and contrast ratings indicate that the proposed mine expansion would not exceed BLM visual management objectives for these areas. The contrast rating for the South Claims and Dolomite Claims areas is moderate, which corresponds to the Visual Resource Class IV.

SOCIAL AND ECONOMIC RESOURCES

Implementation of the Proposed Action would generate a payroll in excess of \$82 million over the life-of-mine in 2007 dollars. Direct employment and income would continue for an additional 35 years beyond the current remaining life-of-mine (15 years) subject to market conditions. Contributions to federal, state, and local tax systems would continue over the projected mine life.

The Proposed Action would maintain the income generated from net proceeds, which could exceed \$9.7 million in property taxes (2003 dollars) and over \$3.8 million in net proceeds tax (2006 dollars). Federal and state income tax revenues would be extended as derived from personal income tax paid by workers at the facility through out the mine life.

CULTURAL RESOURCES

To date, 15 Native American cultural resource properties have been identified and documented within the Project area. These sites are classified as lithic scatter and are largely characterized by pieces of chipped stone. One site is associated with a tipi ring. One

historic cultural property has been identified and consists of a historic building foundation and roadbed segment, which may or may not be mining related. Numerous unassociated prospecting pits are also present and appear to be remnants of gold and silver prospecting that occurred during the late 19th century and again in the Great Depression era of the 20th century.

Analysis of artifacts recovered from site investigations is contained in reports to BLM and the State Historic Preservation Office for inclusion in the Statewide Inventory. Recordation of the 15 Native American sites and one historic cultural property has been completed. The status of these sites for listing on the National Register of Historical Places remains undetermined.

Twelve of the Native American cultural sites (lithic scatter) lie within the proposed disturbance boundary and could be affected by future mine operations. Of these, Graymont has identified four that could be avoided through adjustment to haul routes and/or other mine facilities. Some or all of the remaining eight sites and features could be lost under the Proposed Action. Graymont has indicated that the historic cultural property lying within the proposed disturbance boundary could likely be avoided.

When the eligibility of the affected sites is determined after consultation with the State Historic Preservation Office and tribal governments, BLM and Graymont will mitigate the “adverse effects” as defined by 36 CFR 800.6 of the National Historic Preservation Act (as amended, 1992).

PROJECT ALTERNATIVES

Primary issues identified during public scoping of the proposed Project include: 1) effects of

proposed mine expansion on mule deer winter range, and 2) Montana Army National Guard training activities may interfere with proposed mine expansion in the Limestone Hills Training Area.

Issues identified during agency review of the Proposed Action include potential effects of the proposed reclamation plan with respect to steep slope reclamation, habitat diversity, and visual resources. In response to these issues, BLM and DEQ developed Alternative A – Modified Pit Backfill. In addition, the agencies considered the No Action Alternative as a baseline condition on which to base impact analysis for the Proposed Action and Alternative A. These alternatives are summarized below. BLM and DEQ determined that potential interference of National Guard activities in the Project area with the Proposed Action does not require development of an alternative. See discussion in Chapter I – *Introduction*.

ALTERNATIVE A – MODIFIED PIT BACKFILL

This alternative would implement the same components as the Proposed Action but would require Graymont to place up to 50 percent of run-of-mine overburden and mixed with limestone reject rock and minimal amounts (2 inches or less) of growth media in selected areas of mined-out pits in a configuration that would fill portions of pit highwalls and create steep in-pit slopes. Pit backfill under Alternative A would reduce the visual effect of highwalls and create varied slope angles resulting in areas conducive to establishment of mountain mahogany and other browse species to support wildlife.

NO ACTION ALTERNATIVE

Under the No Action Alternative, the proposed life-of-mine expansion (Proposed Action) would not be approved. Graymont would not develop ore reserves in the South Claims Area or the Dolomite Claims Area. Potential impacts predicted to result from development in these areas would not be realized. Mining operations within the existing permitted area would continue for approximately 15 years at the current production rate.

AGENCY PREFERRED ALTERNATIVE

The agency preferred alternative is Alternative A – Modified Pit Backfill.

TABLE OF CONTENTS

Page

DEAR READER LETTER

ABSTRACT

SUMMARY S-1

CHAPTER 1 INTRODUCTION 1-1

PURPOSE OF AND NEED FOR THE PROJECT 1-1

AUTHORIZING ACTIONS 1-2

 Bureau of Land Management 1-2

 Montana Department of Environmental Quality 1-2

 Montana Army National Guard 1-7

RELATIONSHIP TO BLM AND NON-BLM POLICIES, PLANS, AND PROGRAMS 1-8

PUBLIC SCOPING 1-8

CHAPTER 2 DESCRIPTION OF PROPOSED ACTION AND ALTERNATIVES 2-1

INTRODUCTION 2-1

EXISTING OPERATIONS 2-1

 Mine Operations 2-2

 Reject Rock 2-5

 Ore Processing 2-5

 Kiln Dust 2-6

 Soil Salvage 2-6

 Haul Roads 2-6

 Surface Water Controls 2-7

 Unexploded Ordnance (UXO) Clearance 2-7

 Ancillary Facilities 2-7

 Employment 2-9

 Monitoring Programs 2-9

 Reclamation Plan 2-10

 Environmental Control Measures 2-12

PROPOSED ACTION (LIFE-OF-MINE EXPANSION) 2-13

 Mine Pit Expansion 2-14

 Reject Rock 2-20

 Ore Processing 2-20

 Kiln Dust 2-20

 Soil Salvage 2-20

 Haul Roads 2-20

 Surface Water Controls 2-21

 Ancillary Facilities 2-21

 Employment 2-21

 Monitoring Programs 2-21

 Reclamation 2-21

 Environmental Control Measures 2-27

ALTERNATIVES 2-27

 Alternative A – Modified Pit Backfill 2-27

 No Action Alternative 2-33

AGENCY PREFERRED ALTERNATIVE 2-33

TABLE OF CONTENTS (continued)

Page

CHAPTER 3 AFFECTED ENVIRONMENT and ENVIRONMENTAL CONSEQUENCES	3-1
INTRODUCTION.....	3-1
SUPPLEMENTAL AUTHORITIES TO BE CONSIDERED	3-1
RESOURCES ELIMINATED FROM FURTHER ANALYSIS	3-2
Threatened and Endangered Species	3-2
Fisheries and Aquatic Resources	3-5
RESOURCES AND RESOURCE USES EVALUATED IN THE EIS	3-5
Air Quality.....	3-5
Climate and Climate Change	3-8
Geology and Minerals	3-10
Water Quantity and Quality.....	3-14
Soil Resources	3- 31
Vegetation.....	3-39
Terrestrial Wildlife.....	3-49
Land Use, Access, and Transportation	3-60
Noise	3-66
Visual Resources	3-74
Social and Economic Resources.....	3-77
Cultural Resources.....	3-84
CHAPTER 4 CUMULATIVE EFFECTS	4-1
INTRODUCTION.....	4-1
PAST, PRESENT, AND REASONABLY FORESEEABLE FUTURE ACTIVITIES	4-1
Mining and Mineral Development.....	4-2
Grazing	4-2
Recreation	4-2
Military Training – UXO Clearance	4-5
Urbanization.....	4-7
Wildlife Management	4-8
Wildfire/Controlled Burns	4-10
Habitat Restoration Projects	4-10
RESOURCE ASSESSMENTS	4-14
Air Quality.....	4-14
Climate and Climate Change	4-15
Geology and Minerals	4-16
Water Quantity and Quality.....	4-17
Soil Resources	4-18
Vegetation Resources	4-20
Terrestrial Wildlife.....	4-21
Land Use, Access, and Transportation	4-31
Noise	4-32
Visual Resources	4-32
Social and Economic Resources.....	4-33
Cultural Resources.....	4-34

TABLE OF CONTENTS (continued)

	<u>Page</u>
CHAPTER 5 CONSULTATION, COORDINATION, AND PREPARATION.....	5-1
PUBLIC PARTICIPATION.....	5-1
IMPLEMENTATION.....	5-2
CRITERIA AND METHODS BY WHICH PUBLIC INPUT IS EVALUATED.....	5-3
LIST OF PREPARERS AND REVIEWERS.....	5-4
CHAPTER 6 PUBLIC COMMENTS AND RESPONSES	6-1
CHAPTER 7 REFERENCES	7-1

LIST OF TABLES

	<u>Page</u>
TABLE 1-1 Regulatory Responsibilities.....	1-8
TABLE 1-2 Scoping Summary.....	1-9
TABLE 2-1 Existing Disturbance – North Claims Area.....	2-2
TABLE 2-2 Proposed Disturbance for Life-of-Mine Expansion.....	2-14
TABLE 2-3 Tree and Shrub Species Proposed for Use on Reclaimed Sites	2-22
TABLE 3-1 Supplemental Authorities	3-2
TABLE 3-2 Non-Particulate Emissions	3-6
TABLE 3-3 Water Monitoring Sites	3-17
TABLE 3-4 Impaired Water Status for Indian and Crow Creeks.....	3-19
TABLE 3-5 Summary of Indian Creek Water Quality Samples Collected by Graymont	3-20
TABLE 3-6 Summary of Crow Creek Water Quality Samples Collected by Graymont	3-21
TABLE 3-7 Summary of Water Quality and Flow Data for Springs	3-25
TABLE 3-8 Summary of Groundwater Quality Data for Two Wells in Study Area.....	3-26
TABLE 3-9 Characteristics of Various Soil Types within Life-of-Mine Disturbance Area.....	3-35
TABLE 3-10 Potential Soil Salvage within Study Area	3-36
TABLE 3-11 Vegetation Community Types within Study Area	3-40
TABLE 3-12 Range Condition of Vegetation Types within Study Area	3-45
TABLE 3-13 Disturbance Area per Community Type	3-47
TABLE 3-14 Sensitive Status Wildlife Species with Potential to Occur in the Study Area.....	3-54
TABLE 3-15 Habitats Affected by Proposed Action	3-56
TABLE 3-16 Existing Grazing Allotment Summary	3-65
TABLE 3-17 Ambient Noise Level Measurements at Representative Locations	3-71
TABLE 3-18 Estimated Blast Peak (L_{pk}) Noise Levels vs. Distance	3-72
TABLE 3-19 Estimated Noise Levels at Various Distances and Representative Residence Locations from Source(s)	3-73
TABLE 3-20 Visual Resource Management Objectives	3-75
TABLE 3-21 Employment by Industry Changes from 1970 to 2000, Broadwater County	3-79
TABLE 3-22 Mining Industry Employment and Earnings in Broadwater County.....	3-79
TABLE 3-23 Annual Unemployment Rates, 2000-2005 for Broadwater County and State of Montana.....	3-80
TABLE 3-24 Personal Income by Type, 1993-2003 for Broadwater County and State of Montana.....	3-80
TABLE 3-25 Income by Type, 2000, Broadwater County and State of Montana.....	3-81

TABLE OF CONTENTS (continued)

	<u>Page</u>
TABLE 3-26 Median Household and Personal Income, 1989, 1999, and 2004 for Broadwater County and Montana	3-81
TABLE 3-27 Major Classes of Taxable Valuation, Broadwater County, 2000.....	3-82
TABLE 3-28 Estimated Property Tax Receivables Fiscal Year 2003, Broadwater County.....	3-82
TABLE 3-29 Alternative Comparison of Tax Contributions	3-84
TABLE 4-1 Grazing Allotment Summary.....	4-5

LIST OF FIGURES

FIGURE 1-1 General Location Map	1-3
FIGURE 1-2 Project Location.....	1-5
FIGURE 2-1 Existing Operations – North Claims Area	2-3
FIGURE 2-2 Proposed Operations – South Claims Area.....	2-15
FIGURE 2-3 Proposed Operations – Dolomite Claims Area.....	2-17
FIGURE 2-4 Proposed Reclamation/Revegetation – South Claims Area.....	2-23
FIGURE 2-5 Proposed Reclamation/Revegetation – Dolomite Claims Area.....	2-25
FIGURE 2-6 Alternative A – South Claims Area Conceptual Backfill Configuration	2-29
FIGURE 2-7 Alternative A – Dolomite Claims Area Conceptual Backfill Configuration	2-31
FIGURE 3-1 General Study Area.....	3-3
FIGURE 3-2 Geology	3-11
FIGURE 3-3 Hydrologic Features and Water Monitoring Sites.....	3-15
FIGURE 3-4 Water Rights and Private Wells.....	3-23
FIGURE 3-5 Soil Resources	3-33
FIGURE 3-6 Vegetation Resources	3-41
FIGURE 3-7 Grazing Allotments	3-63
FIGURE 3-8 Noise Monitoring Locations.....	3-69
FIGURE 3-9 Cultural Sequence.....	3-87
FIGURE 4-1 General Cumulative Effects Study Area	4-3
FIGURE 4-2 Wildfires and Reseeded Areas	4-11
FIGURE 4-3 Elk Habitat Cumulative Effects	4-23
FIGURE 4-4 Mule Deer Habitat Cumulative Effects	4-25
FIGURE 4-5 Bighorn Sheep Habitat Cumulative Effects	4-27

CHAPTER I INTRODUCTION

In February 2006, Graymont Western US, Inc. (Graymont) submitted a proposal to the U.S. Department of the Interior, Bureau of Land Management (BLM) and the Montana Department of Environmental Quality (DEQ) to amend BLM Plan of Operations MTM 78300 and Montana Metal Mine Reclamation Act (MMRA) Operating Permit No. 00105 to include a life-of-mine expansion of limestone and dolomite mining operations at the Indian Creek Mine (Mine) located approximately 4 miles west of Townsend, Montana (**Figure I-1**). The proposed amendment would encompass approximately 1,940 acres of public land currently administered by BLM in the Limestone Hills Training Area (LHTA) used by the Montana Army National Guard (MTARNG) for military training (**Figure I-2**) and represents approximately 50 years of mine production, including 15 years of currently permitted mine life. Graymont (formerly Continental Lime, Inc.) produces calcium oxide (quicklime and lime), hydrated lime, and other lime, limestone, and dolomite products at the Mine.

The proposed mine expansion would result in a continuation of Graymont's existing operations in the Limestone Hills and includes development of mine pits, mine facilities, ore storage sites, soil salvage stockpiles, haul roads, and overburden disposal areas. The proposed expansion would also generate ore feed for the existing processing plant, thereby extending the life of the plant.

The Mine is currently permitted to disturb 757 acres including mine pits, plant and crusher sites, ore stockpiles, growth media storage sites, overburden disposal areas, haul roads, and a load-out facility. These facilities are located within the operating permit boundary which

encompasses 1,735 acres. The approved permits require concurrent reclamation of mined areas and final reclamation of the site.

BLM has determined that the proposed life-of-mine amendment may result in significant impacts to the human environment, and preparation of an Environmental Impact Statement (EIS) is necessary to ensure that BLM's decision regarding the amendment to the Plan of Operations is in conformance with 43 CFR 3809 regulations and the National Environmental Policy Act (NEPA). BLM is the federal co-lead agency for purposes of compilation of the EIS.

DEQ has jurisdiction over mining activities within the State of Montana and as such, Graymont must amend MMRA Operating Permit No. 00105. DEQ is the state co-lead for compilation of the EIS. DEQ must ensure that its decision regarding the proposed life-of-mine amendment conforms to requirements of the Metal Mine Reclamation Act and the Montana Environmental Policy Act (MEPA).

PURPOSE OF AND NEED FOR THE PROJECT

The purpose of the proposed amendment (Proposed Action) is to extend current limestone mining and begin dolomite mining operations at Graymont's Indian Creek Mine beyond currently permitted areas to access additional limestone and dolomite reserves. Extension of mining operations on public land would allow Graymont to continue to mine, provide limestone and dolomite products, employ its workforce, and contribute taxes to the federal, state, and local economies, and profit from sale of products.

The need for the Proposed Action is to produce limestone and dolomite products for use in a variety of commercial and industrial applications and meet market demand for these products. Industrial uses of limestone include quick lime and slaked lime, cement and mortar, neutralization of acid rock and soil, aggregate, glass making, toothpaste, and a source of dietary calcium. Dolomite is used as ornamental stone, concrete aggregate, and as a source of magnesium oxide. Dolomite is sometimes used as a flux for smelting of iron and steel.

AUTHORIZING ACTIONS

Bureau of Land Management

Graymont's proposed mine expansion facilities 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 1872. These laws in combination with other BLM policies (*i.e.*, Resource Management Plan) require BLM to analyze proposed mining operations to ensure 1) adequate provisions are included to prevent unnecessary or undue 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 is limited to that which is reasonably 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

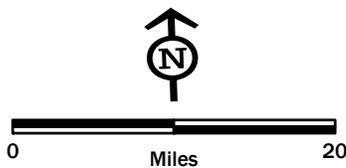
public land identified in the Proposed Action is reasonably incident to the Project in accordance with 43 CFR 3715 – Use and Occupancy under the Mining Laws. The mining and reclamation plans are designed to minimize the amount of land that would be disturbed to develop mine pits, dispose of overburden and reject material, process ore, and construct haul roads and other ancillary facilities to meet Project requirements and ensure that applicable safety standards are met.

BLM's decision regarding the proposed mine expansion can only be made after an environmental analysis is completed as required by NEPA. Included in Graymont's proposed amendment to their existing permit is a Plan of Operations for the mine expansion (Graymont 2007a). BLM decision options include approving Graymont's Plan of Operations as submitted, approving alternatives to the Plan of Operations to mitigate environmental impacts, approving the Plan of Operations with stipulations to mitigate environmental impacts, or denying the Plan of Operations.

Montana Department of Environmental Quality

Under the Montana Metal Mine Reclamation Act (MMRA) (Title 82, Chapter 4, Part 3, Montana Code Annotated [MCA]) DEQ may deny an application for a permit or an application for an amendment to a permit for the following reasons:

- The Plan of Operations or Reclamation Plan conflicts with Title 75, Chapter 2, as amended (Air Quality); Title 75, Chapter 5, as amended (Water Quality); Title 75, Chapter 6, as amended (Public Water Supplies, Distribution, and Treatment); or, rules adopted pursuant to these laws.



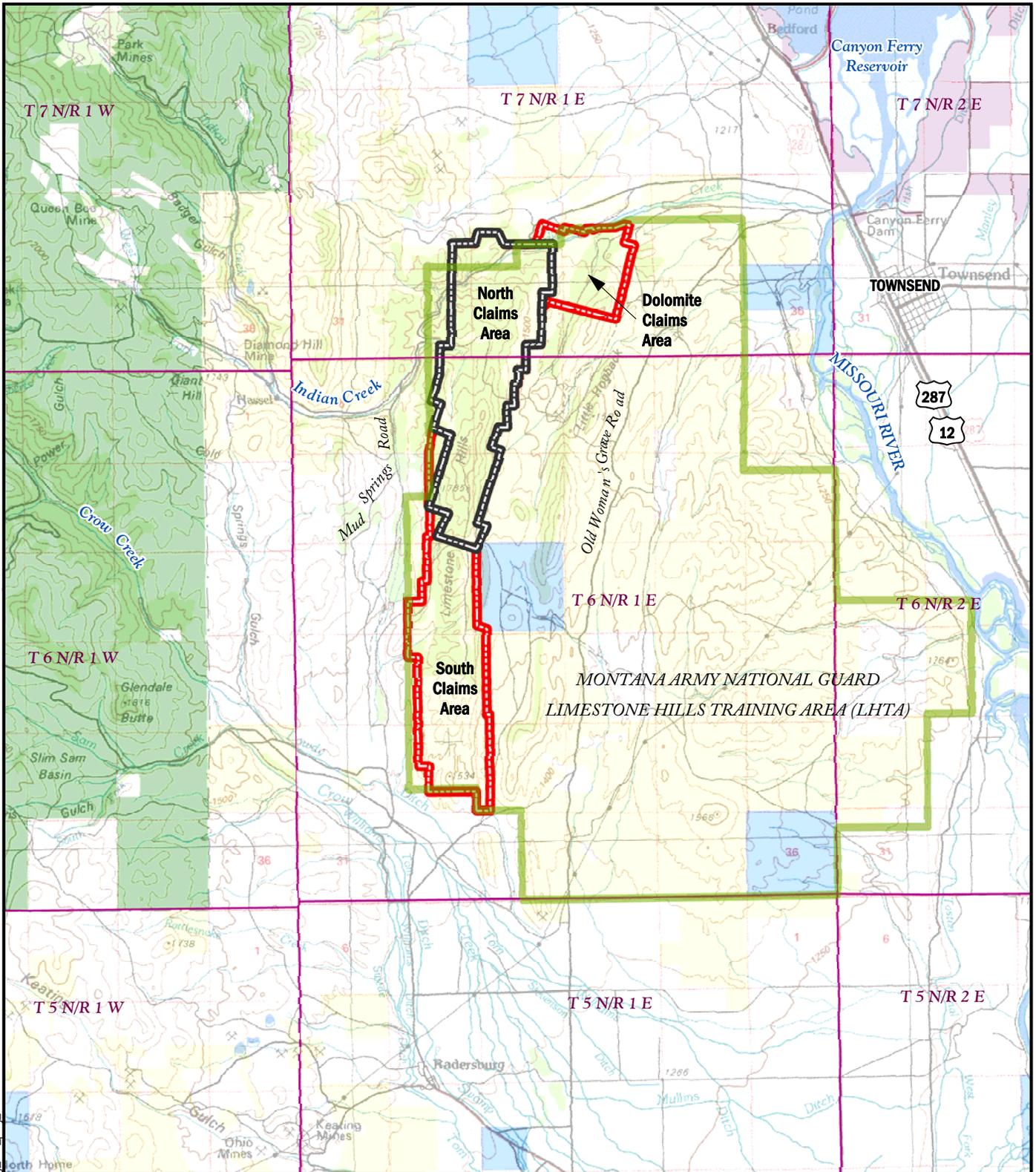
H:\13532 Graymont\ EIS\5000 GIS\Projects\EIS\Fig. 1-1_general_loc.mxd



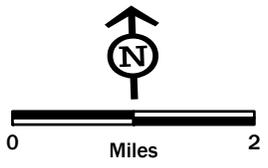
U.S. Department of the Interior
Bureau of Land Management
Butte Field Office
Butte, Montana

GENERAL LOCATION
Indian Creek Mine Expansion - Environmental Impact Statement
Broadwater County, Montana

FIGURE
1-1



Base Data Source: Montana NRIS GIS Data



- Land Ownership**
- Existing LHTA Boundary
 - State of Montana
 - Bureau of Land Management
 - Bureau of Reclamation
 - Forest Service
 - Existing Operating Permit Boundary
 - Proposed Operating Permit Boundary

H:\13532 Graymont1 EIS\5000 GIS\Projects\EIS\Fig. 1-2 proj loc.mxd

U.S. Department of the Interior
Bureau of Land Management
Butte Field Office
Butte, Montana

PROJECT LOCATION
Indian Creek Mine Expansion - Environmental Impact Statement
Broadwater County, Montana

FIGURE
1-2

- The Reclamation Plan does not provide an acceptable method for accomplishment of reclamation as required by the MMRA.

DEQ's decision regarding the proposed mine expansion can only be made after the agency complies with requirements of the Montana Environmental Policy Act (MEPA). DEQ's decision options include approval of the Proposed Action; approval of alternatives that would reduce or eliminate potential impacts associated with the Proposed Action; approval of the Proposed Action with mitigation measures; or selection of the No Action Alternative.

If BLM and/or DEQ deny the Plan of Operations, including the Reclamation Plan, the applicant can modify and resubmit the Plan of Operations to address issues or concerns identified by BLM and/or DEQ.

MMRA provides for reclamation of land disturbed by mining. DEQ bonding requirements for mine reclamation are outlined in MMRA. Bonding policy relating to mining and mineral development on public land is contained in BLM Surface Management Regulations (43 CFR 3809). BLM and DEQ have entered into a Memorandum of Understanding that states BLM will defer to DEQ for establishing bond levels and retention of the reclamation bond. DEQ currently holds a reclamation bond for the existing Graymont operation of \$3.6 million for 305 acres of disturbance. Bonds are reviewed by DEQ annually. Comprehensive review of the bond level occurs every five years, as required under MMRA.

Pursuant to 75-1-201(1)(b)(iv)(D) MCA, DEQ has determined that the proposed mine expansion (Proposed Action) and alternatives to the Proposed Action, will not impact private property rights in the Project area.

Montana Army National Guard

Most of the proposed mine expansion property is located within the boundaries of the Limestone Hills Training Area (LHTA), a military training facility operated by the Montana Army National Guard (MTARNG) under a right-of-way issued by BLM (**Figure I-2**). A Memorandum of Agreement between MTARNG, Graymont, and BLM sets forth the policies and procedures agreed to by MTARNG regarding military training exercises; removal of unexploded ordnance (UXO); exploration, mining, and reclamation activities conducted by Graymont; and administration of public land by BLM to allow joint and compatible use of the LHTA (MTARNG, Graymont, BLM 2005).

BLM and MTARNG distributed a Draft Legislative EIS in August 2007 regarding the proposed withdrawal of the LHTA from BLM administration to U. S. Army Corps of Engineers (ACOE) on behalf of the MTARNG. The proposed land withdrawal must be reviewed and approved by the U.S. Congress. If approved, the ACOE could act as a real estate agent for land acquisition, administer grazing leases, or, if there is no withdrawal, could manage UXO clearance with BLM as the regulatory authority. If the U.S. Congress decides in favor of withdrawal, ACOE would license Limestone Hills for use by MTARNG. BLM would continue to manage mineral rights on the property.

Unexploded Ordnance (UXO)

The MTARNG, Department of the Army, ACOE, and the Department of Defense are responsible for identifying and clearing UXO in the LHTA. The proposed mine expansion area lies west of Old Woman's Grave Road within a portion of the LHTA that has been closed to public access by BLM. Site-specific information on the amount of UXO and ordnance fragmentation contamination in the South Claims Area is unknown.

In addition to BLM and DEQ, other federal, state, and local agencies have jurisdiction over certain aspects of the Proposed Action. **Table**

I-1 provides a comprehensive listing of agencies and their respective permit/authorizing responsibilities.

Plan of Operations MTM 78300/Rights-of-Way	Bureau of Land Management (BLM)
National Environmental Policy Act	BLM
National Historic Preservation Act	BLM; State Historic Preservation Office (SHPO)
Native American Graves Protection & Repatriation Act	BLM
American Indian Religious Freedom Act	BLM
Clean Water Act (Section 404)	U.S. Army Corps of Engineers (ACOE)
High Explosive License/Permit	U.S. Bureau of Alcohol, Tobacco, & Firearms
Storm Water Permit	Montana Department of Environmental Quality (DEQ)
Air Quality Permit – Clean Air Act	DEQ Air Resources Management Bureau
Montana Pollutant Discharge Elimination System Permit – Water Quality Act	DEQ Water Protection Bureau
Metal Mine Reclamation Operating Permit	DEQ Environmental Management Bureau
Safety Plan	Mine Safety & Health Administration (MSHA)
Endangered Species Act of 1973	U.S. Fish and Wildlife Service (USFWS)
Montana Environmental Policy Act	DEQ

RELATIONSHIP TO BLM AND NON-BLM POLICIES, PLANS, AND PROGRAMS

The proposed amendment to Graymont's Plan of Operations (*i.e.*, Proposed Action) has been reviewed for compliance with BLM policies, plans, and programs. The proposal conforms to the Minerals Decision in the Record of Decision, Headwaters Resource Management Plan, approved in 1984.

DEQ has reviewed the proposed mine expansion amendment and determined it to be in conformance with the MMRA (DEQ 2007a). Specifically, Graymont's amendment application is in compliance with provisions contained in Title 82, Chapter 4, Part 3, MCA.

BLM and the State of Montana have determined that the proposed Graymont amendment would

be in conformance with existing land use restrictions and other State of Montana regulations.

PUBLIC SCOPING

To allow a process for determining the scope of issues and concerns related to the Proposed Action (40 CFR 1501.7 and ARM 17.4.615), a public scoping period was provided by BLM and DEQ. A Notice of Intent to prepare the EIS was published in the Federal Register on May 18, 2007 (72 Federal Register 96, pp 28067-28068). Publication of this notice in the Federal Register initiated a 30-day public scoping period for the Proposed Action from May 18, 2007, to June 18, 2007.

BLM and DEQ mailed a scoping package that included a project summary and maps to individuals and organizations listed on the Butte Field Office and DEQ mailing lists. In addition,

the scoping package was distributed at public scoping meetings held by BLM and DEQ on June 6, 2007, in Helena, and June 7, 2007, in Townsend. Members of the public attended both scoping meetings. No comments were received on the proposed amendment. Written comments concerning the permit application were received from four individuals and the following agencies.

Broadwater Development Corporation
Montana Army National Guard
Montana Fish, Wildlife and Parks
U.S. Environmental Protection Agency

Public and agency comments concerning the Proposed Action are shown in **Table I-2**. This table also provides references to sections of this Final EIS which respond to each issue raised in the comments.

Issue Raised	Location of Response
Need to discuss current status of mule deer, bighorn sheep, and pronghorn in the proposed mine expansion area.	Chapter 3 – Terrestrial Wildlife
Vegetation on reclaimed areas is neither the quality nor quantity of pre-mining vegetation for wildlife forage.	Chapter 3 & 4 - Vegetation
Shrub densities on reclaimed land should strive to meet densities that existed prior to mining.	Chapter 3 & 4 - Vegetation
Cultural resources have not been adequately addressed in the permit application.	Chapter 3 – Cultural Resources
Loss of mule deer habitat due to mine expansion.	Chapter 4 – Terrestrial Wildlife
Impacts to air and water quality and wildlife habitat	Chapter 4 – Air Quality Chapter 4 - Water Quantity and Quality Chapter 4 - Terrestrial Wildlife
Proposed mine expansion may interfere with Montana Army National Guard training activities in portions of the Limestone Hills Training Area.	Chapter 1 – Introduction
Specify purpose and need for the mine expansion, reasonable alternatives to the proposed mine expansion, and mitigation and monitoring plans to reduce or eliminate adverse effects of the mine expansion.	Chapter 1 – Purpose and Need Chapter 2 – Alternatives Chapter 4 – Mitigation and Monitoring Measures (see respective resource section)
Describe environmental impacts of mine construction, operation, closure, and reclamation alternatives.	Chapter 2 – Proposed Action Chapter 3 – Consequences of Proposed Action and Alternatives Chapter 4 – Cumulative Effects
Provide an analysis of cumulative effects resulting from the incremental impact of the mine expansion when added to other past, present, and reasonably foreseeable future actions.	Chapter 4 – Cumulative Effects
Describe and characterize current status and trends of resources, ecosystems, and human communities in the affected area including air, water, soil, vegetation, wildlife, fisheries, aquatic, cultural, social and economic resources.	Chapter 3 – Affected Environment
Describe road network needed for mine access and management.	Chapter 2 – Proposed Action
Discuss chemicals that may spill during mine operation or transportation	Chapter 2 – Proposed Action

CHAPTER 2

DESCRIPTION OF PROPOSED ACTION AND ALTERNATIVES

INTRODUCTION

This chapter describes Graymont's existing operations at the Indian Creek Mine, Graymont's proposed amendment to its existing permit for a life-of-mine expansion of operations (Proposed Action), and reasonable alternatives to the Proposed Action. The proposal to amend MMRA Operating Permit No. 00105 and BLM Plan of Operations MTM 78300 for a life-of-mine expansion of operations is referred to as the Proposed Action in this document. The primary source of information for this Chapter is Graymont's Plan of Operations, which includes the Reclamation Plan (Graymont 2007a).

The Indian Creek Mine (Mine) is located in the Limestone Hills along the eastern flank of the Elkhorn Mountains. The area contains rugged terrain, characterized by a series of massive limestone and dolomite outcrops forming spur ridges interspersed with terraces, fans, and foothill slopes. Indian Creek bisects the north end of the Limestone Hills as it flows east toward the Missouri River. The Crow Creek drainage lies at the south end of the Limestone Hills and flows southeast into the Radersburg Valley where it joins the Missouri River near Toston.

EXISTING OPERATIONS

Graymont (formerly Continental Lime, Inc.) has operated a limestone mine and processing plant at Indian Creek since 1981 (Graymont 1981). The Mine is currently permitted for 757 acres of disturbance including mine pits, overburden disposal areas, a reject rock pile, crusher site, haul roads, plant facility, and a load-out area. As

shown on **Figure 2-1**, the existing mine disturbance is within the 1,735-acre operating permit area. Actual surface disturbance is 288 acres. The disturbance boundary is smaller than the permitted disturbance area to allow flexibility for mine planning and response to market conditions.

The legal description of existing permitted operations includes portions of Sections 28, 29, 32, and 33 Township 7 North, Range 1 East and portions of Sections 4, 5, 8, 9, 16, and 17 Township 6 North, Range 1 East, Montana Principal Meridian, Broadwater County, Montana. Included in the mine disturbance is a 3.8-acre rail terminal and load-out facility located in Section 25, Township 7 North, Range 1 East, near the intersection of Indian Creek Road and U.S. Highway 287 approximately 3 miles east of the Plant site (**Figure 2-1**). The existing Plant is located on private land owned by Graymont in Section 28, Township 7 North, Range 1 East.

Graymont has developed a series of mine pits along the north-south strike of the high-calcium limestone ore body in the North Claims Area. Faulting has displaced the limestone bed vertically into numerous blocks along its length resulting in varying thickness of overburden (geologic material considered waste that overlies ore) on either side of the fault zone. Many of the fault blocks have little or no overburden covering the high-calcium bed, while other blocks have in excess of 100 feet. High-calcium limestone ore beds outcrop with variable steepness along the east and west sides of a north-south trending ridge with thicknesses varying from 100 to 160 feet.

Existing surface disturbance for mine pits, reject rock, overburden disposal areas, and ancillary

facilities placed outside mine pits in the North Claims Area is shown in **Table 2-1**.

TABLE 2-1 Existing Disturbance – North Claims Area Indian Creek Mine	
Facility	Existing Disturbance (acres)
Mine Pits	91.7
Overburden Disposal Areas	15.3
Reject Rock	63.4
Soil Stockpiles	11.6
Plant and Facilities	23.9
Haul/Access Roads	20.5
Areas undergoing Reclamation	61.6
TOTAL	288

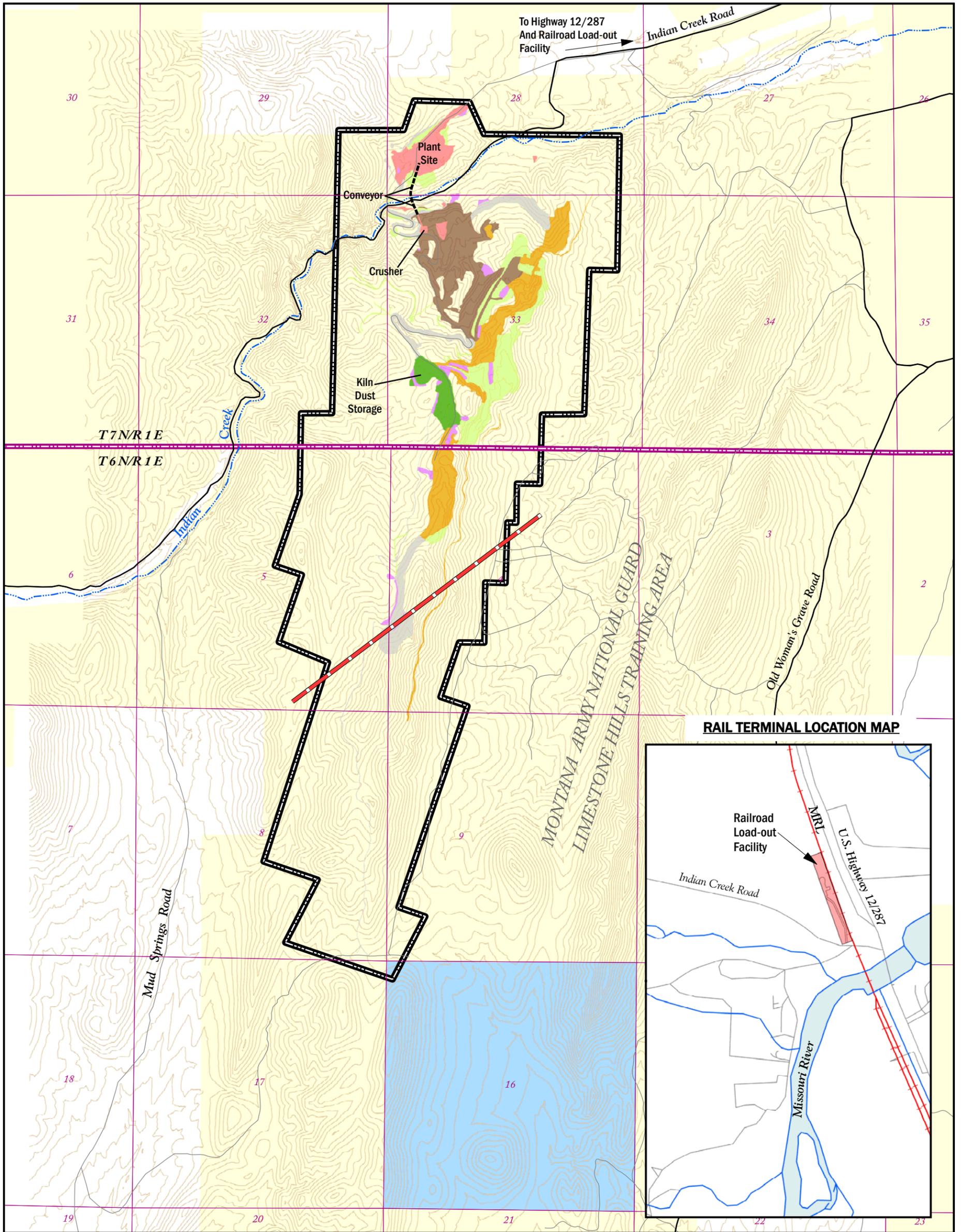
Source: Graymont 2007a.

MINE OPERATIONS

Approximately one million tons of material is mined annually at the Indian Creek Mine which includes ore, in-seam waste rock, and overburden. About 65 percent is used for lime production, reject rock (less than ½ inch in diameter) may account for up to 35 percent, and in-seam or overburden waste ranges from 0 to 20 percent of the total. Exploration drilling conducted in advance of mine operations defines pit layout and disturbance boundaries. Pits are not contiguous but are developed in sequence from north to south along a north-south trending ridge. Clearance of UXO is followed by clearing and grubbing of vegetation and removal and salvage of available soil materials from areas to be disturbed.

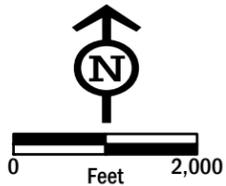
Trees larger than 6 inches in diameter removed in advance of mining operations are generally cut for firewood. Trees and shrubs less than 6 inches in diameter are slashed or machine mulched and mixed into salvaged soil material. Stumps, dead trees, and limbs are placed on reclaimed sites. Timber removed for commercial purposes from public land is coordinated with BLM.

Mining is conducted using standard open pit and quarry practices. Haul roads are constructed to access the highest elevation of the quarry, and mining begins at the top of the ore body and progresses downward. Limestone is removed in layers or “benches” approximately 20 feet thick. The thickness of each bench is dictated by the depth of the blast holes. As mining progresses downward on the deposit, safety rock catch benches are constructed on the mine face at a minimum width of 20 feet. These catch benches are established at vertical intervals ranging from 20 to 60 feet in height. Safety rock catch benches are constructed down slope and outside active mining areas to prevent rocks from rolling beyond the permit area. Highwalls constructed between rock benches are sloped back approximately 5 to 15 degrees. Rock and debris that accumulate along the edge of quarry benches are periodically removed to prevent movement down slope. Ramp roads within the pit connect adjacent benches to provide truck and loader access.



Base Data Source: Montana NRIS GIS Data

- | | | | |
|------------------------|--------------------------------------|----------------------------------|-----------------------------|
| — County Roads | ▭ Township/Range | Existing Mine Disturbance | Land Ownership |
| — Other Roads | ▭ Sections | ■ Mine Pits | ■ State of Montana |
| — Streams | ▭ Existing Operating Permit Boundary | ■ Overburden | ■ Bureau of Land Management |
| — 2.75 Rocket Fan Line | ▭ | ■ Mine Facilities | |
| | | ■ Reclaimed Areas | |
| | | ■ Reject Rock | |
| | | ■ Haul Roads | |
| | | ■ Soil Stockpiles | |



h:\13532 Graymont EIS\5000 GIS\Projects\EIS\Fig. 2-1 Exist_Ops.mxd

Blasted limestone is loaded into trucks using a front-end loader and transported to the crusher facility. Limestone is placed in a hopper then crushed and screened. Screened limestone is transported on a conveyor to storage piles at the plant facility located north of Indian Creek.

Overburden is placed in either designated overburden disposal areas along the perimeter of the mine pit or in portions of mine pits depleted of economically recoverable limestone. Up to an estimated 50 percent of overburden can be placed in certain areas depleted of reserves at various times during the mine life. This is contingent on the availability of overburden and accessibility of these areas.

Prior to placement of overburden in disposal areas, soil and/or growth media are removed. Growth media is earthen material that is desirable and suitable to support growth of vegetation. Temporary haul roads are constructed to overburden disposal areas as mining progresses. Current permitted overburden disposal sites are shown on **Figure 2-1**. Overburden in the North Claims Area averages approximately 4 million tons per 1,000 linear feet of mine development.

Overburden is placed in a configuration so as not to obstruct any major drainage. Final grading re-establishes drainage systems near the toe of re-graded overburden piles. Final contoured slopes in terms of horizontal (H) to vertical (V) ratios would be established ranging from 2.0H:1.0V to 3.0H:1.0V to provide landscape diversity. The natural ground slope angle under and adjacent to some overburden disposal sites may dictate a steeper slope in some areas.

REJECT ROCK

Reject rock resulting from the ore crushing operation consists of limestone fines that pass a ½-inch screen. Screened rejects from the

crusher are placed in lifts between mine pits as shown on **Figure 2-1**. Approximately 5 million tons of reject rock have been placed in this area and is periodically sold for various purposes including land reclamation where acidic conditions exist. The area is maintained at two percent slope toward the north to optimize infiltration of storm water and limit run-off. Final slopes along the north and west sides will be graded to attain slopes ranging from 2.0H:1.0V to 3.0H:1.0V to provide topographic diversity. Flatter slopes are used where necessary to ensure stability.

Analysis of reject rock has shown that it can absorb a 100-year, 24-hour storm event (Chen-Northern 1991). Data from the National Oceanic and Atmospheric Administration indicate that a 100-year, 24-hour storm event for this area would be 2.8 inches of precipitation (NOAA 1973). A value of 3 inches was used in conducting the analysis. To date, run-off or discharge from the reject rock disposal area has not been observed. Past observations indicate that this material does not discharge water with rainfall amounts encountered at the Mine site. A lysimeter (device that measures the moisture content of soil) has been placed at the base of the reject pile to monitor water conditions within the reject pile. The lysimeter indicates an unsaturated pore space environment.

ORE PROCESSING

Limestone ore is hauled to the crusher located south of Indian Creek (**Figure 2-1**). Reject rock is separated from crushed ore, stored (as discussed above – Reject Rock), and sold as a product. Crushed ore is transported via a 1,500-foot conveyor across Indian Creek to stockpiles located at the plant facility (**Figure 2-1**). From the storage piles, limestone is conveyed into rotary kiln heaters.

Limestone ore is initially heated to a temperature of about 1,800° F and fed to one of two rotary kilns where it is subsequently heated to a temperature between 2,200° and 2,500° F for a period of 2½ to 3 hours. As the limestone travels through the slightly sloping, rotating kiln, the temperature of the limestone increases as it moves closer to the flame. The heating action converts the limestone (calcium carbonate - CaCO₃) to lime (calcium oxide - CaO) as the product. After the lime reaches the discharge end of the kiln, it is cooled and conveyed to one of several storage silos. Product lime is then loaded into trucks for transport to the rail terminal or directly to consumers. Each kiln can produce a maximum of 500 tons of lime (also known as quicklime) per day.

Approximately 40,000 tons of coal and 30,000 tons of petroleum coke are used annually to fuel the kilns at the processing plant or about 320 tons of fuel per day. A stockpile of approximately 15,000 tons of coal and petroleum coke is maintained on-site. A berm has been constructed around the stockpile to divert surface water away from the stockpile.

KILN DUST

Kiln dust is produced during the ore processing circuit. Each kiln circuit is equipped with a baghouse to capture particulates from kiln emission exhaust, lime handling, and unloading. Lime kiln dust collected in the baghouse is sold for various applications. Kiln dust is produced at an approximate rate of 7 percent of production (currently 50 tons per day/18,250 tons per year). Kiln dust is stored on-site in a 150-ton silo. At the present time, all kiln dust is sold out of the silo as it is produced. Kiln dust produced in excess of silo storage capacity is transported using a covered 10-ton truck to a storage area located west of the existing haul road as shown on **Figure 2-1**. A dike of overburden and soil was constructed along the southwest side of

the storage site to contain the kiln dust and prevent storm water run-off from entering the area. Storm water run-on is diverted around the kiln dust storage facility.

Kiln dust, used as a neutralizing agent for acidic soil, is generally 20 to 40 percent calcium oxide, 5 percent magnesium oxide, and 40 to 50 percent calcium carbonate with minor amounts of silicon, iron, or aluminum oxides. Laboratory analysis has been performed in accordance with Extraction Procedure Toxicity Test (Federal Register, Vol. 45, No. 98, pp. 33127-33128) on kiln dust to determine leachable concentrations of trace elements. Results showed non-detectable concentrations for arsenic, cadmium, lead, mercury, selenium, and silver. Results for barium and chromium were below the maximum allowable concentration levels (Graymont 2007a).

SOIL SALVAGE

Soil material and growth media (including weathered Amsden Formation) with less than 40 percent coarse fragments are salvaged prior to mining activities. Coarse fragments are defined by Graymont as rocks greater than ½ inch in diameter. Soil volumes salvaged, stockpiled, or used for reclamation are reported each year in Graymont's annual report. To date, approximately 294,000 cubic yards of soil material have been salvaged and placed in stockpiles as shown on **Figure 2-1**. Approximately 64,000 cubic yards have been placed on 61 acres undergoing reclamation. Soil material is replaced to depths ranging from 2 to 9 inches.

HAUL ROADS

Existing haul roads have been constructed using a balanced cut and fill configuration (cutting material from above the slope and using it to fill in the lower slope to construct the width of the roadbed) or a full bench method (full width of

road cut from above slope so no fill is used to make roadbed). Mine roads are constructed to a width of 60 feet with a 4-foot-high berm on the downgradient side in compliance with Mine Safety and Health Administration (MSHA) standards. The wear surface is constructed using reject rock to a maximum grade of 8 percent or less. Temporary haul roads are constructed along the deposit as mining progresses. These roads are ultimately removed or reclaimed as each pit is mined out.

SURFACE WATER CONTROLS

Surface water control structures have been constructed in accordance with an approved Storm Water Pollution Prevention Plan (Graymont 2006). Various storm water control structure designs and calculations are contained in the Storm Water Pollution Prevention Plan.

Surface water detention basins and drainage ditches are constructed as needed as mining progresses. Berms have been constructed along haul roads and around the plant and crusher site in accordance with applicable Mine Safety and Health Administration regulations. When used as a Best Management Practice for storm water control, berms are designed, constructed, and maintained to withstand a 10-year, 24-hour storm event.

UNEXPLODED ORDNANCE (UXO) CLEARANCE

Most of the Project area lies within the Montana Army National Guard (MTARNG) LHTA designated as live fire Surface Danger Zones and may have been contaminated with unexploded ordnance (UXO). Ordnance that fails to detonate fully upon impact is considered UXO. Site preparation by Graymont includes clearing and grubbing vegetation from proposed disturbance areas. Because the Department of Defense prohibits exploration, drilling, and mining on the surface of UXO-contaminated

land, MTARNG initiated UXO clearing activity to remove ordnance and explosives hazards on mining claims considered to be high priority by Graymont. The high priority UXO clearance area is within a BLM-instituted closure area, west of Old Woman's Grave Road, and is currently under the safety control of MTARNG.

The MTARNG, Department of the Army, ACOE, and Department of Defense are jointly responsible for identifying and clearing UXO in the LHTA. Site-specific information on the amount of UXO and ordnance fragmentation contamination in the Project area is unknown. The Army has previously been able to clear about 25 acres per year. However, that rate of clearance has increased with an additional 84 acres released in early 2008. MTARNG currently estimates that UXO clearance in the existing mine permit area (North Claims Area) will be completed by 2010, if funding remains available at current levels. The Right-of-Way and the Memorandum of Agreement between BLM, Graymont, and MTARNG requires remediation of UXO in the proposed joint use area. Any mining that would occur in this area depends upon successful completion of UXO clearance as determined by the Department of Defense Explosive Safety Board.

ANCILLARY FACILITIES

Dust Suppression

A dust suppressant (magnesium chloride) is regularly applied to haul roads in cooperation with Broadwater County with follow up applications of water to help control dust. Dust suppression water systems are used at the crusher hopper and screening plants. Water pumped from the plant site (Well No. 2) is also used for dust suppression. Approximately 5 million gallons of water per year are used for dust suppression (Graymont 2007a).

Potable Water

Graymont maintains two water supply wells at the plant site for operations and potable use. Plant Site Well No. 1 was completed in 1981 to a depth of 805 feet and is screened from 440 to 700 feet below ground surface. Plant Site Well No. 2 was drilled in 1995 to a depth of 685 feet and is screened from 420 to 620 feet below ground surface. Plant Site Well No. 2 serves as the primary water supply well for the facility and provides 100 gallons per minute (Hydrometrics, Inc. 2007).

Explosives

Ammonium nitrate and fuel oil (ANFO) are used as blasting agents at the Indian Creek Mine. Down hole placement of blasting agents is performed by contract suppliers. Drill patterns and detonation are controlled by Graymont licensed blasters.

Electrical Power

Electrical power to the lime plant is provided by NorthWestern Energy Company's 100 kilovolt (kV) system through an outdoor substation. The plant secondary distribution voltage level is 4,160 volts and the utilization voltage levels are 480, 240, and 120 volts.

Sewage Treatment

Portable toilets are maintained at two sites and serviced regularly by a contractor. The existing plant and rail terminal load-out sites have septic systems.

Solid Waste Disposal

Solid waste is disposed of in accordance with regulatory guidelines. No solid waste is buried on-site unless approved by the regulatory agencies. Scrap metal is salvaged and recycled. Refuse and other undefined solid waste are

disposed in the Broadwater County public landfill. No hazardous waste is generated or disposed of on-site.

Public Safety

Graymont is authorized to restrict unaccompanied public access to land within the operating permit boundary (**Figure I-2**) to provide protection of public health and safety. The right-of-way for the Indian Creek Road is excluded from this restriction. Signs, fences, or other markings that identify the restricted area and alert the public to hazardous sites or conditions are posted, maintained, moved and adjusted periodically to meet current conditions and comply with applicable federal and state regulations.

Fire Protection

Graymont has adopted measures to avoid range and forest fires through implementation of the Indian Creek Plant Fire Protection Plan (Graymont 2007a). Equipment and facilities are equipped with fire safety systems and inspected regularly to ensure that MSHA or other applicable standards are met.

Hazardous Materials

Hazardous materials currently used and/or stored at the Indian Creek Mine include ethylene glycol (antifreeze), diesel fuel, unleaded gasoline, motor oil, hydraulic and transmission fluids, and various types of cleaners and fluids (e.g., brake fluid, battery acid, fuel additives) in small containers. Petroleum products used at the Mine are stored in aboveground storage tanks with secondary containment designed to hold 110 percent of the volume of the largest container. Used motor oil and antifreeze are recycled. A Spill Prevention, Control, and Countermeasure Plan has been implemented at the Mine describing cleanup procedures should a spill of hazardous materials occur on the site (Graymont 2007a).

Rail Terminal and Load-Out Facility

A rail terminal load-out facility (3.8 acres) is located within an 8-acre parcel adjacent to U.S. Highway 287 near the intersection with Indian Creek road (**Figure 2-1**). The facility consists of an office and a single 150-ton fuel (coal/coke) storage silo used to off-load coal and coke shipped via rail for use at the Plant site. Two 800-ton lime storage silos are used to fill rail cars for shipment.

EMPLOYMENT

Graymont currently employs 48 persons and operates the plant on a 24-hour, 7-days per week schedule. Graymont's annual payroll was approximately \$1.65 million in 2007. The quarry contractor employs 15 persons with an annual payroll of about \$800,000.

MONITORING PROGRAMS

Air Quality

Particulate emissions from mining, processing, and wind erosion are regulated under the Montana Clean Air Act. Permits authorized under this act are issued by DEQ. Graymont operates the Indian Creek Mine in accordance with Air Quality Permit No. 1554-16. Quarterly and annual reports are submitted to DEQ. No violations of emission standards have occurred at the Indian Creek Mine (DEQ 2006a).

Water Quality

Graymont regularly monitors water resources in and peripheral to the Indian Creek Mine to further develop the water resources database generated over the past several years and to detect possible changes in the hydrologic system that may be related to mining activities. The Operational Monitoring Program includes monitoring of surface water and groundwater,

including springs and seeps, and infiltrating pore water using a lysimeter installed in the reject rock pile (Graymont 2006).

Surface Water

The existing Operational Monitoring Program includes six surface water sites (four on Indian Creek and two on Crow Creek) and five spring/seep sites (Graymont 2006). Surface water sampling locations and laboratory results are discussed in Chapter 3 – *Water Quantity and Quality*. Surface water samples are analyzed for total suspended solids, total dissolved solids, pH, total nitrogen, nitrite plus nitrate nitrogen, total Kjeldahl nitrogen (organic nitrogen), and total phosphorus. Surface water sampling occurs annually.

Graymont maintains a Montana Pollutant Discharge Elimination System (MPDES) permit for industrial storm water point source discharges from the facility. Sampling requirements are outlined in the Storm Water Pollution Prevention Plan if a discharge occurs.

Groundwater

Plant site well(s) are sampled semi-annually by Graymont under the DEQ Public Water Supply program. Water supply monitoring includes sample collection and analysis for oil and grease, total suspended solids, total dissolved solids, pH, total nitrogen, nitrite plus nitrate nitrogen, total Kjeldahl nitrogen, and total phosphorus. Metals analysis has been reduced to aluminum (dissolved) and total recoverable arsenic, cadmium, copper, iron, lead, and zinc. Sampling results are contained in annual reports submitted to DEQ and BLM.

The lysimeter located in the reject rock pile monitors quantity and quality of pore moisture (long-term seepage) through the material at the reject rock/bedrock interface monitoring

indicates the reject rock material is not saturated (Graymont 2007a). The lysimeter is monitored annually under Graymont's Operational Monitoring Program (Graymont 2006).

All Operational Monitoring sites are monitored annually in late spring (May or June) when stream and spring flows are relatively high but snowmelt effects have subsided.

Reclamation and Vegetation

Reclamation activities and revegetation success are routinely monitored by the agencies during regular site compliance inspections. The special status plant "lesser rushy milkvetch" would be monitored every 5 years to ensure that weed control activities and mine construction activities have not disturbed the population.

RECLAMATION PLAN

Graymont updates its reclamation plan annually and submits the revised plan to DEQ and BLM for approval. All areas disturbed by mining activities will be reclaimed in accordance with approved plans. Some pit highwalls will be reclaimed as cliff or talus rock features. Final grading will blend with surrounding topography wherever possible. Sloped areas will have soil and/or growth media placed to a depth ranging from 2 to 9 inches during final grading. Soil thickness varies based on the revegetation plan for a given area. Areas revegetated with mountain mahogany receive 2 inches of growth media, whereas areas seeded with grass-dominated plant communities have up to 9 inches of growth media.

Public access to highwalls, benches, or cliff sites will be controlled at final reclamation with gates, signs, and berms. Prior to final reclamation, Graymont will consult with BLM and DEQ to ensure closure plans meet the approved reclamation plan (Graymont 1981).

Plant Site

During final closure, all processing equipment at the plant and the office building will be dismantled and removed from the property. Concrete structures and foundations will be demolished and buried in graded fill areas or covered with a minimum of 12 inches of reject fines prior to placement of soil material. Slopes along the north side of Indian Creek will be graded to their approximate original contour whenever possible. The fill area east of the Plant site will be graded to a 2.0H:1.0V or 3.0H:1.0V slope. The bridge and conveyor across Indian Creek will be removed. All power lines and poles will be removed from the property. A portion of the access road from Indian Creek Road to the Plant site will be removed and reclaimed unless a subsequent owner applies to the agencies to retain it.

Rail Terminal and Load-Out Facility

The rail terminal, located near U.S. Highway 287 will remain an industrial facility. All residual lime and coal will be removed from storage bins and transported to the Plant site or sold. The rail terminal will be secured for future use by limiting unauthorized access through maintenance of fences and gates.

Crusher

The crusher and overland conveyer system will be dismantled and removed from the site after all mining is completed. Foundations will be demolished and either buried in the reject pile or covered with reject fines. The site will be graded to blend with surrounding topography. Cut embankments will be backfilled with reject fines to establish a smooth transition between original contours and flat areas. Soil material will be placed over the area and revegetated with the seed mix contained in the approved Reclamation Plan (Graymont 1981).

Haul Roads

Haul roads and other access roads no longer needed for mining operations will be reclaimed using an excavator or dozer to place fill material removed from the down slope side of the road into the road cut. Where possible, the cut bank side of the road will be pulled down to make a smooth transition with the backfilled material.

The main access and haul road from the Plant site to the various mining sites will be partially reclaimed. This system of roads will be reclaimed using the same methods as described above but a small corridor, approximately 8 to 16 feet wide, will be left at road grade to provide long-term access from the Indian Creek Road to the south limit of mining within the permit boundary. This access is necessary for monitoring and maintenance of reclaimed and revegetated areas throughout the mine site. This road will be scarified or covered with fines, covered with 2 to 9 inches of soil material, and reseeded to grass.

Reject Rock

Final contours of the reject rock pile will be established as reject fines are placed during day-to-day operations. Final grading will blend temporary haul roads with surrounding topography. Slopes will be established at less than 3.0H:1.0V. Soil material will be placed at a thickness ranging from 2 to 9 inches and seeded with the approved mixture.

Revegetation

All seed purchased for reclamation will be standard grade adapted to Montana conditions and certified noxious weed free. The seed mix may be changed with agency approval. Seed will be broadcast on prepared soil material, soil stockpiles, or reclaimed sites within 48 hours of soil preparation and dragged, raked, or tracked into the seedbed. The tracked vehicle or implement will have grousers at least ½ inch

high. The grooves formed by the tracked vehicle will be oriented perpendicular to the slope, and tracking will cover 100 percent of the slope. The seeding period will be October 15 through April 30 unless revised by the regulatory agencies.

The BLM and DEQ approved seed mix (25 pounds per acre of pure live seed [PLS]) includes the following species and rates for broadcast seeding:

- 2 lbs. PLS Western Wheatgrass
- 2 lbs. PLS Streambank Wheatgrass
- 6 lbs. PLS Slender Wheatgrass
- 6 lbs. PLS Bluebunch Wheatgrass
- 1 lb. PLS Indian Ricegrass
- 2 lbs. PLS Idaho Fescue
- 2 lbs. PLS Wheat or Barley
- 2 lbs. PLS Winterfat
- 1 lb. PLS Lewis Flax
- 0.1 lbs. PLS Western Yarrow

In addition to the grass and forb species listed above, tree and shrub seedlings will be planted at rates of 50 to 400 plants per acre on reclaimed areas. Species include curl-leaf mountain mahogany, Douglas-fir, Rocky Mountain juniper, common juniper, golden currant, small soapweed yucca, rose species, black sagebrush, skunkbush sumac, and limber pine. Seedlings, raised from seed sources collected on the mine property, will be used. Seedlings in selected mountain mahogany/juniper reclaimed areas will be planted at a rate up to 400 plants per acre. Seedlings will be planted during optimum planting periods of October 15 through April 30. Shrub planting from seed was completed during spring of 2007. Species planted included black sagebrush (0.5 lb. PLS/acre), yucca (2 lbs PLS/acre), skunkbush sumac (4 lbs PLS/acre), and rubber rabbitbrush (1 lb. PLS/acre). Two additional species, mountain mahogany and golden currant, will be included in the seed mix in 2008.

Fencing of newly seeded areas will not be necessary as livestock grazing is restricted within the Mine area by steep terrain, cattle guards, and existing fences. Livestock grazing will not be allowed on reclaimed areas until DEQ releases the reclamation bond. If a problem with livestock occurs, Graymont would provide fencing or other measures to prevent damage to reclamation plantings.

Noxious Weeds

Graymont conducts weed control activities under an approved Broadwater County Weed Management Plan. The Weed Management Plan (Graymont 2007b) is updated periodically in response to new infestations or expanded mine operations. Weed control activities are coordinated with Broadwater County, MTARNG, BLM, and USDA - Forest Service. Annual weed control activities are summarized in annual reports to the agencies.

ENVIRONMENTAL CONTROL MEASURES

Standard operational environmental control measures currently used by Graymont at the Indian Creek Mine include:

- All surface disturbances will be reclaimed in accordance with applicable BLM and DEQ regulations and the approved Reclamation Plan.
- Land clearing activities in advance of soil salvage and mining operations are limited to the extent practicable and conducted only on an as-needed basis. Trees larger than 6 inches in diameter removed in advance of mining operations are generally cut for firewood. Trees and shrubs less than 6 inches in diameter are slashed or machine mulched and mixed into

salvaged soil material. Stumps, dead trees, and limbs are placed on reclaimed sites.

- Concurrent reclamation is conducted during ongoing operations to the extent practicable to control sedimentation and erosion and return the land to post-mining use.
- Suitable growth media are salvaged from disturbance areas. Soil material is stockpiled and seeded for future use or direct-hauled to regraded areas and placed for final surface reclamation.
- Graymont's Weed Management Plan (Graymont 2007b) has been approved by Broadwater County. The Weed Management Plan has been implemented to ensure that reclaimed areas are protected from noxious weed invasion. Annual weed control activities are summarized in reports submitted to Broadwater County, BLM, and DEQ.
- Roads no longer needed for reclamation and access in mine areas are graded, covered with salvaged growth media, and contoured to blend with the surrounding terrain. The regraded surface is left in a roughened condition and seeded during the first appropriate season to promote vegetation success. Noxious weeds are monitored and controlled on reclaimed roads.
- Run-on control berms are constructed around active mine pits to prevent surface water from entering work areas. Sediment control basins are constructed to collect, settle, and infiltrate or evaporate run-on/run-off water from areas disturbed by mining operations.

- Storm water is controlled using material handling procedures that minimize exposure of material to storm water; spill prevention and response measures; sediment and erosion control; and physical storm water controls.
- Best Management Practices, including temporary sediment ponds, small check dams, and sediment fences, are placed around all potential sediment sources such as stockpiles, overburden disposal areas, and new construction areas as erosion control measures until vegetation is established to provide stable soil conditions.
- Fugitive dust emissions are controlled in accordance with Air Quality Permit No. 1554-16 through use of direct water application, chemical binders or wetting agents, and revegetation of disturbed areas concurrent with operations.
- Dust suppression sprays and dry dust collection systems (baghouses) have been installed on ore crushing circuits and all ore and coal transfer points at the Mine.
- Gaseous emissions are minimized through proper operation and maintenance of equipment.
- Surface water and groundwater monitoring is conducted during operation of the Mine to identify, quantify, and prompt implementation of corrective actions to reduce or eliminate potential adverse impacts that might result from mining activities.
- Short-term reclamation objectives for the overburden disposal areas are to minimize potential for erosion, slope failures, and sediment movement from disturbed areas and to facilitate final

reclamation. Long-term objectives include preventing ponding, promoting controlled run-off of surface water, and preventing erosion of reclaimed surfaces.

- Recontoured surfaces would be covered with soil material to depths ranging from 2 to 9 inches depending on the type of plant community being restored.
- The Plant and crusher sites will be decommissioned prior to the demolition or salvage of any structures. Portable equipment of value including vehicles, furniture, and computers will be removed from the site for subsequent reuse or salvage. Decommissioning the crusher and screening plant will be initiated after the last ore has been processed.

PROPOSED ACTION (LIFE-OF-MINE EXPANSION)

Graymont is proposing to amend MMRA Operating Permit No. 00105 and BLM Plan of Operations MTM 78300 to include a life-of-mine expansion of mining operations at its Indian Creek Mine located approximately 4 miles west of Townsend, Montana (**Figure 1-1**). The proposed amendment (Proposed Action) would encompass approximately 1,940 acres of public land currently administered by BLM located in portions of Sections 27, 28, 33, and 34; Township 7 North, Range 1 East and portions of Sections 16, 17, 20, 21, 28, and 29; Township 6 North, Range 1 East, Montana Principal Meridian, Broadwater County, Montana (**Figures 2-2 and 2-3**). Graymont proposes to continue mining at a rate of approximately 1 million tons annually. The life-of-mine expansion amendment represents approximately 50 years including 15 years of

currently permitted life-of-mine. Graymont would also mine dolomite as markets and products are developed.

As shown on **Figures 2-2** and **2-3**, a disturbance boundary would be established within the overall proposed operating permit area. Actual surface disturbance for mine activities within the disturbance boundary would be less than the permitted disturbance to allow flexibility for mine planning.

Proposed mining disturbance for the life-of-mine expansion would total 1,313 acres (968 acres in the South Claims Area and 345 acres in the Dolomite Claims Area) as shown in **Table 2-2**.

MINE PIT EXPANSION

Expansion of mine operations into the South Claims and Dolomite Claims areas would increase the area requiring UXO remediation by about 1,300 acres. At this time, MTARNG is unable to provide an estimate of the time and effort necessary to provide UXO clearance in these areas.

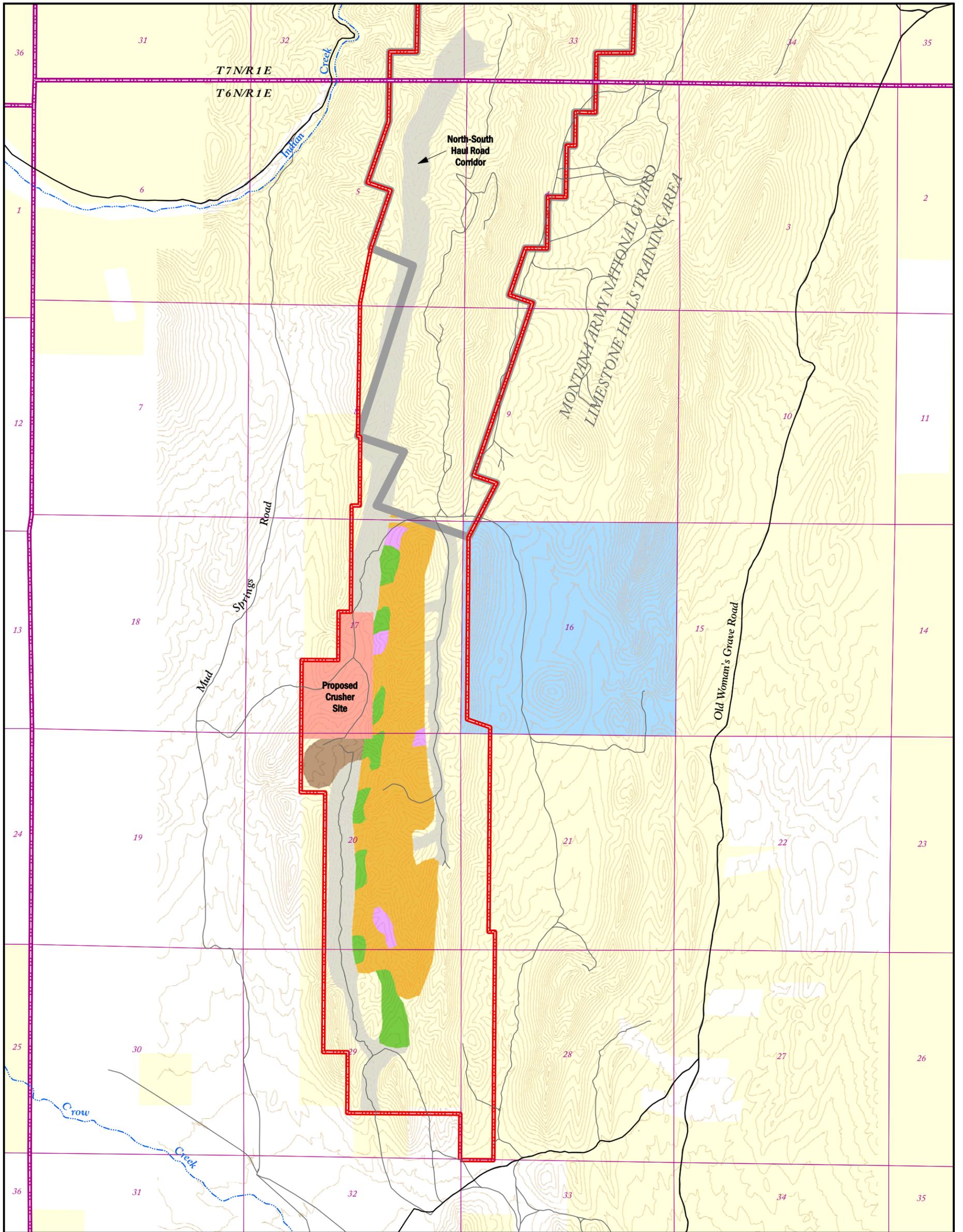
South Claims Area

Graymont proposes to extend mine operations approximately 2.5 miles south beyond the existing operating permit boundary into the South Claims Area as shown on **Figure 2-2**. The South Claims Area contains unpatented claims on public land held by Graymont. Proposed mine operations would progress southward along a high-calcium limestone ore body on the north-south trending ridge currently being mined. Mine pit development in the South Claims Area would disturb approximately 343 acres (**Table 2-2**).

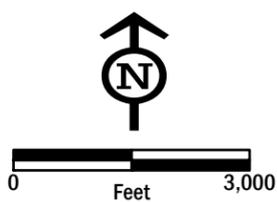
Mining activities in the South Claims Area would continue in the same manner as current operations in the North Claims Area. Limestone would be removed in layers or “benches” approximately 20 feet thick. As mining progresses downward on the deposit, safety rock catch benches would be constructed to a minimum width of 20 feet. These catch benches would be established at vertical intervals ranging from 20 to 60 feet in height. Ramp roads within the quarry would connect successive benches to provide truck and loader access.

TABLE 2-2	
Proposed Disturbance for Life-of-Mine Expansion	
Indian Creek Mine	
Facility	Disturbance (acres)
South Claims Area	
Mine Pits	343.0
Overburden Disposal Areas (8)	64.5
Soil Material Stockpiles (4)	18.8
Haul & Access Roads	412.0
South Claims Area Crusher Site	101.0
Reject Rock	28.9
Subtotal	968.2
Dolomite Claims Area	
Mine Pits	214.1
Overburden Disposal Area (1)	33.0
Soil Stockpiles (1)	9.4
Haul and Access Roads	88.2
Subtotal	344.7
TOTAL	1,312.9

Source: Graymont 2007a.



Base Data Source: Montana NRIS GIS Data



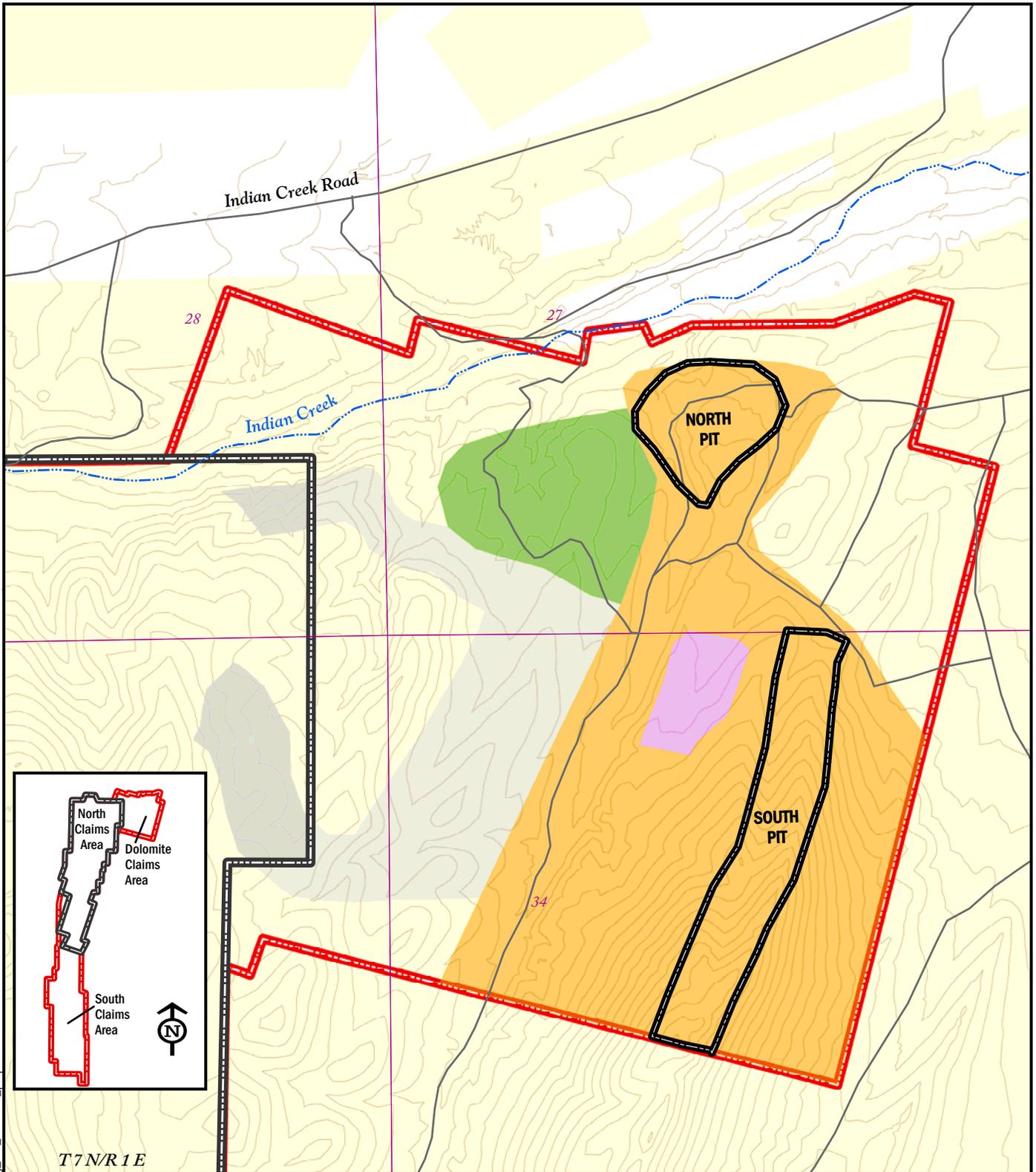
- | | | | |
|--|--|---|--|
| <ul style="list-style-type: none"> — County Roads — Other Roads — Streams ▭ Township/Range ▭ Sections | <ul style="list-style-type: none"> ▭ Proposed Operating Permit Boundary ▭ Existing Operating Permit Boundary | <p>Proposed Mine Disturbance</p> <ul style="list-style-type: none"> ▭ Mine Facilities ▭ Mine Pits ▭ Overburden ▭ Reject Rock ▭ Haul Roads ▭ Soil Stockpile | <p>Land Ownership</p> <ul style="list-style-type: none"> ▭ State of Montana ▭ Bureau of Land Management |
|--|--|---|--|



U.S. Department of the Interior
Bureau of Land Management
Butte Field Office
Butte, Montana

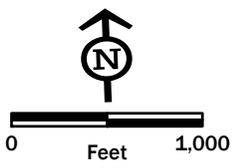
PROPOSED OPERATIONS SOUTH CLAIMS AREA
Indian Creek Mine Expansion - Environmental Impact Statement
Broadwater County, Montana

h:\13532 Graymont EIS\5000 GIS\Projects\EIS\Fig_2-3_South_Proposed.mxd



H:\13532 Graymont EIS\5000 GIS\Projects\EIS\Fig_2-4_dolomite_proposed.mxd

Base Data Source: Montana NRIS GIS Data



- | | | |
|--|---|---|
| <ul style="list-style-type: none"> — · — · — · Streams Roads Sections | <ul style="list-style-type: none"> Existing Operating Permit Boundary Proposed Operating Permit Boundary Bureau of Land Management | <p>Proposed Mine Disturbance</p> <ul style="list-style-type: none"> Mine Pits Overburden Haul Roads Soil Stockpiles |
|--|---|---|



U.S. Department of the Interior
Bureau of Land Management
Butte Field Office
Butte, Montana

PROPOSED OPERATIONS DOLOMITE CLAIMS AREA
Indian Creek Mine Expansion - Environmental Impact Statement
Broadwater County, Montana

FIGURE
2-3

Rock roll catch benches would be constructed down slope and outside active mining areas to help prevent rocks from rolling farther down slope off the permit area. Rocks and debris along the edge of the quarry benches would be evaluated and removed where necessary to prevent movement down slope.

Overburden would be removed by drilling, blasting, and loading into trucks for placement in overburden disposal areas located along the west boundary of the mine, or in portions of mine pits depleted of recoverable limestone. Overburden placed as backfill in mined-out pits could reduce the number of overburden disposal areas. Thirteen million tons of overburden would be excavated to recover approximately 55 million tons of ore along 11,500 linear feet of outcrop in the South Claims Area. Graymont proposes to construct up to eight overburden disposal sites in the South Claims Area as shown on **Figure 2-2**. Proposed overburden stockpiles in the South Claims Area have capacity for up to approximately 7 million tons assuming an average depth of 60 feet. Consistent with permitted mining operations in the North Claims Area, in-pit backfill of up to 50 percent of the overburden is included in the plan.

Overburden would be placed so as not to obstruct any major drainage outside the mine area. Final grading would re-establish contoured slopes ranging from 2.0H:1.0V to 3.0H:1.0V to provide landscape diversity. Natural ground slope angle under and adjacent to some overburden disposal sites may dictate steeper slopes in some areas.

Soil and/or growth media would be removed from areas outside existing mine pits designated for overburden disposal and either be spread over areas undergoing reclamation or placed in designated stockpile areas. Temporary haul roads would be constructed to overburden disposal areas as mining progresses.

Dolomite Claims Area

The Dolomite Claims Area adjoins the northeast corner of the North Claims Area as shown on **Figure 2-3**. The Dolomite Claims Area includes unpatented claims on public land held by Graymont and would be developed as market demand increases. The Dolomite Claims Area deposit trends in a north and south direction. The northern-most dolomite deposit would be mined first with overburden placed along the west side of the pit. As mining proceeds, the northern pit would be mined to an ultimate depth approximately 262 feet below ground surface (4,067 feet in elevation). Excavation of the North Dolomite pit to an elevation of 4,067 feet would intercept groundwater (Hydrometrics, Inc. 2007). Pumping and discharge of groundwater from the pit to keep mining operations dry would require an amendment to Graymont's existing MPDES permit. Graymont would meet effluent limitations set in the MPDES permit.

Mining and processing of dolomite would be similar to that of limestone. Multiple benches would be open at one time to allow production of dolomite ore. Multiple mine pits would be developed concurrently in response to product and market demands. Overburden would be placed in selected disposal areas or placed in mined-out portions of pits. Overburden from the South Dolomite pit would be used to backfill the North pit. The deepest portion of the South Dolomite pit would be partially backfilled with overburden. Approximately 20 million tons of overburden would be excavated to recover 20 million tons of dolomite ore.

Surface disturbance associated with development of the Dolomite Claims Area would be approximately 214 acres for mine pits, 88 acres for haul roads, and 33 acres for overburden disposal outside pit areas (**Table 2-**

2). A 9-acre soil stockpile would be located near the center of the Dolomite Claims Area in an area that would not be mined.

REJECT ROCK

Reject rock created during processing of limestone mined in the South Claims Area would be placed along the west side of the mine area south of a new crusher site or in portions of mined-out pits. Approximately 5 million tons of reject rock, produced over the life-of-mine expansion, may be placed in the proposed disposal area outside of mine pits. Reject rock created from processing dolomite would be placed in the existing limestone reject rock storage area located in the North Claims Area as shown on **Figure 2-1**.

ORE PROCESSING

Once mining operations in the South Claims Area reach a certain distance from the existing crusher facility, the haul distance and cost would become prohibitive. Graymont would construct a new crusher facility to process limestone ore as the mine continues development to the south **Figure 2-2**. Limestone rock processed at the new crusher would be transported via haul truck to the North Claims Area and conveyed over Indian Creek to the kilns located at the main plant facility. Processing limestone in the kilns would be the same as described under *Existing Operations* in this chapter.

The new crusher site would have an office building housing a change/lunch room, maintenance shop, and a septic system and well. An aboveground storage tank for diesel fuel would also be located on the site. The tank would have secondary containment for 110 percent of its capacity.

Dolomite mined from the Dolomite Claims Area would be transported by haul trucks to the existing crusher site in the North Claims Area. Ore from the Dolomite Claims Area would be processed using the existing kilns at the plant site.

KILN DUST

No increase in the daily rate of kiln dust production would result from processing ore mined in the South Claims or Dolomite Claims areas. Management and disposition of kiln dust would be as described under the *Processing* section of *Existing Operations* in this chapter.

SOIL SALVAGE

Site preparation in the South Claims and Dolomite Claims areas would include UXO clearance and vegetation clearing and grubbing from proposed disturbance areas (see *Unexploded Ordnance Clearance* section in this chapter). Prior to commencing mining activities, soil and other identified growth media would be salvaged and either spread over areas undergoing reclamation or placed in designated stockpile areas. In addition, Amsden Formation material encountered during mining operations would be salvaged and used as a growth medium. This material has been successfully used as a growth media in ongoing reclamation activities in the North Claims Area.

Four soil material storage areas are proposed for the South Claims Area and one in the Dolomite Claims Area. Approximately 1.2 million cubic yards (cy) of soil material would be salvaged from the South Claims Area, 523,800 cy from the Dolomite Claims Area, and 670,000 cy from the North-South Haul Road.

HAUL ROADS

Expansion of mine operations into the South Claims Area would require construction of a

North-South Haul Road extending from the existing haul road in the North Claims Area to the southern most mine pits in the South Claims Area. The new North-South Haul Road would extend approximately 5 miles along the west side of the existing North Claims Area operating permit boundary into the proposed South Claims Area as shown on **Figure 2-2**. The haul road would be constructed in similar fashion to existing roads and would use a balanced cut and fill configuration or use reject rock fill to a width of 60 feet with a 4-foot-high berm on the downgradient side in compliance with MSHA standards. The wear surface would be constructed using reject rock to a maximum grade of 8 percent or less. Temporary haul roads would be constructed along the deposit as mining progresses. These roads would be ultimately removed and reclaimed as each pit is mined out.

Fugitive dust emissions from haul roads would be controlled through use of direct water application, chemical binders, or wetting agents in accordance with Air Quality Permit No. 1554-16. Emission levels resulting from expansion of mine operations into the South Claims and Dolomite Claims areas would be similar to existing levels. A modification to the Air Quality Permit would not be required unless emissions exceed the existing permitted level.

SURFACE WATER CONTROLS

Surface water control structures would be constructed in accordance with the approved Storm Water Pollution Prevention Plan. Proposed storm water detention basins, rip-rap structures, diversions, and drainage ditches would be constructed as needed as mining progresses. Berms would be constructed along mine haul roads, soil stockpiles, overburden disposal areas, and the crusher site in accordance with applicable MSHA regulations. When used as a Best Management Practice for

storm water control, berms would be designed, constructed, and maintained to control the volume of run-off associated with a 10-year, 24-hour storm event.

ANCILLARY FACILITIES

Construction of the new crusher in the South Claims Area would require installation of electrical service to the site along the North-South Haul Road corridor. Electrical service to the new crusher would be provided through extension of power lines from the north crusher site. Installation would include a new transformer at the site.

EMPLOYMENT

Employment associated with the proposed life-of-mine expansion would remain at current levels.

MONITORING PROGRAMS

Monitoring programs described under *Existing Operations* would continue over the life-of-mine. A new water supply well proposed in the South Claims Area would be included in the groundwater monitoring program. Air Quality Permit #1554-16 would be modified (if necessary) prior to operation of the South Claims Area crusher.

An aboveground diesel fuel tank would be located in the vicinity of the South Claims Area crusher. The existing Spill Prevention, Control, and Countermeasure (SPCC) plan would be updated to include this tank.

RECLAMATION

Reclamation of the South Claims Area and Dolomite Claims Area would be conducted in the same manner as ongoing reclamation in the North Claims Area. Upon completion of regrading to attain final slope configuration, soil

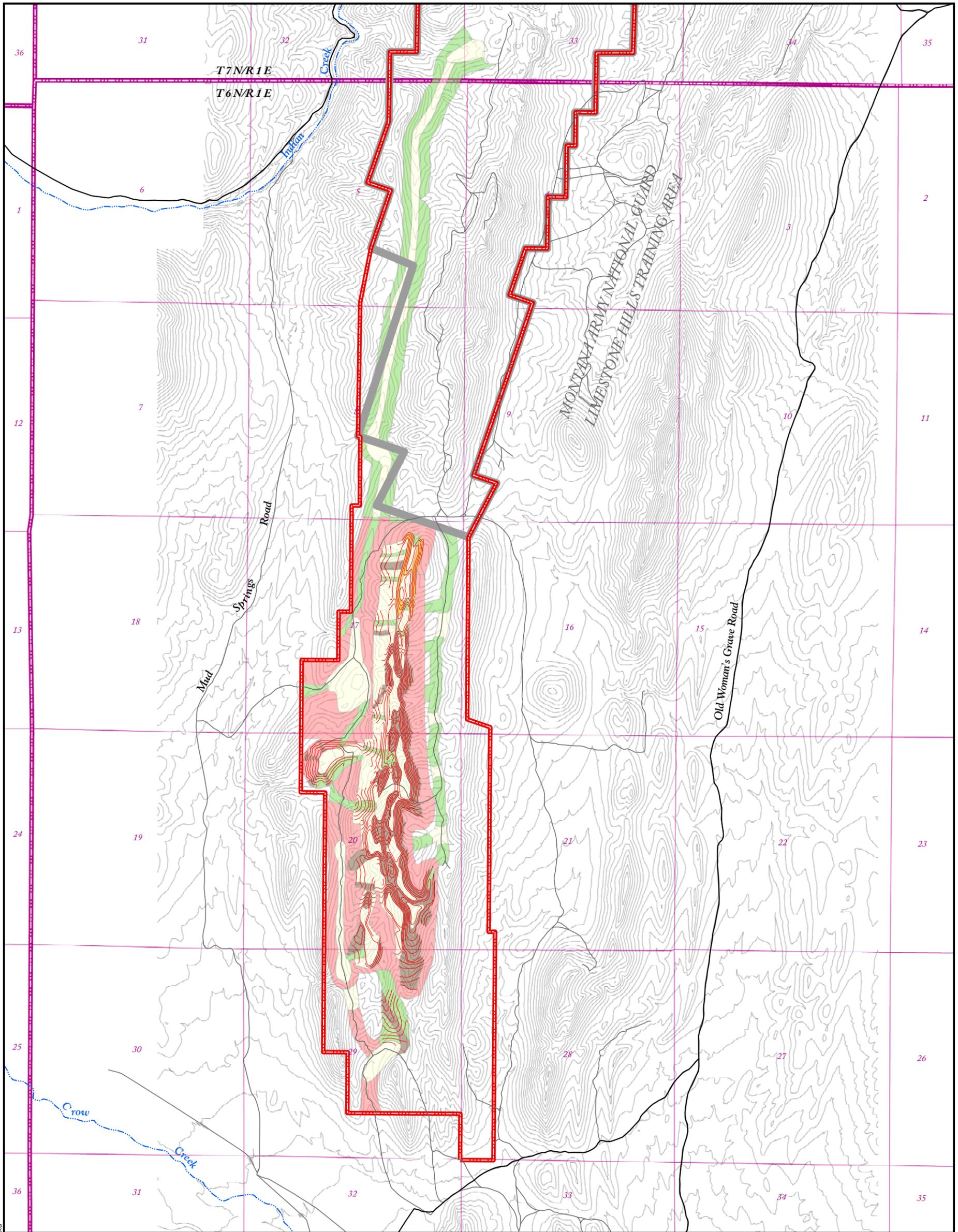
material or growth media would be placed on the surface in depths ranging from 2 to 9 inches based upon the revegetation plan for given areas. A tracked vehicle (dozer) would be used to create grooves to retain moisture. Grooves from tracking would be oriented perpendicular to the slope and would cover 100 percent of the slope.

The approved seed mixture (contained in the Reclamation section of *Existing Operations* of this

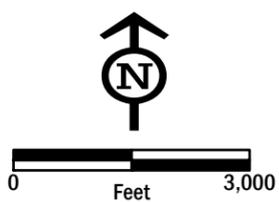
chapter) would be broadcast to all disturbed areas. Seed would be applied between October 15 and April 30. In addition to the approved seed mixture, various species of tree and shrub seedlings would also be planted. Tree and shrub species and rates of planting are shown in **Table 2-3**. Revegetation plans for the South Claims and Dolomite Claims areas are shown on **Figures 2-4** and **2-5**.

Revegetation Type	Tree/Shrub Species	Soil Replacement Depth	Seedlings per Acre	Acres	
				South Claims Area	Dolomite Claims Area
Mountain Mahogany/Juniper	Mountain Mahogany	9"	200	297	192
	Rocky Mountain Juniper		50		
	Common Juniper		50		
	Soapweed Yucca		75		
	Limber Pine		25		
	Subtotal		400		
Douglas-fir	Douglas-Fir	9"	130	122	30
	Rocky Mountain Juniper		20		
	Common Juniper		20		
	Mountain Mahogany		50		
	Limber Pine		30		
	Subtotal		250		
Grassland	Skunkbush Sumac	9"	25	218	55
	Black Sagebrush		25		
	Subtotal		50		
Rock Outcrop – Type 1	Mountain Mahogany	2"	200	127	68
	Rocky Mountain Juniper		50		
	Common Juniper		50		
	Soapweed Yucca		75		
	Limber Pine		25		
	Subtotal		400		
Rock Outcrop – Type 2	Douglas-Fir	2"	130	11	-0-
	Rocky Mountain Juniper		20		
	Common Juniper		20		
	Mountain Mahogany		50		
	Limber Pine		30		
	Subtotal		250		
TOTAL				775	345

Source: Graymont 2007a.

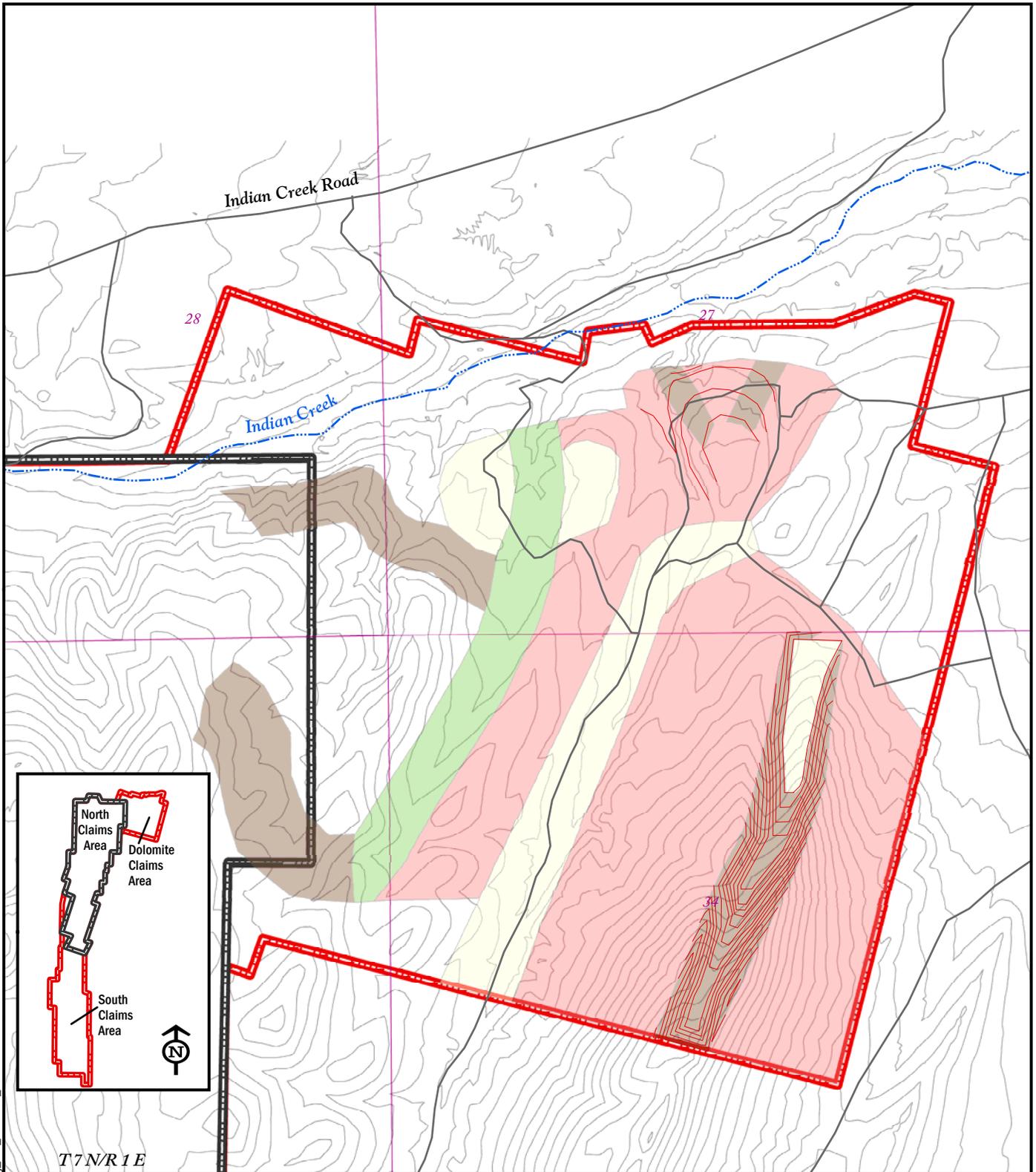


Base Data Source: Montana NRIS GIS Data

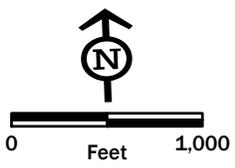


- | | | | |
|------------------|------------------------------------|--------------------------------|--|
| — County Roads | Existing Operating Permit Boundary | Mountain mahogany/juniper type | Rock outcrop type 1 + Mountain mahogany/juniper type |
| — Other Roads | Proposed Operating Permit Boundary | Douglas fir type | Rock outcrop type 2 + Douglas fir type |
| --- Streams | | Grassland type | |
| ▭ Township/Range | | | |
| ▭ Sections | | | ~ Conceptual Reclamation Contours |

h:\13532 Graymont EIS\5000 GIS\Projects\EIS\Fig. 2-4_South_Reclamation.mxd



Base Data Source: Montana NRIS GIS Data



- | | | | |
|---|--|--|---|
| <ul style="list-style-type: none"> Streams Roads Sections | <ul style="list-style-type: none"> Existing Operating Permit Boundary Proposed Operating Permit Boundary | <p>Reclamation Revegetation Types</p> <ul style="list-style-type: none"> Mountain mahogany/juniper type Douglas fir type Grassland type | <ul style="list-style-type: none"> Rock outcrop type I + Mountain mahogany/juniper type Conceptual Reclamation Contours |
|---|--|--|---|

H:\13532 Graymont\1 EIS\5000 GIS\Projects\EIS\Fig_2-5_dolomite_reclaim.mxd



U.S. Department of the Interior
Bureau of Land Management
Butte Field Office
Butte, Montana

PROPOSED RECLAMATION/REVEGETATION - DOLOMITE CLAIMS AREA
Indian Creek Mine Expansion - Environmental Impact Statement
Broadwater County, Montana

FIGURE
2-5

Measures to control surface water run-off after reclamation would be implemented in accordance with stipulations of the Storm Water Pollution Prevention Plan. Storm water control structures, retention ponds, and diversion ditches would be removed and reclaimed unless deemed necessary by the agencies for long-term reclamation of the land. Drainage channels would be re-established in the original channels where possible. Reclaimed use of the area would be for wildlife habitat and livestock grazing.

ENVIRONMENTAL CONTROL MEASURES

Environmental control measures described under *Existing Operations* would be continued over the mine life.

ALTERNATIVES

This section describes alternatives to the Proposed Action including Alternative A – Modified Pit Backfill, No Action Alternative, Alternatives Considered but Eliminated from Detailed Analysis, and the Agency Preferred Alternative. Alternatives selected by BLM and DEQ for consideration in this EIS are based on potential impacts or issues associated with the Proposed Action.

BLM and DEQ are required to analyze environmental effects resulting from the Proposed Action and to identify reasonable alternatives that would mitigate or eliminate potential impacts from the Proposed Action. In addition, BLM and DEQ are required to describe the impacts associated with implementation of the No Action Alternative.

Major components of the proposed mine expansion, respective functions, and potential environmental effects resulting from implementation of these activities are considered in development of alternatives.

Other alternatives were considered early in the review process but were eliminated because they were either technically infeasible or provided no environmental advantage over the Proposed Action.

ALTERNATIVE A – MODIFIED PIT BACKFILL

Issue: The reclamation plan for pit backfill proposed by Graymont would be similar to that approved for the current mine plan. Up to 50 percent of run-of-mine overburden would be used as backfill resulting in portions of selected mine pits being backfilled in various configurations including partial fill of the bottom of a pit; partial fill of a pit including some highwall areas; and/or fill being placed in a pit area resulting in a surface that approximates original grade of the area. The plan also includes placement of 2 to 9 inches of growth media to facilitate establishment of vegetation on reclaimed areas. Placement of growth media in excess of 2 inches appears to limit establishment of mountain mahogany, an important browse species for mule deer and bighorn sheep. Topsoil placed in excess of 2 inches would likely allow higher concentrations of grasses to become established which would out-compete mountain mahogany. The 2-inch layer of topsoil closely replicates the natural, undisturbed growing conditions for mountain mahogany.

The post-closure land use designated for the mine area is wildlife habitat. Configurations of pit backfill included in the Proposed Action would not result in treatment of highwalls to establish varied slope angles conducive to establishment of mountain mahogany and other browse species to support wildlife.

Some highwalls that would result from the Proposed Action would be visible to the public from various locations along public access roads in the vicinity of the Project. These highwalls

exhibit bare rock and terraced benches that visually contrast with adjacent undisturbed areas. No specific treatment of highwalls to reduce the visual effect is included in the Proposed Action.

Description: Alternative A would include implementation of all components of the Proposed Action and require Graymont to include revegetation of shrub species using seed. In addition Graymont would place up to 50 percent of run-of-mine overburden mixed with limestone reject rock and minimal amounts (2 inches or less) of growth media in selected areas of mined-out pits in a configuration that would fill portions of pit highwalls and create steep overburden in-pit slopes. This would result in a varied terrain with appropriate growth media depth to support establishment of mountain mahogany and other browse species.

Modified pit backfill would reduce the visual effect of highwalls and/or establish varied slope angles to create post-mining landscape areas more natural in appearance. Use of visually compatible growth media would be emphasized in reclaimed mine areas visible from public roads.

Several methods would be used to place overburden in selected areas of mine pits and/or treat highwalls to create diverse terrain with varied slope steepness and convex slope configurations. Modified pit backfill methods include:

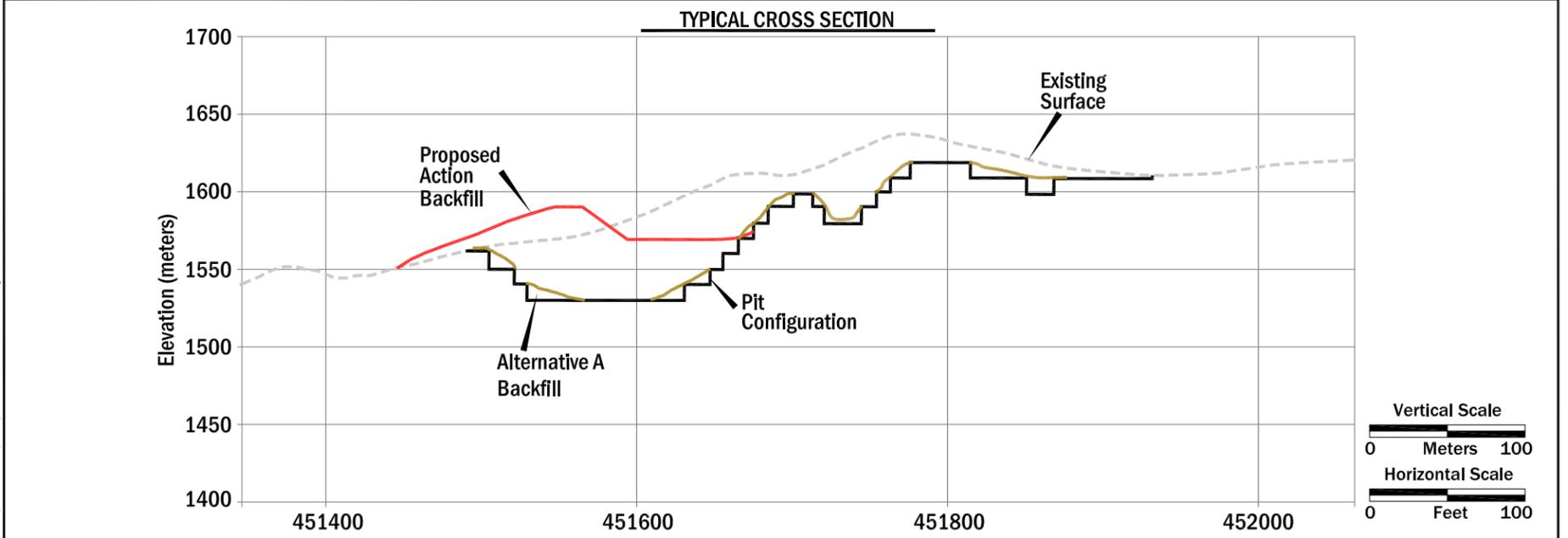
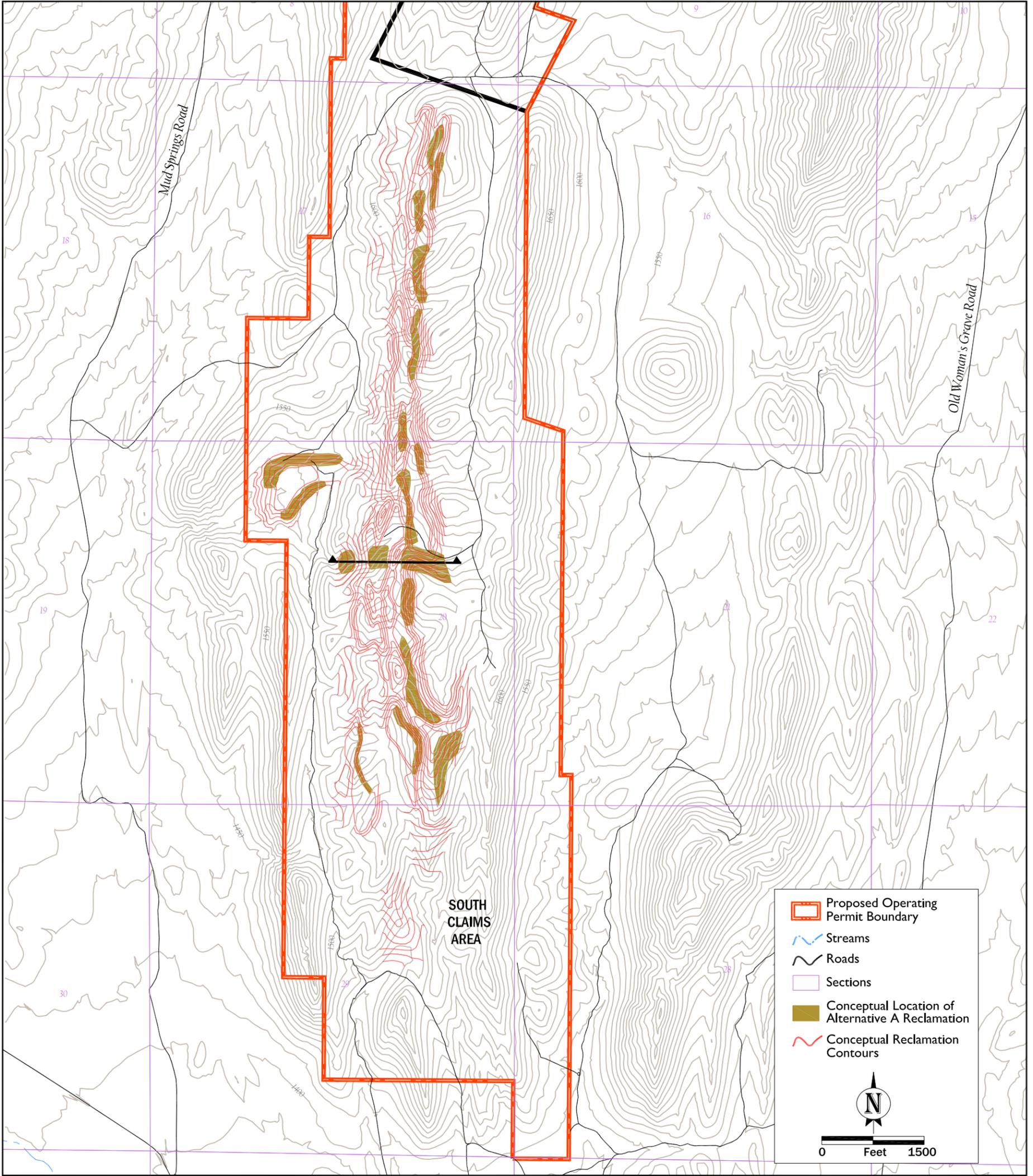
- Placing overburden, limestone rejects, and/or growth medium near the rim of selected mine pit highwalls, and dozing the material over the rim onto two to three benches to form a slope at angle of repose (approximately 1.25H:1.0V);

- Dozing highwall benches downward to create an angle of repose or shallower slope (1.25H:1.0V to 2.0H:1.0V or less);
- Haul, dump, and doze overburden into slope configurations ranging from 2.0H:1.0V to 3.0H:1.0V in pit bottoms and bench areas; and
- Cast blasting selected slopes and highwall benches where equipment operation would be limited to produce angle of repose slopes.

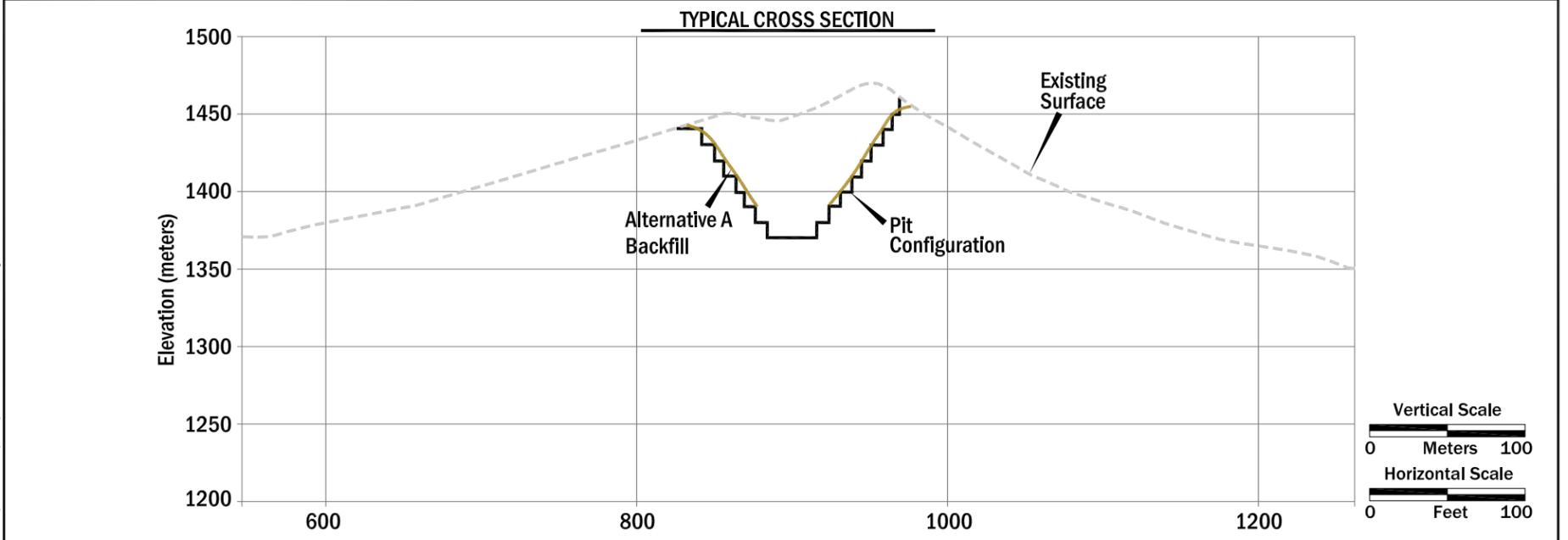
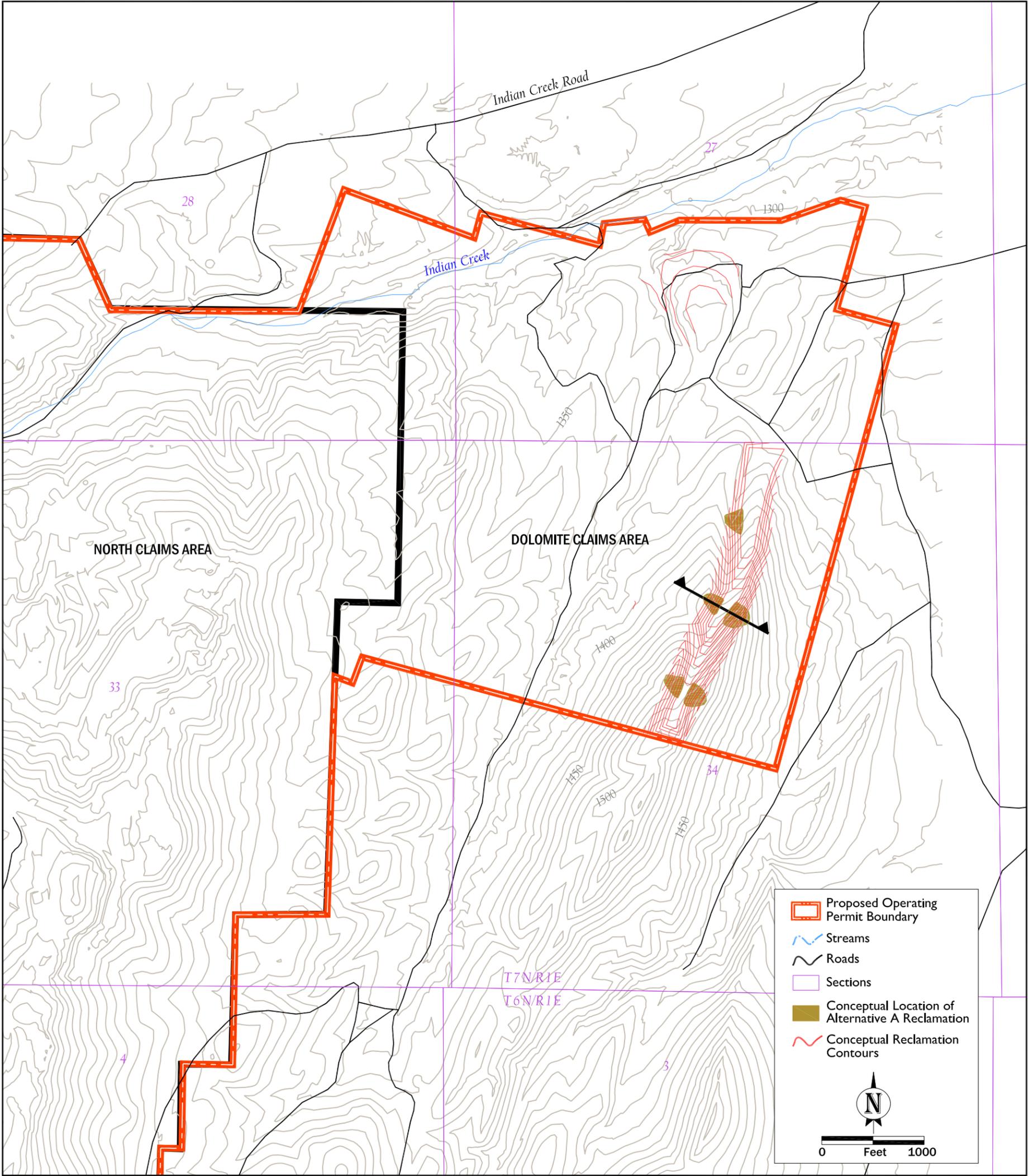
These methods would be used where access and conditions are safe for equipment and operators.

Two inches of soil or limestone rejects would be placed in selected areas of backfill to support seeding browse species according to the approved reclamation plan. Run-of-mine overburden combined with reject rock fragments (sand- to boulder-size) would form a growth medium for seeding mountain mahogany and other browse shrubs. On steeper slopes, pods of soil or limestone rejects would be used to provide growth media and mask the man-made appearance of the slopes.

BLM and DEQ would review final designs during development of the mine expansion as mine pits are depleted to determine optimal locations for application of modified pit backfill methods. Representations in **Figures 2-6** and **2-7** are conceptual and meant to display the variety of locations and settings where this reclamation method could be used to create a diverse landscape suitable for the proposed post mining land use as wildlife habitat. Implementation of Alternative A is not expected to increase the amount of disturbance associated with the Proposed Action.



H:\13532 Graymont EIS\5000 GIS\cod\south_claims_xsec.dwg



**ALTERNATIVE A - DOLOMITE CLAIMS AREA
CONCEPTUAL BACKFILL CONFIGURATION**
Indian Creek Mine Expansion - Environmental Impact Statement
Broadwater County, Montana

**FIGURE
2-7**



Alternative A addresses the requirements of the MMRA concerning pit backfill: highwall structural stability, utility to humans or the environment, visual contrasts between reclaimed land, and undesirable offsite environmental impacts. Relevant sections of Chapter 3 describe how implementation of Alternative A would address these requirements.

NO ACTION ALTERNATIVE

Under the No Action Alternative, the life-of-mine expansion (Proposed Action) would not be approved. Graymont would not develop ore reserves in the South Claims Area or the Dolomite Claims Area. Potential impacts predicted to result from development in these areas would not be realized. Mining and

reclamation operations within the existing permitted area, as described in the *Existing Conditions* section of this chapter, would continue for approximately 15 years at the current production rate.

AGENCY PREFERRED ALTERNATIVE

The agency preferred alternative is Alternative A – Modified Pit Backfill.

CHAPTER 3

AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

INTRODUCTION

Existing environmental resources and potential direct and indirect impacts of the Proposed Action and Alternatives are described in this chapter. Construction, operation, and reclamation of the Indian Creek Mine 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, and are essentially permanent. Irretrievable commitments are those that are lost for a period of time. Residual effects are those effects that remain after completion of the Proposed Action and implementation of mitigation measures.

Graymont currently operates the Indian Creek Mine under authorization by BLM Plan of Operations MTM 78300 and DEQ MMRA Operating Permit No. 00105. The potential impacts of Graymont's current mine and reclamation plan, Amendment 011, were evaluated in an environmental assessment (EA) in 2001 (DEQ 2001).

This chapter discusses potential environmental or social impacts and mitigation measures. Mitigation measures that would reduce or limit the impacts that could result from the Proposed Action and Alternatives are identified in each resource section. Potential impacts that could result from implementation of these mitigation measures are also included in the analysis of impacts. Mitigation and monitoring measures may be required by BLM or DEQ as a condition or stipulation of approval for authorization of

the Plan of Operations. Stipulations or conditions attached to the amended permit would conform to statutory provisions of either 43 CFR 3809 or 82-4-300, MCA.

Figure 3-1 shows the general Study Area for all resources except social and economic resources. The Study Area boundary for social and economic resources extends beyond the boundaries depicted on **Figure 3-1**. Study areas for each resource are based on the predicted locations of direct and indirect impacts that could result from the proposed mine expansion (Proposed Action). A detailed description of the Proposed Action is included in Chapter 2.

Existing mining operations have altered the landscape and represent a portion of the characteristic environment in the Study Area. A description of existing mining operations is included in Chapter 2 of this EIS.

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 Supplemental Authorities for the proposed Project are listed in **Table 3-1**.

This chapter provides a summary of environmental baseline information. In the following sections, "Project area" refers to land associated with the proposed mine expansion within the boundaries of South Claims and Dolomite Claims areas.

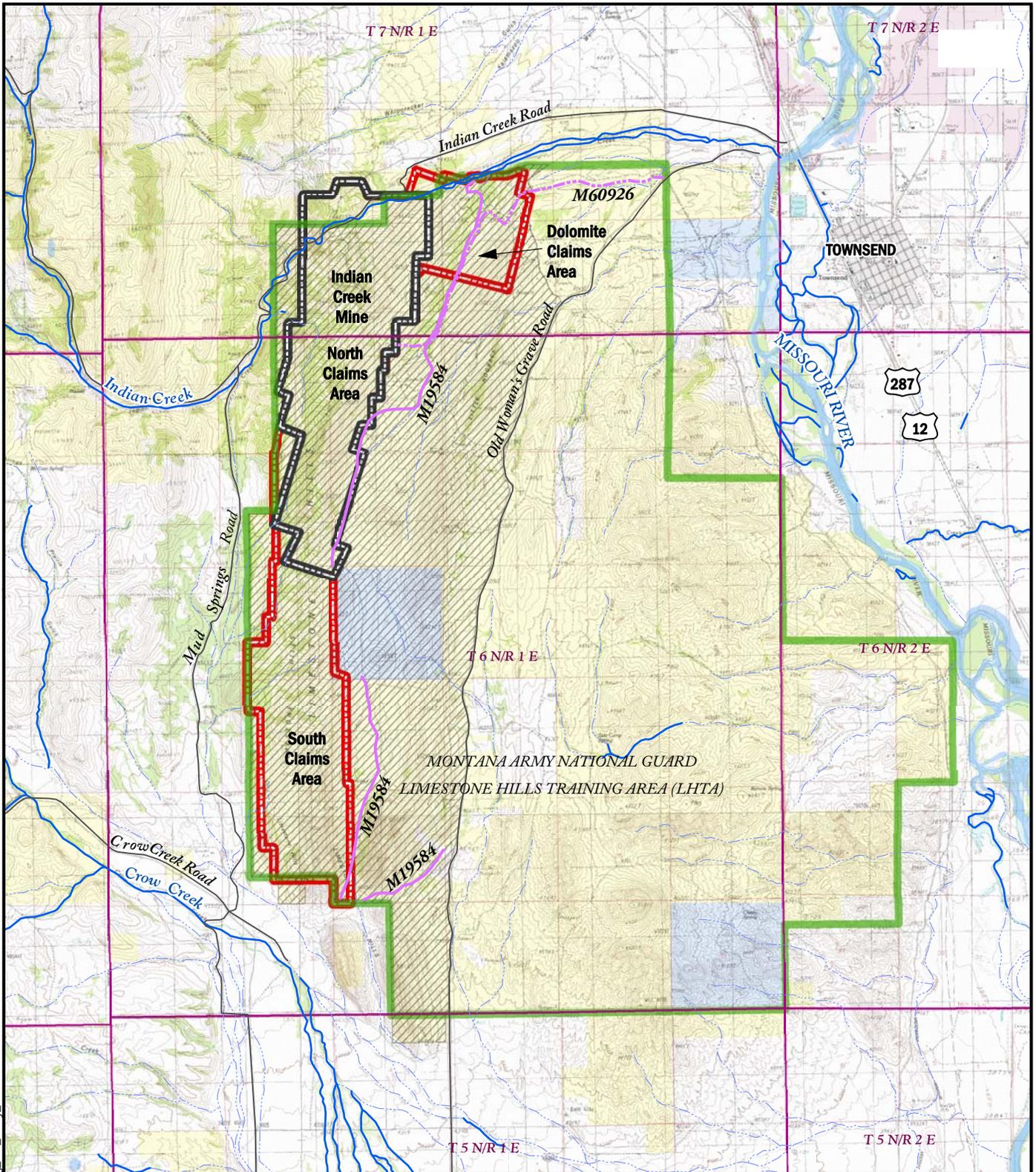
TABLE 3-1 Supplemental Authorities	
Element	Authority
Air Quality	The Clean Air Act as amended (42 USC 7401 et seq.)
	The State of Montana has been granted primacy in administration of the Clean Air Act under Sections 75-2-217 and 218 Montana Code Annotated (MCA), and Administrative Rules of Montana, Title 17.8.12 by the Montana Air Resources Management Bureau.
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 Montana has been granted primacy in administration of the Clean Water Act under Sections 75-5-101 et seq., Montana Code Annotated (MCA) and Administrative Rules of Montana (ARM) 17.30.101 through 2006 by the Montana Department of Environmental Quality.
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

RESOURCES ELIMINATED FROM FURTHER ANALYSIS

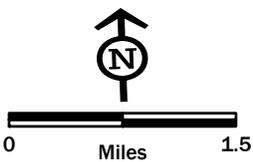
BLM has evaluated the potential impact of the Proposed Action and alternatives to the following resources and has determined that, although present in the Project area, they would not be affected by the Proposed Action and alternatives. Rational for dismissing these resources from further discussion in the document are as follows:

THREATENED AND ENDANGERED SPECIES

No federally listed or proposed threatened or endangered fish, wildlife, or plant species are known to be present in the proposed mine expansion area. Habitat in the area is not suitable for lynx. Wolves have not been documented in the Study Area. As wolves continue to expand in Montana, the Study Area with its high concentration of wintering big game animals may be attractive as a foraging or



Base Data Source: Montana NRIS GIS Data



- | | | |
|--|--|---|
| <ul style="list-style-type: none"> Townships Existing LHTA Boundary Existing Operating Permit Boundary Proposed Operating Permit Boundary | <p>Land Ownership</p> <ul style="list-style-type: none"> State of Montana Bureau of Land Management Bureau of Reclamation | <p>BLM Rights-of-Way</p> <ul style="list-style-type: none"> Road Transmission Line LHTA Closure Area |
|--|--|---|

H:\13532 Graymont1 EIS\5000 GIS\Projects\EIS\Fig. 3-1_study_area.mxd



U.S. Department of the Interior
Bureau of Land Management
Butte Field Office
Butte, Montana

GENERAL STUDY AREA
Indian Creek Mine Expansion - Environmental Impact Statement
Broadwater County, Montana

FIGURE
3-1

denning area. The gray wolf was determined to be recovered and de-listed under the Endangered Species Act (ESA). However, U.S. Federal Court issued a preliminary injunction on July 18, 2008 that immediately provided ESA protection to gray wolves in the Northern Rocky Mountains, including Montana. In May 2009, the Secretary of the Interior removed the gray wolf from protection under the Endangered Species Act.

FISHERIES AND AQUATIC RESOURCES

Indian Creek is a perennial stream in its upper reaches upstream of the Project area. Indian Creek typically loses water to the subsurface and becomes intermittent as it flows along the northern boundary of the existing mine permit area. This precludes establishment of aquatic habitat, biota, and fish. Aquatic habitat in Indian Creek has been degraded by historic placer, hydraulic, and dredge mining not related to Graymont's operations. Loss of surface water in Indian Creek by infiltration is partly due to disturbance from past placer mining and flow into the karst (cave-forming) Madison Formation. Storm water Best Management Practices (detention ponds, diversion ditches, and berms) have been implemented by Graymont to prevent surface water run-off from degrading Indian Creek.

RESOURCES AND RESOURCE USES EVALUATED IN THE EIS

AIR QUALITY

AFFECTED ENVIRONMENT

Climate

The Indian Creek Mine area is characterized by a semi-arid climate. Mean annual precipitation in the area averages 11.3 inches, with May and June being the wettest months and December

and January the driest. Mean annual temperature is 43.7°F. January is the coldest month with a mean temperature of 24°F. July is the hottest month at a mean temperature of 67°F (Graymont 2007a).

Air Quality

Graymont currently operates a limestone quarry, a lime plant, and railroad load-out facility under Air Quality Operating Permit No. 1554 issued in 1981. Sixteen modifications to the permit have been authorized generally in response to emission control equipment upgrades, installation of new equipment to increase efficiency and produce additional lime related products (e.g., hydrated lime), or to allow operational flexibility through use of various fuel mixes (e.g., coal and petroleum coke).

Graymont has demonstrated compliance with the National Ambient Air Quality Standards (NAAQS), Montana Ambient Air Quality Standards, (MAAQs), and Prevention of Significant Deterioration (PSD) air quality analysis requirements for all pollutants and sources currently at the Indian Creek facility.

In 2000, an Air Quality-Related Values (AQRV) analysis, assessment of impacts to visibility in certain Class I areas, and modeling of potential effects of nitrate and sulfate deposition on surface water in Glacier National Park were conducted as part of the application to increase NO_x emissions from Kilns 1 and 2 at the Indian Creek Plant. Results of these analyses showed negligible effects to vegetation, visibility, and surface water from operation of the Indian Creek Plant.

Particulate Emissions (PM₁₀)

Particulate emissions (particulate matter with a diameter less than 10 microns [PM₁₀]) in the Indian Creek Mine area are generated by

drilling, blasting, loading, and hauling limestone and waste rock from designated quarries. Fugitive dust from haul roads, parking areas, and stockpiles of coal, petroleum coke, overburden, and soil material are also non-point sources of air pollutants.

During 1998, Graymont monitored ambient air quality at two locations near the plant facility. Minimum, maximum, and mean quarterly PM₁₀ concentrations measured at the two monitoring sites during the fourth quarter of 1998 were 1, 61, and 17 micrograms per cubic meter (µg/m³ or parts per billion), respectively. The overall average annual data recovery rate was 99.6 percent. Effective January 1, 1999, DEQ removed the requirement to monitor PM₁₀ from Air Quality Permit 1554-11 (Bison Engineering 1999). The federal and Montana 24-hour ambient air quality standard for PM₁₀ is 150 µg/m³, which is not to be exceeded more

than once per year. All measured values at the Indian Creek Mine are below the ambient air quality standard of 150 µg/m³ for a 24-hour sampling period.

Non-particulate (Gaseous) Emissions

Point source emissions are associated with combustion gases from the two coal/coke-fired kilns. Permit stipulations require Graymont to submit annual production and other information for all emission units. These data are necessary to calculate or estimate the amount of air pollutants emitted during each calendar year. Gaseous emissions from the Indian Creek facility include nitrogen oxide(s) (NO_x), sulfur dioxide (SO₂), carbon monoxide (CO), and volatile organic compounds (VOCs). Permitted emissions levels and the DEQ Emission Inventory Summary are shown in **Table 3-2**.

Emission	2005 ¹	2006 ²	Permitted Level ³
	Tons per Year		
Sulfur Dioxide	111.11	108.79	278.6
Nitrogen Oxide(s)	334.64	388.11	876.0
Carbon Monoxide	86.2	95.42	1147.6
Volatile Organic Compounds	8.97	10.41	11.0

¹ Calculated using the 2005 DEQ Emission Factors.

² Calculated using the 2006 DEQ Emission Factors.

³ Air Quality Permit No. 1554-16.

Source: DEQ 2004, 2005, 2006a.

In addition to these regulated gaseous emissions, carbon dioxide (CO₂), an unregulated gas, is produced from the kilns when limestone is converted to lime. See following section on Climate and Climate Change.

Greenhouse Gas (GHG)

Although the Earth's atmosphere consists mainly of oxygen and nitrogen, neither plays a major role in enhancing the greenhouse effect because both are essentially transparent to

terrestrial radiation. The greenhouse effect is primarily a function of the concentration of water vapor, carbon dioxide, and other trace gases (methane, nitrous oxide, and ozone) in the atmosphere that absorb the terrestrial radiation leaving the surface of the Earth (IPCC 1996).

Activities in Montana accounted for approximately 37 million metric tons (MMt) of gross consumption-based carbon dioxide equivalent (CO₂e) emissions in 2005, an amount equal to 0.6 percent of total U.S. gross GHG emissions. Montana's gross GHG emissions are rising at about the same rate as the nation as a whole. Montana's gross GHG emissions were up 14 percent from 1990 to 2005, while national emissions rose by 16 percent during this period (CCS 2007).

Electricity generation, transportation, and agriculture are the State's principal GHG emissions sources. Together, the combustion of fossil fuels for electricity generation used in-state and in the transportation sector account for about 46 percent of Montana's gross GHG emissions. The relative contribution of agricultural emissions (methane and nitrous oxide) emissions from manure management, fertilizer use, and livestock) is higher in Montana (26%) than in the nation as a whole (7%) This is a result of more agricultural activity in Montana compared to the US. The remaining use of fossil fuels – natural gas, oil products, and coal - in the residential, commercial, and industrial sectors and the emissions from fossil fuel production constitute another 23 percent of state emissions (CCS 2007).

DIRECT AND INDIRECT IMPACTS

Proposed Action

Gaseous (SO₂, CO, NO_x, VOCs) and particulate emissions would be generated

throughout the life of the mine. Particulate emissions from mining would be caused by drilling, blasting, excavating, loading, hauling, and dumping of overburden and limestone.

Particulate emissions would be limited by the implementation of Best Management Practices (BMPs), including minimizing drop heights during loading, and watering and chemical stabilization of haul roads.

Particulate Emissions

Fugitive dust emissions would be generated from wind erosion of disturbed areas and road dust. Haul roads would be maintained on a continuous basis for safe and efficient haulage and to minimize fugitive dust emissions. Generation of fugitive dust from ore handling activities would be controlled using direct water application, approved chemical binders or wetting agents, water spray, and revegetation of disturbed areas concurrent with operations.

Gaseous Emissions

The Indian Creek Mine would continue to be a source of gaseous air pollutants including SO₂, CO, NO_x, and VOCs. The primary sources of these emissions would be combustion associated with the two coal/coke-fired kilns and exhaust from diesel engines used to power mining equipment and haul trucks. Gaseous emissions from diesel engines would be minimized through proper operation and maintenance of equipment.

Ammonium nitrate and fuel oil (ANFO) are used as blasting agents and would continue to be a source of gaseous pollutants from the proposed mine expansion area. Use of ANFO can cause fugitive emissions of NO_x, CO, and SO₂.

Production rates associated with the Proposed Action are expected to remain at current levels for about 50 years. PM₁₀ and gaseous emissions would remain unchanged. These levels could rise in response to increased production of lime, limestone, and dolomite product. Increases in emissions may require revision to Graymont's current air quality permit. The location of sources of fugitive dust and gaseous emissions would change in response to pit development progressing southward into the South Claims Area and eastward into the Dolomite Claims Area but would be within permitted levels.

Greenhouse Gas

In 2005, the principal sources of Montana's gross GHG emissions (37 MMt CO₂e) were electricity generation 10 MMt CO₂e (27%), transportation 8.0 MMt CO₂e (22%), and agriculture 7.9 MMt CO₂e (21%). Industrial process emissions comprised almost 1 percent of state GHG emissions in 2005, but these emissions are projected to rise due to the increasing use of hydrofluorocarbons as substitutes for ozone-depleting chlorofluorocarbons. Industrial process emissions result from CO₂ released during aluminum and cement production, soda ash, limestone, and dolomite use. Landfills and wastewater management facilities account for about 2.4 percent (300,000 metric tons CO₂e) of the state's emissions in 2005 (CCS 2007).

In Montana, forestry activities and agricultural soil are considered net sinks for GHG emissions. In 2005, -23.1 MMtCO₂ were sequestered by forestry activities and an additional -2.3 MMtCO₂ by agriculture. Montana's total net GHG emissions for the period of 1990 to 2005, ranged from 7 MMtCO₂e/yr in 1990, to 11 MMtCO₂e/yr in 2005 (CCS 2007).

Alternative A – Modified Pit Backfill

Impacts to Air Resources resulting from implementation of Alternative A would be similar to those described for the Proposed Action.

No Action Alternative

Under the No Action Alternative, currently approved mining operations and related air emissions would continue for approximately 15 years. Potential direct and indirect impacts to air quality associated with the proposed mine expansion in the South Claims and Dolomite Claims areas would not occur.

POTENTIAL MONITORING AND MITIGATION MEASURES

Air pollutant emissions associated with existing operations are within permitted levels. This precludes the need for monitoring or mitigation measures beyond those currently implemented at the Indian Creek Mine.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

No irreversible or irretrievable commitment of air resources would result from either alternative.

RESIDUAL EFFECTS

Residual effects on air resources are not anticipated as a result of implementation of the Proposed Action. After cessation of mining and completion of reclamation activities, air quality would reach pre-mining conditions.

CLIMATE AND CLIMATE CHANGE

AFFECTED ENVIRONMENT

The earth's atmosphere consists primarily of nitrogen and oxygen, neither of which plays a

major role in the “greenhouse effect”, which can be generally described as the absorption of terrestrial radiation leaving the surface of the earth (IPCC 1996). The greenhouse effect is primarily a function of the concentration of water vapor, carbon dioxide, and other trace gases (e.g., methane, nitrous oxide, and ozone). Although greenhouse (GHG) gas levels have varied for millennia, industrialization and burning of fossil carbon sources have caused an increase in the atmospheric concentrations of these GHGs – most notably, carbon dioxide (CO₂). These increases in the atmospheric concentration of GHGs very likely contributed to an increase in the average temperature of the atmosphere and surface of the Earth, typically referred to as global warming (IPCC 2007a).

DIRECT AND INDIRECT IMPACTS

Proposed Action

Ore processing operations at the Indian Creek Mine have a nominal capacity of lime production of 365,000 tons per year. Annual greenhouse gas emissions associated with 365,000 tons of lime production would be approximately 480,000 tons (435,000 metric tons) of CO₂ equivalents (CO₂e). This was estimated using the average greenhouse gas emission intensity, including both process and combustion related emissions, at Indian Creek for the period 2002 through 2008.

Lime production at nominal capacity would result in approximately 16.8 million tons (15.3 million metric tons) of CO₂e emissions over the additional 35-year mine life of the Indian Creek Mine under the Proposed Action. Annual greenhouse gas emissions over the period 2002 through 2008 have averaged 272,000 tons (247,300 metric tons) of CO₂e emissions, with 2008 emissions being approximately 342,000 tons (310,900 metric tons) of CO₂e. Continued operation at current emission levels associated with ore processing at Indian Creek Mine would

equate to an average of 0.8 percent of the total CO₂e emissions from sources within Montana (estimated to be 38.5 million metric tons in 2010 – CCS 2007). This volume equates to 0.004 percent of total U.S. emissions (US emissions estimated at 7.282 CO₂e billion metric tons) (EIA 2008), and 1.1 percent of CO₂e emissions associated with lime manufacture in the U.S (EIA 2008; NLA 2008). The lack of detailed scientific tools to predict climate change on a regional or local scale limits the ability to quantify potential future impacts that could result continued emissions associated with the Proposed Action.

Alternative A – Modified Pit Backfill

Impacts from mining on climate and climate change from implementation of Alternative A would be the same as those described for the Proposed Action.

No Action Alternative

Based on CO₂e emissions from the Indian Creek Mine for 2008 (310,900 metric tons of CO₂e), approximately 4.7 million metric tons of CO₂e would be emitted from lime production over the remaining 15-year mine life. Once the currently permitted limestone resources at the Indian Creek Mine are exhausted, consumers of lime from the Indian Creek Mine, including power plants which currently use lime for pollution control, would acquire lime from an alternative source. Lime consumers would need the same amount of lime whether they purchase lime from the Indian Creek Mine or an alternative source. The same amount of greenhouse gas emissions would be produced at the alternative lime producer and, depending on the location of the consumer in relation to the alternative lime producer, greenhouse gas emissions associated with the transport of this lime may increase as a result of increased transportation distance for some markets currently supplied by the Indian Creek Mine.

POTENTIAL MONITORING AND MITIGATION MEASURES

Potential mitigating measures include improved efficiencies in the mining and processing of limestone.

RESIDUAL EFFECTS

The residual effects of continued CO₂e emissions to the atmosphere are discussed in the *Climate and Climate Change* section in Chapter 4.

GEOLOGY AND MINERALS

AFFECTED ENVIRONMENT

The Indian Creek Mine is located in the Limestone Hills region on the east flank of the Elkhorn Mountains. The bedrock strata (layers) consist of alternating clastic (cemented fragments) and carbonate (limestone and dolomite) units. These strata have been intensely folded and subsequently eroded. The limestone units are more resistant to erosion and form the prominent, distinctive ridges of the Limestone Hills. The clastic layers are less resistant to erosion and form intervening valleys (**Figure 3-2**).

South Claims Area

The north-south trending Limestone Hills ridge marks the approximate hinge (crest) of an anticline (arch-like fold) that developed during an episode of regional folding and faulting (fracturing and displacement of rock). The limestone ridge coincides approximately with the hinge of the anticline, but the faulted blocks are offset by faults, so that the overburden (non-ore material) thickness changes dramatically across these faults. Limestone in the Indian Creek Mine area occurs as a massive bed varying from 110 to 160 feet in thickness, with an average of 120 feet.

During the Cretaceous Period (65 to 145 million years ago), magma forced its way between existing rock layers. During placement of the magma, heated groundwater (hydrothermal fluids) flowed through fractures and along bedding planes. These reactive hydrothermal fluids dissolved magnesium, silica, and manganese from various rocks along the flowpath, then exchanged the elements (impurities) for calcium in the limestone bed. This process formed irregularly shaped bodies of limestone that contain up to 18 percent magnesium oxide (MgO) and often in excess of 1.0 percent silica (SiO₂).

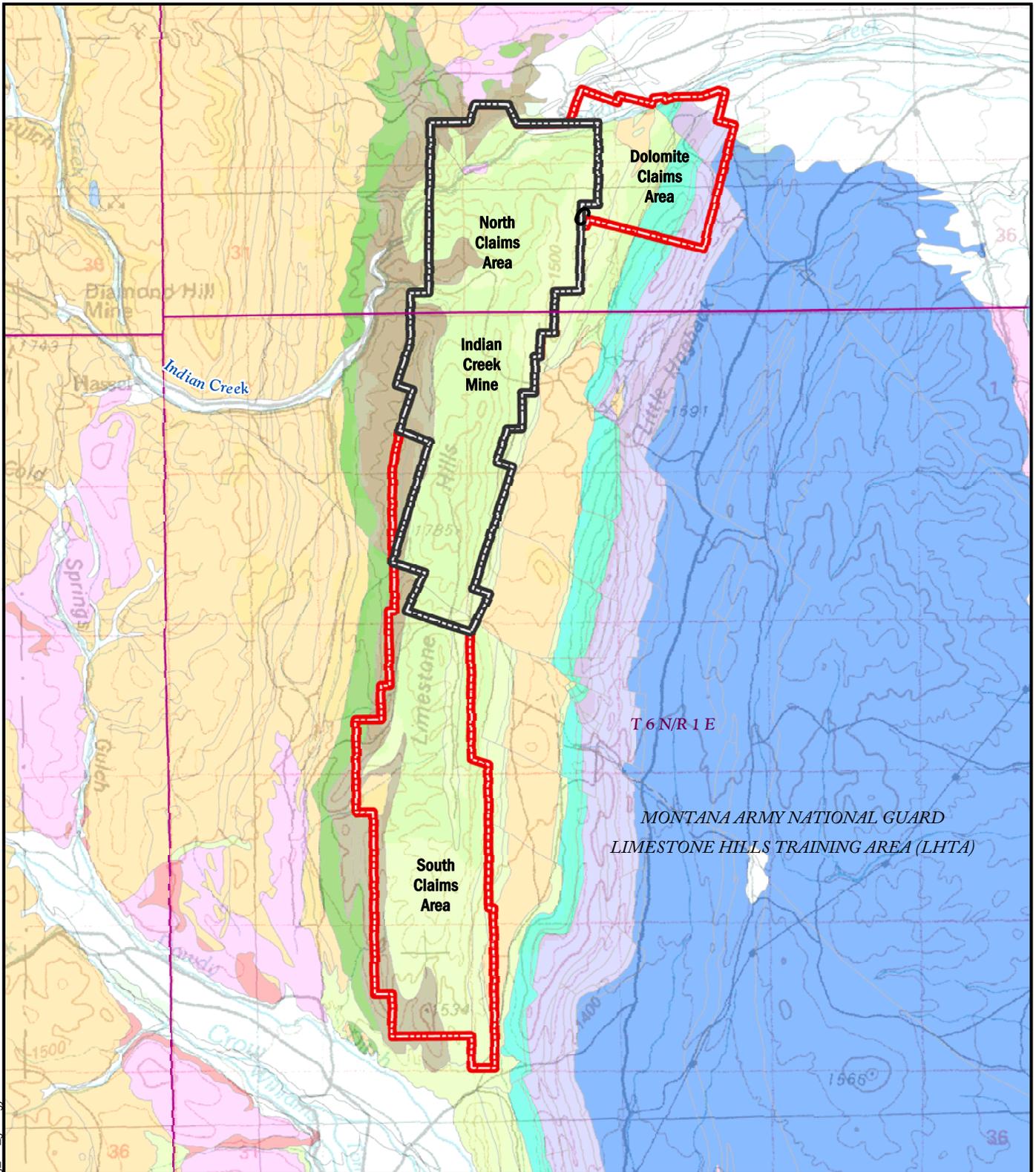
Dolomite Claims Area

The Dolomite Claims Area lies stratigraphically below (consists of rocks much older than those in) the South Claims Area. Two economically favorable dolomite units (Pilgrim and Jefferson) are separated by two other rock formations. Structurally, the dolomite units lie in tilted but not folded layers. Similar to the limestone, tilting of these strata is a result of mountain-building compressional forces. The structure of these units is also complicated by northwest-trending faults. The most favorable dolomite outcrops are located on the crest of the main ridge in the claim block. The Pilgrim dolomite ranges from 350 to 420 feet thick and the Jefferson dolomite is typically 500 feet thick.

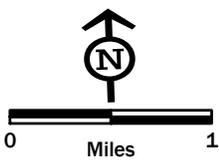
DIRECT AND INDIRECT IMPACTS

Proposed Action

Geologic and mineral resources within the South Claims and Dolomite Claims areas would be directly impacted by mining and processing. Approximately 1 million tons of material (waste rock and ore) would be mined annually over the 50-year life-of-mine. Mining in the South Claims Area is expected to produce about 13 million tons of overburden and remove 55



Data Source: USGS 2006, Townsend 30x60 Preliminary Geologic Map.



- Existing Operating Permit Boundary
- Proposed Operating Permit Boundary

Geologic Formations

- | | | |
|------------|---------------------|-------------|
| Cambrian | Mississippian | Quaternary |
| Devonian | Ordovician | PreCambrian |
| Jurassic | Permian | |
| Cretaceous | Quaternary Tertiary | |

H:\13532 Graymont EIS\5000 GIS\Projects\EIS\Fig_3-1_geology.mxd



U.S. Department of the Interior
Bureau of Land Management
Butte Field Office
Butte, Montana

GEOLOGY
Indian Creek Mine Expansion - Environmental Impact Statement
Broadwater County, Montana

FIGURE
3-2

million tons of ore. Up to 50 percent of overburden produced would be used as backfill in mined out portions of mine pits. Amsden Formation overburden encountered during mining operations would be salvaged and used for reclamation. This material has been successfully used in ongoing reclamation activities in the North Claims Area. The remaining overburden would be placed in up to eight disposal areas adjacent to mine pits. The proposed disposal areas would disturb a total of approximately 64 acres. Mine pits in the South Claims Area (**Figure 2-2**) would disturb about 343 acres (see Proposed Action in Chapter 2).

The Dolomite Claims Area would be mined from north to south and developed as markets expand. Up to 50 percent of the overburden produced during mining would be used as backfill in previously mined out pits. Approximately 33 acres of overburden disposal would occur outside of pits. Mine pits would disturb approximately 214 acres in the Dolomite Claims area (**Figure 2-3**).

Excavation and removal of limestone would continue within the economic feasibility of the mine expansion project. Although high quality limestone continues at depth below projected pit bottoms, current and projected market values for the products produced by Graymont would not allow recovery of ore below projected pit depths. Backfill of mine pits could preclude future access to limestone ore reserves or result in reserves not being economically recoverable.

Exposure of limestone and dolomite overburden and ore to oxygen and water (precipitation) under the Proposed Action would not result in release of acid or trace elements which could be deleterious to the environment. Laboratory analysis has been performed in accordance with Extraction Procedure Toxicity Test (Federal Register, Vol. 45, No. 98, pp. 33127-33128) on kiln dust to

determine leachable concentrations of trace elements. Results showed non-detectable concentrations for arsenic, cadmium, lead, mercury, selenium, and silver. Results for barium and chromium were below the maximum allowable concentration levels (Graymont 2007a). Concentrations of metals in samples of ore and overburden were analyzed in 2005. Results of analysis for 21 trace elements showed non-detectable concentrations or concentrations within typical ranges found in soil (Graymont 2005).

Alternative A – Modified Pit Backfill

Impacts from mining on geology and mineral resources from implementation of Alternative A would be similar to those described for the Proposed Action. Some overburden and reject rock would be relocated from disposal areas for use as backfill at selected sites in mine pits. Backfill of mine pits could preclude future access to limestone ore reserves or result in reserves not being economically recoverable.

No Action Alternative

Approximately 1 million tons of waste rock and ore would be excavated annually over the currently approved 15-year life-of-mine. Mining in the North Claims Area is expected to produce about 8 million tons of overburden and remove 7 million tons of ore from approximately 5,500 linear feet of limestone outcrop. Graymont estimates that based on current operations, up to 50 percent of overburden produced would be used as backfill in mined out portions of mine pits. Remaining overburden would be placed in approved disposal areas adjacent to mine pits. Mine pits in the North Claims Area (**Figure 2-2**) would disturb about 470 acres (see *No Action Alternative* in Chapter 2). Backfill of mine pits could preclude future access to limestone ore reserves or result in reserves not being economically recoverable.

Under the No Action Alternative, potential direct and indirect impacts of the Proposed Action would not occur. This alternative would also eliminate recovery of up to 55 million tons of ore from the geologic resource at the site.

POTENTIAL MONITORING AND MITIGATION MEASURES

No monitoring or mitigation measures for geologic and mineral resources have been identified by BLM or DEQ.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

Approximately 55 million tons of limestone ore would be removed from the geologic resource under the Proposed Action. This action would constitute an irreversible commitment of geologic resources.

Electrical power and fuel (diesel, coal, petroleum coke) would be consumed over the life of the mine to extract ore, process ore, ship products, and reclaim the Project site. Consumption of these energy resources would constitute an irretrievable commitment of resources.

RESIDUAL EFFECTS

No residual effects on physical and geological resources in the proposed mine expansion area are expected to result from excavation, processing, and disposal of ore and overburden associated with the Proposed Action.

WATER QUANTITY AND QUALITY

AFFECTED ENVIRONMENT

The Study Area for water resources (**Figure 3-3**) lies within the Upper Missouri River Basin (hydrologic unit code [HUC] 10030101). Principal surface water bodies within the Study Area are Indian Creek and Crow Creek, both

of which are tributary to the Missouri River. The Missouri River is located approximately 4 miles east of the Study Area.

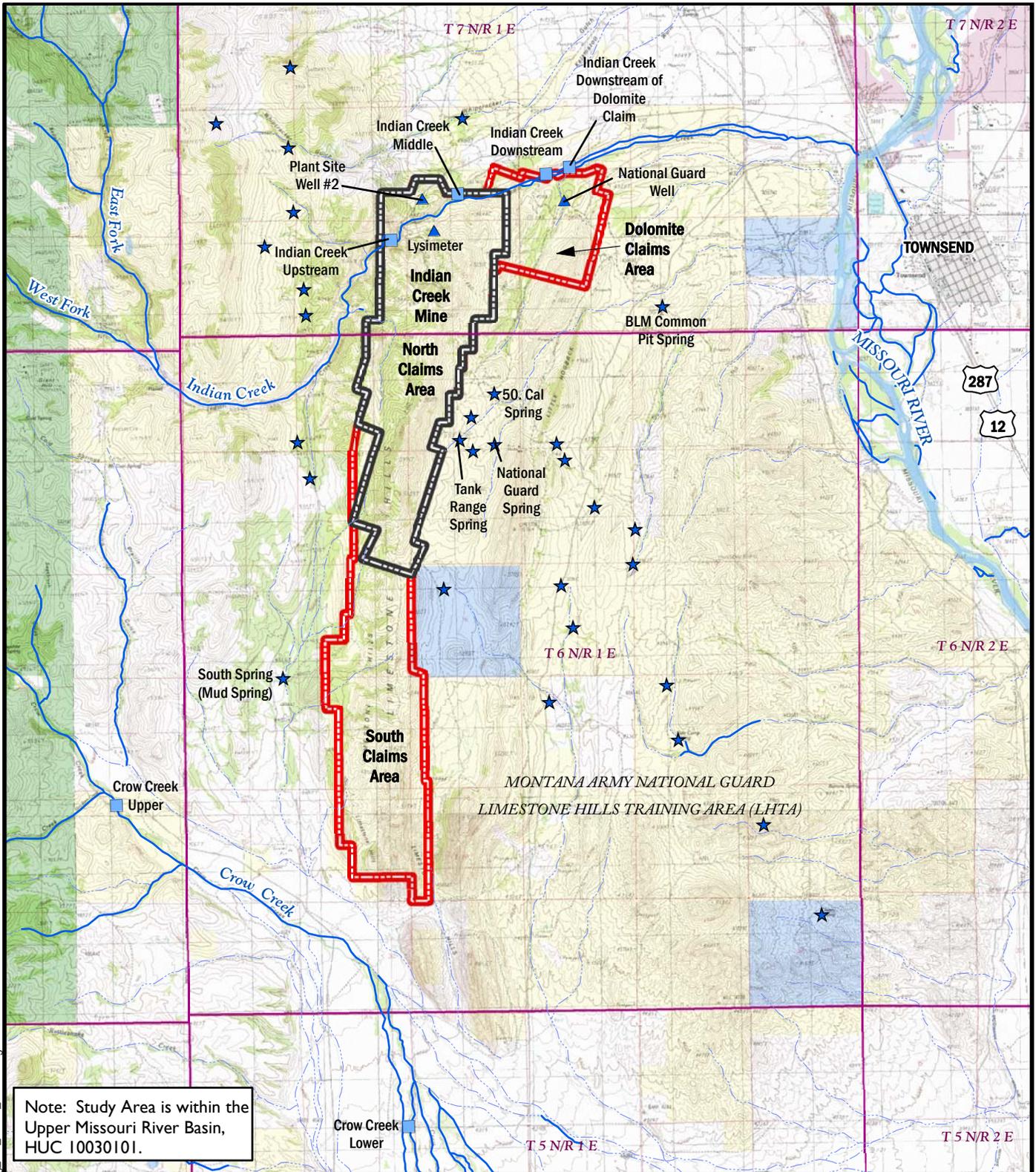
Numerous springs have previously been identified within the Study Area, all of which are outside the proposed mine operating permit boundary. Most springs are seasonal, flowing only during wet periods of the year (**Figure 3-3**).

Thirty-three groundwater wells have been identified within the Study Area. These wells are used for a variety of purposes, including water quality monitoring, domestic water supply, stock watering, industrial use, and irrigation. Static water levels in mine plant site production wells are at levels that are in excess of 100 feet lower than nearby Indian Creek's elevation. Groundwater was not encountered during exploration drilling in the South Claims Area to depths of up to 500 feet below ground surface. Groundwater was not encountered during exploration drilling at depths ranging 135 to 150 feet in the Dolomite Claims Area.

Graymont conducts routine water monitoring of surface water, groundwater, and springs as part of its operational monitoring program. Monitoring sites are shown on **Figure 3-3**, with proposed monitored parameters and frequency summarized in **Table 3-3**.

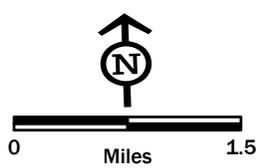
Surface Water Quantity and Quality

Two perennial streams are located in the Study Area: Indian Creek and Crow Creek (**Figure 3-3**), both of which originate in the Elkhorn Mountains. Tributary channels to these two streams are ephemeral, flowing only during prolonged wet periods, snowmelt, and/or brief heavy rain storms. Indian Creek crosses the northern portion of the current mine operations area, and Crow Creek extends just south of the proposed operation permit boundary.



Note: Study Area is within the Upper Missouri River Basin, HUC 10030101.

Base Data Source: Montana NRIS GIS Data



- | | | |
|------------------------------------|---------------------------|-----------------------|
| Townships | State of Montana | Monitoring Well |
| Existing Operating Permit Boundary | Bureau of Land Management | Spring/Seep |
| Proposed Operating Permit Boundary | Bureau of Reclamation | Surface Water Station |
| | Forest Service | |



HYDROLOGIC FEATURES AND WATER MONITORING SITES
Indian Creek Mine Expansion - Environmental Impact Statement
Broadwater County, Montana

FIGURE
3-3

H:\13532 Graymont\1.EIS\5000 GIS\Projects\EIS\Fig. 3-3. Water_Monitoring.mxd

TABLE 3-3 Water Monitoring Sites Indian Creek Mine										
Water Monitoring Site	Frequency	Proposed Parameters								
		TSS/TDS	Nutrients	Metals	Oil & Grease	pH	Water Temp.	Flow	Water Level	Water Vol.
Surface Water Monitoring Sites										
Indian Creek Upstream	Annual	X	X	X	X	X	X	X		
Indian Creek Middle*	Annual	X	X	X	X	X	X	X		
Indian Creek Downstream	Annual	X	X	X	X	X	X	X		
Indian Creek Downstream (d/s) of Dolomite Area	Annual	X	X	X	X	X	X	X		
Crow Creek Upper	Annual	X	X	X	X	X	X	X		
Crow Creek Lower	Annual	X	X	X	X	X	X	X		
Spring Monitoring Sites										
South Spring (Mud Spring)	Annual	X	X	X	X	X	X	X		
Tank Range Spring	Annual	X	X	X	X	X	X	X		
National Guard Spring	Annual	X	X	X	X	X	X	X		
50 Cal Spring	Annual	X	X	X	X	X	X	X		
BLM Common Pit Spring	Annual	X	X	X	X	X	X	X		
Groundwater Monitoring Sites										
National Guard Well	Annual	X	X		X	X	X		X	
Graymont Plant Site Well #2**	Annual		X	X		X		X	X	
Lysimeter	Annual					X				X

Notes:

1. All site locations shown on **Figure 3-3**
 2. Annual (once yearly) monitoring typically is performed in May/June.
 3. TSS = total suspended solids; TDS = total dissolved solids; temp. = temperature; vol. = volume.
 4. Nutrients include: nitrate+nitrite, total Kjeldahl nitrogen (TKN), total nitrogen, and total phosphorus.
 5. Metals include dissolved and/or total recoverable aluminum, antimony, arsenic, barium, beryllium, cadmium, calcium, copper, chromium, iron, lead, magnesium, manganese, mercury, nickel, selenium, thallium, and/or zinc.
- * Staff gage is installed at Indian Creek Middle site.
 ** Plant Site Well #2 is sampled as part of public water supply requirements.
 Source: Graymont 2007a..

Indian Creek, approximately 17 miles long within a watershed area of approximately 13,000 acres, is formed by the confluence of the West Fork, a spring-fed tributary, and the North Fork, which is fed primarily by snowmelt. Although various maps imply that Indian Creek is a perennial stream along its entire length, it is intermittent within the permit boundary (i.e., some reaches periodically become dry).

Independent synoptic (comprehensive) flow measurements conducted by the BLM and Graymont in 2006 both indicate that Indian Creek is an influent stream (i.e., loses water to subsurface) (Hydrometrics, Inc. 2007). Synoptic flow data for Indian Creek measured on October 24, 2006, between the western permit boundary and northeast corner of the permit boundary indicate a decreasing flow from 0.69

cubic feet per second (cfs) upstream, to 0.59 cfs midstream, and to 0.19 cfs downstream near where Indian Creek exits the permit area (Hydrometrics, Inc. 2007). Indian Creek lies 100 to 200 feet above the bedrock aquifer and may be a perched system with no direct hydraulic connection to the regional groundwater system (Hydrometrics, Inc. 2006).

Placer mining was conducted along Indian Creek in the 19th Century, resulting in disturbance of the creek bed and riparian (stream bank) areas. In 1999, BLM completed a mine reclamation project on portions of Indian Creek located in Sections 26, 27, and 28; T7N, R1E. Reclamation activities along Indian Creek have included restoring a 2,400-foot-long stream channel, reclaiming adjacent riparian areas affected by placer mining, and removing sediment with elevated metals concentrations from a pond located in the floodplain.

Crow Creek is approximately 15 miles long with a watershed of approximately 50,000 acres. Based on U. S. Geological Survey flow data for Crow Creek near the town of Radersburg, Montana (approximately 3 miles south of Study Area), mean daily flow ranged from about 8 cfs in January to 249 cfs in May for the period of record (1900 to 1990) (USGS 2007). Highest peak flow was 3,640 cfs on May 22, 1981. South of the Study Area, an irrigation network diverts the majority of Crow Creek flow during irrigation season.

Indian Creek is classified “B-1” according to Title 17, Chapter 30, of the Administrative Rules of Montana (ARM). Water classified B-1 is to be maintained suitable for drinking, culinary and food processing purposes, after conventional treatment; bathing, swimming and recreation; growth and propagation of salmonid fishes and associated aquatic life, waterfowl and furbearers; and agricultural and industrial water supply (ARM 17.30.623). Indian Creek is listed

as impaired under Section 303(d) of the Clean Water Act for both agricultural and drinking water uses due to arsenic, cadmium, lead, and mercury concentrations from historic mining activities (acid mine drainage, mine tailing, and dredge/placer mining) (DEQ 2007b). A summary of 303(d) listing information for Indian Creek for years 1996 and 2006 is presented in **Table 3-4**. For the 2006 303(d) List, 7.9 miles of Indian Creek are designated as impaired, extending from its headwaters to its confluence with the Missouri River.

DEQ collected surface water quality samples from the upper Indian Creek drainage near three abandoned or inactive mine sites upstream from the mine permit boundary along the East Fork (Park Mine) and West Fork (Diamond Hill Mine and St. Louis Mine) of Indian Creek (see Figure 3-3 for location of East and West Forks of Indian Creek) (DEQ 1997). Arsenic, cadmium, copper, mercury, lead, and zinc concentrations exceeded Montana numeric water quality standards for aquatic life and/or human health in at least one of the surface water samples collected near these mine sites.

Water quality monitoring of Indian Creek has been conducted by Graymont since 2003 as part of its Operational Monitoring Program and mine expansion permit application (Graymont 2007a). Monitoring is conducted at four stations along Indian Creek: Upstream, Middle, Downstream, and Downstream of the Dolomite Claims Area (**Figure 3-3**). None of the parameter concentrations measured at these sites (**Table 3-5**) has exceeded Montana numeric surface water quality standards (human health and aquatic life). Water quality in Indian Creek is consistent from upstream to downstream locations (**Table 3-5**), indicating that the Graymont Indian Creek Mine is not affecting water quality in Indian Creek. The highest concentrations of most parameters typically occur at the upstream sample site.

Specific conductance ranges from 130 to 330 µmhos/cm, and pH ranges 6.0 to 7.7 standard units (Graymont 2007a; Hydrometrics, Inc. 2006, 2007).

Crow Creek is classified as a B-I stream according to Title 17, Chapter 30, ARM. Crow Creek is listed as impaired under Section 303(d) of the Clean Water Act (**Table 3-4**). For the 16.2-mile stream reach from the National Forest boundary to the Missouri River, Crow

Creek does not support the following beneficial uses (from 2006 303(d) List; DEQ 2007b): agricultural, aquatic life, cold water fishery, industrial, and primary contact recreation. Probable causes for impairment are alteration in stream-side vegetative cover, low flow alterations, high nitrogen and phosphorus concentrations, stream bed alteration, and sedimentation/siltation due to habitat modification and agricultural practices.

TABLE 3-4 Impaired Water Status for Indian and Crow Creeks				
Year	Non-Supported Use	Probable Cause	Probable Source	Stream Miles Affected
Indian Creek (confluence of West Fork to mouth at Missouri River)				
1996	Aquatic Life Support; Cold Water Fishery – Trout; Recreation – Swimmable	Flow Alteration; Other Habitat Alterations; Siltation	Agriculture; Mine Tailings; Placer Mining; Resource Extraction; Rangeland	11
2006	Agricultural; Drinking Water	Arsenic Cadmium Lead Mercury	Acid Mine Drainage; Dredge Mining; Impacts from Abandoned Mine Lands (inactive); Mine Tailings	7.9
Crow Creek (from USFS boundary to mouth at Missouri River)				
1996	Aquatic Life Support; Cold Water Fishery – Trout; Recreation – Swimmable	Flow Alteration; Siltation	Agriculture; Irrigated Crop Production; Non-irrigated crop production; Placer Mining	12
2006	Agriculture; Aquatic Life; Cold Water Fishery; Industrial; Primary Contact Recreation	Alteration in Stream-side Vegetative Covers; Low Flow Alterations; Nitrogen (total); Phosphorus (total); Physical Substrate Habitat Alterations; Sedimentation/Siltation	Agriculture; Grazing in Riparian Zones; Habitat Modification – other than Hydromodification; Irrigated Crop Production;	16.2

Source: DEQ 2007b.

Hydromodification is “the alteration of stream flow to serve human objectives that can cause nonpoint source pollution and affect aquatic habitats. Pollutants associated with hydromodification include sediment and temperature; however, nutrients and toxics can also be a factor.” DEQ’s document – 2004 Annual Report of Montana’s Nonpoint Source Management Program (March 31, 2005)

Parameter	Units	Location Along Indian Creek			
		Upstream	Middle	Downstream	Downstream of Dolomite Area
General Parameters					
Total Suspended Solids	mg/L	5 - 37	<0.1 - 4	<0.1 - 9	NM
Specific Conductance	µmhos/cm	132 - 324	129 - 331	152 - 311	308
pH	s.u.	6.36 - 7.51	7.25 - 7.70	6.01 - 7.69	7.68
Temperature	°C	5.1 - 12.8	4.0 - 9.6	5.3 - 16.8	5.0
Dissolved Oxygen	mg/L	9.49	10.01	9.28	9.31
Flow*	cfs	0.69	0.59	0.19	0.05
Nutrients and Organics					
Nitrate+Nitrite, as N	mg/L	<0.01 - 0.01	<0.01	<0.01	NM
Total Kjeldahl Nitrogen	mg/L	0.2 - 3.2	0.43 - 2.5	0.18 - 2.9	NM
Nitrogen, total	mg/L	0.2 - 3.2	0.43 - 2.5	0.18 - 2.9	NM
Phosphorus, total	mg/L	<0.01 - 0.4	<0.01 - 0.35	<0.01 - 0.32	NM
Oil & Grease	mg/L	<0.1 - 1.7	<1	0.3 - 1.0	NM

Notes:

1. All concentrations in milligrams per liter (mg/L) unless otherwise noted.
2. ND – not detected; NM – not measured; µmhos/cm – micromhos per centimeter; s.u. – standard units; °C – degrees Celsius; cfs – cubic feet per second; N – nitrogen.
3. See **Figure 3-3** for location of sample sites.

* Flow rate measured on October 24, 2006.

Source: Graymont 2007a; Hydrometrics, Inc. 2006, 2007.

Graymont conducted water quality monitoring at two stations on (Upper and Lower) Crow Creek from 2004 to 2006 (**Figure 3-3**) (Hydrometrics, Inc. 2007). Concentrations of most parameters are similar between the Upper and Lower stations (**Table 3-6**). Although none of the parameter concentrations exceed Montana numeric surface water quality standards, data from both sample locations indicate elevated concentrations of total nitrogen (up to 4.5 mg/L) and total phosphorus (up to 0.6 mg/L).

Springs Water Quantity and Quality

Springs in the Study Area (**Figure 3-3**) were mapped in 1979 and described as generally being associated with either alluvium (stream

deposits) or bedrock (Davis *et al.* 1980). The majority of springs issue from thin veneers of alluvial deposits in small stream valleys throughout the Study Area. Due to the limited extent and thicknesses of alluvium in most of these drainage bottoms, these springs typically flow only during the spring and early summer period. Some springs located along the east side of the Study Area issue from faults and fractures in bedrock along the lower east flank of the Limestone Hills. Springs from bedrock sources typically flow year-round because the bedrock has a larger recharge area than the smaller alluvial springs.

Parameter	Units	Upper Crow Creek	Lower Crow Creek
General Parameters			
Total Suspended Solids	mg/L	2 - 4	3 - 11
Specific Conductance	µmhos/cm	28 - 89	30 - 91
pH	s.u.	NM	NM
Temperature	°C	NM	NM
Dissolved Oxygen	mg/L	NM	NM
Nutrients and Organics			
Nitrate+Nitrite, as N	mg/L	<0.01 - 0.12	<0.01 - 0.03
Total Kjeldahl Nitrogen	mg/L	<0.010 - 2.9	0.65 - 4.44
Nitrogen, total	mg/L	0.1 - 2.97	0.65 - 4.47
Phosphorus, total	mg/L	<0.01 - 0.61	0.02 - 0.47
Oil & Grease	mg/L	<1 - 1	<1 - 4
Common Ions			
Calcium	mg/L	4.8 - 15	8.92 - 16
Magnesium	mg/L	<0.001 - 2.66	<0.001 - 3.3
Metals			
Aluminum	mg/L	<0.001 - 0.056	<0.001 - 0.056
Antimony	mg/L	<0.001	<0.001 - 0.001
Arsenic	mg/L	<0.001 - 0.002	<0.001
Barium	mg/L	0.005 - 0.008	0.006 - 0.009
Boron	mg/L	0.013 - 0.156	0.082 - 0.134
Chromium	mg/L	<0.001 - 0.002	<0.001 - 0.001
Iron	mg/L	<0.001 - 0.64	<0.001 - 0.72
Molybdenum	mg/L	<0.001 - 0.004	<0.001 - 0.006
Silicon	mg/L	5.25 - 6.5	5 - 5.6
Strontium	mg/L	<0.01 - 0.181	0.107 - 0.173
Vanadium	mg/L	<0.001	<0.001
Zinc	mg/L	<0.001 - 0.019	<0.001

Notes:

1. All concentrations in milligrams per liter (mg/L) unless otherwise noted.
2. NM – not measured; µmhos/cm – micromhos per centimeter; s.u. – standard units; °C – degrees Celsius; N – nitrogen.
3. Some concentrations of iron from both sites exceed the human health (HH) standard (i.e., drinking water) of 0.3 mg/L from Circular DEQ-7 (DEQ 2006).
4. See **Figure 3-3** for location of sample sites.

Source: Graymont 2007a; Hydrometrics, Inc. 2006, 2007.

Field investigations conducted by Graymont in 2005-2006 confirmed that most springs identified by Davis *et al.* (1980) are ephemeral, were dry at the time of inspection, and did not appear to have flowed in the recent past. Five year-round or intermittent flowing springs were identified and are monitored in the Study Area: 50 Caliber Spring, National Guard Spring, Tank Range Spring, South Spring (Mud Spring), and BLM Common Pit Spring (**Figure 3-3**) (Hydrometrics, Inc. 2006, 2007). All but South Spring (Mud Spring) are located along the east

flank of the Limestone Hills and appear to be associated with faults in bedrock. Measured flow for these springs ranged from <0.25 gallon per minute (gpm) at 50 Caliber Spring to 0.6 gpm at Tank Range Spring. Available water quality and flow data for the five primary springs within the Study Area are summarized in **Table 3-7**. The springs have low or non-detectable concentrations of nutrients (phosphorus and nitrogen) and metals.

Groundwater Quantity and Quality

Groundwater in the Study Area occurs in Quaternary-age (younger than 1.8 million years) alluvium in stream drainage bottoms, in Tertiary-age (1.8 to 66 million year old) unconsolidated (loose) sediment eroded from the Limestone Hills, and in bedrock aquifers. The Madison Limestone, a regional source of groundwater, is mined at the Graymont facility.

Regional groundwater flow in the Study Area is eastward from the uplands toward the Missouri River (Kendy and Tresch 1996). Smaller-scale groundwater flow systems likely occur and are controlled primarily by local topography and drainage features. As previously discussed, Indian Creek loses some water to the subsurface in the Study Area, indicating localized groundwater flow is not always directed toward streams in the valley bottoms.

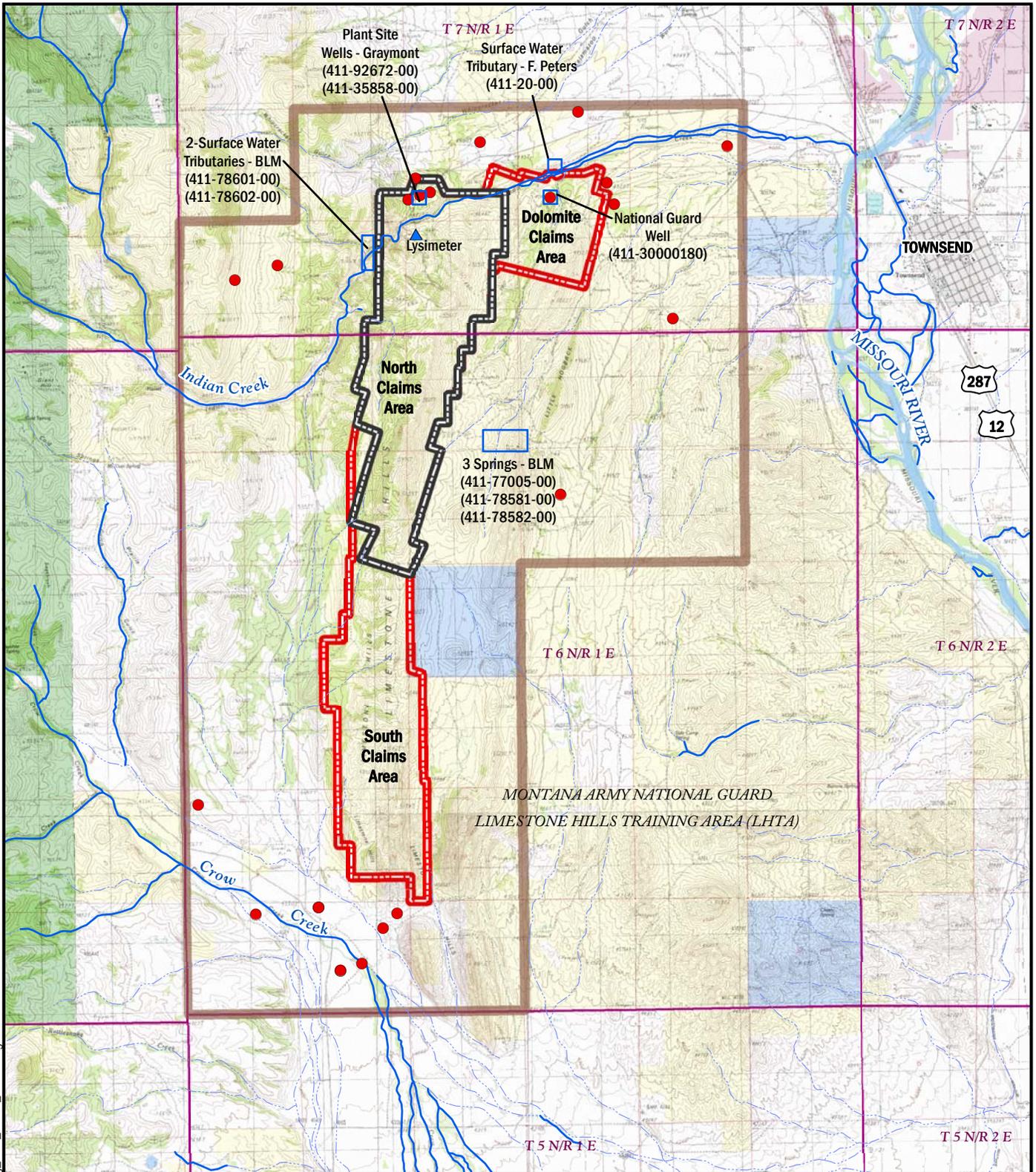
Groundwater well information for the Study Area is available from the Montana Bureau of Mines & Geology – Groundwater Information Center (MBMG-GWIC 2007) and is shown in **Table 3-8. Figure 3-4** shows the location of wells in the Study Area. Records indicate that groundwater wells are completed either in unconsolidated deposits or bedrock (limestone or shale). Wells in unconsolidated deposits range in depth from 180 to 300 feet, and the bedrock wells are up to about 600 feet deep. Reported water levels for wells completed in unconsolidated deposits range from 15 to 35 feet, and water levels in bedrock range from 55 to 405 feet below ground surface. Exploration boreholes within the mine operations area and South Claims Area have not encountered groundwater at depths of up to 500 feet below

ground surface (Rupke and Knox 2006). Exploration boreholes, completed to depths ranging from 135 to 150 feet in the Dolomite Claims Area, did not encounter groundwater.

Storm Water Management

Graymont manages storm water run-off from its mine area in accordance with a DEQ-approved Storm Water Pollution Prevention Plan (SWPPP). The current version of the SWPPP, which is part of general storm water Montana Pollutant Discharge Elimination System (MPDES) permit no. MTR000090, was updated September 29, 2006 (Graymont 2006). Currently, two storm water outfalls are monitored as part of permit requirements: (1) Outfall 001A – discharge from kiln-site detention pond; and (2) Outfall 003A – discharge from quarry/crusher-site detention pond. Water that discharges from these outfalls would flow into Indian Creek. As part of overall storm water monitoring for the Project site, the Life of Mine Permit (stipulation 105-11-002 in Amendment 011) includes monitoring Indian Creek upgradient and downgradient of the mine site.

Storm water sampling and visual monitoring are performed at specific locations throughout the mine site during and immediately following precipitation events. Results of water samples collected from the upstream and downstream Indian Creek stations are summarized in **Table 3-5**. These data show that the upstream and downstream sites have similar values for many parameters. Temperature generally increases downstream, and TSS and flow decrease downstream.



Base Data Source: Montana NRIS GIS Data

Private Well	Existing Operating Permit Boundary	Land Ownership
Lysimeter	Proposed Operating Permit Boundary	State of Montana
Water Rights Study Boundary	Townships	Bureau of Land Management
Place of Diversion and Water Right Numbers		Bureau of Reclamation
		Forest Service

U.S. Department of the Interior
 Bureau of Land Management
 Butte Field Office
 Butte, Montana

WATER RIGHTS AND PRIVATE WELLS
Indian Creek Mine Expansion - Environmental Impact Statement
Broadwater County, Montana

FIGURE
3-4

H:\13532 Graymont EIS\5000 GIS\Projects\EIS\Fig_3-3a_Water_Monitoring.mxd

TABLE 3-7
Summary of Water Quality and Flow Data for Springs
Indian Creek Mine

Parameter	Units	National Guard Spring	South Spring (Mud Spring)	Tank Range Spring	50 Cal Spring	BLM Common Pit Spring
General Parameters						
SC	µmhos/cm	623 – 746	87* - 594	556 - 630	781	484
pH	s.u.	6.24 – 7.30	NM	7.55	NM	NM
DO	mg/L	4.89	NM	1.83	NM	NM
Temperature	°C	9.1 – 13.6	NM	11.8	NM	NM
TSS	mg/L	<1.0 – 6.0	1.0 – 201*	8.0	6.0	126
Flow	gpm	0.5	NM	0.6	<0.25e	NM or dry
Nutrients and Organics						
NO ₃ +NO ₂	mg/L	<0.01 – 0.05	<0.01	0.17	1.1	0.14
TKN	mg/L	0.32 – 3.0	0.46 – 2.82	1.4	2.6	1.8
Total Nitrogen	mg/L	0.32 – 3.0	0.46 – 2.94	1.6	3.7	1.9
Total Phosphorus	mg/L	0.09 – 27*	<0.01 – 0.21	0.10	0.24	0.34
Oil & Grease	mg/L	<0.1 – 5.2*	<1.0	1.0	<1.0	NM
Common Ions						
Calcium	mg/L	NM	64.4	NM	NM	NM
Magnesium	mg/L	NM	<0.001	NM	NM	NM
Metals (Total)						
Aluminum	mg/L	NM	<0.001	NM	NM	NM
Antimony	mg/L	NM	<0.001	NM	NM	NM
Arsenic	mg/L	NM	<0.001	NM	NM	NM
Barium	mg/L	NM	0.021	NM	NM	NM
Beryllium	mg/L	NM	<0.001	NM	NM	NM
Boron	mg/L	NM	0.348	NM	NM	NM
Cadmium	mg/L	NM	<0.001	NM	NM	NM
Chromium	mg/L	NM	0.013	NM	NM	NM
Cobalt	mg/L	NM	<0.001	NM	NM	NM
Copper	mg/L	NM	<0.001	NM	NM	NM
Iron	mg/L	NM	0.65	NM	NM	NM
Lead	mg/L	NM	<0.001	NM	NM	NM
Manganese	mg/L	NM	<0.001	NM	NM	NM
Molybdenum	mg/L	NM	0.01	NM	NM	NM
Nickel	mg/L	NM	<0.001	NM	NM	NM
Selenium	mg/L	NM	<0.001	NM	NM	NM
Silicon	mg/L	NM	4.78	NM	NM	NM
Silver	mg/L	NM	<0.001	NM	NM	NM
Strontium	mg/L	NM	2.382	NM	NM	NM
Thallium	mg/L	NM	<0.001	NM	NM	NM
Titanium	mg/L	NM	<0.001	NM	NM	NM
Vanadium	mg/L	NM	0.002	NM	NM	NM
Zinc	mg/L	NM	<0.001	NM	NM	NM

Notes:

1. mg/L – milligrams per liter; TSS – total suspended solids; NO₂ – nitrite nitrogen; TKN – total Kjeldahl nitrogen; NO₃ – nitrate nitrogen; DO – dissolved oxygen; SC – specific conductance; e – estimate; gpm – gallons per minute; µmhos/cm – micromhos/centimeter; NM – not measured; °C – degrees Celsius; s.u. – standard units of pH.

2. Concentration of iron (0.65 mg/L) from South Spring exceeds the human health (HH) standard (i.e., drinking water) of 0.3 mg/L from Circular DEQ-7 (DEQ 2006).

3. See **Figure 3-3** for location of springs.

* - data noted by Hydrometrics (2007) as anomalous and not representative of actual water quality, possibly due to laboratory error and/or field meter problems.

Source: Hydrometrics, Inc. 2007.

TABLE 3-8			
Summary of Groundwater Quality Data for Two Wells in Study Area			
Indian Creek Mine			
Parameter	Units	National Guard Well	Graymont Plant Site Well #2
Sample Period		5/2003 – 6/2006	5/1994 – 5/2006
Number of Samples		4	13**
General Parameters			
SC	µmhos/cm	344 - 448	513
pH	s.u.	6.60 – 7.35	8.08
Temperature	°C	15.4 – 17.0	NM
TSS	mg/L	<1.0 – 1.0	NM
Fluoride	mg/L	NM	0.17
Alkalinity, total	mg/L	NM	144
Hardness, total	mg/L	NM	221
Organics			
Oil & Grease	mg/L	<0.1 – 2.7*	NM
VOC	mg/L	NM	ND
Pesticides	mg/L	NM	ND
Herbicides	mg/L	NM	ND
Nutrients			
NO ₃ +NO ₂	mg/L	0.62 – 0.81	0.38 – 1.92
NO ₂	mg/L	NM	<0.01
TKN	mg/L	0.19 – 3.0	NM
Total Nitrogen	mg/L	0.96 – 3.7	NM
Total Phosphorus	mg/L	<0.01 – 0.09	NM
Common Ions			
Calcium	mg/L	NM	64
Magnesium	mg/L	NM	14.8
Sodium	mg/L	NM	14.2
Metals (total)			
Antimony	mg/L	NM	<0.001
Arsenic	mg/L	NM	<0.001 – 0.002
Barium	mg/L	NM	0.047 – 0.053
Beryllium	mg/L	NM	<0.001
Cadmium	mg/L	NM	<0.001
Chromium	mg/L	NM	<0.001
Copper	mg/L	NM	<0.01 – 0.13
Iron	mg/L	NM	<0.01
Lead	mg/L	NM	<0.001 - <0.005
Manganese	mg/L	NM	<0.005
Mercury	mg/L	NM	<0.0002
Nickel	mg/L	NM	<0.01
Selenium	mg/L	NM	0.001 – 0.002
Thallium	mg/L	NM	<0.001

Notes:

1. mg/L – milligrams per liter; TSS – total suspended solids; NO₂ – nitrite nitrogen; NO₃ – nitrate nitrogen; TKN – total Kjeldahl nitrogen; SC – specific conductance; e – estimate; VOC – volatile organic compounds; µmhos/cm – micromhos/centimeter; NM – not measured; °C – degrees Celsius; ND – not detected; s.u. – standard units of pH.

2. None of the reported concentrations exceed human health standards for groundwater from Circular DEQ-7 (DEQ 2006).

3. See Figure 3-3 for location of wells.

* - data noted by Hydrometrics (2007) as anomalous and not representative of actual water quality, possibly due to laboratory error. ** - Not all parameters were analyzed for each sample event.

Source: Hydrometrics, Inc. 2007.

Water Rights and Water Use

The Upper Missouri River Basin includes all surface water in the Study Area and has been closed to further surface water appropriations and reservations since April 16, 1993. The closure is temporary until final decrees have been issued for all sub-basins within the Upper Missouri River Basin (Montana Department of Natural Resources and Conservation (DNRC 2003)). Groundwater appropriations are still allowed, provided that groundwater is not immediately or directly connected to surface water. Individual real property owners are allowed to appropriate up to 35 gpm or 10 acre-feet per year without obtaining a water right permit.

The Natural Resource Information System Water Rights Query System was used to identify existing water rights within the permit boundary, plus a buffer of approximately 1 mile beyond the proposed permit boundary (NRIS 2007). A total of 99 water rights were listed from this query for surface water, developed springs, and groundwater.

Nine water rights were found that, based on information contained in the Water Rights Query System, appear to be located in or near the permit boundary. These water rights are shown on **Figure 3-4**.

- Graymont Western U.S., Inc. holds two Provisional Permits for groundwater withdrawal from water supply wells located on its Indian Creek Mine plant site in Section 28, T7N, R1E.
- The U.S. Department of Military Affairs has a Groundwater Certificate for a water supply well (National Guard Well) in Section 27, T7N, R1E.
- The BLM holds the following water rights for livestock use:

- One Groundwater Certificate for a developed spring in Section 4, T6N, R1E.
- Two Claims for springs in an unnamed tributary to Missouri River in Section 4, T6N, R1E.
- Two Claims for surface water in an unnamed tributary to Missouri River in Section 32, T7N, R1E.
- Franklin Peters has one Claim for surface water (irrigation) in an unnamed tributary in Section 27, T7N, R1E, which lies north of Indian Creek outside the proposed operating permit boundary.

DIRECT AND INDIRECT IMPACTS

Proposed Action

The Proposed Action is an amendment to the existing permit for a life-of-mine expansion which would increase the total permitted area from 1,735 acres to approximately 3,675 acres (an expansion of 1,940 acres). The area permitted to be disturbed would expand from 757 acres to approximately 2,070 acres (an expansion of 1,313 acres), and include 343 acres of mine pit operations in the South Claims Area, and 214 acres of mining in the Dolomite Claims Area. In the Dolomite Claims Area, the anticipated deepest portion of the north mine pit would be at an elevation of approximately 4,070 feet. The deepest portion of the mine pit in the South Claims Area would extend to an elevation of approximately 5,020 feet.

Under the Proposed Action, Graymont would implement water resource protection practices throughout the entire permitted area. Management of water resources would be conducted by Graymont in accordance with its Operating and Reclamation Plan (Graymont 2007a) and in accordance with all applicable

state and federal requirements. Water rights and water withdrawals would continue to be managed by DNRC. Storm water run-off would continue to be managed under a storm water permit issued by DEQ.

Water Quantity

Under the Proposed Action, the total area of disturbance would be increased to include new open mine pits, overburden disposal areas, soil stockpiles, haul roads, and a new rock crusher and associated reject pile. Potential impacts could occur to surface water quantity in drainages where excess run-off would leave the permit boundary.

For the Proposed Action, applications for additional storm water discharge outfalls would be submitted for new disturbance areas. Exhibit F (Storm Water Pollution Prevention Plan Map) in the Operating and Reclamation Plan (Graymont 2007a) shows proposed diversion channels, detention basins, and rip-rap rock structures. The majority of these structures would be located along the west and north sides of proposed mine expansion areas. Run-off along the east side of mine expansion areas would report to the mine pits. Best Management Practices would be constructed as needed in disturbed areas to dissipate energy of flowing water and capture suspended sediment. Detention ponds would be designed to contain run-off from a 10-year, 24-hour storm in each affected basin, as specified in the mine Plan of Operations (Graymont 2007a). The extended permit and disturbance boundaries would result in the need for new permitted outfalls under Graymont's Storm Water Permit.

All drainages within the proposed disturbance areas are ephemeral, flowing only in response to storm events and possibly snow-melt. Storm water run-off typically occurs only for a few brief events per year, usually in the spring. The volume of storm water run-off that flows from

mine-related disturbance areas usually is contained within the detention ponds with no resultant discharge. From 1996 to 2007, there were only two discharge events from the outfalls (December 1996 and December 1998) (DEQ 2007c). Infrequent discharge of storm water run-off would also occur for the proposed mine expansion area. Any discharge that occurs from mine area outfalls would report to Indian Creek and/or ephemeral drainages that report to Crow Creek. The impact of mine storm water discharge on either creek would be minor because the volume of discharge is expected to be low compared to stream flow.

No surface water rights are located in the South Claims or Dolomite Claims areas.

The proposed northern-most mine pit in the Dolomite Claims Area would extend to within about 500 feet of Indian Creek (**Figure 2-3**). The mine pit would not intercept any alluvium along the creek. Indian Creek in this reach is intermittent and loses flow to the subsurface and would not be affected by the proposed expansion.

With respect to potential impacts to groundwater quantity, including flow from springs, the proposed expansion in the South Claims Area would have no adverse effect. No groundwater rights are present in the South Claims Area that could be affected by mining. Based on exploratory drilling observations, groundwater has not been encountered within 500 feet of ground surface. It is possible that recharge to groundwater could be increased by capture and infiltration of precipitation into bedrock through the mine pits.

In the Dolomite Claims Area, the northern-most mine pit would eventually extend below the groundwater level. The pit bottom is projected to extend to an ultimate elevation of about 4,070 feet, which is 155 feet below the

groundwater level elevation in the nearby National Guard Well (water right no. 411 30000180) of 4,225 feet (Hydrometrics, Inc. 2007). The pit bottom is projected to be 45 feet below the total depth of this well (elevation 4,115).

The National Guard Well is located approximately 400 feet southwest of the northern-most mine pit and within the proposed permit boundary. The well is used for stock watering during spring, summer, and fall. Pit dewatering may adversely impact the National Guard Well by lowering the groundwater level in the vicinity of the well, possibly to a depth below the current pumping level or below the bottom of the well. If necessary, Graymont would replace the water source under MMRA requirements if it is determined that the mine pit development has affected the water source.

The north mine pit in the Dolomite Claims Area would eventually be backfilled with overburden to an elevation above the groundwater level. The groundwater level would be re-established to pre-mine levels, restoring the water level in the National Guard Well.

The ultimate pit bottom elevation proposed for the southern-most mine pit in the Dolomite Claims Area is 4,265 feet, which is about 40 feet above the water level measured in the National Guard Well. Groundwater would not be encountered, so dewatering would not be required for this pit, and no adverse impact is expected to occur to the National Guard Well.

Impacts to flow from springs in the Dolomite Claims and South Claims areas are not expected to occur due to the Proposed Action because the five permanent or intermittent flowing springs identified in the Study Area (50 Caliber Spring, National Guard Spring, Tank

Range Spring, South Spring (Mud Spring), and BLM Common Pit Spring) are located at least 1,000 feet from any proposed disturbance (**Figure 3-3**). All but South Spring (Mud Spring) are located along the east flank of the Limestone Hills and appear to be associated with faults in bedrock. Recharge areas for these springs are likely in the mountains and foothills to the west. As stated above, it is possible that recharge to groundwater could be increased by capture and infiltration of precipitation into bedrock through the mine pits.

Water Quality

The only water quality concern in run-off water from the Project area is suspended sediment. Concentrations of metals in samples of ore and overburden were analyzed in 2005. Results of analysis for 21 trace elements showed non-detectable concentrations or concentrations within typical ranges found in soil (Graymont 2005). Due to the rock being primarily limestone and dolomite, acid mine drainage at this site and associated increased concentrations of metals are not expected.

Best management practices (BMPs) would be used to control and contain run-off water from all mine-related disturbance areas. With the exception of extreme storm events, all run-off water is expected to be retained on-site in the detention ponds. Any discharges from these ponds would flow to Indian Creek and/or Crow Creek under a DEQ-approved Storm Water Permit. Water samples previously collected from two permitted storm water outfalls (001A and 003A) at the Indian Creek Mine show elevated levels of total suspended solids. From 1996 to 2007, only two discharge events occurred (December 1996 and December 1998) with resultant total suspended solids concentrations of 6,000 mg/L and 24,280 mg/L, respectively (DEQ 2007c). Therefore, BMPs would be an important part of mine operations

and reclamation in order to reduce potential sediment load to nearby streams if discharge occurs from the outfalls.

Analysis of surface water samples collected in the Study Area show that Indian and Crow creeks contain good quality water downstream from the Indian Creek Mine area. No aquatic life standards are known to have been exceeded in surface water samples collected in the vicinity of the Indian Creek Mine site. Some iron concentrations in Crow Creek (up to 0.72 mg/L) have exceeded the secondary aesthetic standard of 0.3 mg/L (**Table 3-6**). Concentrations of arsenic, cadmium, copper, lead, mercury, and zinc have exceeded aquatic life and/or human health standards in samples from upper Indian Creek drainage in the vicinity of some abandoned or inactive mine sites, including the Park, St. Louis, and Diamond Hill mines (DEQ 1997). Reclamation at the Park Mine was performed by DEQ in 1997 under the Abandoned Mine Reclamation Program.

With the exception of one iron concentration in a South Spring sample, water quality data from springs and wells in the Study Area do not exceed Montana's standards for human health and aquatic life. Specific conductance for these springs is higher (344 to 781 $\mu\text{mhos/cm}$) than surface water samples (28 to 331 $\mu\text{mhos/cm}$) in the Study Area.

As stated above, the north mine pit in the Dolomite Claims Area would intercept the water table, but would be backfilled with overburden to an elevation above the water table. Nitrate from ANFO used in blasting could result in increased concentrations in groundwater for a period of time after pit backfill is completed. Groundwater quality would not be adversely affected by backfilling this pit, because it would consist primarily of dolomite and limestone rock, and there is no

evidence that metals would be leached from this rock allowing groundwater quality to return to pre-mine levels (Graymont 2005).

Alternative A – Modified Pit Backfill

Impacts on water quantity and quality from implementation of Alternative A would be similar to those described for the Proposed Action.

No Action Alternative

Under the No Action Alternative, existing mine operations would continue as currently approved for about 15 years. The proposed additional disturbance, and associated impacts to water resources, would not occur. Existing uses of proposed expansion areas by livestock would persist, and the effects of this use, including some erosion, increased nutrient loading to streams, and potential increased sedimentation to drainages, would continue.

POTENTIAL MONITORING AND MITIGATION MEASURES

Mitigation would be required for the National Guard Well (water right no. 411-30000180) if groundwater drawdown during development of the Dolomite Claims north mine pit affects this well. Should the National Guard Well be affected by the mine pit development, DEQ would require Graymont to replace this source of water under 82-4-355 MCA.

Wells installed around the north mine pit in the Dolomite Claims Area to draw the groundwater level down below the pit as mining occurs could be used to limit potential contamination of groundwater by nitrates from blasting residue. Groundwater in the overburden placed as backfill in the north mine pit would be monitored for quality.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

There would be no irreversible commitments of water resources. Approximately 5 million gallons per year would be consumed for ore processing, dust suppression and potable water supply. This water use would last 15 years or 50 years depending on the alternative selected. Precipitation not intercepted by mine pits could contribute to intermittent surface water flow in drainages downstream from the Project site during storm events or run-off from snow melt. Precipitation falling into the pits would likely collect in the pits and evaporate and/or infiltrate to the subsurface.

RESIDUAL EFFECTS

No residual effects to water resources would be expected as a result of the Proposed Action and alternatives.

SOIL RESOURCES

AFFECTED ENVIRONMENT

Soil resources within the proposed mine expansion disturbance boundary are shown on **Figure 3-5**. Soil information for most of this area was obtained from site-specific field data collected as part of Graymont's mining operations and includes areas proposed for disturbance.

The Study Area is located on the western slope of the Townsend Basin between the Big Belt and Elkhorn mountains. The terrain consists of steep north-south trending limestone, igneous, argillite, and tertiary sediment ridges and valleys in the Study Area. Alternating beds of limestone, argillite, and intrusive igneous materials have been chemically and physically altered, uplifted, and eroded to create the Limestone Hills geomorphic terrain. Most soil within the Study Area developed from

limestone bedrock, calcium and clay-rich sediment, igneous rock, and unconsolidated rock transported downslope by water and gravity. The various soil types developed from the differences in these parent materials.

Soil types in the Study Area have been delineated and described in conjunction with four separate survey efforts. Map units and typical soil properties of Broadwater County were described in a soil survey conducted by NRCS (NRCS 2007). Subsequent surveys were conducted in the Study Area to collect information for use in reclamation planning.

Soil types in the existing permit area, and portions of the proposed North-South Haul Road to the South Claims Area, were delineated and described by ECON, Inc. (1980). Detailed surveys of the South Claims and Dolomite Claims areas were completed in 2004 and 2006, respectively (Resource Management Associates 2006a).

The detailed surveys include observation and description of soil and associated vegetation at sites distributed throughout the Study Area. Soil pits were excavated to a depth where the content of materials greater than 0.5 inch in size (coarse fragments) exceeded 40 percent (above which soil is no longer considered suitable for salvage). These observations were used to delineate map units, prepare attendant descriptions and estimate salvage depths in each unit. Although the map units are more precisely delineated, they were not prepared as a refinement of the NRCS survey.

Characteristics of soil types and relative distribution in the Study Area are presented in **Table 3-9**.

Data from the NRCS survey were used to address data gaps for small areas missed during the subsequent surveys. The Pensore, very stony-rock outcrop-Crago, stony complex and Whitecow, stony-Lap, very stony-rock outcrop

complex delineated by the NRCS (2007) in these areas are comparable to soil types found elsewhere in the Study Area.

The Study Area is comprised of loamy textured soil with high coarse fragment content and extensive areas of rock outcrop. Limestone parent materials affect nearly all soil in the area with coarse fragment content increasing with depth and bedrock contact commonly occurring at depths less than 20 inches. These characteristics and the prevalent steep slopes yield four dominant ecological sites including: very shallow limy; shallow limy droughty; limy droughty; and loamy droughty steep. No wetlands or hydric soil types occur within the Study Area.

Depth of soil suitable for salvage ranges from zero (rock outcrops) to 84 inches across all units. Coarse fragment content and bedrock contact are the primary factors limiting suitability, although high salt and lime content occur in some areas. The deepest soil occurs in drainage bottoms (alluvium) and toe slopes, with the latter being more prevalent. While the shallowest soil is found in the southern half of the South Claims Area, the average salvage depth across the Dolomite Claims Area as a whole is slightly less than that of the South Claims area as a whole.

The north end of the Study Area lies within the Indian Creek drainage, which was historically placer mined for gold. Placer mining disturbed the original drainage by removing finer particles and leaving river rock (*i.e.*, placer tailing, soil type "T"), which is now present over most of the surface. This area is considered previously disturbed and has no salvageable soil.

Soil Salvage

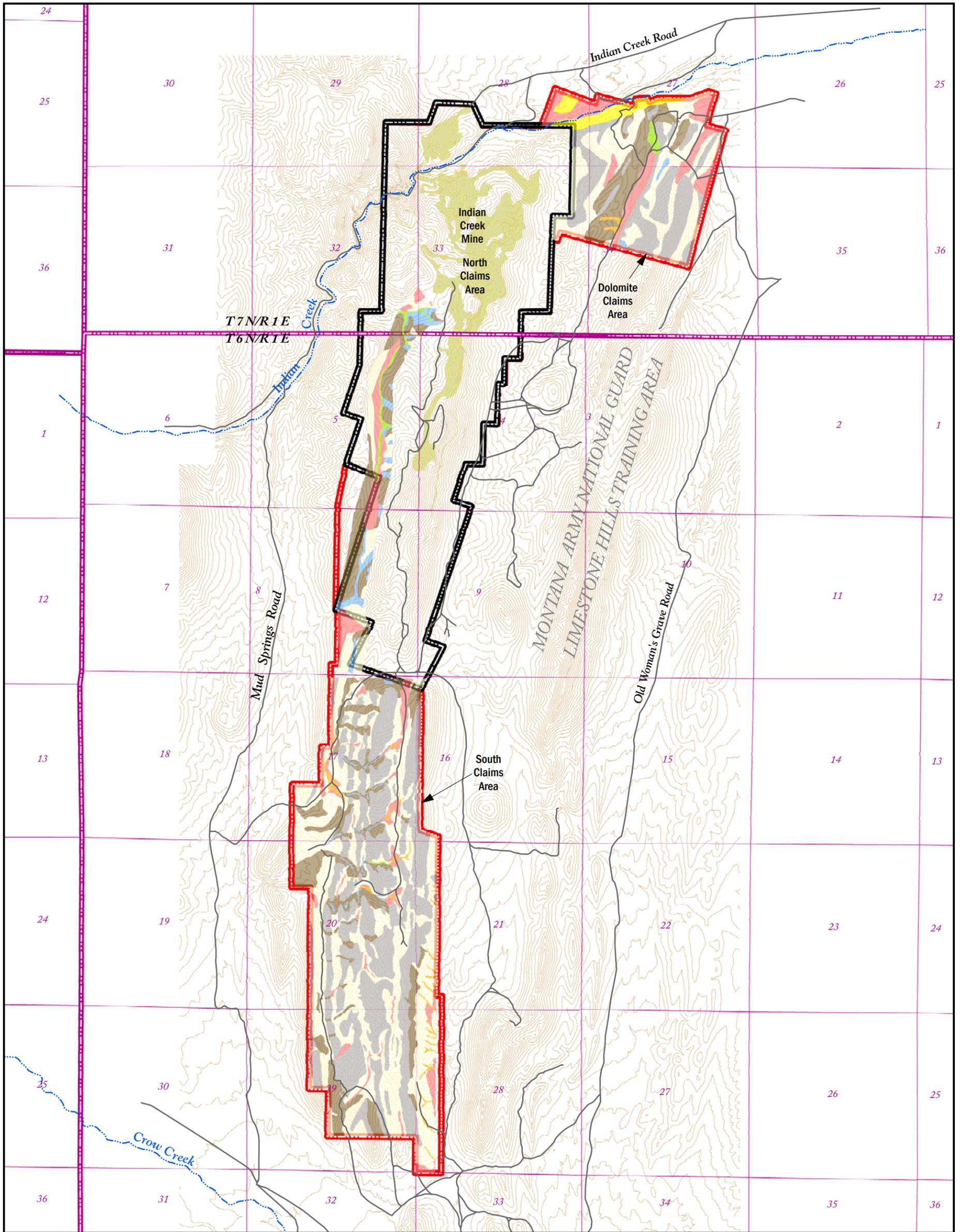
Potential soil salvage by classification unit for the South Claims and Dolomite Claims areas is shown in **Table 3-10**. Soil salvage is described in Chapter 2 – *Proposed Action*. In areas where no detailed soil data are available, the depth of material available for salvage is represented by a weighted average of the salvage depths from the inventoried area.

DIRECT AND INDIRECT IMPACTS

Soil is directly impacted by mine development when salvage operations and other surface disturbances alter the natural horizon development thereby affecting soil conditions existing in the natural setting. Direct impacts that result through mixing and handling of soil resources include soil loss due to erosion and alteration of soil chemical, physical, and biological properties. Effects occur during two separate stages of mining operations: 1) initial disturbance including salvage and stockpiling operations; and 2) in conjunction with replacement and final reclamation activities.

Proposed Action

Direct impacts on soil resources resulting from the Proposed Action would include loss of soil from wind and water erosion, alteration of soil chemical and physical properties, and decreased soil biological activity. Aside from the differences in the area of disturbance and the amount to be salvaged and ultimately replaced in the reclaimed landscape, the effects to soil in the Dolomite Claims and the South Claims areas are expected to be comparable.



Data Source: Resource Management Associates, 2004/2006



h:\13532 Graymont EIS\5000 GIS\Projects\EIS\Fig_3-4_Soils.mxd

**TABLE 3-9
Characteristics of Various Soil Types within Life-of-Mine Disturbance Area
Indian Creek Mine**

Unit	Map Unit Name ¹	Dominant Soil Series	Primary Vegetation Physiognomic Types	Portion of Life-of-Mine Expansion (percent)	Topsoil Textures	Subsoil Textures	Depth to Bedrock (inches)	Parent Material ¹	Slope Range ²
1	Deep Alluvium (Forested)	Whitecow	Conifer Forest, Pine Savannah, Juniper and Low Shrub	1.3	Gravelly Loam	Gravelly Loam to Very Gravelly Loam	100+	Alluvial Deposits	0 to 5+%
2	Moderately Deep Colluvium (Forested)	Windham & Whitecow	Juniper and Pine Savannah	0.8	Loam	Gravelly to Very Gravelly Loam and Sandy Clay Loam	100+	Colluvium influenced by the Amsden Formation	10 to 40+%
3	Shallow Colluvium (Grassy)	Pensore & Lap	Juniper and Pine Savannah and Low Shrub	8.2	Loam and Sandy Loam	Gravelly Loam and Sandy Loam	Approx. 30	Colluvium with some aeolian influences	<5 to 35%
4	Shallow Colluvium (Forested)	Whitecow	Conifer Forest and Pine Savannah	2.8	Gravelly Loam	Gravelly Loam over Very Gravelly or Sandy Loam	Varies from rock outcrop to 75	Colluvium with some rock outcrops	5 to 15%
5	Residuum/Very Shallow (Grassy)	Pensore & Crago	Tall Shrub, Juniper and Pine Savannah, Low Shrub and Grasslands	34.5	Very Gravelly Loam	Very Gravelly Sandy Loam	Approx. 20	Colluvium over fractured limestone residuum	10 to 25+%
6	Residuum/Very Shallow (Forest/Shrub)	Whitecow & Pensore	Pine Savannah, Tall Shrub, Conifer Forest	19.7	Very Gravelly Loam and Sandy Loam	Very Gravelly Loam and Sandy Loam	Approx. 25	Colluvium over slightly weathered limestone	10 to 40%
R	Rock	Rock Outcrop	Tall Shrub & Conifer Forest	30.4	Not Analyzed	Not Analyzed	0	Limestone Residuum.	<10 to 75+%
T	Placer Tailing	Dumps	Juniper and Pine Communities	< 0.01	Not Analyzed	Not Analyzed	Not Analyzed	Mine Tailing and Alluvium	0 to 15+%
--	No Detailed Survey	Pensore, Whitecow, & Lap	Conifer Forest & Juniper & Pine Savannah	2.1	Loam to Very Gravelly Loam	Often Gravelly Loam to Very Gravelly Loam	0 to 100+	Expected to be comparable to adjacent soil types.	0 to 40%

Source: Resource Management Associates 2006a; NRCS 2007.

¹ Colluvium – material transported by gravity then weathered to become soil; Alluvium – material transported by water then weathered to become soil; Residuum – material transported by gravity then weathered to become soil. ² Slopes determined from comparison to USGS topographic quadrangles encompassing the Study Area.

TABLE 3-10 Potential Soil Salvage within Study Area				
Unit	Map Unit Name	Average Depth (feet)	Estimated Disturbance (acres)	Potential Soil Salvage (cubic yards)
South Claims Area				
1	Deep Alluvium (Forested)	3.4	12.2	66,866
2	Moderately Deep Colluvium (Forested)	4	7.7	49,497
3	Shallow Colluvium (Grassy)	2.3	76.1	282,270
4	Shallow Colluvium (Forested)	2.4	34.5	133,661
5	Residuum/Very Shallow (Grassy)	1.3	350.1	734,360
6	Residuum/Very Shallow (Forest/Shrub)	1.3	196.2	411,413
R	Rock	none	284.0	--
--	No Soil Data (average depth used)	1.1	7.4	13,133
Subtotal			968.2	1,691,201
Dolomite Claims Area				
1	Deep Alluvium (Forested)	3.4	5.2	28,469
2	Moderately Deep Colluvium (Forested)	4	3.2	20,393
3	Shallow Colluvium (Grassy)	2.3	31.2	115,847
4	Shallow Colluvium (Forested)	2.4	2.6	9,912
5	Residuum/Very Shallow (Grassy)	1.3	103.3	216,592
6	Residuum/Very Shallow (Forest/Shrub)	1.3	63.0	132,216
R	Rock	0	115.7	--
T	Placer Mine Tailings	0	0.1	--
--	No Soil Data (average depth used)	1	20.5	33,073
Subtotal			344.7	556,502
TOTAL			1,312.9	2,247,703

Source: Resource Management Associates 2006a.

Erosion

Soil erosion occurs as a result of the alteration of soil structure, reduction of binding components such as roots, and the elimination of protective plant cover that result from mining activities. While the greatest potential for erosion occurs immediately following replacement of soil on the graded landscape, soil loss can occur from the time plant cover is first removed and soil is first disturbed. The amount of erosion (soil loss) is often directly related to the surface area of exposure.

Proposed environmental control measures (outlined in Chapter 2 – *Proposed Action*) include several practices that would help reduce erosion. Graymont proposes to limit the acreage of land clearing and soil salvage in advance of mining thereby reducing the amount of soil exposed to erosional forces. Graymont also proposes to conduct concurrent reclamation and promptly plant areas following soil preparation. This action would further limit the amount of soil exposure through reestablishment of perennial plant cover.

Proposed Best Management Practices include construction of sediment containment structures and silt fencing that further limit soil movement offsite that may result from disturbed areas. These practices are expected to maintain low levels of soil loss during all phases of mining and reclamation.

Timing of soil removal and placement is another key factor affecting erosion, where risk for erosion is reduced by limiting the period of exposure during salvage and reclamation operations. Prompt removal and stockpiling of soil following clearing of trees and brush reduces the time that soil is exposed to wind and precipitation during the initial phases of mining activity. Prompt establishment of a vegetative cover reduces the period between soil preparation and final seeding and helps limit the period of soil exposure. The reclamation plan and best management practices incorporate strategies for limiting time of exposure (see Chapter 2 – *Proposed Action*).

Actual amount of soil loss from wind and water erosion resulting from the Proposed Action cannot be predicted. Erosion is largely dependent on weather, intensity of rainfall events or wind speed equating to the greatest risk of erosion. Natural characteristics of soil that would be salvaged in the proposed mine expansion area are expected to limit the amount of soil loss, including coarse textures of soil to be disturbed. This characteristic would likely allow for moderate to rapid permeability, reducing the amount of run-off that occurs. In addition, the high coarse fragment content in mixed soil materials placed on the regraded landscape would likely further reduce the potential for sheet (via water) or wind erosion on reclaimed landscapes through natural surface armoring. Grooves created from tracking soil would further reduce run-off, thereby reducing water erosion and improving soil moisture.

Installation of sediment control structures and measures (e.g., run-on control / diversion ditches; run-off control ditches; sediment ponds; silt fences; cover crop on soil stockpiles) would arrest soil movement from the site. Graymont would also maintain these structures and systems and return soil and sediment trapped by these structures to soil stockpiles and/or reclaimed areas.

Physical and Chemical Properties

Mixing topsoil and subsoil during salvage operations would affect the chemical and physical properties of soil. Potential effects to chemical properties include reduced organic matter content (decreased fertility) relative to pre-mine conditions. Physical effects would include change in soil structure and an increase in coarse fragment content, especially in near-surface soil. Increase in coarse fragment content would decrease effective water holding capacity of some soil, but may decrease erosion potential, improve permeability and reduce potential for compaction.

Organic matter content is expected to be low in weakly developed soil that dominates soil types found in the proposed disturbance area. The ability of these low-nutrient soil types to support shrub and tree communities suggests that these impacts are not necessarily negative. However, reduced fertility may impair the ability of soil to support grass species. The proposed use of high coarse fragment materials in some reclamation types would further reduce the fertility and productivity of surface soil materials in favor of materials more suitable for shrub and tree establishment.

Physical properties would also be affected through mixing of horizons and compaction and changes in soil structure that occur during soil handling operations. Some decrease in permeability and water holding capacity may occur.

Coarse-textured soil types in the proposed disturbance area are not as susceptible to compaction. However, compaction can occur where soil handling and reclamation efforts require numerous equipment passes. Frequent passes combined with change in soil structure during handling can cause compaction in finer-textured soil such as that in the near-surface horizons of the grassy shallow colluvium and residuum soil units. Where it occurs, compaction may retard root growth or reduce infiltration and permeability.

Incorporation of coarse fragments and other coarse-textured materials into surface soil types during handling and replacement in the reclaimed landscape would help reduce these effects. Use of tracked equipment (e.g., dozers) rather than rubber-tired equipment would further reduce potential for compaction. These practices and the resultant conditions would likely minimize the amount of compaction that occurs.

Soil Biological Properties

The most notable effects to biological characteristics of soil are likely to occur during soil stockpiling. Thickness of stockpiled soil effectively reduces the amount of biological activity per unit of volume, where only the near-surface soil in the stockpile would likely maintain plant and microbial populations necessary to sustain biological processes. Long-term storage may further reduce activity as seeds lose viability and buried plants decay.

The Proposed Action includes direct-haul placement of soil where feasible, negating the need to stockpile all soil salvaged. Where stockpiling is required, contemporaneous reclamation limits the amount of time soil is stockpiled. These practices improve the likelihood of maintaining soil biological processes and preserving other natural chemical and physical soil characteristics. These practices

also support rapid plant establishment and growth, which encourage reestablishment of interrupted biological processes, including nutrient cycling, in reclaimed soil.

Soil Replacement Thicknesses

Based on findings of the baseline soil survey, adequate suitable soil material is available to meet or exceed the proposed soil cover replacement thickness ranging from 2 to 9 inches depending on the proposed revegetation plan. The balance suggests that the volume of material would be adequate to replace 12 and 13 inches of soil on areas disturbed in conjunction with the Dolomite Claims and South Claims areas, respectively. While replacement of these thicknesses in the reclaimed landscape may improve establishment and production of select plants, especially grasses, these thicknesses are not necessarily conducive to establishment of trees and shrubs. As previously noted, salvaged materials would be replaced in accordance with the reclamation plan described in the *Proposed Action* section of Chapter 2. Based on the current plan and volume requirements, available soil and growth media materials are adequate to support reclamation activities.

Alternative A – Modified Pit Backfill

Impacts on soil resources from implementation of Alternative A would be similar to those described for the Proposed Action. Some growth media would be used in conjunction with mixed reject rock and overburden used in the various modified pit backfill methods described in Chapter 2.

No Action

Under this alternative, existing mine operations would continue as currently approved and impacts to soil associated with proposed mine expansion would not occur. Graymont has

identified soil resources within the existing permitted disturbance area to provide an adequate volume of soil for reclamation. DEQ and BLM have addressed the issue by requiring bonding for 1 percent organic amendments in limestone rejects to produce the growth medium needed. Limestone would provide adequate reclamation material for shallow soil types proposed to replace substrate for the mountain mahogany vegetation type needed for big game winter range (DEQ 2001).

POTENTIAL MONITORING AND MITIGATION MEASURES

No monitoring or mitigation measures have been identified by BLM or DEQ for soil resources.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

Many of the potential effects to soil are reversible and retrievable, including soil loss from erosion. Soil washed downslope to containment structures can be retrieved and replaced into soil stockpiles or reclaimed areas, if necessary. However, some soil would be lost during soil handling operations and wind erosion. Potential impacts to chemical and physical soil characteristics would require extended periods of time to recover and are considered irreversible over the life of the Project.

RESIDUAL EFFECTS

Although some soil would be lost due to wind and water erosion as a result of soil handling and stockpiling, residual effects to soil resources are expected to be minimized after implementation of BMPs and any other control measures that may be required by BLM or DEQ.

VEGETATION

AFFECTED ENVIRONMENT

The Study Area for vegetation includes the proposed mine expansion in the South Claims and Dolomite Claims areas.

Vegetation Community Types

A variety of native plant-dominated vegetation community types occur within the Study Area. To simplify discussion and map presentation, vegetation community types were combined into seven physiognomic types as shown on **Figure 3-6** and listed in **Table 3-11**. A cross-reference between community types mapped by Scow (2005) and physiognomic types is also included in **Table 3-11**. Vegetation community types are similar to “habitat types” defined in Pfister *et al.* (1977) and Mueggler and Stewart (1980). Vegetation community type descriptions are based on dominant existing vegetation and depart somewhat from the predicted “climax habitat types.” Vegetation community types were used in the baseline vegetation inventories and as the basis for this analysis since they describe current conditions within the Study Area and are more relevant to reclamation standards.

Tall Shrub and Low Shrub

Two general shrub types occur within the Study Area and include community types dominated by tall shrubs, such as mountain mahogany, and low shrubs such as black sagebrush. Areas dominated by tall shrubs include the mountain mahogany/Rocky Mountain juniper community type. This is the most common community type within the Study Area, occupying over one-third of the acreage within the site. Mountain mahogany communities typically occur on limestone rock outcrops or shallow soils over rock outcrops. Slope angles vary widely from

relatively flat to very steep, and among all aspects depending upon ridge alignment. Common species include mountain mahogany, Rocky Mountain juniper, black sagebrush, bluebunch wheatgrass, and Indian ricegrass. Mean shrub density within types dominated by mountain mahogany is 3,658 plants per acre of

which 80 percent is mountain mahogany, 8 percent is black sagebrush, and 6 percent is shrubby cinquefoil. The remaining woody plant density is comprised of a variety of species, such as winterfat, skunkbush sumac, and slenderbush buckwheat.

Physiognomic Type	Community Type²	Acreage
Tall Shrub	Mountain mahogany/Rocky Mountain juniper	768
Juniper Savannah	Rocky Mountain juniper phases (bluebunch wheatgrass, black sagebrush, Idaho fescue)	517
Pine Savannah	Limber pine/Rocky Mountain juniper	421
Low Shrub	Black sagebrush/bluebunch wheatgrass	117
Conifer Forest	Douglas-fir/Rocky Mountain juniper	61
Grassland	Bluebunch wheatgrass/Sandberg bluegrass	29
Disturbance Types	Historical Placer/Dredge Tailing	22
	Grassland Reclamation	5
TOTAL³		1,940

¹ Portions of the current Study Area occur outside the boundaries mapped by Scow (2005). In these cases, EIS preparers contacted Mr. Scow to determine mapping conventions and methods used in the 2005 report in order to map areas outside the original 2005 report boundary in a consistent manner (Scow 2008.). The community type acreages reported in the Scow report will not match those presented in **Table 3-11**.

² Dominant community types within the Study Area. Phases of each dominant type and mapping complexes within each type have been combined for brevity. Specific community type phases and mapping complexes are presented in Scow 2005 and 2006.

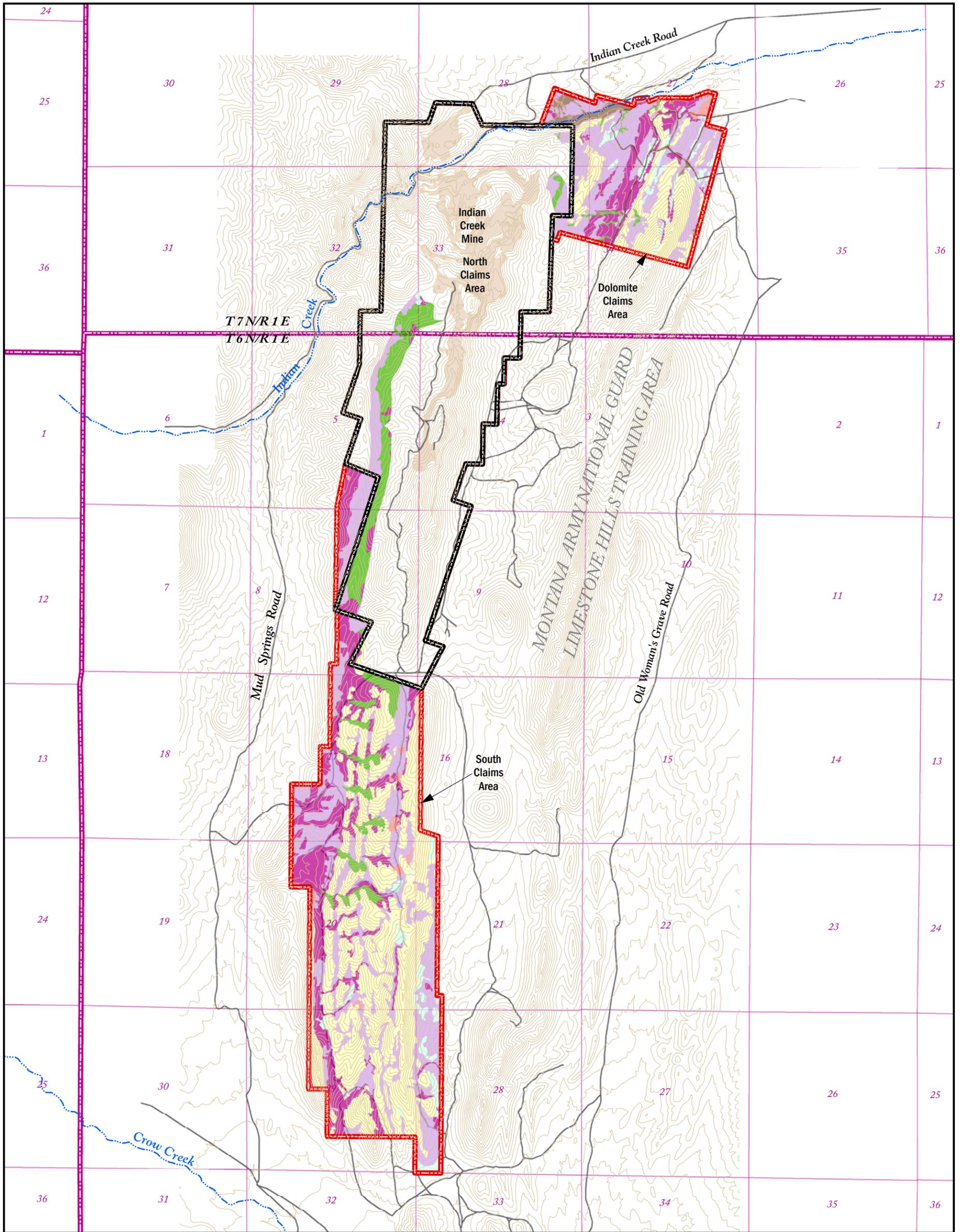
³ Total acreage based on vegetation types within the proposed mine expansion Study Area boundary. The majority of community type acreage was determined from Scow (2005). Areas within the Study Area that are outside the boundary sampled and mapped by Scow (2005) were mapped using the same types and mapping conventions.

Within the low shrub type, black sagebrush/bluebunch wheatgrass is a relatively common, although not abundant, community type within the Study Area. This type occurs primarily on lower to lower-midslopes of moderate to steep angle and southeasterly to easterly aspect. Predominant range sites are shallow to very shallow soil. Common species within the type include bluebunch wheatgrass, prairie junegrass, fringed sage, black sagebrush, and Rocky Mountain juniper. Big sagebrush occurs in limited areas within the Study Area and was not described as a community type (Scow 2005). Mean shrub density within the black sagebrush type is 8,350 plants per acre of which 80 percent is black sagebrush, 8 percent is mountain mahogany, and 8 percent is yucca. The remaining woody plant density is

comprised of a variety of species such as big sagebrush, rubber rabbitbrush, and skunkbush sumac.

Conifer Forest/Juniper Savannah/Pine Savannah

Three forest and savannah community types occur within the Study Area. Community types dominated by Rocky Mountain juniper and the limber pine/Rocky Mountain juniper represent savannah, open-canopy habitats, while the Douglas-fir/Rocky Mountain juniper type represents a conifer forest, closed-canopy habitat. Sites dominated by Rocky Mountain juniper cover a large portion of the Study Area. Three co-dominant understory species (bluebunch wheatgrass, black sagebrush, and Idaho fescue) define the Rocky Mountain type



Data Source: Westech, 2005/2006.

- | | | | |
|----------------|------------------------------------|------------------|-------------------|
| Streams | Existing Operating Permit Boundary | Tall Shrub | Conifer Forest |
| Roads | Proposed Operating Permit Boundary | Juniper Savannah | Grassland |
| Township/Range | Existing Mine Disturbance | Pine Savannah | Disturbance Types |
| Sections | | Low Shrub | |



0 Feet 4,000



U.S. Department of the Interior
Bureau of Land Management
Butte Field Office
Butte, Montana

VEGETATION RESOURCES
Indian Creek Mine Expansion - Environmental Impact Statement
Broadwater County, Montana

FIGURE

3-6

h:\13532 Graymont EIS\5000 GIS\Projects\EIS\Fig_3-8_Vegetation.mxd

juniper vegetation types within the Study Area. All three types typically occur on shallow to very shallow soil range sites. The bluebunch wheatgrass phase occupies warmer aspects; aspect varies within the Rocky Mountain juniper/black sagebrush type; while the Idaho fescue phase occupies cooler aspects. Common species within these community types include Rocky Mountain juniper, limber pine, black sagebrush, clubmoss, bluebunch wheatgrass, prairie junegrass, and needle-and-thread grass. Mean shrub density within types dominated by Rocky Mountain juniper is 4,096 plants per acre of which 86 percent is black sagebrush. Mean tree density within these types is 756 plants per acre of which 68 percent is Rocky Mountain juniper, 18 percent is Douglas-fir, and 13 percent is limber pine.

Limber pine/Rocky Mountain juniper is a common type within the Study Area and occurs on moderate to steep angle slopes of various aspects. Common species within the limber pine type include limber pine, Rocky Mountain juniper, black sagebrush, fringed sage, bluebunch wheatgrass, and prairie junegrass. Douglas-fir/Rocky Mountain juniper occurs in relatively limited areas on slopes of various angles, typically with a northerly or northwesterly aspect. Common species within the Douglas-fir type include Douglas-fir, Rocky Mountain juniper, Idaho fescue, and bluebunch wheatgrass. Both limber pine and Douglas-fir types occur on very shallow soil range sites. Mean shrub density within types dominated by limber pine and Douglas-fir is 2,075 plants per acre and 518 plants per acre, respectively. Black sagebrush is the most common shrub species within the limber pine type, accounting for 54 percent of shrub density, while wax currant is the most common shrub within the Douglas-fir type, accounting for 91 percent of shrub density. Mean tree density within these types is 961 plants per acre and 1,728 plants per acre, respectively. Rocky Mountain juniper is the most common tree within both types,

accounting for 80 percent of tree density within the limber pine type and 72 percent of tree density within the Douglas-fir type. Limber pine accounts for 18 percent of tree density within the limber pine type, while Douglas-fir accounts for 26 percent of tree density within the Douglas-fir type.

Grassland

The bluebunch wheatgrass/Sandberg bluegrass community type is the only grassland type occurring within the South Claims and Dolomite Claims areas. This limited type occurs on shallow-soil range sites and is dominated by bluebunch wheatgrass, prairie junegrass, and Sandberg bluegrass. Encroachment of shrubs and trees into this grassland type limits its extent. In the absence of fire, much of this community type would likely convert to forest/savannah dominated by Rocky Mountain juniper.

Historical Placer/Dredge Tailing

The historical placer/dredge tailing type includes the riparian or wooded portions of the Indian Creek drainage where historical mining has occurred in the northwestern corner of the Dolomite Claims Area. More introduced plant species are found on these disturbed sites. Vegetation occupies mined terraces and tailing dumps comprised of coarse fragments and rubble piles with limited soil development. Three vegetation subtypes were identified within the mapping unit including forested riparian vegetation dominated by narrowleaf cottonwood; shrub riparian vegetation dominated by Woods' rose and snowberry with a weedy herbaceous understory; and side draws and benches dominated by Rocky Mountain juniper or limber pine. Common species within these subtypes include the trees and shrubs previously mentioned, as well as introduced species such as dandelion, yellow sweetclover, spotted knapweed, and Kentucky bluegrass.

Grassland Reclamation

Portions of the historical placer/dredged tailing along Indian Creek have been recontoured and revegetated with herbaceous species. Dominant species include native thickspike wheatgrass and introduced species such as intermediate wheatgrass and crested wheatgrass. Introduced weedy forbs, such as dandelion, yellow sweetclover, and spotted knapweed, also occur within the reclaimed areas.

Range Condition

Range condition is a rating system developed by the Natural Resources Conservation Service (NRCS) for determining grazing capacity and vegetation status. Baseline studies have used range condition as an indicator of ecological condition. Range condition within the Study Area was calculated according to the NRCS (formerly Soil Conservation Service) Technical Guide for Foothills and Mountains within the 10 to 14-inch precipitation zone of southwestern Montana (SCS 1985).

Most portions of the South Claims Area are too steep and/or rocky for cattle grazing. Limited grazing occurs within the Dolomite Claims Area. Similar to the baseline studies, range condition is used in this EIS as an indicator of ecological condition rather than as an analysis of grazing management or options in the Study Area.

Various species compositions are allowed under the NRCS range condition rating system for different soil types. In general, the greater the amount of native perennial grasses within a soil mapping unit, the higher the range condition scores for the unit. Range condition is rated

from early seral to potential natural community and was determined for vegetation community types within the South Claims Area (Scow 2005). Range condition was not determined for the Dolomite Claims Area. Further, range condition rating systems have not been developed by the NRCS for disturbed types (e.g. tailing areas or reclamation) nor are range condition ratings relevant to non-grazing areas such as rock outcrops. Consequently, these areas were not evaluated. Range condition for the Study Area is presented in **Table 3-12**.

Most of the Study Area is in Late Seral condition, with only limited areas in Early to Mid Seral condition. The one area of Early Seral condition occurs within the Douglas-fir type. This type was ranked in Early Seral condition due to the dense canopy cover within this community type and the limited herbaceous understory (less than 8 percent herbaceous cover) (Scow 2005).

The Montana Natural Heritage Program (MTNHP) lists and tracks plant species of special concern within the state. Two species tracked by the MTNHP, lesser rushy milkvetch and sword townsendia, have been identified within the Study Area (Scow 2005, 2006). One population of lesser rushy milkvetch was located within the South Claims Area at a Rocky Mountain juniper/Idaho fescue sample site. Typical habitat for this species includes open grasslands of Idaho fescue, bluebunch wheatgrass, and rough fescue; and, savannah woodlands of Rocky Mountain juniper, Douglas-fir, and ponderosa pine.

TABLE 3-12			
Range Condition of Vegetation Types within Study Area			
Vegetation Type	Predominant Range Site	Average Range Condition	Acreage
Tall Shrub and Low Shrub			
Tall Shrub Mountain mahogany	Very Shallow (10-19 inch p. z.)	Late Seral	768
Low Shrub Black sagebrush	Very Shallow (10-19 inch p. z.)	Late Seral	117
Conifer Forest/Juniper Savannah/Pine Savannah			
Rocky Mountain juniper	Very Shallow (10-19 inch p. z.)	Late Seral	517
Limber pine	Grazeable Woodland Very Shallow (10-19 inch p. z.)	Late Seral	421
Douglas-fir	Grazeable Woodland Very Shallow (10-19 inch p. z.)	Early Seral	61
Grassland			
Bluebunch wheatgrass	Shallow (10-14 inch p. z.)	Mid Seral	29
TOTAL			1,913

Note: p.z. = precipitation zone.

Source: Scow 2005 for range condition classification. See **Table 3-11** for an explanation of mapping and acreage sources.

Special Status Plant Species

Lesser rushy milkvetch is a locally rare species that occurs within the Study Area and surrounding local region. Lesser rushy milkvetch is listed “G5S2” by the MTNHP indicating that it is globally secure, but within Montana it is considered at risk due to limited or declining population, range, or habitat (MTNHP 2008). The species is also listed as sensitive by BLM. BLM Sensitive species are known to occur on BLM-administered land for which BLM has the capability to affect the conservation status of the species through management, or known to occur on land affected by BLM-authorized actions.

Three populations of sword townsendia were located on the South Claims Area, while 23 populations were located within the Dolomite Claims Area. All populations occurred on limestone gravels within mountain mahogany

communities (Scow 2005, 2006). Sword townsendia is listed “S3” by the MTNHP, indicating that it is potentially at risk because of limited or declining population, range, or habitat both globally and within the state (MTNHP 2008). Sword townsendia has a limited distribution in limestone areas of southwest and south-central Montana and the population in the Limestone Hills would not be negatively impacted as other plants occur outside the proposed mine expansion areas (MTNHP 2008). The species has no federal listing or rank.

Invasive, Non-native Species (Noxious Weeds)

Montana’s county noxious weed list determines noxious weeds for the state pursuant to the County Weed Control Act 7-22-2101(5), MCA. Several noxious weed species were located within the Study Area during vegetation surveys including: spotted knapweed, leafy spurge,

Dalmatian toadflax, butter-and-eggs or yellow toadflax, Canada thistle, musk thistle, whitetop, and houndstongue (Scow 2005, 2006).

Noxious weeds and invasive, non-native species occur primarily around roads and other disturbances. The majority of the noxious weeds occurring within the Study Area are spotted knapweed and thistle species. Dense patches of spotted knapweed occur in the historical dredge and tailing area along Indian Creek and in shrub and conifer communities near roads. Leafy spurge was recorded at one site in the southwestern corner of the Dolomite Claims Area, while musk thistle was noted at one site within a mountain mahogany stand in the South Claims Area. The remaining weed species typically occur as small, scattered populations on disturbances throughout the Study Area. Field investigators speculated that these small, scattered populations were likely established by animal-transport (Scow 2005).

Wetlands

A wetland and non-wetland jurisdictional Waters of the U.S. survey of the LHTA, including the Study Area for the Proposed Action, was completed in 1998 (Tetra Tech EMI 1998). Areas supporting the three U.S. Army Corps of Engineers wetlands criteria (hydrophytic vegetation, hydric soil, and wetland hydrology) were not recorded within the Study Area, although limited wetlands do exist on the LHTA south of the Study Area. Limited hydrophytic vegetation occurs along the Indian Creek dredge and tailing reclamation area; however, hydric soil is not present (Scow 2007a). Consequently, no jurisdictional wetlands were recorded within the Dolomite Claims Area. A subsequent survey of hydrophytic vegetation did not reveal any wetlands in the South Claims Area (Scow 2005).

Several incised, ephemeral drainages that were considered jurisdictional non-wetland Waters of the U.S. were recorded within the Study Area during the 1998 survey. Wetland delineations are valid for 5 years following submittal (U.S. Army Corps of Engineers Regulatory Guidance Letter 94-01). Consequently, the jurisdictional status of these non-wetland drainages may fall under a recent U.S. Supreme Court ruling. In 2006, the U.S. Supreme Court ruled in “*Rapanos v. U.S.*”, that ephemeral drainages are required to exhibit a “significant nexus” (physical, chemical, biological, or hydrological connection) to traditional navigable waters in order to be considered jurisdictional. The U.S. Army Corps of Engineers issued guidance on determining jurisdictional waters of the U.S. in its handbook *U.S. Army Corps of Engineers Jurisdictional Determination Form Instructional Handbook* (U.S. Army Corps of Engineers 2007). The small ephemeral drainages that could be filled as a part of the Proposed Action occur in two areas: 1) unnamed tributaries to Indian Creek, a seasonal tributary to the Missouri River, occur in Section 34 of the Dolomite Claims Area; and 2) unnamed tributaries to Crow Creek, a perennial tributary to the Missouri River, occur in Section 17 of the South Claims Area. Jurisdictional status of these ephemeral drainages would be determined during the U.S. Army Corps of Engineers 404 permit process when Graymont files a pre-construction notification with the Corps of Engineers.

DIRECT AND INDIRECT IMPACTS

Proposed Action

The Proposed Action would result in direct loss of native species-dominated vegetation communities as shown in **Table 3-13**. Acreages include those areas that would be disturbed by mine-related activities within the South Claims and Dolomite Claims areas.

Physiognomic Type	Community Type	Acreage
Tall Shrub	Mountain mahogany/Rocky Mountain juniper	451
Juniper Savannah	Rocky Mountain juniper phases (bluebunch wheatgrass, black sagebrush, Idaho fescue)	298
Pine Savannah	Limber pine/Rocky Mountain juniper	295
Low Shrub	Black sagebrush/bluebunch wheatgrass	159
Conifer Forest	Douglas-fir/Rocky Mountain juniper	96
Grassland	Bluebunch wheatgrass/Sandberg bluegrass	12
Disturbance Types	Historical Placer/Dredge Tailing	0.1
	Grassland Reclamation	2
TOTAL		1,313

¹ Dominant community types within the Study Area. Phases of each dominant type and mapping complexes within each type have been combined for brevity. Specific community type phases and mapping complexes are presented in Scow (2005, 2006).

Reclamation procedures, including growth media replacement depths, have been developed by Graymont, BLM, and DEQ and are designed to replace the dominant species removed by mining with the same or similar species. Native grass species are used in reclamation seed mixes, while shrub and tree seedlings grown from seed collected from native plants in the Study Area are planted in the mountain mahogany/juniper and Douglas-fir reclamation types. Recently, Graymont has undertaken experimental seeding of shrubs. During spring 2007, the following species were seeded: black sagebrush (0.5 lb. PLS/acre), yucca (2 lbs PLS/acre), skunkbush sumac (4 lbs PLS/acre), and rubber rabbitbrush (1 lb. PLS/acre). Two additional species, mountain mahogany and golden currant, were included in the seed mix in 2008.

A listing of grass, forb, shrub, and tree species proposed for use in reclamation is contained in the *Reclamation Plan* section of Chapter 2. Reclamation monitoring of previously disturbed areas at the Indian Creek Mine has shown that native perennial grasses have attained canopy cover levels similar to pre-mine conditions in a period ranging from 10 to 15 years (Scow 2007b).

Shrub and tree re-establishment is typically one of the most difficult aspects of reclamation in the arid and semi-arid west, and lengthy time horizons (e.g., 10 to 20 years) are frequently required before woody plant density and canopy cover are similar to adjacent or baseline conditions (Roundy *et al.* 1993).

Even though Graymont's proposed reclamation methods include planting up to 400 shrubs and/or trees per acre, woody plant density on reclaimed sites would not be similar to baseline conditions for at least 50 years. The generally shallow slopes and deeper soil proposed would tend to favor other plant species in competition with mountain mahogany. Shrubs and trees have been established on about 60 acres of reclamation, but reproduction from these plants has probably not occurred (Scow 2008). The slow establishment of shrubs (especially mountain mahogany) on reclaimed areas results in long-term impacts to wildlife through slow re-establishment of browse species (see *Terrestrial Wildlife* section in this chapter). No indirect impacts to vegetation communities are anticipated.

Overall range condition within the reclaimed areas would be initially very Early Seral as native species become established. Once native perennial grasses have established to the levels measured in 2003 and 2007, range condition would likely be considered Mid Seral to Late Seral, similar to baseline conditions (Scow 2007b). No indirect impacts to range condition are anticipated except as noted under *Invasive, Non-native Species (Noxious Weeds)*.

Special Status Plant Species

Nineteen of 23 sword townsendia plant populations in the Dolomite Claims Area would potentially be removed by mine activities. Removal of these populations due to proposed mining activity would not likely lead to the demise of the species or elimination of the species from the state, as other plant populations occur outside the Dolomite Claims Area in the Limestone Hills. Forty-three occurrences of the species are documented in Montana (MTNHP 2008). Most populations occur in southwestern Montana in Beaverhead County or in the Beartooth Mountains of Carbon County. Populations within and near the Study Area represent the northernmost known extent of this species in Montana.

A single population of rushy milkvetch was identified in the Study Area and could be affected by proposed mine expansion. The MTNHP considers the plant globally secure, but at risk within Montana.

Invasive, Non-native Species (Noxious Weeds)

Noxious weeds are relatively limited in the Study Area, particularly within the South Claims Area (Scow 2005, 2006). Noxious weeds are more common in areas surrounding the Study Area, but have invaded portions of the current

mine operations and are controlled on an annual basis. Control of noxious weeds in the proposed mine expansion areas would continue in accordance with Graymont's Weed Management Plan (Graymont 2007b). After reclamation has been completed and active weed control and management has ended by Graymont, the Project area would be vulnerable to noxious weed invasion from uncontrolled sources located in adjacent areas.

Noxious weed control using chemicals not only kills weeds but can also affect native plants surrounding the weeds. This is an unavoidable impact of a noxious weed control program. As noxious weeds increase over the long-term, more native plant species would be lost. Reclaimed plant communities would be less diverse than pre-mine native plant communities. This would be an unavoidable impact of disturbance and the presence of aggressive introduced species in the area.

Wetlands

Relatively small, ephemeral non-wetland Waters of the U.S. may be disturbed by the Proposed Action. The current jurisdictional status of these drainages is unknown following the 2006 U.S. Supreme Court decision "*Rapanos v. U.S.*" A Section 404 permit may be required to allow fill of these drainages if they are determined to be jurisdictional by subsequent legal proceedings.

Alternative A – Modified Pit Backfill

Impacts on vegetation resources from implementation of Alternative A would be similar to those described for the Proposed Action. Modified pit backfill methods would be used to enhance establishment of mountain mahogany and other browse species on steep slopes to support wildlife.

No Action

Under the No Action Alternative, the proposed mine expansion would not be authorized. Predicted impacts to vegetation in the mine expansion area would not occur. Existing permitted mining operations would continue for approximately 15 years disturbing a total of 757 acres in the North Claims Area. Establishment and reproduction of mountain mahogany would be limited because the shallow slopes and soil thickness in the approved reclamation plan tend to favor other plant species in competition with mountain mahogany.

POTENTIAL MONITORING AND MITIGATION MEASURES

The population of lesser rushy milkvetch would be monitored every 5 years to ensure that weed control activities or mine construction activities have not disturbed the population.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

Reclamation activities are ultimately expected to result in replacement of vegetation approximately 50 years after the completion of reclamation which roughly approximates the pre-existing vegetative communities, thus no irreversible commitment of vegetation structural habitat would occur. As structural characteristics of reclaimed areas develop (e.g. bunchgrasses develop mature swards, shrubs develop mature canopies, trees develop longer branches and snags), grass and shrub productivity would eventually lead to a plant community that could provide winter browse for mule deer.

The diversity of native plant species would be reduced relative to the existing undisturbed communities. This impact would be long-term and would be considered irreversible, since reclamation would not reestablish vegetation communities similar in species diversity to those that occurred pre-mining.

Some sword townsendia populations within the Dolomite Claims Area would not be irreversibly lost, since they have been observed colonizing disturbed areas, especially abandoned roads where limestone gravel is present (Westech 1993).

RESIDUAL EFFECTS

Residual effects on vegetation resources would include potential for continued noxious weed invasion from adjacent areas outside the mine site and spread within the Study Area. Loss of diverse native plant communities in reclaimed areas would be an adverse effect. The capacity of shrub communities, excepting rubber rabbitbrush, to produce forage would be reduced for a period of up to 50 years or more after reclamation.

TERRESTRIAL WILDLIFE

AFFECTED ENVIRONMENT

The Study Area for wildlife lies between Old Woman's Grave Road on the east, Mud Springs Road on the west, Indian Creek to the north, and Crow Creek on the south, and encompasses the Indian Creek Mine as depicted on **Figure 3-1**.

The Study Area is characterized by steep terrain consisting of dry limestone ridges and valleys with dominant plants, including bluebunch wheatgrass and other bunch grasses, black sagebrush, Rocky Mountain juniper, rubber rabbitbrush, curl-leaf mountain mahogany, limber pine, and Douglas-fir.

Current land uses include military training, limestone mining, livestock grazing, and wildlife habitat. The most substantial changes to wildlife habitat in recent years are from mining and wildfire caused by military exercises.

Wildlife Habitats

Wildlife habitats are defined by multiple vegetation community types. Acreages for vegetation community types may differ from wildlife habitats.

Woodland Habitats

Woodland habitats occur on dry rocky slopes and are dominated by limber pine, Rocky Mountain juniper, and Douglas-fir. Woodland habitats comprise a total of about 1,000 acres in the South Claims and Dolomite Claims areas.

Woodlands occupy a transition area between the drier grassland and shrub habitats and the cooler, moister conifer habitats at higher elevations and are important big game winter range and year-round habitat for other species. This habitat can be especially important for wolves and mountain lions, when elk or deer, their primary prey, are present.

Rocky Mountain juniper occurs with Douglas-fir at higher elevations extending into lower riparian areas along Indian Creek, forming nearly pure stands on some sites. Juniper berries are an important food for small mammals and birds, especially waxwings and provide important nesting habitat for a variety of birds including chipping sparrow, robins, song sparrows, and sharp-shinned hawks (Scher 2002).

Limber pine communities grow on some of the driest sites capable of supporting trees, generally on shallow, rocky soil derived from limestone. On the driest sites, bluebunch wheatgrass is a dominant understory species, and Idaho fescue becomes dominant with increasing moisture (Pfister *et al.* 1977). The

foliage of limber pine is largely unpalatable as a browse species for wildlife; however, its large high-energy seeds are an important food for birds and small mammals. Clark's nutcracker cache seeds from limber pine, which are often found and eaten by bears.

Woodlands provide habitat for a variety of birds, small mammals, and big game animals including elk, mule deer, bighorn sheep, white-tailed deer, coyote, bobcat, mountain lion, black bear, yellow-pine chipmunk, red squirrel, striped skunk, sharp-shinned hawk, Cooper's hawk, blue grouse, hairy and downy woodpeckers, mourning dove, finches, jays, Clark's nutcracker, nuthatches, mountain bluebird, chickadees, northern flicker, and Townsend's solitaire.

Curl-leaf Mountain Mahogany

Curl-leaf mountain mahogany habitats occupy 768 acres on dry limestone ridges within the South Claims and Dolomite Claims areas. Mountain mahogany is an evergreen shrub that is an important winter range browse species for mule deer. It is one of the few species that meet the protein requirements for wintering deer and is heavily favored by bighorn sheep in summer. Utilization of mountain mahogany by mule deer in the Study Area exceeds 50 percent (Graymont 2007a). Relatively small populations of Wyoming big sagebrush, rubber and green rabbitbrush, and juniper are present in mountain mahogany habitats. Bluebunch wheatgrass dominates the undergrowth and needle-and-thread is present in varying amounts.

Sagebrush Habitats

Sagebrush habitats occupy 117 acres in the proposed Project area and provide important winter range for antelope, elk, mule deer, and bighorn sheep. Brewer's sparrow, a sensitive species, nests in sagebrush habitats on portions of the Study Area. Other species include coyote, badger, red fox, prairie falcon, western rattlesnake, and ground squirrels.

Sagebrush habitats in the Study Area are dominated by black sagebrush, rubber rabbitbrush, skunkbush sumac, and a diversity of understory species including bluebunch wheatgrass, prairie junegrass, and fringed sage. Black sagebrush and low sagebrush form the driest shrubland types occurring in western Montana (Mueggler and Stewart 1980), usually growing on south and west exposures, on dry, rocky soil. Low sagebrush communities usually do not form extensive landscape-level stands, but are usually part of larger black sagebrush mosaics. Grasses, such as bluebunch wheatgrass, prairie junegrass, and Sandberg bluegrass dominate the undergrowth. Non-native annual grasses, such as cheatgrass and Japanese brome, are also present. Black sagebrush can be an important browse species for mule deer and pronghorn antelope; however, browse utilization studies conducted by Geomatrix (2008) in the vicinity of the proposed mine expansion found little use of this species by ungulates.

Grassland Habitats

Grassland habitats occupy about 29 acres of the South Claims and Dolomite Claims areas on the driest sites. These communities are common on the lower slopes and valley floors. Some of the common grass species are needle-and-thread, western wheatgrass, prairie junegrass, Sandberg bluegrass, bluebunch wheatgrass, and Idaho fescue. Grasslands provide habitat for

meadowlarks, prairie falcons, horned larks, mice, voles, and other small mammals. Elk also rely on grasslands for forage throughout the year.

Riparian and Wetland Habitats

Wetland and riparian habitats are present along Indian Creek. These habitats were subject to placer mining in the late 1800s and many of the native species that occurred in these habitats have not re-established. Wetland/riparian areas comprise about 1 percent of the Study Area and provide important watering sites for a variety of birds and wildlife. They are the most productive areas within the watershed and can be critical habitat during specific stages of the lifecycle of wildlife species that rely on them. These areas are also important travel corridors.

Riparian vegetation includes cottonwoods, willows, grasses, and sedges. Wetlands commonly have a diversity of herbaceous vegetation such as sedges, rushes, grasses, and moss. Wildlife species that use wetland and riparian habitats include: white-tailed deer, mink, coyotes, and a variety of small mammals such as skunks, shrews, mice, and voles. Bats are attracted to water in riparian areas and at seeps and springs for feeding and drinking. Wetland/riparian habitats support the highest densities and diversity of breeding birds such as flycatchers, warblers, and other migratory birds. These sites have been invaded by many introduced species such as spotted knapweed, dandelion, yellow sweetclover, and Kentucky bluegrass.

Wildlife Corridors

Wildlife travel corridors are a vital component of habitat for a variety of species. Corridors are travel routes used by wildlife to allow them to disperse to new core areas and allow for seasonal movements between summer and

winter ranges for species such as elk and deer. Corridors are also important for movement of young animals dispersing from their place of birth to establish new territories and home ranges and may also be used for daily movements from loafing to foraging areas.

Specific movement corridors have not been identified in the Study Area, but they likely are present along Indian Creek and to areas that link the higher elevation Elkhorn Mountains with ridges and valleys within and to the east of the Study Area. Mule deer that winter within and east of the mine area likely move seasonally over a broad east-west corridor over the broken topography between the Elkhorn Mountains and Old Woman's Grave Road.

Big Game Animals

Mule Deer

In seasonally harsh environments, like western and central Montana, mule deer tend to migrate between seasonal ranges (Mackie *et al.* 1998). Winter range is associated with areas accumulating minimal snow and tends to occur at low elevation on south and west-facing slopes and wind-blown ridges. Winter range is particularly important for maintaining healthy mule deer populations because the scarcity of high quality forage, cold temperatures, and increased energy demand associated with winter tends to stress populations.

The area west of Old Woman's Grave Road is the most important mule deer winter range associated with the Elkhorn Mountains. In most years, about half of all mule deer counted on winter ranges around the Elkhorn Mountains are observed in the Limestone Hills. When local mule deer numbers are at their peak, over 1,000 mule deer may be present in the Limestone Hills (MTARNG/BLM 2007). Most of this use is associated with limestone hogback

ridges and accompanying mountain mahogany/shrub habitats west of Old Woman's Grave Road (Westech 1999). Approximately 2,446 acres of mountain mahogany habitat are located in the Limestone Hills of which approximately 768 acres occur within the South Claims and Dolomite Claims areas.

Mule deer generally browse year-round favoring species such as mountain mahogany, sagebrush, and deciduous shrubs. Forbs and herbaceous plants become an important part of their diet in late spring and summer, while shrubs are critical in fall and winter.

Elk

Elk are generalists exhibiting a wide habitat tolerance and are adapted to habitat transitional areas needing forested habitat for thermal and hiding cover and grasslands and shrublands for favored foraging habitat. Elk migrate seasonally between winter and summer ranges with snow accumulation being the factor influencing migration. Wintering grounds are commonly located within foothill areas with south-southwest exposures and windblown ridges. Grassland and shrubland habitats are typically used as winter range.

The elk population in the Elkhorn Management Unit has been relatively stable since 1992 and typically fluctuates around 2,000 animals (Montana Fish, Wildlife & Parks 2004). Elk are primarily in the Study Area during winter, but a few individuals may be present in all seasons (MTARNG/BLM 2007). Although large concentrations of elk winter adjacent to the Limestone Hills, few are present in the South Claims and Dolomite Claims portions of the Study Area because grassland-dominated communities and forage are limited. In most winters, 20 to 50 elk are present in the Limestone Hills (Westech 1999).

Bighorn Sheep

Bighorn sheep typically use areas with cliffs, mountain slopes, or rolling foothills. Winter habitat generally occurs on open slopes or ridges where grass is available. Grass and shrubs are common food sources during winter, while grass, sedges, and forbs are heavily used in spring and summer. Winter range is the limiting factor for management of healthy bighorn populations.

Bighorn sheep were transplanted into the Crow Creek drainage during the winter of 1996, 1997, and 2000 and had successfully established ranges in the Crow Creek and Indian Creek drainages (MTARNG/BLM 2007). During winter 2007-2008 bighorn sheep in the area contracted pneumonia resulting in a loss of approximately 95 percent of the herd. A FWP aerial survey in March 2008 revealed 19 bighorn sheep remaining from a population estimated at 220 animals (Carlson 2008).

Some sheep are present in the Study Area year-round. Wintering bighorn sheep may occur anywhere in the area, but are most often associated with limestone ridges and their associated mountain mahogany/shrub habitats (MTARNG/BLM 2007).

An October 1997 Memorandum of Understanding (MOU) between MFWP, BLM, and Continental Lime (now Graymont) addressed specific concerns expressed by the company regarding effects of reintroduction of bighorn sheep in the Indian Creek drainage may have on reclamation, liability issues, and future mine expansions. MFWP agreed to respond to reclamation damage complaints in accordance with Guidelines for Big Game Damage Procedures as defined in 87-1-225, MCA. BLM and MFWP further agreed not to use the

presence of bighorn sheep to oppose future expansion of mining activities (MFWP/BLM/Continental Lime 1997).

White-Tailed Deer

Few white-tailed deer are present in the Study Area year-round. White-tailed deer occur throughout Montana and are adapted to a variety of habitats (Foresman 2001). Riparian cover, which is limited in the Study Area, appears to influence the abundance of white-tailed deer (Mackie *et al.* 1998). White-tailed deer prefer grasses and forbs during spring and early summer and then switch to new-growth leaves and twigs of small trees and shrubs.

Pronghorn

A few pronghorn are present in the Study Area from spring to fall (Westech 1999). Pronghorn are found within open sagebrush or grassland areas, which are limited within the Study Area.

Sagebrush grasslands located outside of the Study Area are the preferred winter habitat as browse is a critical food source during this period.

Black Bear

Black bears are periodically present in the Study Area, but habitat is limited (MTARNG/BLM 2007). Black bears use a variety of habitats depending on seasonal variation in diet and availability of food. Black bears are omnivorous; however, a major portion of their diet consists of berries, fruits, grasses, sedges, and inner bark. The entire Study Area is black bear habitat; however, they tend to prefer dense forested areas, riparian areas, open slopes, and mountain meadows (Foresman 2001).

Mountain Lion

Mountain lions are present in the Study Area in small numbers usually when their favored prey species (deer, elk, and bighorn sheep) are most abundant on winter ranges. They use a variety of vegetation types, depending on prey availability, cover and preference for areas with minimal human disturbance. Mountain lions typically prefer mountainous and foothill areas.

Birds

The Study Area provides habitat for a variety of raptors (eagles, hawks, falcons, and owls). Species documented in the Study Area include the red-tailed hawk, American kestrel, great horned owl, Cooper's hawk, prairie falcon, and golden eagle (Butts 1993).

Native blue grouse and the non-native gray partridge have been observed but are uncommon in the Study Area (MTARNG/BLM

2007). Most other avian species recorded in the Study Area are common (including the turkey vulture) and typical of grassland, dry shrub, and dry forest habitats (Butts 1993).

Small Mammals

Small mammals present in the Study Area include deer mice, voles, ground and pine squirrels, chipmunks, bats, yellow-bellied marmot, white-tailed jackrabbit, cottontail rabbit, bushy-tailed wood rat, and porcupine.

Reptiles and Amphibians

No amphibians have been recorded in the Study Area, but habitat may be present for the spotted frog and western toad. Reptiles reported in the Study Area include bull snake, common garter snake, western rattlesnake, and western yellow-bellied racer.

TABLE 3-14	
Special Status Wildlife Species with Potential to Occur in the Study Area	
Common/Scientific Name and State Rank	Habitat/Occurrence in the Proposed Project Area
Threatened and Endangered Species	
Gray wolf (<i>Canis lupus</i>) Nonessential Experimental Population (S3)	Wolves have not been documented in the Study Area. As wolves continue to expand in Montana, the Study Area with its high concentration of wintering big game animals may be attractive as a foraging or denning area. The gray wolf was determined to be recovered and de-listed under the Endangered Species Act (ESA). However, U.S. Federal Court issued a preliminary injunction on July 18, 2008 that immediately provided ESA protection to gray wolves in the Northern Rocky Mountains, including Montana. In May 2009, the Secretary of the Interior removed the gray wolf from protection under the ESA.
Sensitive Mammal Species	
Wolverine (<i>Gulo gulo</i>) (S3)	Habitat in the Study Area is marginal for wolverines and none have been recorded; however, wolverines may be transient in the Study Area, attracted to winter-killed big game.
Fringed myotis (<i>Myotis thysanodes</i>) (S3)	Variety of habitats from low to mid-elevation grass, woodland, and desert regions, up to and including spruce-fir forests. The fringed myotis has not been documented in the Study Area.
Long-eared myotis (<i>Myotis evotis</i>) (S3)	Associated with forested stands containing old-growth characteristics, but found in habitats characterized by shrubland and juniper. Long-eared myotis have been documented in the Study Area at Mud Springs (Butts 2005).
Preble's shrew (<i>Sorex preblei</i>) (S3)	Sagebrush, grassland, and moist habitats. Preble's shrew has not been documented in the Study Area or surrounding counties.

TABLE 3-14 Special Status Wildlife Species with Potential to Occur in the Study Area	
Common/Scientific Name and State Rank	Habitat/Occurrence in the Proposed Project Area
Townsend's big-eared bat (<i>Plecotus townsendii</i>) (S2)	Roosts and hibernates in caves and mines; forages over open areas with wetlands and riparian communities. Species has been documented in the Study Area, but lack of surface water sources may limit its widespread use by bats (Butts 1993). No hibernacula or roosts that support large numbers of bats are known to occur within the Study Area (Butts 2005).
Sensitive Bird Species	
Black-backed woodpecker (<i>Picoides arcticus</i>) (S2)	Foraging and nesting habitats in conifer forests that have insect infestations associated with fire and disease. Black-backed woodpeckers are not known to be present in the Study Area and habitat is marginal.
Brewer's sparrow (<i>Spizella breweri</i>) (S2)	Shortgrass prairie with scattered or abundant sagebrush, or other arid shrub habitats. These sparrows have not been documented in the Study Area (Butts 1993).
Burrowing owl (<i>Athene cucularia</i>) (S2)	Prairie grasslands and shrublands often in prairie dog or ground squirrel burrows. This species has not been documented in the Study Area and habitat may not be suitable because of the steep, rocky terrain.
Ferruginous hawk (<i>Buteo regalis</i>) (S3)	Grassland and shrublands in rolling foothills and middle elevation plateaus. They have not been observed in the Study Area.
Golden eagle (<i>Aquila chrysaetos</i>)	Prefers open habitats and nests on cliffs or large trees. Golden eagles have been observed in the Study Area (Butts 1993).
Loggerhead shrike (<i>Lanius ludovicianus</i>) (S2)	Open shrub and grassland habitats. This species has not been observed in the Study Area.
Mountain plover (<i>Charadrius montanus</i>) (S2)	Arid shortgrass prairie, often in association with prairie dog colonies. Mountain plovers have not been documented in the Study Area and habitat is not suitable.
Northern goshawk (<i>Accipiter gentilis</i>) (S3)	Nests in mature to old-growth conifer and aspen forest. Goshawks have not been observed in the Study Area and habitat is not suitable for nesting. Goshawks occupying higher conifer habitats in the Elkhorn Mountains might be transient foragers in the Study Area.
Prairie falcon (<i>Falco mexicanus</i>)	Nest almost exclusively on cliffs and hunt in grassland and prairie habitats. Prairie falcons breed throughout Montana, which is near the northern edge of their winter range. They have been observed near the Study Area, but nesting has not been documented (Butts 1993).
Peregrine falcon (<i>Falco peregrinus anatum</i>) (S2)	Nests on ledges and cliffs, often near water with prevalent prey base (birds). The peregrine falcon has not been documented in the Study Area.
Sage thrasher (<i>Oreoscoptes montanus</i>) (S3)	Limited almost entirely to semi-dry regions and communities containing extensive sagebrush. Sage thrashers have not been documented in the Study Area.
Swainson's hawk (<i>Buteo swainsoni</i>) (S3)	Nests in trees, often in riparian areas. These hawks have not been observed in the Study Area.
Sensitive Reptiles and Amphibians	
Boreal/Western toad (<i>Bufo boreas</i>) (S2)	Uses a variety of habitats including low elevation beaver ponds, reservoirs, streams, marshes, lake shores, potholes, wet meadows, and marshes, to high elevation ponds, fens, and tarns at or near treeline. While still widespread in western Montana, surveys suggest that populations may be declining (Maxell et al. 2003). Boreal toads have not been documented in the Study Area.

S2 = At risk because of limited and/or declining numbers, range, and/or habitat, making it vulnerable to global extinction or extirpation within the state.

S3 = Potentially at risk because of limited and/or declining numbers, range, and/or habitat even though it may be abundant in some areas.

Special Status Wildlife Species

BLM special-status species are species proposed for listing, officially listed as threatened or endangered, or are candidates for listing as threatened or endangered under the provisions

of the Endangered Species Act (ESA); those listed by the state in a category such as threatened or endangered implying potential endangerment or extinction; and those designated by each State Director as sensitive. BLM sensitive species typically are species that

occur on BLM-administered land for which BLM has the capability to affect the conservation status of the species through management. BLM policy is to provide sensitive species with the same level of protection as is provided for candidate species in BLM Manual 6840.06 C; that is, to ensure that actions authorized, funded, or carried out do not contribute to the need for the species to become listed.

The Montana Natural Heritage Program ranks species of conservation concern in Montana. The ranks are determined jointly by biologists from the Program and Montana Fish, Wildlife and Parks. Sensitive species with potential to occur in the vicinity of the Study Area or have suitable habitat are shown in **Table 3-14**.

DIRECT AND INDIRECT IMPACTS

Proposed Action

The Proposed Action would result in direct loss of woodlands, mountain mahogany, sagebrush, and grassland habitats (**Table 3-15**). Loss of these habitats would reduce availability of forage, security, and breeding cover for wildlife inhabiting the area. Individuals of 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 as a result of increased interaction with displaced animals.

With mine development, there would be a loss of habitat until reclamation is successful. The capacity of the Study Area to support wildlife would be reduced until suitable habitat (including mountain mahogany, other shrubs, and trees) has re-established. Initially, 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 land and areas burned by wildfire (Vicklund et al. 2004; Schuman and Booth 1998). Because shrubs are important forage for mule deer, bighorn sheep, and other wildlife species, low rates or slow re-establishment of these plant species on reclaimed sites would reduce the capacity of the Study Area to support species with affinities for shrub habitat (e.g., mule deer, Brewer's sparrow, and bighorn sheep).

Habitat	Acres Affected by Proposed Action
Woodlands	752
Mountain Mahogany	451
Sagebrush	96
Grassland	14
Riparian/wetland	0.1
TOTAL¹	1,313

Reclamation under the Proposed Action would be similar to the No Action alternative (see *Reclamation Plan* section of *Existing Operations* in Chapter 2). The reclamation plan for the proposed Project specifies that revegetation of

disturbed areas would include planting seedlings of various species of shrubs and trees at densities ranging from 50 to 400 plants per acre. Approximately 680 acres of habitat would be revegetated with mountain mahogany

seedlings at a density of 200 plants per acre, as replacement for mountain mahogany habitat disturbed by mining (Graymont 2007a). In addition to grasses and forbs listed in the *Reclamation Plan* section of Chapter 2, other species of tree and shrub seedlings used in revegetation of disturbed areas would include juniper (100 plants/acre), Douglas-fir (130 plants/acre), yucca (75 plants/acre), and limber pine (25 plants/acre).

Experimental seeding of shrubs was conducted on reclaimed areas during spring 2007. The following species were seeded: black sagebrush (0.5 lb. PLS/acre), yucca (2 lbs PLS/acre), skunkbush sumac (4 lbs PLS/acre), and rubber rabbitbrush (1 lb. PLS/acre). Two additional species, mountain mahogany and golden currant, were included in the seed mix in 2008.

Reclamation monitoring studies conducted at the Indian Creek Mine show that shrub densities on reclaimed areas ranged from 90 plants per acre in 2002 to 405 plants per acre in 2007 with the most abundant species in 2007 being rubber rabbitbrush (314 plants/acre), mountain mahogany (71 plants/acre), and wax currant (20 plants/acre).

Shrub densities, canopy cover values, and biomass production are lower for reclaimed sites than for shrub communities on sites not affected by mining. The proposed planting density of 50 to 400 plants per acre is less than the woody plant densities in shrub communities on undisturbed sites. The capacity of reclaimed areas to provide forage for mule deer and bighorn sheep would be lower than for undisturbed shrub communities.

Species that would experience impacts from loss of shrub habitats include mule deer, Brewer's sparrow, and bighorn sheep. These species depend on sagebrush, mountain mahogany, and other shrubs for food and cover, especially in winter.

The amount of winter range determines the capacity of habitat to support mule deer. Because winter poses nutritional and thermal stress to animals, it becomes the population limiting factor. Removal of 451 acres of mountain mahogany habitat (18 percent of mountain mahogany in the Limestone Hills) as a result of the Proposed Action would have potential to reduce the capacity of the Study Area and adjacent Elkhorn Mountains to support mule deer. The extent of reduction would depend on availability of winter forage including mountain mahogany and other browse species favored by mule deer (e.g., sagebrush, juniper, winterfat, rabbitbrush, and skunkbush sumac). According to FWP (2009) approximately 30 to 40 percent of mule deer in the Elkhorn Mountains use this as winter range. Loss of 18 percent of mountain mahogany habitat would likely result in reduced carrying capacity of mule deer winter range in the Limestone Hills until reclaimed sites develop vegetation characteristics comparable to pre-mining conditions.

Under the Proposed Action, 1,252 acres of bighorn sheep winter range would be disturbed. Like mule deer, bighorn sheep are dependent on shrubs such as mountain mahogany for winter forage. Reductions in the winter forage base could reduce the capacity of the range to support bighorn sheep, if the range is currently at its maximum carrying capacity. The population goal is 250 animals, indicating that the capacity of the range to support bighorn sheep has not been reached; therefore, implementation of the Proposed Action may not reduce the existing population but it may affect achieving the population goal of 250 animals. During winter 2007-2008 bighorn sheep in the area contracted pneumonia resulting in a loss of approximately 95 percent of the herd. A FWP aerial survey in March 2008 revealed 19 bighorn sheep remaining from a population estimated at 220 animals (Carlson 2008).

Re-establishment of browse species important to mule deer (e.g., mountain mahogany, sagebrush, rubber rabbitbrush, and juniper), on reclaimed land, would restore the capacity of the range to support mule deer and bighorn sheep affected by mining operations. In addition to mountain mahogany, several browse species (e.g., winterfat, skunkbush sumac) would invade the reclaimed mine site, which would increase the carrying capacity of the mule deer winter range. Capacity of the winter range to support mule deer would therefore increase as browse species become established. Most plant species used in reclamation are similar to those now existing in the area, although the exact composition of reclaimed communities would be different as they follow a unique succession process. Approximately 50 years could be required to establish shrub cover on reclaimed land with forage values roughly comparable to pre-mining conditions.

During spring and early summer, when newly planted grasses and forbs on reclaimed areas are succulent and rapidly growing, mule deer, bighorn sheep, rabbits, and 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 until shrubs re-establish. Availability of adequate shrub-dominated habitat in winter is important to survival of mule deer and bighorn sheep.

Mule deer using the Study Area for year-round and wintering habitat would be displaced by the actual disturbance of the mine development. Migration of mule deer through the Project area may be hindered or slightly impeded by the mine expansion and its ancillary facilities, but would not be prevented. Traffic on haul roads is restricted to 25 mph and the mine operates on a 4/10 hour day schedule so there are time windows available when there would be no traffic or personnel at the site.

Small mammals, snakes, and insects could be killed by construction activities and vehicle traffic. Small mammals and snakes seek cover underground, and removal of soil and rock could result in direct mortality.

Raptors, coyotes, and other predators could experience a reduced prey base due to a reduction in available habitat until successful reclamation is achieved; however, reclaimed land typically is invaded by small mammals, often within 1 to 2 years following the start of reclamation (Hingten and Clark 1984a, 1984b).

Populations of small mammals on reclaimed land could provide a prey base for raptors, even during early stages of reclamation.

Noise levels associated with the Proposed Action would increase in areas that were previously distant from mining activity, 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 are present in the Study Area and present in areas outside the area in suitable habitat. Proposed expansion of the Indian Creek Mine would affect individuals nesting or foraging in disturbed habitats but would not affect the viability of populations of species not directly affected by areas of disturbance. None of the existing facilities located at the Indian Creek Mine or those proposed would attract migratory birds.

Migratory birds could experience losses of foraging and nesting habitats. If UXO clearance or mine construction were to take place in the nesting and brood-rearing period, young birds could be killed and nests destroyed. Killing or destroying migratory birds would violate the Migratory Bird Treaty Act.

Bats would experience reduced habitat quality through removal of foraging habitat and fractured rock faces for roosting. Bats would experience a loss of roosting habitat (e.g., trees and fractured rock faces) and foraging areas over upland and wetland habitats removed by proposed mine development. Few bats have been recorded in the Study Area, probably because of the limited water sources (Butts 2005).

Alternative A – Modified Pit Backfill

Impacts on terrestrial wildlife from implementation of Alternative A would be similar to those described for the Proposed Action. Configurations of modified pit backfill would establish varied slope angles that create landscape areas conducive to establishment of a diverse habitat, including mountain mahogany, to support wildlife. Overburden combined with reject rock fragments (sand- to boulder-size) would form a growth medium conducive to planting or seeding mountain mahogany and other browse species preferred by mule deer and bighorn sheep. Browse species for mule deer and bighorn sheep would be enhanced by limited competition from other species on steep slopes having rocky limestone-dominated growth media.

Depending on the specific method employed to treat steep slopes under Alternative A, access to browse species established on steep slopes may not be available for certain wildlife species (e.g., mule deer). Other types of wildlife (e.g., bighorn sheep, deer mice, marmots, chipmunks) would find habitat in steep slope areas similar to the Proposed Action.

Materials placed at angle of repose may continue to move in response to gravity until stable slope configurations are achieved. Plantings and seedings of vegetation on these

slopes may not survive because of slope movement until such time as slope stability would allow growth.

No Action Alternative

Under the No Action Alternative, the proposed mine expansion would not be approved and therefore, potential impacts to wildlife resulting from the Proposed Action would not occur. Existing permitted mining operations would continue for approximately 15 years disturbing and reclaiming a total of 757 acres. The potential for successful establishment and reproduction of mountain mahogany would be limited.

POTENTIAL MONITORING AND MITIGATION MEASURES

The reclamation plan in the Preferred Alternative was specifically developed by the agencies to mitigate impacts to winter range and wildlife dependent on winter range by focusing on restoring diverse habitat including mountain mahogany. Reclamation success is routinely monitored by the agencies during site compliance inspections.

To avoid any violation of the Migratory Bird Treaty Act, Graymont would conduct nesting bird surveys by qualified personnel prior to disturbing undeveloped ground or removing vegetation. If active nests are found, Graymont may not disturb the area between May 1 and August 30 or would consult with the U.S. Fish and Wildlife Service to apply appropriate protection measures.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

While mining operations will irreversibly and irretrievably alter conditions in the mine area, the expected successful reclamation would result in no irreversible or irretrievable

commitment of wildlife resources over the long term from the Proposed Action. However, reestablishment of mountain mahogany to pre-mine conditions could require decades to achieve. Control of noxious weeds is important to ensure that weeds do not out-compete desired plant communities on reclaimed areas.

RESIDUAL EFFECTS

Residual effects on wildlife resources from implementation of the Proposed Action could include changes in composition of relative species abundance and changes in the preferred habitat areas in the wildlife community. Reclamation activities would eventually restore areas disturbed by mining and processing operations resulting in reestablishment of wildlife habitat.

LAND USE, ACCESS, AND TRANSPORTATION

AFFECTED ENVIRONMENT

The Study Area for land use and access includes the area lying between Mud Springs Road on the west and Old Woman's Grave Road on the east. The area includes public land administered by BLM, the LHTA used by the MTARNG, and state land as shown on **Figure 3-1**.

Land Use

Limestone Hills Training Area

The Indian Creek Mine and proposed life-of-mine expansion are located within a right-of-way issued by BLM to the MTARNG for the LHTA. The LHTA has been used by the MTARNG from the 1950s to the present. In 1984, BLM granted MTARNG a 30-year "non-exclusive non-possessory right-of-way" to use federal land within the LHTA for constructing and maintaining certain improvements and to conduct military training exercises under

specific limited terms and conditions. The right-of-way agreement expires in March 2014. In order to continue use of this area, the U.S. Army on behalf of the MTARNG must apply to withdraw federal land in the LHTA in accordance with the Engle Act of 1958, which requires an Act of Congress for military withdrawals encompassing more than 5,000 acres. The MTARNG began the proposed withdrawal process in 1997, by seeking a waiver to the moratorium on military land acquisitions.

A Memorandum of Agreement between MTARNG, Graymont, and BLM sets forth the policies and procedures agreed to by MTARNG regarding military training exercises; UXO clearance, exploration, mining, and reclamation activities conducted by Graymont; and administration of public land by BLM to allow joint and compatible use of the LHTA. The LHTA is used for military exercises approximately 140 days per year within a 6.5-month training period beginning mid-April through November each year. The LHTA is not used for military training exercises during the 5.5-month period beginning in December through mid-April. The non-training use period is currently in effect, as requested by FWP, to protect big game on the winter range.

Other Existing Rights-of-Way

The proposed Dolomite Claims Area encompasses a portion of two existing linear rights-of-way (ROW) authorizations. One ROW was issued to the BLM (MTM-19584), as an access road through the area. The other ROW was issued to NorthWestern Energy (MTM-60926), for a powerline buried along existing roads (**Figure 3-1**). The powerline is used to support LHTA range facilities. Except for the above mentioned authorizations in the Dolomite Claims Area, no other ROW or land use permits within the area would be affected by the Proposed Action.

Recreation

Recreation in the Study Area is managed by BLM under the Elkhorn Mountains Travel Management Plan (BLM 1995). The Study Area is designated in the Elkhorn Mountains travel management plan as category "B," defined as an area closed to off-road motorized traffic yearlong, but open to road-use yearlong with periodic designated road closures from April 15 to November 30. Public access to withdrawn land west of Old Woman's Grave Road is allowed with prior permission and a MTARNG-approved escort due to risk of encountering military training activities (**Figure 3-1**).

Livestock Grazing

Grazing by sheep, cattle, and horses has occurred in the Study Area since the late 1800s associated with early mining and settlement. Settlers and ranch families often established a claim for land around a spring where a homestead would be built, and cattle and horses would graze on surrounding unclaimed public domain areas. In 1934, under the *Taylor Grazing Act*, unclaimed federal land, such as occurs in the Study Area, was put under management of the Department of the Interior. Livestock grazing continues on this federal land under a permit system regulated by BLM.

The current grazing permit system recognizes priority in occupancy and allows grazing permits for specific parcels to remain with individuals and ranches as long as operators meet permit conditions. Most permits are renewable and valid for a period of 10 years. Preference for grazing allotments is given to operators engaged in the livestock business that own or control land suitable as base property. Permits and associated allotment management plans describe allowable livestock class, intensity, duration, timing of grazing, and range

improvements that may be installed. Grazing allotments within the Study Area are shown on **Figure 3-7**.

Access

The Indian Creek Mine lies within an area bordered by four public roads: Indian Creek Road on the north, Crow Creek Road on the south, Mud Springs Road on the west, and Old Woman's Grave Road on the east. Public access to the Indian Creek Mine area is restricted for safety and security reasons. Most of the Project area lies within the MTARNG LHTA, which is closed to nonmilitary use at all times west of Old Woman's Grave Road.

Transportation

U.S. Highway 12/287 is an asphalt two-lane highway located about 4 miles east of the Indian Creek Mine. Highway 12/287 provides access to the mine site at the intersection with Indian Creek Road. In addition to Indian Creek Road, Old Woman's Grave Road and Mud Springs Road are Broadwater County improved roads open to year-long motorized travel where not otherwise restricted.

Montana Rail Link, a commercial rail carrier, runs parallel to U.S. Highway 12/287 in a north-south direction. Coal and petroleum coke used at the Indian Creek Mine and lime products produced by Graymont are transported to and from the load-out facility located on a rail siding west of the main rail line north of the Indian Creek Road.

DIRECT AND INDIRECT IMPACTS

Proposed Action

Limestone Hills Training Area

Expansion of mine operations into the South Claims and Dolomite Claims areas could have an impact on the "nonexclusive, nonpossessory"

military use of the LHTA. The currently approved Memorandum of Agreement between Graymont, BLM, and MTARNG contains a map showing no conflict between the areas proposed for mining by Graymont and the Surface Danger Zones identified by MTARNG and agreed to by BLM. Subsequent to execution of the Memorandum of Agreement, MTARNG has published other maps indicating that implementation of the Proposed Action would affect live-fire training exercises at five weapon system Surface Danger Zones located within the proposed mine expansion area. Military regulations do not allow MTARNG to conduct live-fire operations when personnel are within the bounds of a Surface Danger Zone for a respective weapon system.

The MTARNG has expressed its view that the proposed mining operations in the South Claims Area would conflict with the MTARNG training program (Putnam 2006), notwithstanding the limited area of Surface Danger Zones as depicted in the currently approved Memorandum of Agreement. Unless the right-of-way is allowed to expire in 2014, the level of impact mining operations in the South Claims Area would have on MTARNG training will ultimately be resolved by Congress before Graymont's operations reach the South Claims Area.

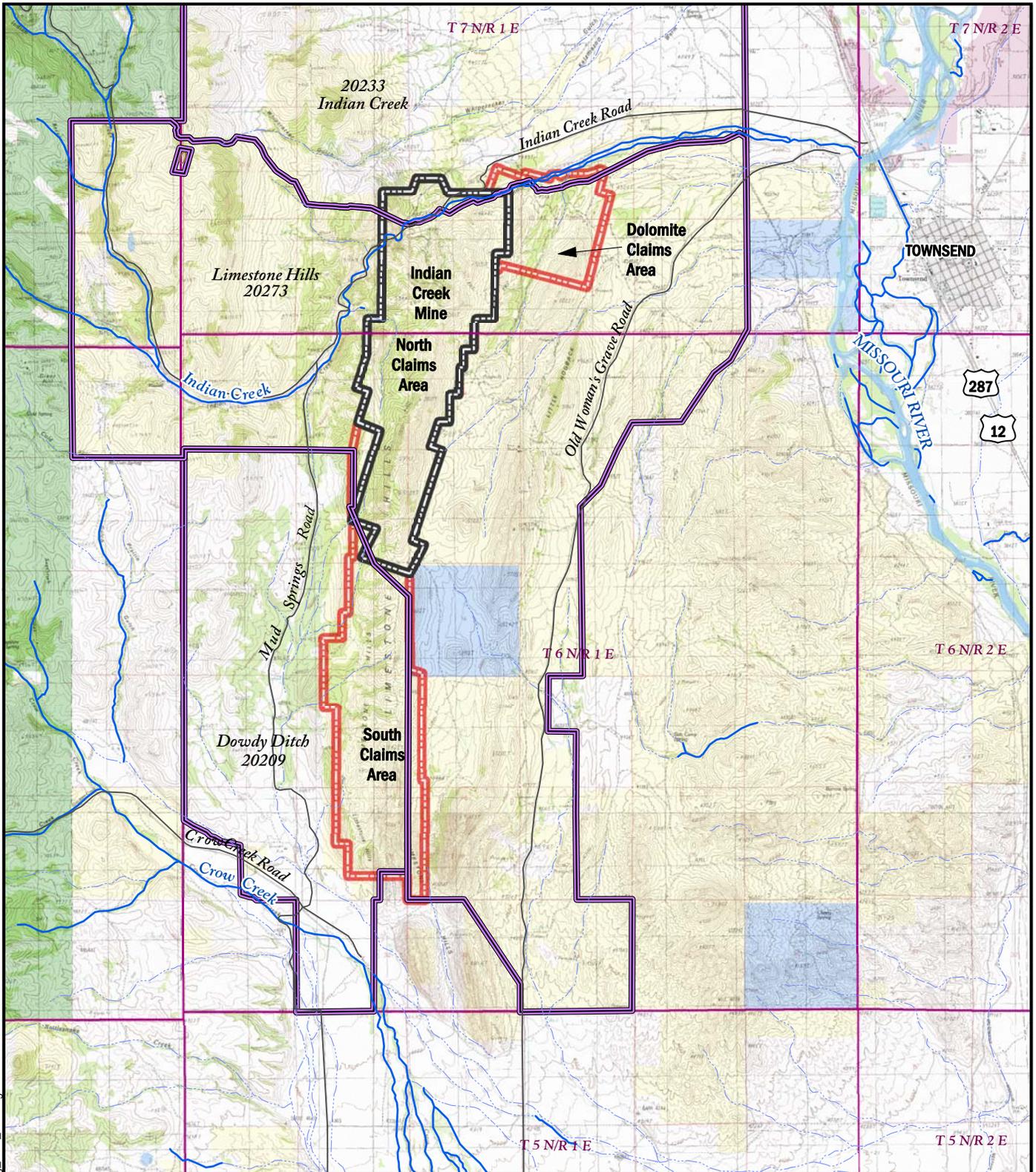
Most of the South Claims Area has potential to have been contaminated with UXO. The Right-of-Way and Memorandum of Agreement between BLM, Graymont, and MTARNG require MTARNG to remove UXO from the area. The preferred alternative in the Legislative EIS for *Land Withdrawal in the Limestone Hills* (MTARNG/BLM 2007) "...calls for the Army to clear claims of unexploded ordnance within the current mine permit area by 2008." The Army has previously been able to clear about 25 acres per year. However, that rate of clearance has increased with an additional 84 acres released in

early 2008. MTARNG currently estimates that UXO clearance in the existing mine permit area (North Claims Area) will be completed by 2010, if funding remains available at current levels. Expansion of mine operations into the South Claims and Dolomite Claims areas would increase the area requiring UXO remediation by about 1,300 acres. At the present time, MTARNG is unable to provide an estimate of the time and effort necessary to provide UXO clearance in these areas.

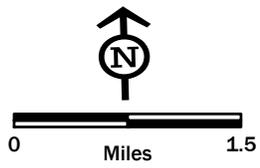
Livestock Grazing

Grazing allotments affected by proposed mine expansion into the South Claims and Dolomite Claims areas are listed in **Table 3-16**. According to the BLM MRB Survey and Allotment Tabulation Record, mine expansion would result in loss of carrying capacity on 356 acres of the Limestone Hills Grazing Allotment, 772 acres of the Dowdy Ditch Allotment, and about 11 acres in the Indian Creek Allotment (**Table 3-16**). These records are available at the BLM Butte Field Office.

Grazing on mine-related disturbance areas would be lost until revegetation and forage production are comparable to adjacent land. Steep slopes, lack of water, and sparse vegetation have limited livestock grazing in the proposed mine expansion areas. Revegetation of disturbed areas with reduced slopes may attract some livestock to the area for brief periods, but lack of water generally inhibits livestock from wandering too far from water sources. If necessary, temporary fences would be installed to prevent grazing on newly seeded areas. Temporary fencing may also be installed near the National Guard Well and/or the South and Dolomite Claims areas to preclude cattle from wandering into active mine areas. If mine dewatering activities affect the National Guard Well, Graymont would make arrangements to provide water for livestock.



Data Source: BLM GIS Data



 Grazing Allotments
 Townships

 Existing Operating Permit Boundary
 Proposed Operating Permit Boundary

Land Ownership

 State of Montana
 Bureau of Land Management
 Bureau of Reclamation
 Forest Service

H:\13532 Graymont EIS\5000 GIS\Projects\EIS\Fig_3-10_Grazing.mxd

 U.S. Department of the Interior
 Bureau of Land Management
 Butte Field Office
 Butte, Montana

GRAZING ALLOTMENTS
Indian Creek Mine Expansion - Environmental Impact Statement
Broadwater County, Montana

FIGURE
3-7

Allotment	Number of Livestock	Grazing Season	BLM AUMs	Total Acreage ¹	Area Affected by Mine Disturbance		
					South Claims Area	Dolomite Claims Area	Estimated Loss of AUMs ²
Dowdy Ditch North & South No. 20209	20 cattle	May 1 – June 15	30	5,056	772	0	4
Limestone Hills No. 20273	484 cattle	May 15 – Sept. 30	1,937	14,331	42	314	31 ³
Indian Creek No. 20233	212 cattle	May 15 – Oct. 15	344	9,772	0	11	1

Source: BLM 2007.

Note: AUM – animal unit month (approximately 780 pounds of forage (dry weight)).

¹ Includes Federal, State, and Private land.

² AUM losses were estimated by cross referencing available BLM grazing capacity survey information with the proposed mine expansion areas.

³ Refers only to the Dolomite Claims are of the Limestone Hills allotment.

Recreation

The South Claims and Dolomite Claims areas lie within a portion of the LHTA closed to public access without an escort approved by the MTARNG (**Figure 3-1**). Recreational use and public access in this area are restricted for safety and security reasons. Continued closure of the South Claims and Dolomite Claims areas would have no affect on recreation as areas with unrestricted access adjacent to the area remain available for dispersed recreational use.

Access

Access into active mine areas is restricted for safety and security purposes. The South Claims and Dolomite Claims areas lie within a portion of the LHTA closed to public access without an escort approved by the MTARNG. As detailed mining plans are developed the agencies will work with Graymont and MTARNG to develop a plan which maintains MTARNG access to the core portion of the range and provides detailed traffic control, if necessary.

Transportation

Implementation of the Proposed Action would have no effect on transportation in the Study Area. Mine related traffic on Indian Creek Road would likely remain at current levels throughout the life-of-mine.

Alternative A – Modified Pit Backfill

Impacts on land use, access, and transportation from implementation of Alternative A would be similar to those described for the Proposed Action.

No Action Alternative

Under the No Action Alternative, expansion of the Indian Creek Mine into the South Claims and Dolomite Claims areas would not be authorized. Potential effects to land use, access, and transportation associated with the Proposed Action would not occur.

Existing permitted mining operations would continue for approximately 15 years. UXO clearance would continue and is estimated to be completed in the North Claims Area by 2010.

Carrying capacities on grazing allotments would likely remain at current levels. The current mine permit area lies within a portion of the LHTA closed to public access without an escort approved by the MTARNG. Recreational use and public access would remain restricted for safety and security reasons.

POTENTIAL MONITORING AND MITIGATION MEASURES

No potential monitoring or mitigation measures for land use, access, and transportation have been identified by BLM or DEQ.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

Grazing on mine-related disturbance areas would be lost until revegetation and forage production are comparable to pre-mining levels associated with adjacent land. No irreversible or irretrievable impacts to recreation, access, or transportation are expected as a result of the Proposed Action.

RESIDUAL EFFECTS

No residual effects to land use, access, and transportation would result from implementation of the Proposed Action. With the exception of mine pits and rock faces, reclamation of disturbed areas would restore grazing on areas previously supporting livestock.

NOISE

AFFECTED ENVIRONMENT

Noise is generally defined as unwanted sound and can be intermittent or continuous, steady or impulsive, stationary or transient. Noise levels heard by humans and animals are dependent on several variables, including distance between the source and receiver, altitude, temperature, humidity, wind speed,

terrain, and vegetation. Human and animal perception of noise is affected by intensity, frequency, pitch, and duration, as well as the auditory system and physiology of the animal. Noise can influence humans or wildlife by interfering with normal activities or diminishing the quality of the environment. Response to noise is subjective, and therefore, the perception of noise can vary from person to person or among animals.

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.

Different A-weighted metrics can be used to describe and quantify noise levels. The equivalent noise level, 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.

The day-night average noise level, L_{dn} , is a single number descriptor that represents the constantly varying sound level during a continuous 24-hour period. The L_{dn} can be determined using 24 consecutive one-hour L_{eq} noise levels, or estimated using measured L_{eq} noise levels during shorter time periods. The L_{dn} includes a 10 decibel penalty that is added to noises that occur during the nighttime hours between 10:00 p.m. and 7:00 a.m., to account for people’s higher sensitivity to noise at night

when the background noise level is typically low. Because it represents the average noise level during a 24-hour period, the L_{dn} is not effective for describing individual noise events, such as a single blast.

The 90th percentile-exceeded noise level, L_{90} , is a metric that indicates the single noise level that is exceeded during 90 percent of a measurement period, although the actual instantaneous noise levels fluctuate continuously. The L_{90} noise level is typically considered the ambient noise level and is often near the low end of the instantaneous noise levels during a measurement period. It does not typically include the influence of discrete noises of short duration, such as car doors closing, bird chirps, dog barks, or car horns. If a continuously operating piece of equipment is audible at a measurement location, typically it is the noise created by the equipment that determines the L_{90} of a measurement period even though other noise sources may be briefly audible and occasionally louder than the equipment during the same measurement period.

Comparing the L_{eq} noise levels of a noise source to L_{90} (ambient) noise levels at a listener location helps approximate whether a noise source would be audible. In general, if the L_{eq} value is less than the L_{90} , then the noise would rarely be heard, if at all. If the L_{eq} is up to 10 dBA higher than the L_{90} , then the noise would be audible sometimes, and if the L_{eq} is more than 10 dBA higher than the L_{90} , then the noise would be heard often (Menge 2005).

Large amplitude impulsive sounds, such as blasting and large caliber weapons noise (larger than 20 millimeter [mm]) are commonly defined using the un-weighted instantaneous peak noise level, L_{pk} . L_{pk} represents the highest instantaneous noise level during a certain time period, and the units of L_{pk} are unweighted peak decibels (dBP).

Noise Guidelines

No state or county regulations exist to govern environmental noise. Federal noise guidelines apply to noise that would be generated by the Proposed Action under the Noise Control Act of 1972. Under this act, EPA developed acceptable noise levels under various conditions that would protect public health and welfare with an adequate margin of safety. The EPA identified outdoor L_{dn} noise levels less than or equal to 55 dBA are sufficient to protect public health and welfare in residential areas and other places where quiet is a basis for use (EPA 1979). Although the EPA guideline is not an enforceable regulation, it is a commonly accepted target noise level for environmental noise studies.

The Montana Department of Transportation (MDT) determines traffic noise impacts based on the noise levels generated by peak-hour traffic. The MDT criteria state that traffic noise impacts occur if predicted 1-hour $L_{eq}(h)$ traffic noise levels are 66 dBA or greater at a residential property during the peak traffic hour (MDT 2001).

No regulations exist to limit the blasting noise produced by the Proposed Action, but the U.S. Army has determined an approximate level associated with human annoyance to blast noise. In general, L_{pk} 115 dBP at a listener location represents the threshold of annoyance for people, and below this level, there is a low risk of noise complaints (USACHPPM 2005).

Existing Noise Sources

The ambient noise at a receptor location in a given environment is the all-encompassing sound associated with that environment and is due to the combination of noise sources from many directions, near and far, including the noise source of interest. In an outdoor environment, noise levels decrease as the distance increases between the source and

receptor. Noise levels typically decrease by approximately 6 dBA each time the distance between the source and receptor is doubled, depending on the characteristics of the source and the conditions over the path the noise travels. The reduction in noise levels can be increased if a solid barrier, such as a man-made wall, a building, or natural topography, is located between the source and receptor.

The Indian Creek Mine is located in a rugged rural area, approximately 4 miles west of Townsend off of Indian Creek Road. The mine has been operating since 1981. The mine uses standard open pit and quarry mining practices. Noise sources associated with the limestone quarry and processing plant include drilling, blasting, loading, hauling, and ore processing. Noise is primarily generated by heavy equipment (i.e., haul trucks, front end loaders, rotary drills, bulldozers, or graders) in the quarry, and ore processing equipment at the plant site (i.e., conveyors, crushers, a kiln, or process fans) (Graymont 2007a).

Blasting at the mine occurs 1 day per week at 4:00 p.m. Although a total of approximately 9,400 pounds of ANFO explosive is used for each blast, the total blast uses smaller sequenced charges of 125 pounds per delay placed in 24-foot-deep holes (Graymont 2007c).

Graymont's rail terminal and loadout facility are located at the intersection of Indian Creek Road and U.S. Highway 287. Noise sources at these facilities include haul truck engines and dumping when filling rail cars (Graymont 2007a).

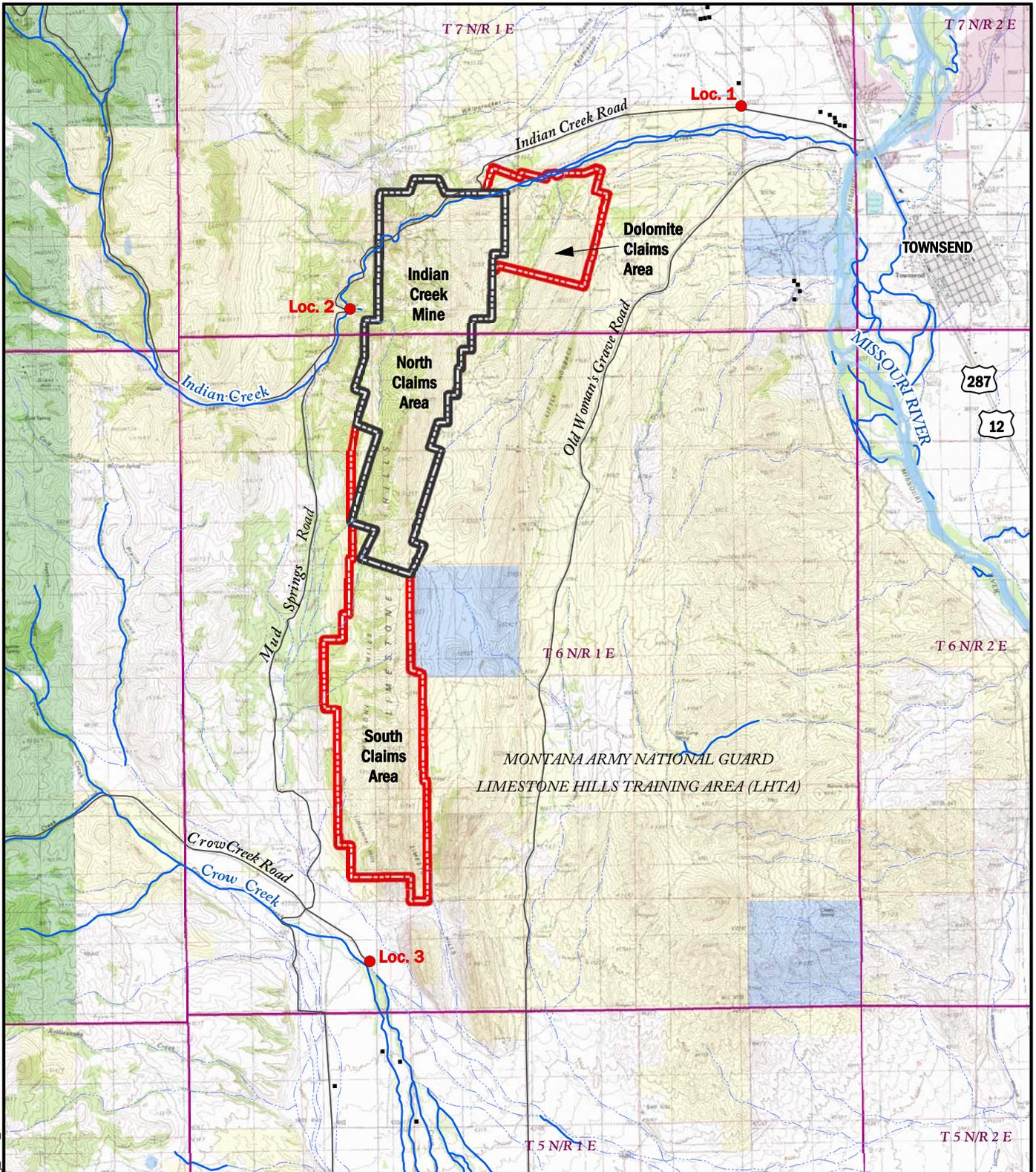
Other noise sources in the mine area include intermittent impulsive noise from weapons and explosives used at the LHTA, the railroad, wind-generated noise through grass and trees, flowing water near Indian Creek, wildlife, aircraft flying overhead, and vehicles traveling on roads (BSA 2007).

The Study Area is located within the LHTA used by the MTARNG for weapons training. Weapons and equipment used at the LHTA include 60 mm and 81 mm mortars, 120 mm tanks (M1A1 Abrams Battle Tank and M2A2 Bradley Fighting Vehicle), and smaller weapons such as rifles and machine guns. Operational data for LHTA indicate that training using small and large weapons occurs during the daytime and nighttime hours from April through November (USACHPPM 2003).

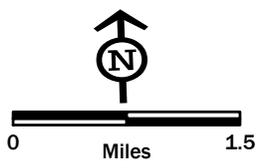
The Proposed Action boundary is within the LHTA, providing a buffer for mine-related noise. Residences are located within 1 to 3 miles of the Study Area: one residence located approximately 1.1 miles west of the existing plant site on Indian Creek Road, several existing residences and a new subdivision located approximately 2.8 miles east of the existing plant off Desert Road, and five residences located off of Crow Creek Road between the south boundary of the Southern Claims Area and Toma Road (**Figure 3-8**). Residents and mine workers, as well as wildlife that live, forage, and pass through the mine area, are the primary noise-sensitive receptors (BSA 2007).

Existing Noise Levels

Ambient noise level measurements were conducted at three representative locations (**Figure 3-8**) within 1 to 3 miles of the Study Area boundary to determine the L_{90} at each location. Measured data were used to estimate the existing L_{dn} at each location. In general, the ambient noise at each location was due to natural sounds, such as birds, insects, and wind in trees or grasses, except at Location 2 where mine plant equipment and haul trucks were audible but faint. **Table 3-17** summarizes the measured ambient noise levels (BSA 2007). The measured L_{90} and estimated L_{dn} levels are typical for sparsely populated, rural locations (Harris 1998). The estimated noise levels are less than the EPA recommended L_{dn} 55 dBA guideline (EPA 1979).



Data Source: Big Sky Acoustic, 2007



- **Loc. 1** Noise Monitoring Location
- Residences

- Existing Operating Permit Boundary
- Proposed Operating Permit Boundary
- Townships

- Land Ownership**
- State of Montana
 - Bureau of Land Management
 - Bureau of Reclamation
 - Forest Service

H:\13532 Graymont EIS\5000 GIS\Projects\EIS\Fig. 3-11_Noise.mxd



NOISE MONITORING LOCATIONS
Indian Creek Mine Expansion - Environmental Impact Statement
Broadwater County, Montana

FIGURE
3-8

Location	Noise Sources During Measurements	L ₉₀ (dBA)	L _{dn} (dBA)
1	Dominant noise sources included wind in grass, insects, and vehicles on Indian Creek Road. Mine plant was not audible.	27	34
2	Dominant noise sources included wind in trees and insects. Steady drone from mine plant audible but faint. Haul trucks occasionally visible and audible from ridge approx. 0.9 mile east.	30	33
3	Dominant noise sources insects, birds, wind in trees, and water flowing in creek. Mine was not audible.	24	27

Note: See **Figure 3-8** for measurement locations. L₉₀ = 90th percentile-exceeded noise level; L_{dn} = day-night average noise level; dBA = A-weighted decibels.

Source: BSA 2007.

Impulsive noises from blasting at the mine and from large weapons used at the LHTA are probably audible within several miles of the mine facilities and can vary due to atmospheric conditions at the time of blast including wind speed and direction, temperature, and relative humidity. The L_{pk} noise level due to blasting at the mine quarry was estimated based on the weight of explosive per delay and the distance to the listener (Fidel 1983). Mine blast noise was compared to noise created by artillery used at the LHTA at various distances. For reference, a 60 mm mortar firing is L_{pk} 185 dBP at 2 feet, and an 81 mm mortar firing is L_{pk} 179 dBP at 3 feet (USACHPPM 2007). A 120 mm tank firing is L_{pk} 120 dBP at 2,000 meters (6,560 feet) (USACHPPM 2003). **Table 3-18** is intended to provide a general comparison of mine blasting to noise from mortars and tanks at the same distances. As shown in the table, blasting from the mine is less than the L_{pk} 115 dBP blast annoyance criteria (USACHPPM 2005) within 0.5 mile of the blast location. Mortars exceed the criteria between approximately 1 to 1.5 miles, and the tank exceeds the criteria within approximately 2 to 2.5 miles from the firing location. Although blasts from both the mine and the LHTA are audible for several miles and can vary due to atmospheric conditions, the large weapons used at the LHTA appear to be

more likely to cause annoyance at greater distances than blasting at the mine. Although not measured, local area residents claim that noise generated by the railroad located adjacent to U.S. Highway 12/287 creates a greater sustained level of noise than mining operations at the Indian Creek Mine (BSA 2007).

Noise produced by diesel-powered equipment used at the mine is typically 85 dBA at a distance of 50 feet (FTA 1995). The mine or rail facility equipment could be audible at distances up to approximately 1 mile away, depending on shielding provided by surrounding terrain or an open pit, as well as the locations of the equipment, listeners, and the level of other noise sources (BSA 2007).

Haul trucks and employee vehicles access the mine and rail facility along Indian Creek Road. The haul trucks to the rail facility operate 24 hours a day. Graymont employs 48 people at the plant and processing facility. Quarry operations such as drilling, blasting, loading, and hauling are contracted (Graymont 2007a). The speed limit on Indian Creek Road is 35 miles per hour (mph) between US Highway 287 and Desert Road, and 45 mph west of Desert Road.

Distance	Mine Blast	LHTA 60 mm Mortar (dBP)	LHTA 81 mm Mortar (dBP)	LHTA 120 mm Tank (dBP)
0.5 mile	112	123	121	128
1 mile	107	117	115	122
1.5 miles	104	113	111	118
2 miles	102	111	109	116
2.5 miles	101	109	107	114
3 miles	100	107	105	112

Source: BSA 2007. Note: mm = millimeter; dBP = unweighted peak decibels.

The closest residences to Indian Creek Road are approximately 135 feet from the road east of Desert Road and approximately 300 feet west of Desert Road. Assuming that all 48 cars and approximately 4 haul trucks travel Indian Creek Road during the same hour, estimated noise 135 feet from Indian Creek Road east of Desert Road is approximately $L_{eq}(h)$ 48 dBA, and the estimated noise at 300 feet from Indian Creek Road west of Desert Road is approximately $L_{eq}(h)$ 45 dBA (FHWA 1998). Estimated traffic noise levels are less than MDT's $L_{eq}(h)$ 66 dBA impact criterion (MDT 2001).

DIRECT AND INDIRECT IMPACTS

Proposed Action

Under the Proposed Action, mining would expand into the South Claims and Dolomite Claims areas. Project equipment used for construction, mining, and reclamation activities would include drill rigs, end-dump trucks, dozers, front-end loaders, and other standard construction and earth moving equipment (Graymont 2007a).

Impacts from noise were predicted at various distances from the activities for general information, and at specific locations that represent existing residences. Noise level

calculations included the estimated effects of distance, ground attenuation, and attenuation resulting from air absorption per international standards. Although the calculations conservatively assume that atmospheric conditions are favorable for noise propagation, the estimated noise levels can vary due to atmospheric conditions and should be considered average noise levels (ISO 1996).

Mining and quarry operations would continue in the same manner using similar equipment as the current operations. A new crusher would be constructed in the South Claims Area (Graymont 2007a). Noise sources include diesel-powered earth-moving equipment that can typically generate intermittent noise levels of 85 dBA at a distance of 50 feet from the equipment (FTA 1995). Equipment noise can vary considerably depending on age, condition, manufacturer, use during a time period, and a changing distance from the equipment to a listener location. The existing crusher is L_{eq} 63 dBA at approximately 820 feet from the crusher (BSA 2007). Blasting using 125 pounds of ANFO per delay would continue to be used in the South Claims and Dolomite Claims areas (Graymont 2007c). The number of haul trucks and employee vehicles traveling along Indian Creek Road is expected to remain similar to the current volume (Graymont 2007a).

Estimated noise levels are summarized in **Table 3-19**. Estimated noise levels assume a direct line of sight between the receiver and the noise source(s). If the line of sight is blocked due to terrain or the depth of a quarry, the estimated noise level would be reduced by 6 dBA or more due to shielding. Noise levels due to heavy equipment operating during mining operations, haul trucks transporting limestone to the plant facility, and reclamation are predicted to be L_{dn} 49 dBA at 0.25 mile from the Project area (**Table 3-19**), which is less than the EPA

guideline of L_{dn} 55 dBA, and the predicted L_{dn} 36 dBA at 1 mile from heavy equipment would be considered typical for sparsely populated, rural locations (Harris 1998). The predicted L_{dn} 31 dBA at 0.5 mile from the crusher (**Table 3-19**) would be considered typical for sparsely populated, rural locations (Harris 1998). The predicted peak blasting noise level for the mine is predicted to be less than the U.S. Army guideline for human annoyance of L_{pk} 115 dBP between 0.25 and 0.5 mile of the blast (**Table 3-19**).

TABLE 3-19				
Estimated Noise Levels at Various Distances and Representative Residence Locations from Source(s)				
Proposed Action	Equipment / Noise Source(s)	Noise Level at Receiver		
		¼ mile	½ mile	1 mile
Construction, quarry operations, overburden disposal, and reclamation	Four pieces of earth moving equipment operating simultaneously, such as end-dump trucks, bulldozers, front-end loaders, and graders operating continuously for 12 hours during daytime.	L_{eq} 52 dBA L_{dn} 49 dBA	L_{eq} 46 dBA L_{dn} 43 dBA	L_{eq} 39 dBA L_{dn} 36 dBA
Operations — • Crusher	Crusher operating continuously for 12 hours during daytime.	L_{eq} 50 dBA L_{dn} 47 dBA	L_{eq} 34 dBA L_{dn} 31 dBA	L_{eq} 9 dBA L_{dn} 6 dBA
Operations — • Quarry	Blasting – 125 pounds of ammonium-nitrate fuel oil (ANFO) per delay, once per week at 4:00 p.m.	L_{pk} 117 dBP	L_{pk} 112 dBP	L_{pk} 107 dBP ¹
Estimated Noise Levels at Representative Residence Locations from Source(s)				
Proposed Action	Equipment / Noise Source(s)	Noise Level at Receiver		
		Location 1	Location 2	Location 3
Construction, quarry operations, overburden disposal, and reclamation	Four pieces of earth moving equipment operating simultaneously, such as end-dump trucks, bulldozers, front-end loaders, graders, etc. operating continuously 12 hours during the daytime.	L_{eq} 35 dBA L_{dn} 33 dBA	L_{eq} 33 dBA L_{dn} 30 dBA	L_{eq} 41 dBA L_{dn} 38 dBA
Operations — • Crusher	New South Claims Area crusher operating continuously 12 hours during the daytime.	L_{eq} <10 dBA L_{dn} <10 dBA	L_{eq} <10 dBA L_{dn} <10 dBA	L_{eq} <10 dBA L_{dn} <10 dBA
Operations — • Quarry	Blasting – 125 pounds of ANFO per delay, once per week at 4:00 p.m.	L_{pk} 105 dBP	L_{pk} 102 dBP	L_{pk} 109 dBP ¹

¹ Blast noise potentially audible for several miles.

L_{eq} = equivalent noise level; L_{dn} = day-night average noise level; L_{pk} = peak noise level; dBA = A-weighted decibels; dBP = unweighted peak decibels. Shading indicates exceedance of US Army guideline of 115 dBP.

Note: Estimated construction and blasting noise levels at Locations 1 and 2 based on operations near the closest Dolomite Claims Area boundary. Estimated construction and blasting noise levels at Location 3 based on operations near the closest South Claims Area boundary. See **Figure 3-8** for locations.

Estimated noise level (per activity) at three existing residences near the claims area boundaries are shown in **Table 3-19 (Figure 3-8)**. The estimated levels assume a direct line of sight between the receiver and the closest claims area boundary. If the line of sight is blocked due to terrain or depth of the quarry, the estimated noise levels would be reduced by 6 dBA or more due to shielding. The L_{dn} noise level at the receiver location would be L_{dn} 38 dBA or less, which is below the EPA guideline of L_{dn} 55 dBA and considered typical for sparsely populated, rural locations (Harris 1998). Noise level at receiver from the new crusher would be less than L_{dn} 10 dBA. The predicted L_{pk} levels at the representative residence locations are predicted to be L_{pk} 109 dBP or lower, which is less than the L_{pk} 115 dBP annoyance criterion.

Comparing the L_{eq} noise levels to measured L_{90} (ambient) levels at a location helps approximate whether a noise source would be audible. **Table 3-19** compares the predicted L_{eq} noise levels with measured L_{90} noise levels at several representative locations. Noise from earth-moving equipment is predicted to be audible intermittently at Locations 1 and 2, and audible often at Location 3 and at 1 mile from equipment. The predicted noise level at Location 3 is based on equipment being located near the closest point of the South Claims Area boundary to Location 3, and therefore, the predicted equipment noise level would be less when the equipment is located further north of the boundary or shielded by natural terrain. Comparison of L_{eq} and L_{90} noise levels indicates that mining equipment would be audible at all representative locations. Noise levels between approximately 25 and 40 dBA, such as the predicted L_{eq} levels associated with the Proposed Action, are typically considered “faint”, if at all audible (Egan 1988).

Alternative A – Modified Pit Backfill

Impacts from noise due to implementation of Alternative A would be the same as those described for the Proposed Action.

No Action Alternative

Under the No Action Alternative, existing sources of noise associated with ongoing mining operations would continue at current levels (**Table 3-17**) and for the time period that operations would occur under approved operating permits.

POTENTIAL MONITORING AND MITIGATION MEASURES

No monitoring or mitigation measures for noise have been identified by BLM or DEQ.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

No irreversible or irretrievable commitment of resources would result from the creation of noise associated with the Proposed Action.

RESIDUAL EFFECTS

No residual effects would result from noise created during implementation of the Proposed Action. Noise levels would return to ambient conditions in the Project area once mining operations cease.

VISUAL RESOURCES

AFFECTED ENVIRONMENT

The Study Area for visual resources includes all land areas from which the proposed mine expansion would be visible. This includes the area lying east, west and northwest of Townsend, north and northeast of Radersburg, and the eastern slopes of the Elkhorn Mountains.

Landscape of the Study Area is characterized by the Limestone Hills on the east flank of the Elkhorn Mountains. The Limestone Hills include prominent exposed ridges and cliffs with intervening valleys formed by intense folding and subsequent erosion of steeply dipping bedrock units. Elevations in the area rise to over 5700 feet above mean sea level.

Vegetation in the Study Area consists primarily of shrub-dominated upland types of mountain mahogany and Rocky Mountain juniper communities. Rocky Mountain juniper is conspicuous in several shrub- and tree-dominated stands and dominates the visual aspect of many stands. Mountain mahogany stands dominate the crests and upper slopes of limestone ridges, together with limber pine savannah. Natural vegetation patterns are disturbed by active mining operations, wildfires, and reclaimed mine sites. Dominant vegetation colors are gray, gray-green, and olive green. Soil and rock are exposed in numerous areas where

vegetative cover is sparse or has been disturbed by mining activities. Soil color ranges from chalky off-white to beige. Disturbed areas exhibit a wider range of color including chalky white, gray, dark gray, reddish brown, and buff.

Color hues of disturbed areas are stronger than those of undisturbed areas and exhibit greater variation. These colors contrast with surrounding soil and vegetation. Excavated areas vary in color from chalky off-white, gray, and beige contrasting with the gray-green and olive green vegetation.

The existing mine disturbance creates moderate to strong contrasts with horizontal lines, smooth surfaces, blocky and pyramidal forms, and more vivid colors from disturbed soil and rock. Existing disturbances at the Indian Creek Mine consist of exploration roads, drill pads, quarries, and overburden disposal areas creating contrasts with the forms, lines, and colors of the undisturbed landscape.

Class	Objective
I	The objective of this class is to preserve the existing character of the landscape. This class provides for natural ecological changes; however, it does not preclude very limited management activity. The level of change to the characteristic landscape should be very low and must not attract attention.
II	The objective of this class is to retain the existing character of the landscape. The level of change to the characteristic landscape should be low. Management activities may be seen, but should not attract the attention of the casual observer. Any changes must repeat the basic elements of form, line, color, and texture found in the predominant natural features of the characteristic landscape.
III	The objective of this class is to partially retain the existing character of the landscape. The level of change to the characteristic landscape should be moderate. Management activities may attract attention but should not dominate the view of the casual observer. Changes should repeat the basic elements found in the predominant natural features of the characteristic landscape.
IV	The objective of this class is to provide for management activities which require major modifications of the existing character of the landscape. The level of change to the characteristic landscape can be high. These management activities may dominate the view and be the major focus of viewer attention. However, every attempt should be made to minimize the impact of these activities through careful location, minimal disturbance, and repeating the basic elements.

Source: BLM 2003.

Visual Resource Inventory

A Visual Resource Inventory was performed by Resource Management Associates, Inc. in 2006.

The inventory was conducted in accordance with BLM Visual Resource Management (VRM) objectives. BLM developed the VRM system to classify visual resources based on scenic quality,

visual sensitivity, and visual distance zones. These values determine management guidelines and class objectives for specific areas. VRM objectives are shown in **Table 3-20**. The Indian Creek Mine site is located within a VRM Class IV area (BLM 2003).

DIRECT AND INDIRECT IMPACTS

Proposed Action

The Indian Creek Road provides access to the Project site from U.S. Highway 12/287. The southeastern view of the proposed mine expansion in the Dolomite Claims Area would be viewed by travelers on U.S. Highway 12/287 and by Graymont workers and supply haulers going to and from the mine on Indian Creek Road. Mining operations in the South Claims Area would not be visible from U.S. Highway 12/287 or the Indian Creek Road. Partial views of the South Claims Area operations would be visible from the Mud Springs Road along the western boundary. A small portion of the South Claims Area operations would be visible to residents of Radersburg looking north-northwest (Resource Management Associates 2006b).

Results of the Visual Resource Management Inventory and contrast ratings indicate that the proposed mine expansion would not exceed visual management objectives for these areas (Resource Management Associates 2006b). The contrast rating for the South Claims Area is “moderate”, which corresponds to the Visual Resource Class IV. As the South Claims Area has been determined to be a Visual Resource Class IV, the rating of moderate contrast is acceptable under this area’s management objective. Contrast rating for the Dolomite Claims Area is moderate matching the Visual Resource Class IV established for this area (BLM 1984).

The South Claims Area is remote with little public viewing and proposed mine activities would not destroy the landscape’s essential form using the VRM methodology. The Dolomite Claims Area is visible to many sections of the public; however, the land around this area has limited public access and existing mine operations are visible in the vicinity (Resource Management Associates 2006b)

Alternative A – Modified Pit Backfill

Implementation of the modified pit backfill methods described under Alternative A in Chapter 2 would reduce the visual effect of highwalls and/or establish varied slope angles to create post-mining landscape more natural in appearance. Use of visually compatible growth media would be emphasized in reclaimed areas visible from public roads. Placement of overburden or cast blasting benches would eliminate the flat terrace features (pit benches) of pit highwalls by breaking up the surface of the benches. The resultant visual element would resemble natural cliff faces or talus slopes.

Establishing vegetation species that are similar to adjacent undisturbed areas would further reduce visual impacts from various locations along public roads in the Project area. Color and texture of vegetation established on various locations along slopes over time would result in visually blending the reclaimed slope areas with adjacent undisturbed areas.

No Action Alternative

Under the No Action Alternative, no visual impacts would occur beyond those created by existing mine operations. Existing mining operations in the North Claims Area will be visible from the Indian Creek Road and U.S. Highway 12/287 for approximately 15 years. Visual impacts will be reduced once reclamation is complete.

POTENTIAL MONITORING AND MITIGATION MEASURES

No monitoring or mitigation measures for visual resources have been identified by BLM and DEQ.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

An irretrievable commitment of visual resources would occur during construction and active mine operations until reclamation is successful. Impacts on visual resources would be reduced through implementation of reclamation measures that reestablish the vegetation mosaic and visual elements associated with vegetation. Rock faces and talus slopes would represent an irreversible commitment of visual resources compared to the pre-mining landscape, but would resemble natural rock faces in the area.

RESIDUAL EFFECTS

Following successful reclamation, weak contrasts in form and line would remain. Straight lines associated with reclaimed slopes of overburden piles and roads would be weakened by color and texture of revegetation to blend with surrounding landscape. Rock faces would remain visible after reclamation as weak contrast associated with straight lines and color.

SOCIAL AND ECONOMIC RESOURCES

AFFECTED ENVIRONMENT

Broadwater County is the geographical area in which the direct and indirect socioeconomic effects of the Proposed Action and the No Action Alternative are likely to occur. The Proposed Action includes a life-of-mine expansion of limestone and dolomite mining operations at the Indian Creek Mine located

approximately 4 miles west of Townsend, Montana. The proposed expansion would encompass approximately 1,940 acres of public land administered by BLM and represents approximately 35 more years of mine production at current rates (Graymont 2007a). Graymont produces calcium oxide (quicklime or lime), hydrated lime, and lime products at the Mine. Broadwater County is the Study Area because the mine and the majority of its employees are located within its boundaries.

Demographics

The county seat and only incorporated city in Broadwater County is Townsend. Other unincorporated towns include Radersburg, Toston, and Winston (NACO 2007). In 2006, the U.S. Census Bureau estimated the population of Broadwater County at 4,572, a 4.3 percent increase since the 2000 census. Townsend had an estimated population of 1,974 in 2006 (U.S. Census Bureau 2007). Sixteen subdivisions totaling 429 lots currently under construction or planned in Broadwater County could increase the population by up to 30 percent (BCBP 2003). These subdivisions are located between Townsend and Helena and primarily serve as bedroom communities for Helena.

Historically, Montana has been one of slowest growing states in the Union. The population is not expected to exceed 1 million until 2015, growing at a rate of approximately 1 percent per year from the 2000 census estimates. Broadwater County is projected to grow at a rate of 1.7 percent almost twice as quickly as the state as a whole between 2000 and 2015 (NPA Data Services, Inc. 2004.).

The median age in Broadwater County was 41.3 in 2000, an increase of 14 percent from 1990 (U.S. Census Bureau 2001). The 2000 census reported 2,002 housing units in Broadwater County with 1,752 households and predicted

the number of housing units would increase to 2,030 by 2005. There were 2.47 persons per household, and the median value of owner-occupied housing was \$85,500 in 2000.

Infrastructure

Townsend lies approximately 4 miles east of the Indian Creek Mine and has a full complement of residential, commercial, industrial, and community services. The surrounding area is rural with farms and ranches engaged in livestock and crop production.

In 2008, Townsend public schools served 709 students with one elementary school and one high school (Greatschools 2008). Community services include municipal water, sewer, and trash collection; health services; law enforcement from the County Sheriff's office; and a volunteer fire department.

Employment

According to the Economic Profile System, the fastest growing categories under Services and Professional include health, business, legal, engineering, and management services (19 percent of total employment in 2000). Retail trade accounted for 12 percent of total employment in 2000. The majority of the growth in government employment has been in state and local government. Broadwater County economic activities supported 2,098 full- and part-time jobs in 2000, an increase of 1,031 since 1970, an almost 100 percent increase (**Table 3-21**). Over the last 30 years, job growth in Broadwater County has outpaced that of the state and the nation (Sonoran Institute 2003).

In Broadwater County, the mining industry employed 110 people in 2000, which accounted for 5 percent of total employment and 13 percent of earnings in 2000 (**Table 3-22**).

The Indian Creek Mine is one of Broadwater County's 10 largest private employers and is classified as a basic industry. "Basic industries" are those business and government activities which bring outside income into an area economy. By paying salaries and making purchases with non-local money, Graymont's mine provides a foundation for state and local county economic development by:

- Direct and indirect employment;
- Purchases of goods and services;
- Capital improvements; and
- Property and Net Proceeds Taxes.

Since its startup in the early 1980s under the management of Continental Lime Company (now Graymont), the Indian Creek Mine has evolved into an important contributor to the Broadwater County/Townsend economic base. In 2003, the Mine employed 36 people with an annual salary and hourly payroll of \$1.16 million and purchases of \$2.67 million in goods and services from Montana vendors (Chorney 2004).

In 2005, Graymont employed 27 workers directly and contracted 11 other jobs through Quarry Services, accounting for 43 percent of mining jobs in Broadwater County and 0.2 percent of total employment in the county. In addition, Graymont paid approximately \$196,000 in property taxes in 2004, about \$47,500 in net proceeds tax, and approximately \$11,000 to the state Resource Indemnity Trust Tax in 2003 (BCPB 2003; Chorney 2004; Brown 2005).

TABLE 3-21
Employment by Industry Changes from 1970 to 2000, Broadwater County

	1970	Percent of Total	2000	Percent of Total	New Employment	Percent Change 1970-2000
Total Employment	1,067		2,098		1,031	97
Farm and Agricultural Services ¹	372	34.9	386	18.4	14	4
Farm	360	33.7	324	15.4	-36	-10
Ag. Services	12	1.1	62	3.0	50	417
Mining	19	1.8	89	4.2	70	368
Manufacturing (incl. forest products)	98	9.2	368	17.5	270	276
Services and Professional	388	36.4	867	41.3	479	123
Transportation and Public Utilities	26	2.4	80	3.8	54	208
Wholesale Trade	7	0.7	56	2.7	49	700
Retail Trade	179	16.8	245	11.7	66	37
Finance, Insurance, & Real Estate	31	2.9	96	4.6	65	210
Services (Health, Legal, Business, Others)	145	13.6	390	18.6	245	169
Construction	27	2.5	123	5.9	96	356
Government	163	15.3	265	12.6	102	63

¹ Agricultural services include soil preparation services, crop services, forestry services, such as reforestation services, and fishing, hunting, and trapping. Manufacturing includes paper, lumber and wood products manufacturing. Source: Sonoran Institute 2003.

TABLE 3-22
Mining Industry Employment and Earnings in Broadwater County, 2000

	Employment	Earnings
Mining Production	90	\$4,900,000
Mining Processing	20	800,000
Total Mining Industry	110	\$5,700,000
Percent of Total Employment and Earnings in County	5	13

Source: BCBP 2003.

In 2007, Graymont employed 48 persons and operated the plant on a 24-hour, 7-days-per-week schedule. The quarry contractor operates a 10-hour shift per day for four days. Annual payroll at the Plant is approximately \$1.65 million. The quarry contractor payroll is about \$800,000.

Unemployment rates in Broadwater County have been relatively stable since 2000 at a rate similar to that of the State of Montana (**Table 3-23**). This indicates a relative economic stability for the county, particularly as the unemployment rate for the United States has increased since 2003.

	2000	2001	2002	2003	2004	2005
Broadwater County	4.7	5.5	4.0	4.9	3.9*	3.7*
State of Montana	5.0	4.6	4.6	4.7	4.3*	4.0*

Source: US Department of Labor 2004; *Source: Montana Department of Labor and Industry 2005.

Income

Personal Income is defined as all income received by individuals from all sources: income from work (labor income or earnings); income from non-labor sources such as income from savings and investments (investment income); and income from outside sources, such as social security or Medicare (transfer payment

income). In 2003, total personal income in Broadwater County increased 19.5 percent from \$77 million to \$92 million. Rate of growth for Montana during the same period was 22 percent (**Table 3-24**). Broadwater County had higher growth in non-labor sources, dividends, interest, rent, and personal current transfer receipts than the State of Montana.

Category	Broadwater County			Montana		
	1993	2003	Percent Change	1993	2003	Percent Change
Total Personal Income	77	92	19.5	19,115	23,327	22
Labor Sources	45	52	16	12,011	15,076	26
Non-Labor Sources	31	40	29	7,104	8,251	16
Dividends, interest and rent	17	19	12	3,963	4,359	10
Personal current transfer receipts	14	21	50	3,142	3,892	24

Source: Sonoran Institute 2007.

Almost 43 percent of total personal income in Broadwater County is derived from Non-Labor sources, including 22 percent from investment income and 21 percent from transfer payment income (**Table 3-25**). The percentage of non-labor personal income reflects the 32 percent of the population in 2000 that was 65 years of age or older and no longer in the labor force. Travel and recreation employment account for

3 percent of personal income in Broadwater County (BCPB 2003). Income from wages and salaries is lower in Broadwater County than for the state as a whole: in 2004, the state average earnings per job were estimated at \$30,878, while Broadwater County average earnings per job were approximately \$22,432 (Fedstats 2007).

	2000 Broadwater County	Percent of Total	2000 State of Montana	Percent of Total
Labor Income				
Wage and Salary Income	30	36	9,987	49
Other Labor Income	4	5	1,306	6
Proprietor's Income	10	12	2,014	10
Non-Labor Income				
Investment Income	19	22	4,623	23
Transfer Payment Income	17	21	3,275	16

Source: Sonoran Institute 2003.

Median household income and personal income per capita are commonly used to evaluate the relationship within a community or county with regard to personal income (Table 3-26). Broadwater County outpaced the State of

Montana's growth between 1999 and 2004 in median household income but was outpaced by the State of Montana in personal income per capita for that same period.

	1989¹	1999²	Percent Change 1989-1999	2004³	Percent Change 1999-2004
Median Household					
Broadwater County	\$20,257	\$32,689	61.3	\$35,899	9.8
State of Montana	\$22,988	\$33,024	43.7	\$35,574	7.2
Personal Income Per Capita					
Broadwater County	\$10,125	\$16,237	60.4	\$22,782	40.3
State of Montana	\$11,213	\$17,151	52.8	\$27,657	61.3

Sources: ¹ US Census 1997; ² US Census 2001; ³ US Census Bureau 2007.

Government and Public Finance

In fiscal year (FY) 2005-2006, Broadwater County had a budget of \$7,263,072. The two primary sources of local government revenues in Montana are intergovernmental transfers (funds passed through from federal and state governments, such as grants-in-aid and payments in lieu of taxes (PILT) for publicly owned land for forgone property tax revenues)

and local taxes and assessment. In fiscal year 2006, BLM paid \$369,374 (5.1 percent of the budget) to Broadwater County for compensation for BLM and other federal land within the county (Tomeo 2007).

In 2000, mining ranked fourth in the value of taxable income, with Utilities, Residential, and Agriculture in the first, second, and third ranking, respectively (Table 3-27).

Type of Property Value (Tax Rate)	Taxable Value	Percent of Taxable Value	Assessed
Utilities (12%)	\$3,122,000	30%	\$28,029,000
Residential (3.6%)	2,690,000	26%	75,057,000
Agriculture (3-3.6%)	1,450,000	14%	42,663,000
Mining	811,000	8%	22,455,000
Commercial/Industrial (3.6%)	626,000	6%	17,696,000
Railroad (4.27%)	614,000	6%	13,641,000
Telecommunications (6%)	579,000	6%	9,651,000
Other	371,000	4%	38,214,000
Total	\$10,254,000	100%	\$224,716,000

Source: BCBP 2003.

In FY 2006, Broadwater County collected \$3.5 million in property tax revenues; Graymont paid over \$77,200 of those taxes for its Indian Creek property (Nelson 2007). Net Proceeds Tax is a tax classification in which proceeds from non-metal mining production are taxed.

Graymont is the only contributor to Net Proceeds Tax in Broadwater County (BCBP 2003) Between 2003 and 2006, Graymont's net proceeds revenues increased by almost 60 percent, while the County tax revenues increased 18 percent (Table 3-28).

Type of Property Tax	Property Tax Amount FY 2003 ¹	Property Tax Amount FY 2006 ²
Real Estate Property Tax	\$2,780,156	\$3,502,371
Mobile Home Tax	90,530	96,556
Personal Property Tax	91,429	66,918
Net Proceeds (Graymont)	48,490	77,217
Utilities	1,550,571	1,641,811
Total	\$4,561,175	\$5,384,873

Sources: ¹ Gillespie 2004; ² Nelson 2007.

DIRECT AND INDIRECT IMPACTS

Proposed Action

Mining and Mineral Production

Implementation of the Proposed Action would allow mining and lime processing operations at the Indian Creek Mine to continue at current production rates for approximately 50 years, including 15 years of currently permitted life-of-mine.

Direct Employment and Income

The current direct employment and income trend would continue for an additional 35 years (50 years total) subject to market conditions. Implementation of the Proposed Action would generate a payroll in excess of \$82 million over the life-of-mine in 2007 dollars.

Indirect Employment and Spending

The current employment trend would continue during the 50-year expansion period. Indirect

payroll amount over the expansion period would be approximately \$40 million in 2007 dollars.

Given the average annual wage in Broadwater County for 2004 of \$22,432, the inferred annual payroll for this indirect work force is approximately \$1,435,648. These indirect workers (retail employees, teachers, and service workers) in Broadwater County would have a stable and longer employment horizon in conjunction with the proposed life-of-mine expansion period. Extrapolated combined annual wages of this group considered over the additional 35 year life-of-mine is estimated to be \$71.7 million in 2007 dollars.

In 2005, 25 of 27 Graymont employees lived in Broadwater County (MTARNG/BLM 2007), and it is reasonable to assume the ratio is similar among the 2009 workforce and that many of the contract workers also live in the county and would continue to do so as a result of the life-of-mine expansion.

Graymont would continue to purchase goods and services in Montana throughout the life-of-mine period. In 2003, Graymont spent \$2.6 million on purchases from Montana vendors. This spending also creates employment and income although the effects are not quantifiable. In 2005, a combined amount of \$5.1 million was spent on contracted services and purchases from Montana vendors (Chorney 2007).

At the 2003 expenditure rate, the life-of-mine expansion (35 years) would result in expenditures with Montana vendors in excess of \$133 million (2003 dollars). Employment associated with these expenditures would likely remain at current levels over the period.

Tax and Fee Distributions

In 2004, Graymont contributed \$14,918 to the Resource Indemnity Trust Tax fund. Extended tax distribution over the life-of-mine period

would include nearly \$750,000 to the Resource Indemnity Trust Tax fund in 2004 dollars. In addition, Graymont paid \$146,379 in income tax to the state in 2004. Extended over the life-of-mine, about \$7.3 million in income tax would be paid to the state.

In 2003, Graymont paid Broadwater County \$195,808 in property taxes as well as \$47,490 in annual net proceeds in 2004 (Brown 2005). This amount is derived from the taxable value of Graymont's lime operations in the tax year (BCPB 2003). In 2006, Graymont paid approximately \$77,200 in Net Proceeds Tax to Broadwater County. In 2005, Graymont was the only contributor to Net Proceeds Tax revenue for Broadwater County (BCPB 2003). The life-of-mine expansion would maintain the income generated from the Net Proceeds Tax, which could exceed \$9.7 million in property taxes in 2003 dollars and over \$3.8 million in Net Proceeds Tax in 2006 dollars. Streams of federal and state income tax revenues would be extended as derived from personal income tax paid by workers at the facility throughout the life-of-mine.

Alternative A – Modified Pit Backfill

Impacts to social and economic resources from implementation of Alternative A would be the same as those described for the Proposed Action.

No Action Alternative

Under the No Action Alternative, mining and lime production would continue at the Indian Creek Mine for approximately 15 years. Graymont would continue to employ a staff commensurate with the current rate of production and subcontractors to provide the goods and services necessary to support the mining operation over the 15-year period. At the end of mining and production operations employees would be transferred to other

Graymont operations or provided a separation package at termination. A cascading employment reduction effect may also occur with downstream jobs potentially effecting as many as 96 indirect jobs in the regional economy. The net effect to regional employment would continue downward in the absence of mine spending on goods and services Graymont purchases from Montana vendors.

With mining operations coming to a close at the end of the current operating period, the State of Montana would lose contributions to the Resource Indemnity Trust Tax fund and the taxable income generated by mine operations. In addition, Broadwater County would lose a portion of property taxes derived from the mine as well as revenue derived from annual net proceeds.

The effect on tax receipts for local and state government for the remaining 15 years of mine life under the No Action Alternative and for the Proposed Action are shown in **Table 3-29**.

POTENTIAL MONITORING AND MITIGATION MEASURES

No monitoring or mitigation measures for social and economical resources have been identified by BLM or DEQ.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

No irreversible or irretrievable commitment of socioeconomic resources is expected to occur as a result of the Proposed Action.

Tax	No Action (Life-of-Mine 15 years)	Proposed Action (Life-of-Mine 35 years)	Total
Property Tax	2.9 million	6.8 million	9.7 million
Net Proceeds	1.1 million	2.7	3.8 million
Resource Indemnity Trust	.225 million	.525 million	.75 million
State Income Tax	2.2 million	5.1 million	7.3 million

Source: BCPB 2003; Brown 2005.

RESIDUAL EFFECTS

No residual effects to social or economic resources are expected to occur.

CULTURAL RESOURCES

AFFECTED ENVIRONMENT

The Study Area for cultural resources encompasses proposed mine development in the South Claims and Dolomite Claims areas of the Indian Creek Mine. Cultural resources are considered archaeological, historic, or

architectural properties, buildings, structures, objects, and districts, as well as properties of traditional cultural importance to living communities. Cultural properties can be prehistoric, historic, or both prehistoric and historic in age. Historic properties are those cultural properties which meet both the criteria for significance and for integrity established by the Secretary of the Interior and are therefore eligible for listing on the National Register of Historic Places.

Previous Surveys and Studies

In 1979, Montana State University conducted a cultural and paleontological resource inventory of the MTARNG LHTA, which included the Study Area. That survey resulted in identification and documentation of 87 historic and prehistoric cultural properties, of which 15 were within the Study Area (Davis *et al.* 1980). Since the 1979 inventory, an additional five cultural properties have been identified and recorded within the Study Area.

A bibliographic search of records by the Montana State Historic Preservation Office (SHPO) identified references to eight subsequent cultural resource studies conducted at locations within the Study Area. These subsequent studies were conducted at an inventory level investigation; no excavations were performed. The studies were conducted in response to development activities within the Study Area. Collectively, these datasets indicate the Study Area has been examined for cultural resources; information concerning the character of those resources has been collected; and additional inventory work is unlikely to identify cultural resource properties differing substantially from those already known.

Native American Cultural Resources

Archaeologists working on the northwestern plains have found evidence of human occupation extending over 11,000 years. Archaeological material from various sites characterized by distinctive tool types and geographic and/or temporal distributions are the basis for defining cultural complexes. Cultural complexes in the northern plains have largely been defined and identified on the basis of similar diagnostic projectile point forms and/or ceramics found in various assemblages (**Figure 3-9**). The cultural periods and their general defining characteristics are described below.

Early Prehistoric Period.

Dating from ca. 11,000 to 8,000 radiocarbon years before present (BP), this period contains a number of archaeological complexes some of which are characterized by projectile point styles presumably designed for use on heavy throwing or stabbing spears. The primary Early Prehistoric Period complexes and phases presently identified in Montana include Clovis, Goshen, Folsom, Agate Basin, Hell Gap, Alberta-Cody, and the early part of Plains/Mountain.

Middle Prehistoric Period

The period from ca. 8000 to 1300 BP is characterized by projectile point types presumably designed for use with a spear thrower or atlatl. Evidence of stone boiling in the form of water fractured fire cracked rock is abundant throughout the Middle Prehistoric period. Water fractured fire cracked rocks (FCR) are stones which have been heated to high temperatures and then dropped into a water filled container and fractured.

Water fractured rock is interpreted as a food processing or food preparation technique (stone boiling) used for such activities as rendering grease from bone pieces, or cooking meat and other foodstuffs. The presence of fractured rock at a prehistoric site reflects a campsite where a range of domestic cultural activities occurred.

Pottery also appears during the latter part of the Middle Prehistoric period within some cultural complexes. Middle Prehistoric Period complexes or phases characterized by side-notched projectile point forms include Mummy Cave, Oxbow, Sandy Creek, and Besant. Complexes characterized by lanceolate, stemmed, or corner notched forms include the latter part of Plains/Mountain, McKean, and Pelican Lake.

Late Prehistoric Period

The period from ca. 400 BP to proto historic/historic times is characterized by projectile points intended for use with the bow and arrow. Point forms include a variety of un-notched, stemmed and notched forms. Bison hunting remained the primary subsistence activity in the plains of central and northern Montana, and a diversified hunting and gathering economy characterized groups in southern and western Montana. Communal bison kills, which involved coordinated efforts by groups of hunters driving a number of animals over cliffs, into corrals, or other natural traps, are present throughout the archaeological record, but reach a peak in both number and magnitude during the Late Prehistoric period.

Proto-historic/Historic Periods

In the northwest plains, the Proto-historic Period is usually defined as the time between arrival of the horse and/or manufactured trade goods on the northern plains but before arrival of white traders/explorers. The Proto-historic Period was of relatively short duration for Native American groups of Montana. Depending upon the authority cited, the Proto-historic Period may have lasted for no more than 100 years beginning early in the 18th Century with its end, and the beginning of the Historic Period, marked by the Lewis and Clark expedition passing through the area in the first years of the 19th Century. Historically, the Study Area was primarily occupied by Salish speaking groups such as the Flathead (Kroeber 1939; Kehoe 1992).

Native American Cultural Properties within the Study Area

To date 15 Native American cultural resource properties have been identified and documented within the Study Area. These sites are classified as lithic scatter and are largely

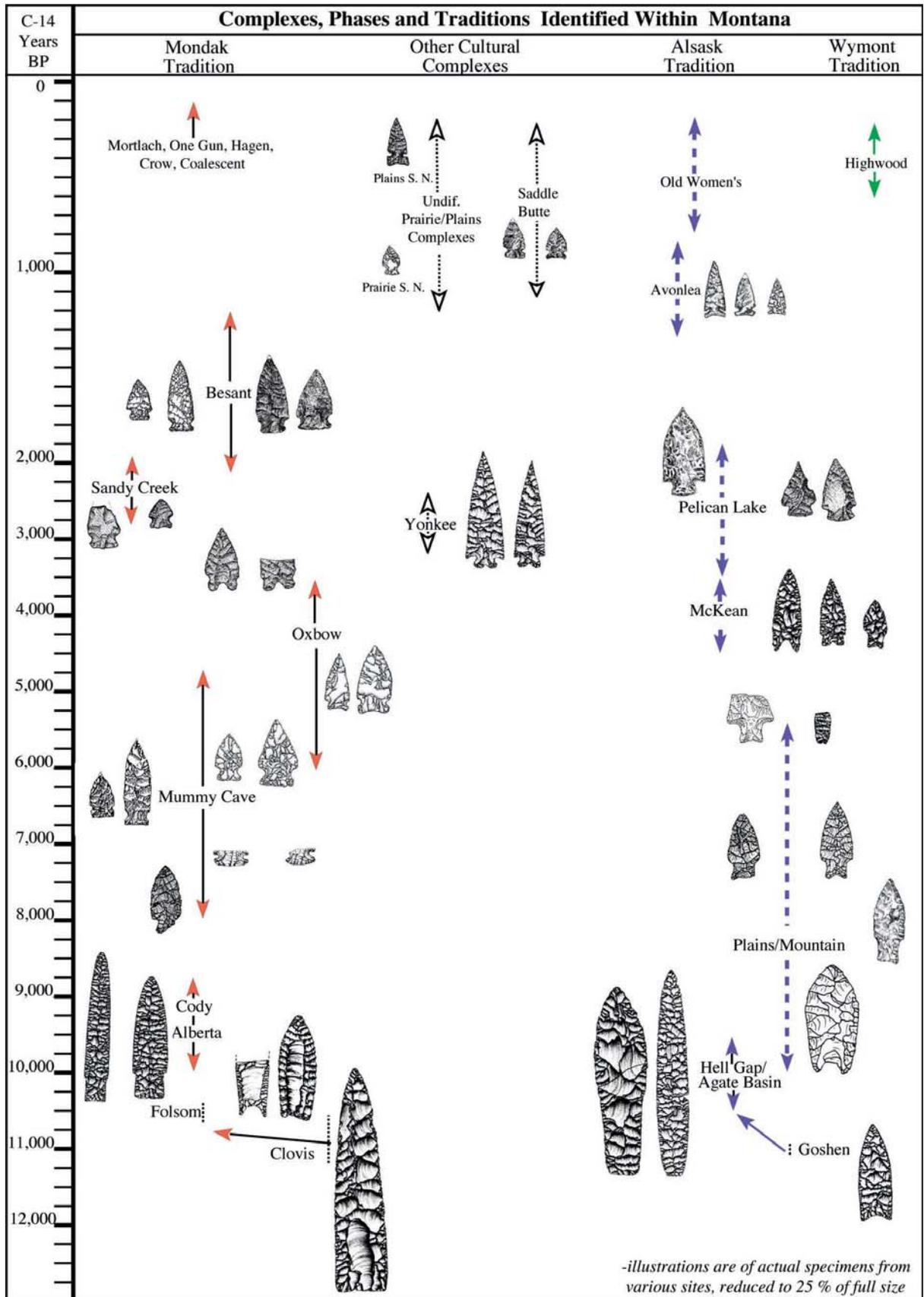
characterized by pieces of chipped stone. One site is associated with a tipi ring. Lithic scatter sites presumably reflect locations where chipped stone tool production was the primary or only activity taking place. Occasionally cores and complete or broken stone tools may also be present.

Existing documentation is not clear whether any of these properties has been excavated or shovel tested. Time diagnostic projectile point forms suggest Middle Prehistoric use at one site and Late Prehistoric use at one site. The age and cultural association of the remaining sites are indeterminate.

The National Register of Historic Places' eligibility for all Native American cultural properties within the Study Area is identified by the Montana State Historic Preservation Office (2007) as undetermined or unresolved.

Historic Euro-American Cultural Properties within the Study Area

Non-Indian settlement within the Study Area began in 1866 with the discovery of placer gold deposits in the Indian Creek drainage. The northern margin of the Study Area is located within the Park-Indian Creek Mining District (aka Hassel districts). Mining of placer gold deposits within the Indian Creek drainage started in 1866, with lode deposits subsequently identified upstream that were initially mined in 1875. Placer mining was hampered by seasonal availability of water. A dam and associated ditches and flume were constructed in the 1870s to control the flow of water in order to extend the placer season. After the turn of the century, mining within the district was reduced, but limited hardrock mining continued into the Depression Era. Beginning around 1940, gravel on lower Indian Creek was reworked using dry land dragline dredges. These operations were closed by Federal order during World War II, but resumed in 1946 and continued until 1950.



Prehistoric Cultural Sequence for Montana



U.S. Department of the Interior
Bureau of Land Management
Butte Field Office
Butte, Montana

CULTURAL SEQUENCE
Indian Creek Mine Expansion - Environmental Impact Statement
Broadwater County, Montana

FIGURE
3-9

One historic cultural property has been identified within the Study Area. The site consists of an historic building foundation and roadbed segment, which may or may not be mining related. Numerous unassociated prospecting pits are also present in the Study Area and appear to be remnants of gold and silver prospecting that occurred during the late 19th century and again in the Great Depression era of the 20th century.

Historic agricultural settlement within the general Project Area as evidenced by homestead and cash entries was first attempted in the early 1900's and continued into the late 1930's. Most of the public domain within the Study Area was never filed upon and that which was, subsequently was either relinquished or cancelled. No cultural resource properties reflecting historic agricultural settlement have been identified to date within the Project Area.

DIRECT AND INDIRECT IMPACTS

Proposed Action

Analysis of artifacts recovered from site investigations is contained in reports to BLM and the State Historic Preservation Office for inclusion in the Statewide Inventory. Documentation of fifteen Native American sites and one Historic cultural property identified within the Study Area has been completed. The status of these sites for listing on the National Register of Historical Places remains undetermined.

Twelve of the Native American cultural sites (lithic scatter) lie within the proposed disturbance boundary and could be affected by future mine operations. Of these, Graymont has identified four which could potentially be avoided through adjustment to haul routes and/or other mine facilities. Some or all of the

remaining eight sites and features could be lost under the Proposed Action. Graymont has indicated that the Historic cultural property lying within the proposed disturbance boundary could likely be avoided.

Some loss to archaeological resources occurs 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 Montana's past. Mitigation of cultural resources preserves a picture of the past through scientific archaeological research. Archaeological sites do not remain intact forever. The paleo-environmental record of Montana 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.

Alternative A – Modified Pit Backfill

Impacts to cultural resources from implementation of Alternative A would be the same as those described for the Proposed Action.

No Action Alternative

Potential impacts on cultural resources in the proposed mine expansion area would not occur as a result of the No Action Alternative. Previous EA documents (DEQ 2001) concluded that cultural resources in the North Claims Area would not be affected by existing permitted mining operations.

POTENTIAL MONITORING AND MITIGATION MEASURES

In accordance with the provisions of the National Historic Preservation Act, eligibility of unresolved or undetermined properties would be formally determined prior to any mining related disturbance. Impacts to sites determined as eligible would be mitigated prior to any mining disturbance. In the event new sites are discovered during mining operations, Graymont would notify the BLM authorized officer. Activities that could occur after notification include cessation of mining activity in the area of discovery, verification and preliminary inspection of discovery, and development/implementation of plans to avoid or mitigate the site. Mitigation measures would be developed with BLM and SHPO representatives and may include archival recordation of the site(s).

BLM and SHPO are currently considering excavation and further documentation at five sites within Graymont's Indian Creek Mine operations. One site lies within the currently permitted North Claims Area; one site lies outside the proposed mine expansion disturbance boundary; three sites lie within the proposed mine expansion disturbance boundary, one of which has been identified by Graymont as potentially avoidable.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

Implementation of the Proposed Action could result in loss of up to twelve known Native American cultural properties and one Historic cultural property. Loss of these features would constitute an irreversible commitment of a resource.

RESIDUAL EFFECTS

No residual effects to cultural resources are expected to result from implementation of the Proposed Action.

CHAPTER 4 CUMULATIVE EFFECTS

INTRODUCTION

Potential cumulative effects of the Proposed Action, Alternative A – Modified Pit Backfill, and No Action Alternative are described in this chapter. Continued operation and reclamation of the Indian Creek Mine as described in Chapter 2 would result in cumulative effects to the environment. A cumulative effect as stated in 40 CFR 1508.7 “...is the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency [Federal or non-Federal] or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.”

Cumulative impacts as defined by the Montana Environmental Policy Act include “...collective impacts on the human environment of the proposed action when considered in conjunction with other past, present, and future actions related to the proposed action by location or generic type” (75-I-220, MCA). Further, “[R]elated future actions may only be considered when these actions are under concurrent consideration by any agency through pre-impact statement studies, separate impact statement evaluations, or permit processing procedures” (75-I-208, MCA).

Results of cumulative effects analyses determine whether an action contributes to impacts associated with other activities in the area. Cumulative impact analyses do not consider potential mitigation for reasonably foreseeable future actions.

This chapter presents descriptions of the collective or additive impacts of combining past, present, and reasonably foreseeable future activities associated with mining and land uses in the vicinity of the Indian Creek Mine. Past, present, and reasonably foreseeable future land uses and man-made and natural occurrences are described in this chapter. Each resource analysis in this section begins with a description of the geographic area considered to be the Cumulative Effects Study Area for that resource and the rationale for the designation. The Cumulative Effects Study Area (Study Area) is typically a unique geographic area specific to individual resources.

The geographic cumulative effects area referred to in this section varies depending on the resource being discussed. **Figure 4-1** depicts the general area for most resources for which cumulative effects have been evaluated.

This analysis incorporates by reference information and analyses contained in the Draft Limestone Hills Training Area Land Withdrawal Legislative Environmental Impact Statement (MTARNG/BLM 2007).

PAST, PRESENT, AND REASONABLY FORESEEABLE FUTURE ACTIVITIES

Land uses and management activities in the vicinity of the Indian Creek Mine include the following general categories:

- Mining and Mineral Development
- Grazing
- Recreation
- Military Training – UXO Clearance

- Wildlife Management
- Wildfire /Controlled Burns
- Habitat Restoration Projects
- Urbanization (Subdivisions)

MINING AND MINERAL DEVELOPMENT

PAST AND PRESENT ACTIVITIES

Graymont or predecessor companies have been actively mining at the Indian Creek Mine since 1981. Historic dredge and placer mining occurred along Indian Creek east of the Graymont mine complex.

Pegasus Gold (now Apollo Gold) operated the Diamond Hill Mine located upstream from the Indian Creek Mine beginning in 1998. The Diamond Hill Mine is an underground gold mine that was developed in an ephemeral tributary to Indian Creek. Ore from this mine was shipped to Apollo Gold's mill facility located at the Montana Tunnels Mine west of Jefferson City, Montana. The Diamond Hill Mine closed in 2002 and is currently on a care and maintenance schedule.

Graphite and lead mining occurred in the Iron Mask Mine area about 5 miles north of the Indian Creek Mine. The Iron Mask Mine is no longer active. The Park Mine located near the headwaters of Indian Creek was reclaimed under the DEQ Abandoned Mine Reclamation program in 1997.

REASONABLY FORESEEABLE FUTURE ACTIVITIES

Neither BLM nor DEQ have received a Plan of Operations for any future mining activity in the Study Area. Future mining and mineral development in the area would likely be limited to operations at the Indian Creek Mine and

resumption of operations at the Diamond Hill Mine. There are active unpatented claims in the area.

GRAZING

PAST AND PRESENT ACTIVITIES

Livestock grazing has been and continues to be an important land use in the Project area. Multiple grazing allotments have been permitted and administered by BLM over the past several decades. The Study Area contains all, or portions of, three grazing allotments which are summarized in **Table 4-1**.

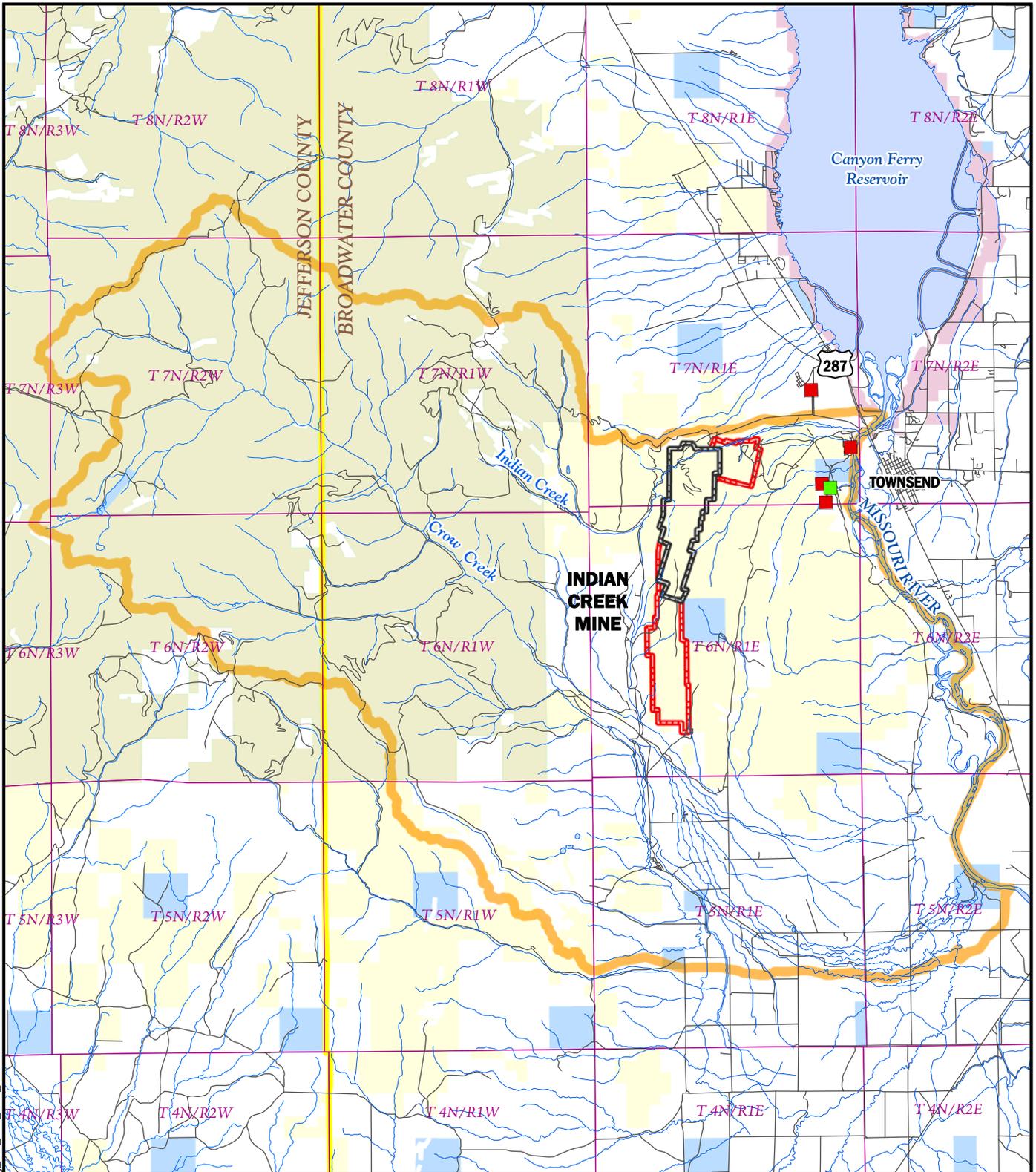
REASONABLY FORESEEABLE FUTURE ACTIVITIES

Congressional approval to withdraw 18,644 acres of public land within the LHTA from BLM administration would transfer responsibility for grazing management on land within the LHTA to MTARNG. Existing grazing allotments would be extended for up to 20 years under the Preferred Alternative for the LHTA (MTARNG/BLM 2007).

RECREATION

PAST AND PRESENT ACTIVITIES

No developed recreation sites are located in the vicinity of the Indian Creek Mine. Recreation in the area is managed by BLM in accordance with the Elkhorn Mountains Travel Management Plan. Public land in the area has been and continues to be used for recreation activities including hiking, rock climbing, hunting, and off-road vehicle use. About 8,200 acres of public land in the LHTA have been closed to non-military use due to the potential presence of UXO.



Base Data Source: Montana NRIS GIS Data; Helena National Forest; Broadwater County.

Land Ownership

 	Existing Operating Permit Boundary	Major Subdivision	State of Montana	General Cumulative Effects Study Area Including: Soil, Water, Vegetation, Air, Land Use/Access, Cultural, Geology/Minerals, Noise, and Visual Resources
	Proposed Operating Permit Boundary	Minor Subdivision	Bureau of Land Management	
	Roads	Bureau of Reclamation	Forest Service	
	Streams			

H:\13532 Graymont\1 EIS\5000 GIS\Projects\EIS\Fig_4-2_wild_cum_effects.mxd



U.S. Department of the Interior
Bureau of Land Management
Butte Field Office
Butte, Montana

GENERAL CUMULATIVE EFFECTS STUDY AREA
Indian Creek Mine Expansion - Environmental Impact Statement
Broadwater County, Montana

FIGURE
4-1

Allotment Name/Number	Number of Livestock	Grazing Season (Month/Day)	BLM AUMs	Total Acreage ¹
Dowdy Ditch (North & South) No. 20209	20 cattle	5/1 to 6/15	30	5,056
Limestone Hills No. 20273	484 cattle	5/15 to 9/30	1,937	14,331
Indian Creek No. 20233	212 cattle	5/15 – 10/15	344	9,772

¹ Includes federal, state, and private land.

AUMs = Animal Unit Month (Approximately 780 pounds forage [dry weight]).

Source: MTARNG/BLM 2007.

County roads are accessible to all traffic. The MTARNG restricts access on roads within the LHTA when military operations could cause unsafe conditions. All roads east of and including Old Woman's Grave Road are open year-round with periodic designated road closures mid-April through November. With the exception of Indian Creek Road and access roads to Graymont's mining areas, roads passing through the LHTA area west of Old Woman's Grave Road are closed to non-military use at all times.

Other recreation related activities include:

- Projects by the USFS to reconstruct and relocate trails to enhance accessibility and avoid private property; and
- Joint effort between BLM and USFS on road stabilization projects in the Elkhorn Mountains.

REASONABLY FORESEEABLE FUTURE ACTIVITIES

Recreational activities would continue at current levels in the area. Surface management of the LHTA by the U.S. Army Corps of Engineers may result in modification to some current access to specific locations within the area. Periodic designated road closures (described above) from mid-April through

November would continue. Roads passing through the LHTA area west of Old Woman's Grave Road would likely remain closed to non-military use at all times.

Projects included in the Elkhorn Implementation Group Program of Work would likely continue as reasonably foreseeable future activities depending on availability of funding.

MILITARY TRAINING – UXO CLEARANCE

PAST AND PRESENT ACTIVITIES

Limestone Hills Training Area (LHTA)

The LHTA, located near Townsend, Montana, has supported the military mission of the MTARNG from the 1950s to the present (**Figure 3-1**). In 1984, the U.S. Department of the Interior, BLM granted the MTARNG a 30-year right-of-way to use BLM-administered public land within the LHTA for military purposes under specific terms and conditions.

The LHTA is used for military training exercises approximately 140 days per year during the period mid-April through November. The LHTA is not used for military training exercises from December 1 to mid-April each year. This annual non-training period was requested by FWP to protect big game wildlife habitat.

The current right-of-way agreement between BLM and MTARNG allows the following military practices on the LHTA:

- Firing of armored tanks, mortars, howitzers, and support weapons, including live ammunition;
- Helicopter training and firing of associated weapons with live ammunition;
- Infantry maneuvers and firing exercises, including small arms, grenades, and mortars;
- Training various support groups, usually involving a bivouac, perimeter defense, and small arms fire;
- Equipment maintenance and testing exercises;
- Construction and maintenance of improvements – all existing improvements and all planned improvements approved by past permits are authorized; and
- MTARNG is authorized to extract material from a community gravel pit. Large withdrawals of material from the pit must be confirmed with BLM.

The LHTA provides 18,644 acres for MTARNG to train mechanized infantry, armor, aviation, artillery, and cavalry units. Training occurs on one or more of 17 designated live-fire ranges and a dismounted training area. The frequency of use of each range varies from year to year as some are used more than others to meet the military mission.

UXO Clearance

As a result of training exercises, portions of the LHTA have been contaminated with unexploded ordnance (UXO). UXO is ordnance that failed to detonate fully upon impact after being fired. Details regarding the UXO status and management protocols are described in the Limestone Hills Training Area Land Withdrawal Draft Legislative Environmental Impact Statement (MTRNG/BLM 2007).

Past live-fire training has resulted in ordnance and explosives contamination of public land now encumbered by unpatented mining claims controlled by Graymont. Graymont has a permit to mine limestone authorized by DEQ and BLM with a provision that mining cannot proceed past the 2.75-inch rocket safety fan line until the area is cleared of ordnance and explosives hazards. The 2.75-inch rocket safety fan line shown on **Figure 2-1** demarcates the boundary between active mining operations permitted by DEQ and BLM and the area potentially contaminated with UXO.

Because the Department of Defense prohibits exploration, drilling, and mining on the surface of UXO contaminated land, MTARNG initiated a clearing activity on mining claims considered to be high priority by Graymont. This high priority UXO clearance area is within a BLM-instituted closure area, west of Old Woman's Grave Road, and is currently under the safety control of MTARNG. The purpose of the clearance activity is to remove the ordnance and explosives hazard to allow mining by Graymont. Any mining that would occur in this area depends upon successful completion of UXO clearance as determined by the Department of Defense Explosive Safety Board.

Clearance information is transmitted to BLM, which then informs Graymont that operations can proceed in the cleared area. Approximately 75 acres have been cleared of UXO contamination south of the rocket safety fan line and mining is occurring in that area (**Figure 2-1**).

REASONABLY FORESEEABLE FUTURE ACTIVITIES

The right-of-way agreement between BLM and MTARNG expires March 26, 2014. To continue military use of public land within the LHTA, the U. S. Department of the Army (Army) must apply to withdraw federal land in the LHTA in accordance with the Engle Act of 1958, which requires an Act of Congress for military withdrawals encompassing more than 5,000 acres.

BLM Instruction Memorandum No. 91-283 states that any land for which the military is likely to have UXO, chemical munitions, or other similar hazardous materials, or where long-term exclusive use of the land is required for public safety or national security reasons, may be authorized for use only by public land withdrawal. The Army on behalf of the MTARNG has proposed to withdraw 18,644 acres of public land within the LHTA from BLM administration. The Army proposes that the Department of the Interior and Congress transfer administrative responsibility of all public land within the LHTA to the Army as a land withdrawal for military training use by the MTARNG. Under the Engle Act, withdrawal of public land within the LHTA would be subject to the condition that all minerals, including oil and gas, remain under the jurisdiction of the Secretary of the Interior (BLM) and administered under applicable public mining and mineral leasing laws.

Reasonably foreseeable future activities would likely include a continuation of military training exercises and UXO clearance operations at

current levels. Administration of surface resources would be transferred to the U.S. Army Corps of Engineers.

URBANIZATION

PAST AND PRESENT ACTIVITIES

Broadwater County has experienced marked expansion in the last 5 years. Recent population growth in the County and its impact on services and infrastructure was reported in a study conducted on County Government in 2006:

“The needs of the county, however, have changed since 1995. Population is increasing rapidly, population patterns are shifting, and citizen demands for services are rising. The population increase of 3% in the past 5 years is placing heavy new demands on county government to provide urban services such as roads, law enforcement, and refuse disposal. To effectively respond to these growing needs, county government must modify its structure and authority” (Broadwater County Local Government Study Commission, Final Report, August 18, 2006).

Sixteen new subdivisions have been or are currently under construction in the county. Subdivisions are classified by the county planning office as Major (> 5 lots) and Minor (< 5 lots). Five subdivisions are currently pending approval, approved, or under construction in close proximity to the proposed mine area boundary (**Figure 4-1**). These include:

- Indian Creek Estates Major - Northeast of current Graymont Indian Creek Plant - 60 Total Lots (30 A+B Lots for development);
- Riverview Heights Major - East of current Graymont Indian Creek Plant 29 Lots;
- V-K Minor - East of current Graymont Indian Creek Plant - 13 Lots;

- Deer Path Major - East of current Graymont Indian Creek Plant - 7 Lots; and
- Riverview Estates Major - East of Current Graymont Indian Creek Plant - 6 Lots.

Other Broadwater County Major Subdivisions (greater than 5 lots) approved, under construction, or pending approval include:

- Antelope Acres – 24 lots;
- Antelope Estates – 18 lots;
- Grandview Manor – 57 lots;
- Lazy HM Estates- 26 lots;
- Spruce Grove - 70 lots;
- Furman - 17 lots;
- Muffley Estates - 10 lots;
- Muffley No. 2 - 7 lots;
- Mountain West Estates - 19 lots;
- Elkhorn - 14 lots; and
- Valley Heights - 52 lots.

REASONABLY FORESEEABLE FUTURE ACTIVITIES

According to the Montana Department of Commerce, Census and Economic Information Center, it is estimated the State of Montana will experience a total increase in population of 33 percent from the year 2000 to 2030. It is also anticipated the population group 65 years of age and over will increase 112 percent for the same period.

The total population of Broadwater County is expected to increase 47 percent from year 2000 to 2030. For the same period, the county will also experience an increase in the age group 65 and over of 166 percent.

Land in the Study Area is currently owned or administered by the following groups:

- Public land administered by Bureau of Land Management – 65,139 acres
- Public land administered by Bureau of Reclamation – 47 acres
- Public land administered by Forest Service – 160,593 acres
- Public land administered by State of Montana – 12,505 acres
- Private land – 155,779 acres

Public land in the Study Area administered by BLM supports a variety of current and reasonably foreseeable future uses including farming, ranching, and grazing. Public land administered by the Bureau of Reclamation supports similar current and future uses in addition to recreation and wildlife management. National Forest System land in the Project area supports recreation and wildlife management.

Private property in the area supports livestock grazing, residential housing, commercial enterprise, and agriculture. Broadwater County currently has no zoning rules or regulations pertaining to new construction or land use associated with private property.

WILDLIFE MANAGEMENT

PAST AND PRESENT ACTIVITIES

The Elkhorn Mountains are managed in partnership with the Beaverhead-Deerlodge and Helena National Forests, Butte Field office of BLM, and FWP as the Elkhorn Cooperative Management Area. In 1992, these agencies agreed to cooperatively manage all federal public land in the Elkhorns with emphasis on management of diverse and healthy wildlife and fish habitats. An Elkhorn Working Group consisting of about 20 private citizens and agency representatives was formed to develop collaborative recommendations related to wildlife/livestock management strategies in the Elkhorns. Projects completed by the agencies in

the Crow Creek and Indian Creek drainages include acquisition of the Iron Mask Ranch, reintroduction of bighorn sheep, and stream restoration of a portion of Indian Creek.

The Iron Mask Ranch, located northwest of Townsend on the east flank of the Elkhorn Mountains, was acquired by BLM in 2007. The acquisition resulted in 5,548 acres being placed into public ownership. The ranch provides critical winter range for elk, bighorn sheep, and year-round habitat for elk, antelope, mule deer, and white-tailed deer.

Bighorn sheep were transplanted into the Indian Creek/Crow Creek area of the Elkhorn Mountains in the winters of 1996, 1997, and 2000. These sheep successfully reproduced and established primary winter ranges in the Crow Creek and Indian Creek drainages. Some sheep are present in the Study Area year-round. Wintering bighorn sheep may occur anywhere in the Study Area, but are most often associated with limestone ridges and mountain mahogany/shrub habitats (MTARNG/BLM 2007). During winter 2007-2008 bighorn sheep in the area contracted pneumonia resulting in a loss of approximately 95 percent of the herd. A FWP aerial survey in March 2008 revealed 19 bighorn sheep remaining from a population estimated at 220 animals (Carlson 2008).

Other wildlife management related projects in the Elkhorns include:

- Elkhorn Mountains Westslope Cutthroat Trout Restoration Program - a cooperative effort supported by FWP, Helena National Forest, BLM, and Montana Trout Unlimited to reintroduce westslope cutthroat trout to selected streams throughout the Elkhorn Mountains;

- Aerial surveys on elk, bighorn sheep, mule deer, antelope, and mountain goats conducted by FWP in Hunting District 380 to support hunting season quotas for each species;
- Coordination by FWP with respective landowners of 20 Block Management Areas consisting of over 100,000 acres; and
- The North Elkhorn National Network Research Project funded by the U.S. Forest Service to inventory and monitor key breeding bird species and cavity nesting species for baseline trends.

Various habitat restoration projects have been implemented to enhance or reclaim habitat for selected species. Specific projects are described in the *Habitat Restoration Projects* section of this chapter.

REASONABLY FORESEEABLE FUTURE ACTIVITIES

The Iron Mask Ranch acquisition was the focus of the Elkhorn Conservation Initiative, launched in 2003, by the Rocky Mountain Elk Foundation, USFS, BLM, and FWP. The goal of the initiative is to bring communities, landowners, and hunters together in a 5-year effort to protect and enhance at least 20,000 acres of wildlife habitat in the Elkhorn Mountains.

Evaluation of the possibility of conducting the second phase of the Lower Indian Creek Stream Restoration Project from the end of the Phase I section to the confluence with the Missouri River has been underway since 1999, with a test project to be conducted in 2008.

Aerial wildlife surveys and the Block Management Program would continue, whereas species specific studies would likely terminate at a predetermined date or upon exhaustion of funding.

WILDFIRE/CONTROLLED BURNS

PAST AND PRESENT ACTIVITIES

Since 2000, four fires have occurred in the Study Area, burning a total of 258 acres as shown on (Figure 4-2).

- July 2000 – 84 acres;
- September 2005 – 52 acres;
- July 2006 – 21 acres; and
- July 2006 – 101 acres.

These fires resulted from mandatory use of tracer ordnance during military training exercises in the LHTA (Wheeler 2008). Following the 2006 fires, the MTARNG constructed a fire break around the High Explosive Impact Area. The fire break is 5.3 miles in length by 20 feet in width and disturbed approximately 13 acres (MTARNG 2008).

REASONABLY FORESEEABLE FUTURE ACTIVITIES

Wildfires will continue to be an important component of land management for public and private landowners. Potential for wildfires to continue in the Study Area has been reduced by construction of a fire break around the High Explosive Impact Area.

HABITAT RESTORATION PROJECTS

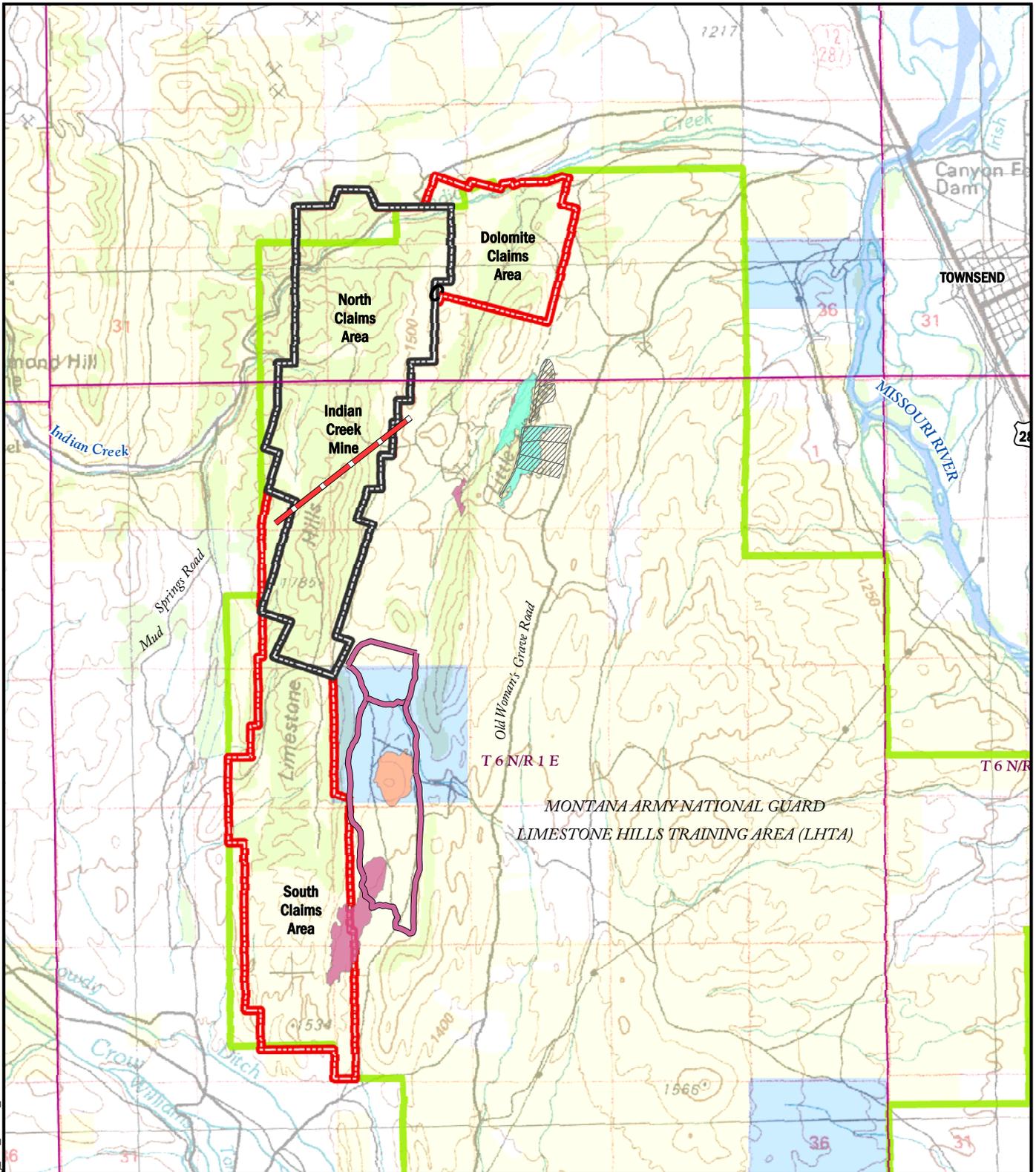
PAST AND PRESENT ACTIVITIES

As a first step toward management of the Elkhorn ecosystem, the BLM, USFS, and FWP undertook a landscape level inventory of the components and a study of the landscape level

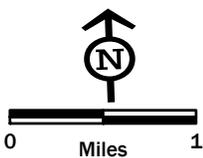
changes. The Landscape Analysis, completed in 1992, provided the agencies a common vision and a solid foundation for establishing overall annual work priorities. Each year the Implementation Group develops a program of work for approval by the Elkhorn Steering Committee.

Since its inception the Elkhorn Implementation Group has developed and implemented numerous projects, some of which are ongoing (USFS 2006). A summary of habitat restoration related projects and objectives include:

- Elkhorn Initiative – a cooperative (BLM, USFS, and FWP) effort coordinated with the Rocky Mountain Elk Foundation to enhance wildlife habitat in the Elkhorns through land adjustments, habitat projects, and acquisitions. Coordinate with private landowners to enhance bighorn sheep and elk habitat in order to reduce impacts of wildlife on private land. Ongoing projects include prescribed burns, fence and water development projects, and noxious weed treatments.
- Iron Mask Acquisition – Phase I completed in 2006; completion of acquisition.
- Integrated Weed Management Program – baseline data collection and monitoring to develop a digitized weed map for the Elkhorn Mountains. Coordinate weed management priorities with private landowners and respective county weed management areas.
- Private Landowner Coordination and Vegetation Enhancement – Complete 1st phase of the Rattlesnake and Prairie Gulch private land prescribed burns.



Data Source: National Guard GIS Data.



- Existing Operating Permit Boundary
- Proposed Operating Permit Boundary
- Existing LHTA Boundary

- Fire Break - 2006
- 2.75 Rocket Fan Line
- Fall 2006 Reseeded Areas

Wildfires

- July 2000
- September 2005
- July 2006

Land Ownership

- State of Montana
- U.S. Bureau of Land Management

H:\13532 Graymont\13532000 GIS\Projects\IEIS\Fig. 4-2_Guard_Fire.mxd



U.S. Department of the Interior
Bureau of Land Management
Butte Field Office
Butte, Montana

WILDFIRES AND RESEEDED AREAS
Indian Creek Mine Expansion - Environmental Impact Statement
Broadwater County, Montana

FIGURE
4-2

Elkhorn Mountains Westslope Cutthroat Trout Restoration Program – Introduction of trout into South Fork Crow Creek, Little Tizer Creek, and Crazy Creek.

- Update the Landscape Analysis to include data from past accomplishments, data collected from the Vegetation and Range Utilization Study and Fire History Study to provide a database for cataloging and tracking implementation and effectiveness, and identify a comprehensive restoration plan involving fuel treatments, commercial and non-commercial thinning, riparian enhancement, and weed treatments.
- Compile and submit grant proposals to various private organizations and public agencies to support acquisitions, noxious weed treatments, and other habitat restoration projects.
- Elkhorn Fire Plan – Implement fire plan affecting fire management on 80,000 acres.

In October 2006, the MTARNG contracted a study to determine the extent of curl-leaf mountain mahogany within the LHTA and reseed previously burned areas with a mixture of shrubs (DBEC, Inc. 2007). Approximately 103 acres were broadcast seeded with a mixture of the following shrubs:

- Big sagebrush;
- Rubber rabbitbrush;
- Curl-leaf mountain mahogany;
- Skunkbush sumac; and
- Woods' rose.

REASONABLY FORESEEABLE FUTURE ACTIVITIES

Habitat restoration projects undertaken by BLM, USFS, and FWP would involve management of vegetative communities including grassland, shrubland, forests and woodland, riparian vegetation, and noxious weeds. Most of the projects developed by the Elkhorn Implementation Group (listed above) will likely continue.

Grassland and Shrubland within the Upper Missouri Watershed Area

Due to the lack of periodic fires, partially in response to decades of successful fire suppression efforts, grasslands are becoming woodland or shrubland, and many shrubland areas are being converted to woodland. Conifer encroachment into these habitats is occurring at a rate of over 600 acres annually. Under the current Resource Management Plan (BLM 2009) vegetation treatments (prescribed burns) would range from 180 to 650 acres annually.

Forests and Woodlands within the Upper Missouri Watershed Area

Treatments in these habitat types are designed to mimic pre-fire suppression conditions and promote healthy, diverse forest ecosystems and wildlife habitat. Smaller diameter thinning along with low intensity understory burning would occur in seedling, pole, and some medium (9 to 15 inch diameter) sized trees to open the canopy and allow understory vegetation to become re-established. Under the current Resource Management Plan (BLM 2009) vegetation treatments would range from 210 to 860 acres annually.

Under the Helena National Forest Plan (USFS 1986), timber in Elkhorn Management Unit No. 1 (includes lower Crow and Indian creeks) is classified as unsuitable and would only be harvested as a management tool to maintain and enhance elk winter range.

Riparian Types within the Upper Missouri Watershed Area

Riparian areas occur throughout all forest types, grassland, and shrubland and have experienced many of the same effects of long-term fire suppression. Some riparian habitats have been degraded due to historic grazing, mining, timber harvest, and road construction. Treatments in riparian areas focus on re-establishing willows, aspen, and cottonwood stands as well as other riparian vegetation to move towards pre-fire suppression stem densities in conifer stands. Under the current Resource Management Plan (BLM 2009), BLM would manage 3,270 acres of riparian and associated upland vegetation in streamside management zones and mechanically treat or prescribe burn 10 to 20 acres annually to restore communities to properly functioning condition.

Noxious Weeds

Treatment of noxious weed infestations is dependent on the amount of disturbance proposed by other management actions as well as the number of designated open roads. Treatments would include, but not be limited to, hand-pulling; chemical spray; use of biological agents such as insects, goats, or sheep; cultural treatments such as modifying timing or intensity of other management activities; and public education. Changing grazing management or prescription grazing would also be used as a treatment and could include changing the season of use, intensity of use, or type of livestock.

Under the current Resource Management Plan (BLM 2009), from 2,100 to 5,000 acres would be treated annually throughout the Butte Field Office area including up to 2,000 acres in the Upper Missouri Watershed which includes the Elkhorns and Limestone Hills.

RESOURCE ASSESSMENTS

AIR QUALITY

Air pollutant sources within the Study Area include existing mining operations and other background sources. Emissions from mining include criteria air pollutants, such as particulate matter less than 10 microns (PM₁₀) and gaseous emissions (nitrogen oxides, sulfur dioxide, and carbon monoxide). Background emission sources include fugitive dust from traffic on unpaved roads, windblown dust, agricultural activities, and a railroad load-out facility.

Mining and processing operations at the Indian Creek Mine are regulated under Air Quality Permit No. 1554-16 issued by DEQ. This permit establishes air emission levels that meet air quality standards which are protective of human health and the environment.

CUMULATIVE EFFECTS STUDY AREA

The Cumulative Effects Study Area for Air Quality encompasses the eastern slopes of the Elkhorn Mountains, Indian Creek Mine area and load-out facility, and the City of Townsend. This area was selected for the geographic study area for cumulative effects because it represents an area in which other sources of air emissions (if present) could combine with emissions from the Indian Creek Mine.

CUMULATIVE EFFECTS

No cumulative effects have been identified for Air Resources as a result of implementation of the Proposed Action or Alternative A – Modified Pit Backfill in the Project area. No

emission sources are located within the Cumulative Effects Study Area that would combine with emissions from mining and ore processing operations. Emissions from the Indian Creek Mine are in compliance with the air quality permits held by Graymont.

CLIMATE AND CLIMATE CHANGE

CUMULATIVE EFFECTS STUDY AREA

The Cumulative Effects Study Area for climate change includes the earth and its atmosphere. The atmosphere is largely comprised of nitrogen (78%) and oxygen (21%). The remaining one percent of the atmosphere is comprised of the following noble gases: argon, neon, krypton, xenon, helium and trace gases: carbon dioxide, nitrous oxide, methane, water vapor, and ozone.

CUMULATIVE EFFECTS

Through complex interactions on a regional and global scale, accumulation of greenhouse gases (GHG) in the atmosphere results in a net warming of the atmosphere, primarily by decreasing the amount of heat energy radiated by the earth back into space. Although GHG levels have varied for millennia, industrialization and burning of fossil carbon sources have caused an increase in the atmospheric concentrations of GHGs – most notably, carbon dioxide (CO₂). Increases in atmospheric concentration of GHGs likely contribute to an increase in the average temperature of the atmosphere and surface of the earth, typically referred to as global warming (IPCC 2007a). This increase in temperature contributes to overall changes in precipitation and weather patterns, typically referred to as climate change. Climate change likely contributes to numerous long- and short-term environmental effects, including plant and animal species redistribution, desertification, rising sea levels, preferential fertilization and growth of plant life, melting

permafrost, changing global climate patterns, redistribution of disease vectors, and altered precipitation regimes around the globe (IPCC 2007a; USGCRIO 2009).

While the Proposed Action may contribute to the effects of climate change to some extent, it is not currently possible to associate any of these particular emissions with the creation of any specific climate-related environmental effects. The impact of CO₂e emissions on climate change and the hydrologic cycle is in its formative phase; therefore, it is not yet possible to know with confidence the net impact to climate. Although the effects of GHG emissions and other climate drivers in the global aggregate are estimable, it is not possible to determine what effect GHGs associated with the Indian Creek Mine might have on the phenomena of global warming and climate change (IPCC 2007b). Global warming and climate change are variable across time and space, contributing to disparate impacts in various regions at different times. Thus, the state of the science makes it currently impossible to predict what impact emissions associated with the preferred alternative may have on the global climate system, much less determine what impact these activities, by contributing to climate change, may ultimately have on the environment at any particular time or place.

The lack of detailed scientific tools designed to predict climate change on regional or local scales limits the ability to quantify potential future impacts based on specific local actions. Most models suggest the Northwest United States, including Western Montana, would experience longer, hotter and drier summers with a likelihood of drought conditions. These conditions would likely lead to damaging wildfires and an increased likelihood of continued invasive species impacts on native plants (USEPA 2008; IPCC 2007b; USGCRIO 2009).

Though predicted emissions associated with the Proposed Action cannot currently be connected to any specific effect or contribution to climate change, these emissions may contribute to the climate change phenomenon nonetheless. Therefore, this discussion will attempt to put the relatively minor emissions associated with the Indian Creek Mine in context with other past, present, and reasonably foreseeable actions from around the globe which, together with the actions contemplated in the alternatives, contribute to climate change and its impacts.

Approximately 730 billion tons of CO₂ are present in the atmosphere (Veizer 2009). In 2006, global anthropogenic CO₂e emissions were approximately 30.2 billion metric tons (Boden *et al.* 2009). In 2007, total CO₂e emissions from all sources in the US were 7.282 billion metric tons. Of this amount, contribution of CO₂e from lime production facilities in the US was 29.8 million metric tons or approximately 0.4 percent of the total annual emission level (EIA 2008; NLA 2008). CO₂e emissions from the Indian Creek Mine represent less than 0.001 percent of the total annual global CO₂e emissions.

While the Proposed Action and alternatives both continue emissions of CO₂e, the mining and processing of limestone is not a major factor in global climate change. Major anthropogenic factors in climate change have been and remain; burning of fossil fuels for electricity, manufacturing, transportation; deforestation and land surface change; agricultural and livestock operations; and fugitive methane emissions associated with pipelines and coal/oil/natural gas production.

GEOLOGY AND MINERALS

Effects of mining on geology and mineral resources under the Proposed Action and Alternative A – Modified Pit Backfill include

excavation and relocation of rock materials from the natural setting and removal of limestone and dolomite ore from the Project area. Movement and disposition of rock materials in terms of volume and location varies by mine pit within the permit area. Approximately 55 million tons of ore and 13 million tons of overburden would be removed during the proposed mine expansion.

Potential sedimentation of run-off water and release of trace elements is the primary issue associated with excavation and disposal of rock materials in the mining process. These issues are described in the *Water Resources* section of Chapter 3 and this chapter.

CUMULATIVE EFFECTS STUDY AREA

The Cumulative Effects Study Area (Study Area) for geology and mineral resources is the combination of the existing and proposed mine permit areas depicted on **Figures 2-1, 2-2, and 2-3**, respectively, and incorporates past, present, and reasonably foreseeable mining activity over a 50-year period within the Indian Creek drainage.

CUMULATIVE EFFECTS

Cumulative impacts that could result from extraction of the mineral resource are primarily associated with relocating approximately 1 million tons of ore and overburden annually, of which 37 to 45 percent is sold as lime product. Reasonably foreseeable future activity associated with existing permitted mine disturbance would continue at this rate for approximately 15 years. Proposed expansion of the Indian Creek Mine would include mining and processing at current rates over an additional 35 years for a total 50-year mine life.

Past, present, and reasonably foreseeable impacts associated with development of geologic resources include historic placer

operations along Indian Creek; development and operation of the Diamond Hill Mine; sand and gravel removal from a community gravel pit within the LHTA for range maintenance; building and maintenance of Indian Creek Road; and planned subdivision developments northeast of the Study Area. The volume of rock and soil removed during past mining activity and placed in waste rock dumps or as spent placer tailing has not been quantified.

The cumulative effects of excavation, processing, and relocation of rock associated with mining and road building include release of sediment to watersheds, release of dust to air, and release of trace metals to groundwater and surface water sources. No quantification is available for these releases from historic and past mining activity. The primary environmental receptor potentially affected by mining, road building, and other land disturbing activities is water resources (groundwater and surface water). Quality of groundwater and surface water in the Cumulative Effects Study Area is described in the *Water Quantity and Quality* section of Chapter 3.

WATER QUANTITY AND QUALITY

Water resources in the Study Area include surface water (streams, rivers, springs, and seeps) and groundwater. Principal drainages include Indian and Crow creeks. These sources of surface water support livestock, wildlife, fish, aquatic animals, birds, and vegetation and are hydrologically connected to some groundwater systems. Surface water is not used at the mine. Storm water is and would continue to be collected from disturbed areas using ditches and detention ponds. If discharge from any detention pond occurs during storm events, it would be from an agency-approved storm water outfall.

Use of groundwater from aquifers in the Study Area includes mining, domestic, stock water, irrigation, and other uses. Groundwater pumped from wells at the Indian Creek Mine is used for dust control, mineral processing, and potable uses. The proposed north mine pit in the Dolomite Claims Area would intercept groundwater. There is no current or planned discharge of groundwater from the mine site. Any groundwater encountered in the Dolomite Claims north mine pit may be used for dust control or other mine-related purposes. Some limited drawdown of groundwater may occur around the Dolomite Claims pit area during mining operations. The north mine pit would be partially backfilled at closure to avoid development of a pit lake. Some nitrates from blasting residues on rock may be introduced to groundwater in the local area.

CUMULATIVE EFFECTS STUDY AREA

The Cumulative Effects Study Area for water resources encompasses surface water and groundwater in the vicinity of existing and proposed mine expansion areas associated with the Indian Creek Mine and historic and inactive mining that has occurred on upper reaches of Indian Creek. The Study Area includes Indian Creek from its headwaters to the confluence with the Missouri River near Townsend and Crow Creek from the National Forest Boundary to the confluence with the Missouri River near Toston.

This geographic area was selected as the Cumulative Effects Study Area for water quantity and quality because potential effects of the Proposed Action and Alternatives on water resources could combine with other land use activities to impact watersheds that encompass the Indian Creek Mine area. The Indian Creek and Crow Creek watersheds are the primary drainages that encompass the Project area.

CUMULATIVE EFFECTS

Cumulative effects to water quantity and quality could result from wildfire, livestock grazing, proposed expansion of the Indian Creek Mine, and other possible construction activities including Alternative A – Modified Pit Backfill. The Diamond Hill Mine, located in the upper Indian Creek drainage, maintains a valid operating permit but has ceased operations and is not expected to contribute impacts to water quantity or quality in the Indian Creek drainage.

Historic placer operations along and in Indian Creek have altered the original stream channel. Stream rehabilitation projects have been initiated along Indian Creek to restore stability of the creek.

Cumulative impacts to water quantity and quality are primarily associated with potential sediment loading in surface water run-off resulting from mining and other land-disturbing activities. This could affect lower portions of Indian Creek and/or Crow Creek to their confluence with the Missouri River. As described previously, only run-off water from the Indian Creek Mine that exceeds the capacity of detention ponds would discharge off-site under an agency-approved storm water permit. Other types of best management practices (e.g., silt fences, straw bales, run-off control ditches) are used at the mine site to reduce sediment levels in run-off water.

Sediment from historic placer mining has resulted in redistribution of fines in the original creek channel to other locations within the drainage. The fine sediment bedload in Indian Creek in areas where placer mining occurred has been deposited in locations where stream energy has limited affect on bedload movement. Some sediment is entrained by stream flow on an annual basis in response to spring run-off.

Potential increases in sedimentation to the nearby streams could add to sediment loading from other areas subject to livestock grazing, wildfires, and/or construction activities. Present and reasonably foreseeable land disturbing activities in the Study Area include subdivision development northeast of the Study Area and sand and gravel operation from a community gravel pit within the LHTA. Aggregate from this gravel pit is used for range maintenance and building and maintenance of the Old Woman's Grave Road. No information or data exist to quantify the contribution of sediment from roads, burned areas, grazing allotments, or gravel pit operations to area drainages.

No trace elements are predicted to be released from proposed mine expansion at the Indian Creek Mine. Contribution of trace metals from other historical mining and natural sources within the Indian Creek watershed is expected to continue into the future.

Groundwater drawdown could occur in the vicinity of the Dolomite Claims north mine pit area during operations at the Indian Creek Mine. No other reasonably foreseeable activities in the Study Area, however, are expected to result in cumulative groundwater drawdown effects.

Reasonably foreseeable future activity associated with the existing permitted Indian Creek Mine disturbance would continue for approximately 15 years. Proposed expansion of the Indian Creek Mine would include mining and processing at current rates over a 50-year mine life.

SOIL RESOURCES

Information on soil resources in the Study Area is developed on a planning level or project specific basis through soil surveys. Surveys are conducted at various levels of intensity depending on the use proposed. Soil data

collected to support planning and evaluation of the Proposed Action and Alternative A – Modified Pit Backfill are described in the *Soil Resources* section of Chapter 3 and includes the chemical and physical properties, distribution and extent of each soil type (**Figure 3-5**), and suitability rating of the soil for reclamation.

CUMULATIVE EFFECTS STUDY AREA

The Cumulative Effects Study Area (Study Area) for soil resources (**Figure 4-1**) encompasses the existing and proposed mine expansion permit areas and watersheds that drain the Project area. The Study Area includes the headwaters of Indian and Crow creeks to the confluence with the Missouri River. This Study Area is based on natural and manmade impacts to soil resources that result in soil movement or loss and changes in soil fertility and productivity combined with the Proposed Action and Alternatives that could impact other resources (e.g., surface water).

CUMULATIVE EFFECTS

Soil resources are cumulatively impacted through land disturbance by mining, fire, agriculture, recreation, and a variety of other natural and man-caused activities within the Study Area. These impacts are described in terms of the type of impact and the number of acres affected. Consideration is also given to the amount of those acres likely to be reclaimed.

Mining, military training, UXO clearance, and livestock grazing are expected to continue as major activities in the Study Area and impacts to soil resources from wildfire in the area would also continue to occur. Impacts from these activities include loss of soil productivity due to changes in soil chemical and physical properties (sterilization due to fire); water and wind erosion; and changes to structure and associated properties resulting from compaction.

Historically, several wildfires have occurred in the Study Area, creating additional regional impacts to soil. Although other soil characteristics are altered, soil loss due to erosion is commonly of greatest concern. In burned areas, soil is commonly exposed and susceptible to erosion by wind and water. Movement of soil from burn areas is dependent on weather conditions, duration of exposure, and success of seeding efforts, and/or volunteer seeding to re-establish vegetation. Empirical data are not available to report the amount of soil movement or loss that has historically occurred as a result of wildfires.

Mine construction and development practices in the Study Area include salvaging and stockpiling soil for use in reclamation. Soil salvage occurs immediately following clearing and grubbing of the surface area and 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. Standard practice is to install berms at the toe of each stockpile to collect soil that may move from the face of the stockpile. This soil is captured and returned to the stockpile, limiting loss of soil.

Wind and water erosion can initiate soil movement during the soil redistribution phase of reclamation. This period occurs prior to establishment of vegetation on the reclaimed area. Standard practice involves the use of best management practices to control and minimize sediment movement until vegetation is established. Best management practices include silt fences, straw bales, run-off control ditches, sediment ponds, and other sediment trapping devices which allow soil to be captured and returned to the reclaimed area minimizing soil loss.

Reclamation associated with current mining activities and reseeded of burned areas would mitigate soil movement and productivity loss. Soil salvaged and used in reclamation is expected to return to pre-mining productivity once vegetation is established and soil nutrient cycling is restored. Seeding and revegetation of areas that have been burned would reduce soil movement and loss. Habitat restoration projects including channel rehabilitation along Indian Creek have reduced the contribution of soil loss associated with past placer mining activities.

Data that quantify cumulative soil movement that results in soil loss in the Study Area from all land uses (e.g., mining, roads, wildfire burn areas, grazing) are not available. As described above, soil movement in response to any of the land disturbing activities or phenomena is site specific, weather dependent, and subject to the timing and success of rehabilitation efforts. Soil movement that could result in impacts to water quality is site specific and dependent on the proximity of a site to surface water. No data are available that provide quantification of sediment load to area streams from historic mining, livestock grazing, and wildfire.

VEGETATION RESOURCES

The cumulative effects discussion for vegetation focuses on changes in dominant plant communities that affect habitat for wildlife (e.g., mountain mahogany/juniper types). Mining activities, wildfire, and livestock grazing combined with displacement of native species by invasive species 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 for vegetation includes the area encompassed by the Indian Creek Mine and watersheds that

drain the Project area. Impacts to vegetation (mining, wildfire, military training, and grazing) associated with land use activities in the Indian Creek and Crow Creek drainages could result in exposure of bare mineral soil which can be mobilized through water and wind erosion. Potential cumulative impacts to vegetation include past, present, and reasonably foreseeable mining developments, use of the LHTA by the Montana Army National Guard, grazing of public and private land, subdivision developments, wildfire, and noxious weed invasion.

CUMULATIVE EFFECTS

Cumulative effects on vegetation would result from proposed expansion of the Indian Creek Mine, wildfires, livestock grazing, military training exercises, subdivision development, and displacement of native species by noxious weeds. Past, present, and reasonably foreseeable activities affecting vegetation in the Study Area are ongoing mining operations at the Indian Creek Mine, wildfires, livestock grazing, military training exercises by MTARNG in the LHTA, and displacement of native species by noxious weeds.

Shrub and savannah habitat types are the most difficult to reclaim and require long periods of time (*i.e.*, several decades) before reclaimed areas resemble similar undisturbed habitats. Enhanced revegetation efforts may reduce the recovery time; nevertheless, a relatively short return to current conditions would be unlikely in shrub and habitat types affected by proposed mine expansion or implementation of Alternative A – Modified Pit Backfill.

Livestock grazing in the Study Area would likely continue at current levels. Season of use and carrying capacity of grazing allotments in the Study Area would not change.

Military training exercises minimally affect vegetation as activities are confined to small areas, and traffic is restricted to existing roads. Wildfire is an occasional unintended consequence of training activities as evidenced by an ordnance-triggered wildfire in the southern portion of the LHTA Impact Area in 2006. This fire burned about 100 acres of sagebrush/grassland habitat. Long periods of time (10 to 15 years) are typically required for trees and shrubs to voluntarily reestablish in burned areas. About 100 acres of burned area were seeded with a variety of shrubs in October 2006.

Development of subdivisions in and near the Study Area would reduce habitat available for wildlife and livestock grazing.

Special Status Species

One known population of lesser rushy milkvetch and up to 19 known plants of sword townsendia may be affected by reasonably foreseeable future activities associated with proposed expansion of the Indian Creek Mine. Cumulative impacts to rushy milkvetch and sword townsendia are unlikely to occur from past, present, or reasonably foreseeable MTARNG activities. Wildfire is a potential cumulative impact in the Study Area. Lesser rushy milkvetch has been observed regenerating from burn sites within 1 year (Trainor 2007).

Sword townsendia occurs in sparsely vegetated limestone gravels and outcrops where minimal fuels would typically prevent intense fires. This type of habitat provides limited recreational opportunities and therefore, potential effects that could result from recreational activities are minimal. In addition, the population of sword townsendia lies within the LHTA and/or mine permit area and as such, access to this population is controlled. It is unlikely that any cumulative effects would occur to special status plant species.

Invasive, Non-native Species

After establishment of the desired plant community and Graymont has met the goals and objectives of reclamation, active management and control of weeds by Graymont would end. Activities that disturb soil and vegetation (e.g., other mining operations, military training exercises, UXO clearance, grazing, subdivisions, and wildfires) open niches for invasive plant colonization, provide a means of seed transport along roadways and trails, and would increase the potential for noxious weeds to invade reclaimed areas from uncontrolled sources located in adjacent areas.

TERRESTRIAL WILDLIFE

CUMULATIVE EFFECTS STUDY AREA

The Cumulative Effects Study Area (Study Area) for terrestrial wildlife includes the Elkhorn Mountains, the Elkhorn Wildlife Management Unit, and wildlife winter ranges in the Limestone Hills as shown on **Figures 4-3, 4-4, and 4-5**. This Study Area was selected based on the multi-agency management prescription for the Elkhorn Mountains.

CUMULATIVE EFFECTS

Past, present, and reasonably foreseeable future activities that could affect wildlife and their habitats in the Study Area include suppression of wildfires; wildfires; use of the LHTA for military training activities; grazing; hunting and other recreational use; mining and associated activities at the Graymont Mine; UXO clearance; loss of habitat through construction and use of roads and military facilities; development of residential housing, and displacement of native species by invasive noxious weeds. Development of the Elkhorn Cooperative Management Area would enhance future work in the area to improve wildlife habitat.

Elk

The Study Area contains approximately 135,000 acres of elk fall and winter habitat (**Figure 4-3**). Past, present, and proposed mining activities would remove approximately 1,200 acres (0.9 percent) of this habitat within the Study Area.

Management by the Elkhorn Cooperative Wildlife Management Unit would continue to develop management strategies compatible with livestock grazing and wildlife. Seasonal road closures, livestock grazing management, controlled burns to improve wildlife habitat, and other habitat improvement practices such as rangeland seeding with desirable plant species, fuel reduction to remove encroaching conifers, and weed control would benefit various species of wildlife.

Acquisition by BLM of the Iron Mask Ranch to the north of Graymont's operations in the Elkhorn Mountains would preserve important big game winter range and year-round habitat. Measures to improve habitat quality may be implemented in the future, and management of livestock to prevent conflicts with wildlife and wildlife habitat would benefit wildlife species in the cumulative effects area.

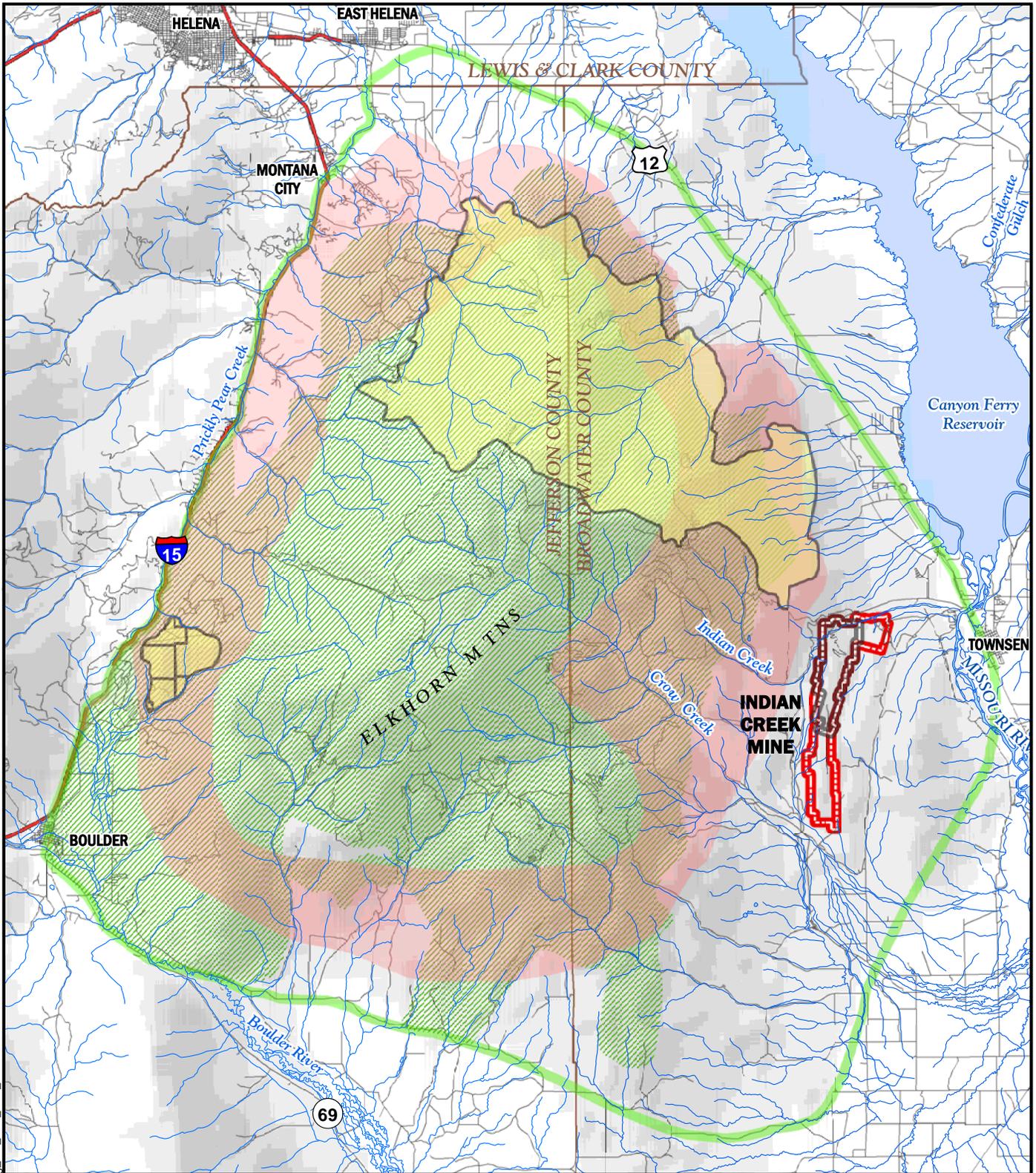
Development of subdivisions in and near the Study Area would affect wildlife through direct loss of habitat, displacement due to human activities, and habituation of wildlife to humans, which can cause management problems (e.g., wildlife damage to landscape plants, aggressive actions toward people and pets, attraction of predators, and increased collisions with vehicles). Proposed and existing subdivisions in the cumulative effects area are outside of habitat typically used by elk and would have negligible cumulative impact on this species.

Since 1988, wildfires have burned approximately 46,983 acres of elk summer range and 21,051 acres of winter range in the larger Elkhorn

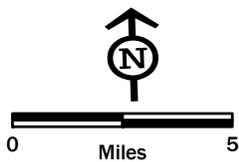
Mountain complex. Typically, wildfires remove woody fuels and open tree and shrub canopies resulting in increased growth of understory grasses and forbs. Wildfires have resulted in increased amounts of herbaceous forage available to elk and other wildlife species, but have reduced amounts of some trees and shrubs that are killed and do not sprout after fires. Reductions in tree density on summer/fall habitat can decrease security cover, making elk more vulnerable during the hunting season. Over the past 25 years, fire has improved habitat quality for elk in the Study Area by removing encroaching conifers and increasing the forage base.

A study of livestock and elk interactions in the Elkhorn Mountains (Ecosystem Research Group 2006) found that livestock and elk use overlap occurs on lower slopes that receive spring elk use and summer cattle use; however, when use by cattle does not exceed moderate levels, elk benefit from this foraging niche overlap because grass grazed in summer grows more vigorously the following spring. Other studies conducted in the Elkhorn Mountains and the Mount Haggin Wildlife Management Area by FWP have found that vegetation has responded favorably to moderate livestock grazing associated with rest-rotation grazing systems (Ecosystem Research Group 2006). Although there are strong diet similarities between elk and cattle, it does not appear that livestock grazing is having a detrimental effect on elk populations in the Study Area.

Recreation (e.g., hunting, hiking, rock climbing, mountain biking, cross-country skiing, and off-road vehicle use) could displace wildlife, especially if these activities take place on big game winter ranges when animals are present. During winter, big game animals are stressed due to cold and limited food supplies, and human activities would cause them to flee and could result in increased winter mortality or lower birth rates the following year.



Base Data Source: Montana NRIS GIS Data



- Streams
- Other Roads
- Interstate
- Existing Operating Permit Boundary
- Proposed Operating Permit Boundary
- Wildlife Cumulative Effects Boundary
- Historic Large Fires
- Elk Winter Range
- Elk Summer Range

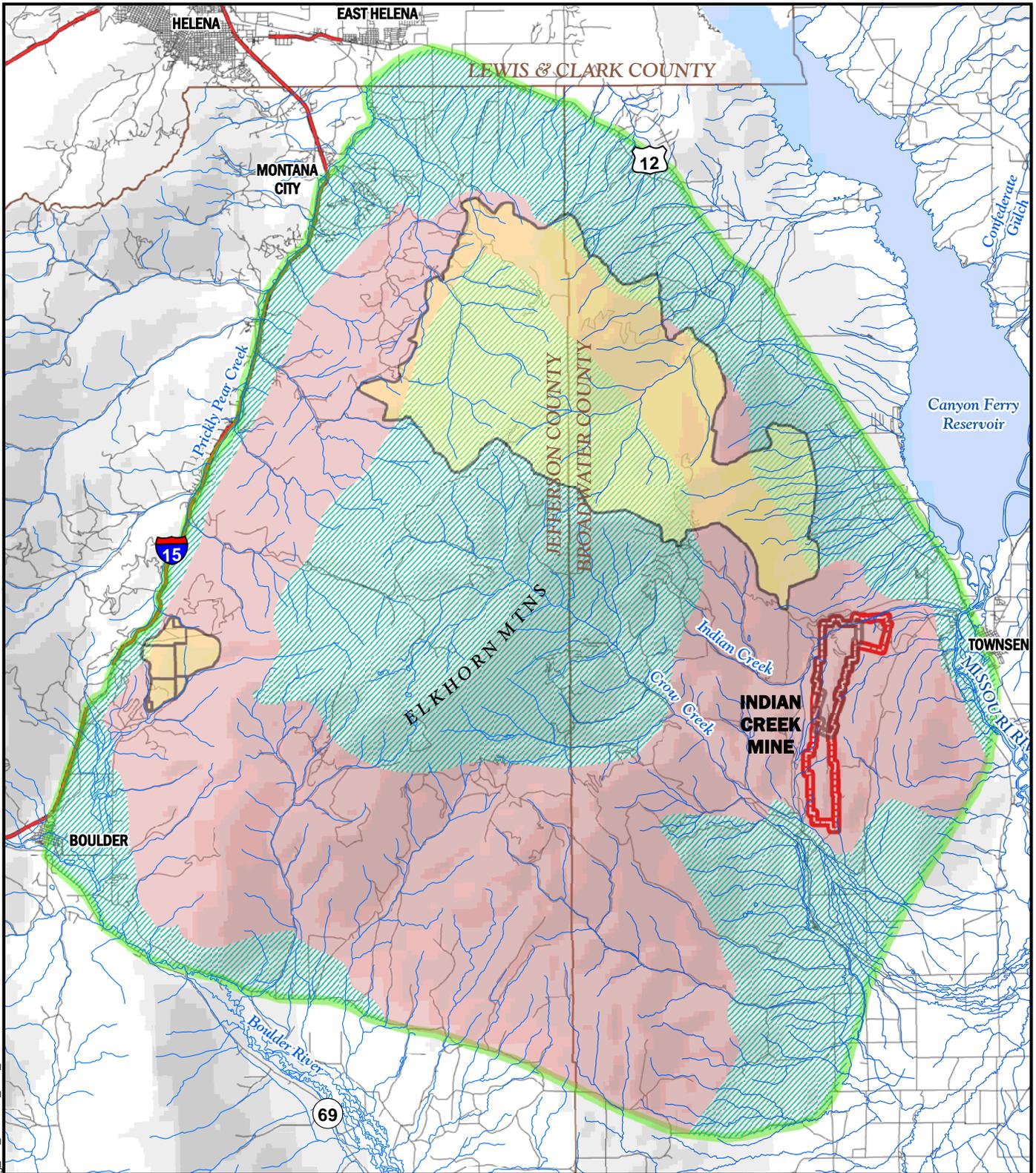
H:\13532 Graymont EIS\5000 GIS\Projects\EIS\Fig_4-3_ELK_cum_effects.mxd



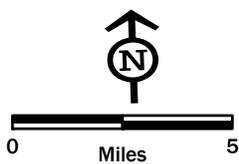
U.S. Department of the Interior
Bureau of Land Management
Butte Field Office
Butte, Montana

ELK HABITAT CUMULATIVE EFFECTS
Indian Creek Mine Expansion - Environmental Impact Statement
Broadwater County, Montana

FIGURE
4-3



Base Data Source: Montana NRIS GIS Data



- Streams
- Other Roads
- Interstate
- Existing Operating Permit Boundary
- Proposed Operating Permit Boundary
- Mule Deer Yearlong Range (Non-Migratory)
- Mule Deer Winter/Yearlong Range
- Historic Large Fires
- Wildlife Cumulative Effects Boundary

H:\13532 Graymont\EIS\5000 GIS\Projects\EIS\Fig. 4-4_MDEER_cum_effects.mxd

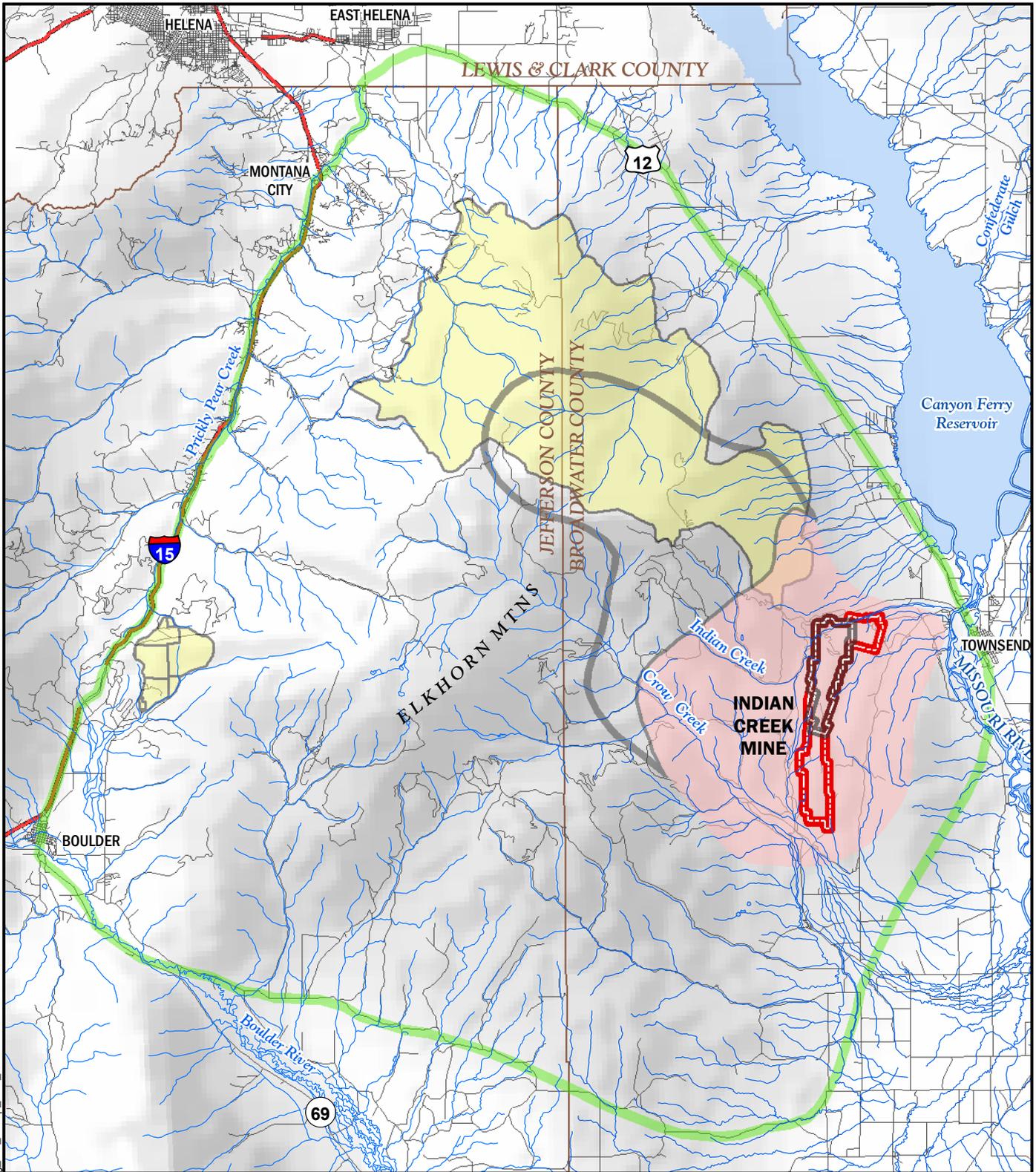


U.S. Department of the Interior
Bureau of Land Management
Butte Field Office
Butte, Montana

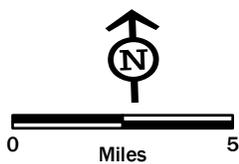
MULE DEER HABITAT CUMULATIVE EFFECTS
Indian Creek Mine Expansion - Environmental Impact Statement
Broadwater County, Montana

FIGURE

4-4



Base Data Source: Montana NRIS GIS Data



- Streams
- Other Roads
- Interstate
- Existing Operating Permit Boundary
- Proposed Operating Permit Boundary
- Wildlife Cumulative Effects Boundary
- Historic Large Fires
- Spring, Summer, Fall Range
- Yearlong Range

H:\13532 Graymont EIS\5000 GIS\Projects\EIS\Fig. 4-5 sheep_cum_effects.mxd



U.S. Department of the Interior
Bureau of Land Management
Butte Field Office
Butte, Montana

BIGHORN SHEEP HABITAT CUMULATIVE EFFECTS
Indian Creek Mine Expansion - Environmental Impact Statement
Broadwater County, Montana

FIGURE
4-5

Mule Deer

Mule deer are present in the Study Area year round, but their numbers increase during winter. The Study Area has approximately 196,000 acres of mule deer winter range and year-round habitat (**Figure 4-4**). Existing and proposed mining activity would affect approximately 2,000 acres (1 percent) of mule deer winter range and year-round habitat in the Study Area. According to FWP (2009) approximately 30 to 40 percent of mule deer in the Elkhorn Mountains use this as winter range. Mountain mahogany, an important winter food for deer, is present on about 2,500 acres in and near the Limestone Hills (Graymont 2007a). Existing and proposed mine expansion would affect about 18 percent of mountain mahogany in the Study Area. This loss of habitat could temporarily reduce the capacity of the Study Area to support mule deer.

Impacts to mule deer could result from military use of LHTA. Noise from explosives could displace animals from habitats when training exercises are taking place from mid-April through November; however, during this period, there is sufficient security habitat to accommodate displaced animals and impacts would be negligible. Exploding ordnance could also start fires that burn shrub and tree habitats that provide important winter forage and thermal cover for mule deer and bighorn sheep.

Development of subdivisions in and near the Study Area would affect wildlife through direct loss of habitat, displacement due to human activities, and habituation of wildlife to humans, which can cause management problems (e.g., wildlife damage to landscape plants, aggressive actions toward people and pets, attraction of predators, and increased collisions with vehicles). Three subdivisions are in mule deer winter range near Townsend (Deer Path, Riverview Estates, and V-K). These subdivisions would remove 226 acres of mule deer winter

range in the cumulative effects area. It is likely that deer would become accustomed to the subdivisions and inhabit areas close to residences and become management problems. The management option of hunting to control deer numbers often is not feasible near subdivisions.

Since 1988, wildfires have burned approximately 29,000 acres of mule deer summer/year-round range and 23,000 acres of winter range. Because some shrubs (e.g., mountain mahogany and sagebrush) and trees (e.g., Rocky Mountain juniper and limber pine) in the Study Area are killed by fire, habitat quality for mule deer, especially on winter range, has been reduced on areas exposed to severe burn intensities. Mule deer forage primarily on shrubs in winter and reductions of mountain mahogany and sagebrush as a result of fire could reduce habitat quality for deer; however, other species important to mule deer (e.g., rubber rabbitbrush and skunkbush sumac) vigorously resprout and reseed following fires and may be enhanced by periodic fires. Because mule deer are adapted to a range of habitats and forage plants and several species of plants have evolved over a range of fire regimes, it is unlikely that fires in the Study Area have had a discernable adverse effect on mule deer.

Fires have been widespread in the Study Area over the last 25 years, and encroachment of conifers into grasslands and increased densities of conifers in woodlands have reduced the amount of forage and overall ecological condition for big game animals, including mule deer. Ecosystem Research Group (2006) reported approximately 2,900 acres of conifer encroachment on rangeland in the Elkhorn Mountains. Although wildfires may have reduced amounts of shrubs important to foraging mule deer, fires have also helped control conifer encroachment onto big game ranges. Fire suppression over the last century has been important in contributing to the

proliferation of conifers at the interface of montane conifer communities and down-slope grassland and shrub communities that typically provide mule deer winter range.

Noxious weeds have also reduced the ecological condition of mule deer winter range in the Study Area. Ecosystem Research Group (2006) stated that other than conifer encroachment, noxious weeds pose the greatest threat to ecological condition and productivity of habitats in the Elkhorn Mountains.

Grazing allotments on public land administered by the Forest Service and BLM would not likely have adverse effects on mule deer. During summer, mule deer eat a variety of shrubs and forbs, whereas cattle graze mostly on grass. There is little competition for forage between livestock and mule deer. On winter range, mule deer are highly dependent on shrubs. Typically, cattle do not browse extensively on important mule deer foods such as rubber rabbitbrush, mountain mahogany, skunkbush sumac, and sagebrush. Grazing is typically for 4 to 5 months in spring, summer, and fall on BLM and Forest Service grazing allotments. Mule deer and livestock would not occupy the same habitats during winter.

Bighorn Sheep

The Study Area has approximately 40,500 acres designated as bighorn sheep winter range and year-round habitat (**Figure 4-5**). The Proposed Action would disturb approximately 2,020 acres (5 percent).

Since 1988, wildfires have burned approximately 19,120 acres of bighorn sheep summer/year-round range and 1,589 acres of winter/year round range. Because some shrubs and trees in the Study Area are killed by fire, habitat quality for bighorn sheep, especially on winter range, could be reduced by frequent fires; however,

like mule deer, bighorn sheep eat rubber rabbitbrush, skunkbush sumac, and other species enhanced by fire. It is unlikely that fires have adversely affected bighorn sheep given the diversity of forage species present on winter range in the Study Area.

Development of subdivisions would not affect bighorn sheep habitat. All proposed and existing subdivisions are outside of bighorn sheep summer/year-round and winter habitat.

Recreation (e.g., hunting, hiking, rock climbing, mountain biking, cross-country skiing, and off-road vehicle use) and military training operations could displace wildlife, especially if these activities take place on winter ranges when animals are present. Human activities that would cause bighorn sheep to flee would stress animals and could result in increased winter mortality or lower birth rates.

Under the approved Butte Resource Management Plan – Alternative B, no new domestic sheep/goat grazing allotments would be allowed in occupied bighorn sheep habitat or within a 5-mile buffer (BLM 2009). This measure would help prevent transmission of disease from domestic animals to bighorn sheep. However, 1,200 sheep would remain on the Limestone East Grazing Allotment. Contact between domestic sheep and bighorn sheep could occur on this allotment and spread disease to the bighorn populations, which could increase bighorn sheep mortality.

Pronghorn Antelope

A few pronghorn antelope are present in the Study Area at lower elevations on flats north of Townsend from spring to fall. Impacts to pronghorns from wildfire have been minimal as most fires have burned in areas with more woody fuels. Livestock grazing probably has had little effect on pronghorns as diets of pronghorns are mostly forbs and shrubs,

whereas cattle prefer grasses. Sixteen subdivisions in the Study Area have the potential to adversely affect pronghorn habitat on the relatively flat land between Townsend and East Helena. Construction of homes and fences would remove forage for pronghorns and restrict pronghorn movements. Human activities including unrestrained dogs would displace pronghorns away from residences.

LAND USE, ACCESS, AND TRANSPORTATION

CUMULATIVE EFFECTS STUDY AREA

The Cumulative Effects Study Area for land use, access, and transportation includes the area encompassing the LHTA, subdivisions accessed by the Indian Creek Road, the railroad load-out facility, and U.S. Highway 12/287. This area was selected for cumulative effects analysis based on the existing transportation system in the vicinity of the Project area, access routes that connect to the primary access route to the Project area, and land tracts located immediately adjacent to the Project area whose ownership and use may conflict or have additive effects on these resources. The Cumulative Effects Study Area for grazing is the same as shown on **Figure 3-7**.

CUMULATIVE EFFECTS

Grazing

Grazing is projected to continue at current levels within the allotments located in the Cumulative Effects Study Area. According to the BLM MRB Survey and Allotment Tabulation Record, mine expansion would result in loss of carrying capacity on 524 acres of the Limestone Hills Grazing Allotment, 775 acres of the Dowdy Ditch Allotment, and about 11 acres in the Indian Creek Allotment. These records are

available at the BLM Butte Field Office. Grazing on mine-related disturbance areas would be lost until revegetation and forage production are comparable to adjacent land.

Mule deer and bighorn sheep could be displaced by mining activities onto areas authorized for livestock grazing outside of the project area, including a domestic sheep allotment located south of the project area. This could eventually place bighorn sheep in competition for forage with cows and possible disease transmission from domestic sheep.

Recreation

Increased development of private land, increased recreational use, and continued mining and military training activities would increase land management intensity for activities such as weed control and fire fuel management. Potential increases in mine development and expansion and recreational use could result in conflicts between military and nonmilitary uses of the LHTA.

Access

Increased subdivision in the Indian and Crow Creek drainages could preclude some access routes, historically used across private land, to public land. Public roads currently used to access public land would not be affected.

Transportation

Future traffic load on the Indian Creek Road is expected to increase as a result of subdivision development on land north of the road. Mine traffic along the road is expected to remain at current levels.

NOISE

CUMULATIVE EFFECTS STUDY AREA

The primary sources of noise that would combine with noise from the Indian Creek Mine are military training activities at the LHTA. The Cumulative Effects Study Area (Study Area) for noise encompasses the proposed mine expansion area, the LHTA, and private land around the mine that is being subdivided.

CUMULATIVE EFFECTS

Cumulative effects from the construction and operation of the Proposed Action and/or Alternative A – Modified Pit Backfill include the combination of noise sources from the mine as the South Claims and Dolomite Claims areas are developed and other existing noise sources. Noise from existing quarry operations in the North Claims Area would be reduced as mining operations move south into the South Claims Area. Noise from the crusher located in the North Claims Area would continue. In addition to mine operations and equipment, other noises, such as natural sources, airplane noise, noise from recreational activities, traffic along Indian Creek Road, and ongoing weapons training at the LHTA, are present in the South Claims and Dolomite Claims areas and would continue into the future. Noise due to the Proposed Action and Alternative A is described in Chapter 3 – Noise.

VISUAL RESOURCES

Visual resources are evaluated within the context of BLM's Visual Resource Management program. This program has established categories of visual elements throughout the area administered by the Butte Field Office. BLM reviews proposed projects for compliance with this program.

CUMULATIVE EFFECTS STUDY AREA

The Cumulative Effects Study Area for visual resources includes the eastern slopes of the Elkhorn Mountains lying west and northwest of Townsend. Key observation points are located along public access points or areas frequented by the public. The rationale for selecting this geographic area is the relationship between mining level disturbance (creation of mine pits, overburden disposal areas, haul roads, and ancillary mine facilities that modify the natural landscape) and the viewshed from various points where public access is established.

The Study Area is predominately located in a Visual Resource Management (VRM) Class IV area under BLM's VRM program. Management activities that require major modification to the existing character of the landscape are allowed in Class IV areas. The level of change to the characteristic landscape can be high. Management activities (e.g., developments) may dominate the view and be the major focus of viewer attention. Impacts of these activities are minimized through careful location, minimal disturbance, and repeating the basic elements (form, line, color, and texture). Class IV allows substantial modifications of the landscape but places emphasis on mitigation, where possible, of those impacts.

CUMULATIVE EFFECTS

Current and future mine development within the Study Area would not exceed the visual prescriptions of the VRM Class IV designation. Reclamation measures are required for mine disturbances, and reclamation would occur on current and future mining activities at the Indian Creek Mine. Visual contrast associated with certain mining facilities would remain after reclamation, including rock faces of some pit highwalls, overburden dump faces, and haul roads. Visual contrasts in form, line, and color created by rock faces and slopes would remain

in the post-mining landscape until vegetation (grasses and shrubs) is established, creating a mosaic of color and texture blending with the surrounding landscape. Rock and slope faces associated with overburden dumps would appear similar to bare ridges, talus slopes, and cliffs in adjacent areas. Mitigation of all visual impacts from mine development may not be possible, but the severity could be minimized through project design and implementation of Alternative A – Modified Pit Backfill.

Other land use activities or conditions within these viewsheds have affected and would continue to affect the visual characteristics of the landscape. Burned areas (range fires), electrical transmission lines, pipeline corridors, highways and roads, and livestock grazing affect the natural landscape to varying degrees and at varying seasons and duration. These land use activities and natural phenomena are expected to continue to affect visual elements of the landscape into the future.

SOCIAL AND ECONOMIC RESOURCES

CUMULATIVE EFFECTS STUDY AREA

The Cumulative Effects Study Area for social and economic resources is Broadwater County. The rationale for selection of this Study Area is outlined below:

- The Indian Creek Mine is located in Broadwater County.
- Residential patterns of mining company employees determine where they are likely to spend their salaries. In 2005, 25 of 27 Graymont employees lived in Broadwater County (MTARNG/BLM 2007), and it is reasonable to assume the ratio is similar among the 2009 workforce and that many of the

contract workers also live in the county and would continue to do so in conjunction with the life-of-mine expansion.

CUMULATIVE EFFECTS

Socioeconomic issues that could have an additive or cumulative effect when coupled with life-of-mine expansion include population growth, employment levels, and tax revenues.

Population Trends and Demographic Characteristics

There are no reasonably foreseeable future projects in the Study Area that would likely result in additional workers or their families moving into the area. Subdivisions in the Silos area, the area north of Winston, and near the Indian Creek Mine may continue to grow. These areas are primarily bedroom communities for Helena. Development of these subdivisions would likely increase demands on local government services and schools.

Employment

Reasonably foreseeable activities in the Study Area would not likely affect employment levels at the Indian Creek Mine and Quarry Services as production levels are not expected to increase to a level that would require additional employees. Employees needed for other new projects in Broadwater County would primarily come from the Services sector.

Tax Revenues

The reasonably foreseeable projects planned in the Study Area would not likely contribute significantly to the Broadwater County tax base, with the exception of residential property taxes generated from the various proposed and approved subdivisions (e.g., Missouri Rendezvous, Rolling Glen). Improvements at the

Silos Recreation Area would be primarily on public land. Growth in Broadwater County may create new businesses, which in turn would increase the tax base.

In 2006, Graymont paid over \$77,200 in net proceeds tax to Broadwater County. Graymont was the only contributor to net proceeds tax revenue for Broadwater County in 2005 (BCPB 2003). None of the other reasonably foreseeable activities in the Study Area would generate additional state Resource Indemnity Trust Tax fund or county (net proceeds) revenues.

CULTURAL RESOURCES

CUMULATIVE EFFECTS STUDY AREA

The Cumulative Effects Study Area and Area of Potential Effect for cultural resources include the existing and proposed operating permit boundary for the Indian Creek Mine. The Study Area lies between Old Woman's Grave Road on the east, Mud Springs Road on the West, Indian Creek Road on the north, and Crow Creek Road on the south.

CUMULATIVE EFFECTS

When sites that have been determined eligible for the National Register are threatened by an action, the preferred mitigation measure is avoidance. Whenever possible, mining-related facilities are redesigned to avoid eligible sites or specific cultural resources; however, avoidance is not always possible. In such cases, excavation of eligible sites by archaeologists is undertaken to preserve the resource and preclude adverse effects. Archaeologists prepare mitigation plans

for submittal to BLM that include a scope of work and specific scientific issues to be addressed as a result of the excavation. BLM submits plans to the State Historic Preservation Office for consultation. Upon final approval by BLM excavation and field work commence in accordance with the approved plan.

Historical and culturally important sites are subject to erosion, vandalism, and burial. Some previously unknown sites or artifacts are exposed as a result of erosion or manmade disturbance. Discovery and recognition of historically and culturally important sites or artifacts is also a function of timing.

In some cases, erosion and manmade disturbance have removed or modified sites and/or artifacts to the extent that the integrity of the site is lost, and therefore, interpretation of the site cannot be made. Erosion and manmade disturbance can also result in burial of sites such that no surficial evidence is available to allow identification of the site(s).

As a consequence of natural processes and manmade disturbances, the number and importance of cultural and historic sites and artifacts in the Study Area is not quantifiable.

The number and type of sites that have been recorded through recent surveys in the Study Area provide the only cultural and historical information on which to assess cumulative effects.

CHAPTER 5

CONSULTATION, COORDINATION, AND PREPARATION

PUBLIC PARTICIPATION

SUMMARY

Public participation specific to the proposed Indian Creek Mine Expansion Project is summarized in this chapter. The summary indicates how the public has been involved, identifies persons and organizations contacted, and specifies time frames to accomplish goals in accordance with the regulations implementing NEPA and MEPA.

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 Action and the potential long-term impacts that could result from the Project; and (3) ensuring that public needs are understood by the agencies.

Public participation in the EIS process is required by NEPA at specific points: the scoping period, review of Draft EIS, review of Final EIS, and receipt of the Record of Decision. There is no administrative review of the Final EIS or Record of Decision available under MEPA for DEQ's decision.

Scoping Period: 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 was combined with issues identified by the agencies and formed the scope of this EIS.

Draft EIS Review: A 60-day public review and comment period for the Draft EIS was initiated by publication of the Notice of Availability for the Draft EIS in the Federal Register. Public meetings were held in Helena and Townsend, Montana, during the 60-day comment period. Future meetings or hearings and any other public involvement activities will be announced 15 days in advance through public notices, media news releases, and/or mailings.

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. This review period does not apply to DEQ.

Record of Decision: Subsequent to the 30-day review period for the Final EIS, a federal Record of Decision would be prepared and issued. A Record of Decision would be issued by DEQ at least 15 days after the Final EIS is published. A joint Record of Decision by BLM and DEQ may be prepared, in which case the federal schedule would apply.

TRIBAL COMMUNICATION AND COORDINATION

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. 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.

The National Historic Preservation Act (P.L. 89-665), National Environmental Policy Act (P.L. 91-190), Federal Land Policy and Management Act (P. L.94-579), American Indian Religious Freedom Act (P.L. 95-341), 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 BLM initiated formal Native American consultation through a series of personal meetings with representatives of the Confederated Salish and Kootenai Tribes of the Flathead Reservation, Blackfeet Tribe, and Shoshone-Bannock Tribe. To date these consultation efforts have not identified any specific Traditional Cultural Properties within or in close proximity to the Project Boundary. Consultation with the tribal representatives will continue as the project goes forward.

IMPLEMENTATION

The public participation process for the Indian Creek Mine Expansion EIS was comprised of the following components:

PUBLIC SCOPING

To allow a process for determining the scope of issues and concerns related to the Proposed Action (40 CFR 1510.7 and ARM 17.4.615), a public scoping period was provided by BLM and DEQ. A Notice of Intent to prepare the EIS was published in the Federal Register on May 18, 2007 (72 Federal Register 96, pp 28067-28068). Publication of this notice in the Federal Register

initiated a 30-day public scoping period for the Proposed Action from May 18, 2007, to June 18, 2007.

BLM and DEQ mailed a scoping package that included a project summary and maps to individuals and organizations listed on the BLM Butte Field Office and DEQ mailing lists. In addition, the scoping package was distributed at public scoping meetings.

Public scoping meetings were held by BLM and DEQ on June 6, 2007, in Helena, and June 7, 2007, in Townsend. Members of the public attended both scoping meetings. No comments were received on the proposed amendment. Written comments concerning the permit application were received from four individuals and four agencies.

DISTRIBUTION OF THE DRAFT EIS

The Draft EIS was distributed as follows:

- A news release was provided to all area media by BLM at the beginning of the 60-day comment period on the Draft EIS.
- The Draft EIS was distributed to interested parties identified in an updated EIS mailing list, and was posted on the BLM Butte Field Office and DEQ websites.

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 will be sent to addresses on the mailing list.

- The Final EIS will be posted on the BLM Butte Field Office and DEQ websites.
- A news release will be issued to the same news outlets used for previous Project announcements.

RECORD OF DECISION

A Record of Decision will be distributed by BLM and DEQ to individuals and organizations identified on the updated Project mailing lists. 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 the agencies on the Draft EIS were reviewed and evaluated to determine if information provided in the comments would require a formal response or contains new data that may identify deficiencies in the Draft EIS. Steps were initiated to correct such deficiencies and to incorporate information into the Final EIS and respond to substantive comments.

CONSULTATION WITH OTHERS

The following federal and state agencies and other entities were consulted during preparation of the EIS:

- U.S. Forest Service
- Montana Army National Guard
- Montana Department of Natural Resources and Conservation
- Montana Department of Environmental Quality, Air Resources Management Bureau
- Montana Fish, Wildlife and Parks
- Broadwater County
- State Historic Preservation Office
- Confederated Salish and Kootenai Tribes of the Flathead Reservation
- Blackfeet Tribe
- Shoshone-Bannock Tribes of the Ft. Hall Reservation

LIST OF PREPARERS AND REVIEWERS

BUREAU OF LAND MANAGEMENT

Core Interdisciplinary Team and Technical Specialty

Butte Field Office Manager, Decision Maker – Richard M. Hotaling
 EIS Project Team Leader/NEPA – Dave Williams
 Geology/Minerals/ – Joan Gabelman
 Soil/Water/Air Resources – Corey Meier
 Vegetation – John Sandford
 Terrestrial Wildlife/Special Status Species – Scott Franklin
 Recreation/Visual Resources – Brad Rixford
 Grazing Management/Range Resources – Mark Goertel
 Access/Land Use – Kelly Acree
 Cultural Resources – Carrie Kiely
 Social and Economic Resources – Joan Trent

MONTANA DEPARTMENT OF ENVIRONMENTAL QUALITY

Director, Decision Maker – Richard Opper
 Environmental Management Bureau Chief/EIS Reviewer - Warren McCullough
 MEPA Coordinator - Greg Hallsten
 Operating Permit Section Supervisor/EIS Reviewer - Herb Rolfes
 EIS Reviewer/Soil/Vegetation/Reclamation/Land Use/Socioeconomics - Patrick Plantenberg
 EIS Reviewer/Geology/Hydrology/Reclamation - Lisa Boettcher
 Mining Engineering/Reclamation Bonding – Charles Freshman
 Geochemistry – James Castro
 Hydrology - Wayne Jepson

GRAYMONT WESTERN US INC.

Robert (Bob) Robison, P.G. – Manager Geologic Services
 Elton Chorney – Manager, Indian Creek Mine
 Dick Juntunen – Resource Management Associates

THIRD PARTY EIS CONTRACTOR

AMEC GEOMATRIX, INC.

Project Manager	Terry Grotbo NEPA Coordinator Helena, MT	B.S, Earth Science/Geology 30 years experience
-----------------	--	---

Assistant Project Manager	Joe Murphy Helena, MT	B.A. Geography 35 years experience
Physical Sciences	Doug Rogness Helena, MT	B.S. Geology M.S. Hydrology 26 years experience
Water Resources	Doug Rogness Helena, MT	B.S. Geology M.S. Hydrology 26 years experience
Geology, Minerals, and Paleontology	Terry Grotbo Helena, MT	B.S. Earth Sciences Geology Major 30 years experience
Soil Resources	Judd Stark Billings, MT	B.S. Land Rehabilitation 10 years experience
Biological Sciences	Joe Elliott Missoula, MT	B.S. Biology and Chemistry Ph.D Botany 38 years experience
Social Sciences	Karen Lincoln Roundup, MT	B.A. Urban Studies 36 years experience
Social Economic Resources	Karen Lincoln	B.A. Urban Studies 36 years experience
Document Control	Lynne Green	23 years experience
ETHOS		
Cultural Resources	John Brumley	30 years experience
BIG SKY ACOUSTICS		
Noise	Sean Connolly	15 years experience

MAILING LIST
INDIAN CREEK MINE EXPANSION

This document was mailed to approximately 40 agencies and individuals.

CHAPTER 6 PUBLIC COMMENTS AND RESPONSES

This chapter includes copies of all public comments received during the comment period on the Draft Environmental Impact Statement (DEIS) for Graymont Western US, Inc. Indian Creek Mine Expansion. BLM and DEQ responses to substantive comments are provided adjacent to the reproduced comment letters. Five letters were received during the public comment period, which ended on March 2, 2009.

Public meetings were held on February 17, 2009 in Helena, Montana, and on February 18, 2009, in Townsend, Montana, to accept comments on the accuracy and adequacy of the DEIS. No comments were received at these meetings.

LETTERS

- Letter No. 1 – US Environmental Protection Agency
- Letter No. 2 – Montana Fish, Wildlife, and Parks
- Letter No. 3 – Elkhorns Working Group
- Letter No. 4 – John T. Flynn
- Letter No 5 – Montana Army National Guard



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
 REGION 8, MONTANA OFFICE
 FEDERAL BUILDING, 10 West 15th St., Suite 3200
 HELENA, MONTANA 59626

LETTER NO I

Ref: SMO

February 17, 2009

Mr. David Williams, Graymont Mine BLM Project Manager
 Bureau of Land Management
 Butte Field Office
 106 North Parkmont
 Butte, Montana 59701

Re: CEQ 20080535; EPA Comments on Graymont
 Indian Creek Limestone Mine Expansion DEIS

Dear Mr. Williams:

The Environmental Protection Agency (EPA) Region VIII Montana Office has reviewed the Draft Environmental Impact Statement (DEIS) for the Graymont Indian Creek Limestone Mine Expansion Project in Montana in accordance with EPA responsibilities under the National Environmental Policy Act (NEPA), 42 U.S.C. 4231 and Section 309 of the Clean Air Act. Section 309 of the Clean Air Act directs EPA to review and comment in writing on the environmental impacts of any major Federal agency action. The EPA's comments include a rating of both the environmental impact of the proposed action and the adequacy of the NEPA document.

The proposed action would amend the permit for Graymont's existing limestone mining and processing operations in the Limestone Hills to allow expansion of the mine to the south. The proposed amendment would expand the existing permit boundary to encompass approximately 1,940 acres of additional BLM land representing approximately 50 years of mine production including 15 years of currently permitted mine life. Proposed mine expansion would include quarry areas, mine facilities, ore storage sites, soil salvage stockpiles, haul roads, overburden disposal areas, and ore processing.

We appreciate the DEIS evaluation of potential water quality impacts of the proposed limestone mine expansion, as well as the conduct of water quality monitoring, storm water management activities, and sediment and erosion control practices at the mine. Water quality monitoring data appear to show that the mine is not aggravating water quality impairments to Indian Creek or Crow Creek, which are both listed by the State of Montana as water quality impaired under Section 303(d) of the Clean Water Act. The BLM should coordinate with

There is no known connection between Crow Creek and mine surface water or groundwater. Graymont has and will continue with an operational water monitoring and storm water plan approved by DEQ for the mine project. TMDL development for these drainages is scheduled for 2012. The agencies will coordinate with DEQ's TMDL program staff to make certain the proposed expansion is consistent with future TMDLs and Water Quality Plans.

I-1 (cont) MDEQ's TMDL Program staff to assure that the proposed mine expansion project is consistent with applicable TMDLs and Water Quality Plans for restoration of Indian Creek and Crow Creek water quality (contact Dean Yashan and/or Robert Ray of the MDEQ in Helena at 444-5317 and 444-5319, respectively).

I-2

Information presented in the Draft EIS does not show elevated nitrogen levels attributable to the Indian Creek Mine. Total nitrogen concentrations along Indian Creek show consistent or decreasing values from upstream to downstream sample sites (see Table 3-5 in Final EIS). Nitrate+nitrite concentrations, which would be elevated for blasting-related effects, are low or non-detect in Indian Creek and Crow Creek. As mentioned in the Draft EIS (p. 3-17), water quality in Indian Creek is consistent from upstream to downstream locations, indicating that the Indian Creek Mine is not affecting the stream. There is no known water resources connection between Crow Creek and the Indian Creek Mine.

I-3

The agencies will continue to require water quality monitoring at the site, including nitrogen concentrations (see Response I-2). Mitigation measures (e.g., replacing ANFO with dynamite) would be developed if increased nitrogen levels are determined to be caused by mining activities.

I-2 The FEIS should more fully discuss elevated nitrogen levels in surface and ground waters at the mine site, and indicate if elevated nitrogen levels are related to use of ammonium nitrate in blasting agents at the mine, or if they may be related to other activities (e.g., grazing, military use of explosives, etc.).

I-4

Comment noted. Graymont will notify the U.S. Army Corps of Engineers in the event any disturbance is proposed in a regulated watercourse. Regulatory responsibilities for various agencies are shown in Table I-1 on page I-8 of the Final EIS.

I-3 The FEIS should also clarify if surface and groundwater monitoring for nitrogen residues will continue throughout the mine life in all mined areas (i.e., Dolomite Claims Area, North Claims Area, and South Claims Area). Mitigation measures planned in the event monitoring evidences surface or groundwater contamination with blasting residues should also be identified.

I-4 The DEIS reports that several small ephemeral drainages may be filled as a part of the Proposed Action (i.e., unnamed tributaries to Indian Creek in Section 34 of the Dolomite Claims Area; and unnamed tributaries to Crow Creek in Section 17 of the South Claims Area). It will be important that the U.S. Army Corps of Engineers be notified before mining occurs in such ephemeral drainages to be sure appropriate 404 permit procedures are followed (i.e., if waters of the U.S. within jurisdiction of the Section 404 Clean Water Act Dredge and Fill Permit Program are identified).

I-5

In developing the existing air quality permit, a study of AQRVs was completed for the processing plant and is on file with DEQ. This study addresses visibility as well as acid deposition and acid neutralizing capacity, SO₂ and NO_x. Additional text has been inserted under the Affected Environment - Air Quality section describing the AQRV.

I-5 The DEIS did not disclose current ambient air quality data for any air pollutants, nor did it include any analysis regarding air quality or visibility impacts from this project or for cumulative effects. The DEIS simply referenced the current air quality permit No. 1554-16, and included a table showing emissions of SO₂, NO_x, CO, and VOCs below permitted levels. For a project that presents current emissions over the major source category for both SO₂ (108.79 tpy) and NO_x (388.11 tpy), an air impact analysis should be presented in the FEIS that incorporates both a near field and far field modeling analysis for both the project specific and cumulative effects. The impact analysis should include National Ambient Air Quality Standards (NAAQS) and the Prevention of Significant Deterioration (PSD) increments. In addition an Air Quality Related Value (AQRV) impact analysis should be presented that includes results for visibility, deposition and acid neutralizing capacity for this project in Class I and Sensitive Class II areas. BLM should contact the Helena National Forest, which is the federal land manager of the nearest Class I area, to coordinate this additional air quality analysis. Should this additional air quality analysis indicate that the operation of this facility will contribute to adverse impacts to these

Graymont is a major stationary source with respect to New Source Review (NSR)/PSD; therefore, Graymont would need to provide the information necessary for DEQ to determine if new equipment and/or any change in method of operations would result in an increase in emissions that would exceed the following significance levels for major modifications at PSD facilities per ARM 17.8.801(27) (a): CO = 100 tons per year (tpy), NO_x = 40 tpy, SO₂ = 40 tpy, PM = 25 tpy, PM₁₀ = 15 tpy. Note that the emissions evaluation would include fugitive emissions, since Graymont is a listed source (lime plant) under ARM 17.8.801(22)(c)(ix). Furthermore, the increase in emissions must be calculated as actual-to-potential, not actual-to-projected actual, since Montana is not a PSD reform state. Graymont is not proposing to add new equipment or change the method of operations.

Graymont is in compliance with its air quality permit and Montana and National Ambient Air Quality Standards. The SO₂ and NO_x emissions levels presented in the first sentence of EPA's comment are the actual emissions from existing sources and do not represent a change or increase in emission due to the proposed project and are within the permitted levels.

Only a minimal emissions increase would occur from additional haulage distance, which would not mandate a new air modeling study. Fugitive dust emissions are controlled in accordance with Air Quality Permit No. 1554-16 through use of direct water application, chemical binders, or wetting agents. Refer to Environmental Protection Measures pp. 2-12 & 2-13.

No increases are planned for the processing plant; however, if an increase in production were considered, additional studies may be conducted at that time in accordance with applicable air quality regulations.

I-5 (cont) designated Class I areas, we request that the BLM work with Montana DEQ, EPA, and Graymont to assess whether additional mitigation measures will be needed to avoid significant air quality impacts to these lands.

I-6 The DEIS includes inconsistent or confusing information regarding total estimated annual lime production at the mine. The estimates of total annual lime production presented in the DEIS appear to range from 120,400 tons up to 1,000,000 tons of lime. The varied and inconsistent information reported in the DEIS regarding annual lime production at the mine should be corrected in the FEIS so that one accurate amount of estimated annual lime production at the mine is reported.

I-7 An estimate of annual lime production at the mine is needed to provide an accurate estimate of annual greenhouse gas emissions (carbon dioxide or CO₂) associated with lime production. The DEIS reports that approximately 156,500 tons of CO₂ emissions would be produced from the kilns. We have concerns about the accuracy of this estimate of annual CO₂ production, since there are varied estimates of lime production, and they appear inconsistent with the DEIS reported estimate of 156,500 tons of annual CO₂ emissions at the mine.

I-7 We recommend that limestone use, lime production, and coal and coke burning in the kilns be reevaluated, and that revised estimates of annual CO₂ production from this reevaluation be provided in the FEIS. We also suggest inclusion of additional information and discussion in the FEIS regarding the link between greenhouse gas emissions and climate change, as well as discussion of potential means to mitigate project-related emissions as appropriate pursuant to CEQ regulations (40 CFR Sections 1502.14(f), 1502.16(h), 1508.14). We encourage the BLM and Graymont to consider conduct of activities that may mitigate greenhouse gas production at the mine. Additional suggestions are included in our more detailed comments.

The EPA's further discussion and more detailed questions, comments, and concerns regarding the analysis, documentation, or potential environmental impacts of the Graymont Indian Creek Limestone Mine Expansion Project are included in the enclosure with this letter. Based on the procedures EPA uses to evaluate the adequacy of the information and the potential environmental impacts of the proposed action and alternatives in an EIS, the Graymont Indian Creek Limestone Mine Expansion Project DEIS has been rated as Category EC-2 (Environmental Concerns - Insufficient Information). A copy of EPA's rating criteria is attached. The EPA believes additional information is needed to fully assess and mitigate all potential impacts of the management actions.

I-6 Approximately one million tons of material is mined annually at the Indian Creek Mine which includes ore, in-seam waste rock, and overburden. About 65 percent is used for lime production, reject rock (less than 1/2 inch in diameter) may account for up to 35 percent, and in-seam or overburden waste ranges from 0 to 20 percent of the total. Total maximum kiln CaO (lime) production would be up to approximately 365,000 tons per year. Final EIS has been revised to reflect the above changes.

Ore processing operations at the Indian Creek Mine have a nominal capacity of lime production of 365,000 tons per year. Annual greenhouse gas emissions associated with 365,000 tons of lime production would be approximately 480,000 tons (435,000 metric tons) of CO₂ equivalents (CO₂e). This was estimated using the average greenhouse gas emission intensity, including both process and combustion related emissions, at Indian Creek for the period 2002 through 2008.

I-7 Lime production at nominal capacity would result in approximately 16.8 million tons (15.3 million metric tons) of CO₂e emissions over the additional 35-year mine life of the Indian Creek Mine under the Proposed Action. Annual greenhouse gas emissions over the period 2002 through 2008 have averaged 272,000 tons (247,300 metric tons) of CO₂e emissions, with 2008 emissions being approximately 342,000 tons (310,900 metric tons) of CO₂e. Continued operation at current emission levels associated with ore processing at Indian Creek Mine would equate to an average of 0.8 percent of the total CO₂e emissions from sources within Montana (estimated to be 38.5 million metric tons in 2010 – CCS 2007). This volume equates to 0.004 percent of total U.S. emissions (US emissions estimated at 7.282 CO₂e billion metric tons) (EIA 2008), and 1.1 percent of CO₂e emissions associated with lime manufacture in the U.S (EIA 2008; NLA 2008).

Graymont is in compliance with its air quality permit and Montana and National Ambient Air Quality Standards. Historically, 35 percent of lime produced at the Indian Creek operation has been used for scrubbing SO₂, which contributes to acid deposition and regional haze. A new section on *Climate and Climate Change* has been added to the Final EIS in both Chapter 3 – *Affected Environment and Environmental Consequences* and Chapter 4 - *Cumulative Effects*.

The EPA appreciates the opportunity to review and comment on the DEIS. If we may provide further explanation of our comments and concerns please contact Mr. Steve Potts of my staff in Missoula at 406-329-3313, or in Helena at (406) 457-5022, or via e-mail at potts.stephen@epa.gov . Thank you very much for your consideration.

Sincerely,

John F. Wardell,
Director
Montana Office

Enclosures

cc: Larry Svoboda/Connie Collins, SEPR-N, EPA, Denver
Greg Hallsten, MDEQ, Helena
Kevin Riordan, Supervisor, Helena NF

EPA Comments on the Graymont Western U.S. Indian Creek Limestone Mine Expansion Draft EIS

Brief Project Overview:

This Draft Environmental Impact Statement (DEIS) analyzes potential impacts associated with the Graymont Western US, Inc. (Graymont) proposal to amend BLM Plan of Operations MTM 78300 and Montana Metal Mine Reclamation Act (MMRA) Operating Permit No. 00105 to include a life-of-mine expansion of limestone and dolomite mining operations at the Indian Creek Mine located approximately 4 miles west of Townsend, Montana. The proposed mine expansion would continue Graymont's existing operations in the Limestone Hills. Graymont proposes to extend mine operations approximately 2.5 miles south beyond the existing permit boundary into the South Claims Area and also eastward into the Dolomite Claims Area adjoining the northeast corner of the existing mine permit boundary. Graymont (formerly Continental Lime Inc.) produces calcium oxide (quicklime and lime), hydrated lime, and other lime products at the Mine. Approximately 1 million tons of limestone are mined annually.

The proposed amendment would expand the existing permit boundary to encompass approximately 1,940 acres of additional public land administered by BLM and represents approximately 50 years of mine production including 15 years of currently permitted mine life. Proposed mine expansion would include quarry areas, mine facilities, ore storage sites, soil salvage stockpiles, haul roads, and overburden disposal areas lying within a disturbance boundary of 1,313 acres (968 acres in the South Claims Area and 345 acres in the Dolomite Claims Area). A disturbance boundary would be established within the overall proposed operating permit area. Actual surface disturbance for mine activities within the disturbance boundary would be less than the permitted disturbance to allow flexibility for mine planning.

The Draft EIS analyzes the potential impacts of: 1) the proposed action, 2) No Action, (existing life-of-mine permit), and 3) Alternative A, Modified Pit Backfill, which would reduce the visual effect of highwalls and create varied slope angles resulting in areas conducive to establishment of diverse habitat to support wildlife. The preliminary preferred alternative is Alternative A – Modified Pit Backfill.

Comments:

Mine Operations/Production

- 1) The DEIS appears to include inconsistent or confusing information regarding total annual lime production at the mine. The DEIS states (page 2-2) that, "a total of approximately 1 million tons of ore, in-seam waste rock, and overburden are mined annually at the Indian Creek Mine; and that finished lime product ranges from 37 to 45 percent of the total rock and overburden removed (1 million tons)." We note that if finished lime product ranges

from 37 to 45 percent of the 1 million tons of rock and overburden removed, it would mean that approximately 370,000 to 450,000 tons of lime would be produced annually at the mine. However, the DEIS also states (page 2-13) that, "Graymont proposes to continue lime production at a rate of approximately 1 million tons annually." In addition, the DEIS states on page 2-6 that, "each kiln can produce about 500 tons of lime per day," and since there are two rotary kilns at the mine, if each operated 365 days per year, they would produce approximately 365,000 tons of lime production per year (close to the 370,000 to 450,000 ton estimate above). However, the DEIS also states on page 3-6 that, "Graymont uses a maximum of 215,000 tons of limestone per year in the kilns, producing about 120,400 tons of lime."

1-8 There appear, therefore, to be varying reports regarding the amount of lime production at the Indian Creek mine (e.g., 370,000 to 450,000 tons of annual lime production; 1 million tons of annual lime production; and 120,400 tons of annual lime production). This varied and inconsistent information regarding annual lime production at the mine should be corrected so that only one accurate amount of overall annual lime production at the mine is reported in the FEIS.

1-8 See Response 1-6.

1-9 2) Figure 2-7, Typical Cross Section (page 2-32), appears to show that the pit in the dolomite claims area would mostly remain in place following overburden placement. Would it be appropriate to provide additional backfill for this pit to better simulate pre-mining conditions?

1-9 All opportunities for pit backfilling will be evaluated and coordinated with the agencies when reclaimed. The backfill will provide access and habitat similar to pre-mining conditions. The lower quarry would be completely backfilled.

Air Quality

3) The DEIS presents 1998 PM10 measured data near the facility that were less than the current 24-hour PM10 National Ambient Air Quality Standard (NAAQS) of 150µg/m³ (page 3-6). Table 3-2 presents 2005 and 2006 calculated emissions of SO₂, NO_x, CO and VOCs and Air Quality Permitted levels for the facility. However, no current ambient air data were presented for any air quality pollutants, and no analytical method was conducted to determine the air quality impacts from this project or for cumulative effects. The DEIS simply references the current air quality permit No. 1554-16, and included Table 3.2 showing emissions of SO₂, NO_x, CO, and VOCs below permitted levels.

As detailed mining plans for the area are developed, proposed backfill will likely be modified in response to ongoing reclamation work in the existing quarry sites, material available for backfill, and specific environmental objectives for the area. Also see Response 2-1.

1-10 For a proposed project that presents current emissions over the major source category for both SO₂ (108.79 tpy) and NO_x (388.11 tpy), an air impact analysis should be presented in the FEIS that incorporates both a near field and far field modeling analysis for both the project specific and cumulative effects. EPA recommends that an air quality impact analysis include consideration for NAAQS and Prevention of Significant Deterioration (PSD) increments.

1-10 See Response 1-5.

1-11 The Affected Environment - current ambient air concentrations for the general project area should be incorporated into the FEIS. Please refer to the following links for recent monitored data.

1-11 See Response 1-5.

<http://www.epa.gov/air/data/index.html>
<http://www2.nature.nps.gov/air/monitoring/ads/adsreport.cfm>
<http://vista.cira.colostate.edu/views/>
<http://nadp.sws.uiuc.edu/>

4) The Graymont mine is located approximately 40 miles south-south East of the Gates of the Mountains Wilderness and 70 miles east-northeast of Anaconda Pintler Wilderness and 80 miles north-northwest of Yellowstone National Park, which are all Class I areas that enjoy special environmental considerations, including protection of air-quality related values (AQRV's). An Air Quality Related Value impact analysis should be presented that includes results for visibility, deposition and acid neutralizing capacity for this project in Class I and Sensitive Class II areas. BLM should contact the Helena National Forest, which is the federal land manager of the nearest Class I area, to coordinate this additional air quality analysis. Should this additional air quality analysis indicate that the operation of this facility will contribute to adverse impacts to these designated Class I areas, we request that the BLM work with Montana DEQ, EPA, and Graymont to assess whether additional mitigation measures will be needed to avoid significant air quality impacts to these lands.

I-12

I-12

5) In regard to greenhouse gas emissions at the mine the DEIS states (page 3-6) that,

“Carbon dioxide (CO₂), an unregulated pollutant, is produced from the kilns when limestone is converted to lime. Graymont uses a maximum of 215,000 tons of limestone per year in the kilns, producing about 120,400 tons of lime. At this maximum, about 156,500 tons of CO₂ would be produced per year.”

As noted in comment no.1 above, the DEIS includes varied and inconsistent disclosures regarding annual lime production at the mine (page 2-2, 370,000 to 450,000 tons of lime produced annually; page 2-13, 1 million tons of lime, page 3-6 120,400 tons of lime). It is not clear to us which figure of annual lime production may be accurate. We also note that if only 120,400 tons of lime per year are produced as reported on page 3-6, it would mean the kilns are only operating at about 34% of capacity, since it is reported that each kiln can produce about 500 tons of lime per day (page 2-6). This appears unlikely to us. In any case, as stated in comment no. 1, a single consistent estimated of annual lime production at the mine should be disclosed. A single estimate of annual lime production at the mine is needed to provide an accurate estimate of annual greenhouse gas emissions (carbon dioxide or CO₂) associated with lime production.

I-13

I-13

We are not sure of the accuracy of the reported 156,500 tons of CO₂ emissions associated with production of 120,400 tons of lime annually. Stoichiometric analysis suggests that approximately 94,500 tons of CO₂ or 85,800 metric tons of CO₂ equivalents would result from converting 215,000 tons of limestone to 120,400 tons of lime. Alternatively, we estimate that 80,800 metric tons of CO₂ equivalents would be released from production of

Monitoring of ambient air concentrations is not currently required by Air Quality Permit No. 1554-16 issued by DEQ. The federal and Montana 24-hour ambient air quality standard for PM₁₀ is 150 µg/m³, which is not to be exceeded more than once per year. All measured values at the Indian Creek Mine are below the ambient air quality standard of 150 µg/m³ for a 24-hour sampling period. Effective January 1, 1999, DEQ removed the requirement to monitor PM₁₀ from Air Quality Permit 1554-11.

Permit stipulations require Graymont to submit annual production and other information for all emission units. These data are necessary to calculate or estimate the amount of air pollutants emitted during each calendar year. Gaseous emissions from the Indian Creek facility include nitrogen oxide(s) (NO_x), sulfur dioxide (SO₂), carbon monoxide (CO), and volatile organic compounds (VOCs). Permitted emissions levels and the DEQ Emission Inventory Summary are shown in **Table 3-2**.

See Response I-6.

120,400 tons of lime using the "*CO₂ emissions from production of lime*" worksheets at <http://www.ghgprotocol.org/calculation-tools/all-tools>. This is about 6% less CO₂ production than suggested by the stoichiometric estimate, and may be a more accurate estimate, accounting for impurities in the limestone and production of kiln dust.

The DEIS also reports (page 2-6) that approximately 40,000 tons of coal and 30,000 tons of petroleum coke are used annually to fuel the kilns at the processing plant (or about 320 tons of fuel per day). We estimate that approximately 149,000 metric tons of CO₂ equivalents (164 tons of CO₂) may be emitted from combustion of this amount of coal and coke using the "*CO₂ emissions from fuel use in facilities*" worksheets at <http://www.ghgprotocol.org/calculation-tools/all-tools>.

Adding 149,000 metric tons of CO₂ equivalents resulting from coal and coke combustion and 80,800 metric tons of CO₂ equivalents from conversion of limestone (CaCO₃) to lime (CaO), results in an overall annual estimate of approximately 229,800 metric tons of CO₂ equivalents (or 253,200 tons of CO₂), which is about 62 % higher than the 156,500 tons of annual CO₂ production that is reported in the DEIS.

We also note that a recent analysis of "CO₂ Emissions Profiles from the U.S. Cement Industry" (<http://www.epa.gov/ttn/chiefc/conference/ei13/ghg/hanle.pdf>) indicated that, "*For each ton of cement produced, approximately 54% of total emissions are process-related and 46% are combustion-related.*" If one assumes that the report of 40,000 tons of coal and 30,000 tons of coke use annually in the kilns at the Indian Creek Mine are accurate, and that 149,000 metric tons of CO₂ equivalents (164,000 tons of CO₂) would result from combustion of this amount of coal and coke, and then applies the above approximate percentages of overall greenhouse emissions being combustion related (46%), an estimate of approximately 324,000 metric tons of CO₂ equivalent emissions (or 357,000 tons of CO₂) at the mine would result ($149,000/0.46 = 324,000$). This would mean that approximately 175,000 metric tons of CO₂ equivalents (193,000 tons of CO₂) would result from conversion of limestone to lime ($324,000 - 149,000 = 175,000$ metric tons), which would correspond to approximately 223,000 metric tons of annual lime production (or 246,000 tons of lime) at the mine (yet another potential estimate of annual lime production at the mine). This would correspond to using approximately 439,000 tons of limestone in the kilns.

In any case, the amount of annual lime production and amount of CO₂ release at the mine is not clear. We recommend that the limestone use, lime production, and coal and coke burning in the kilns be reevaluated, and that estimates of annual CO₂ production from such reevaluation be provided in the FEIS. The estimate of greenhouse gas emissions should include the amount of CO₂ released from both conversion of limestone (CaCO₃) to lime (CaO), as well as the amount of CO₂ released from using coal and coke to heat the kilns.

I-13
(cont)

I-14 We also suggest inclusion of additional information and discussion in the FEIS regarding the link between greenhouse gas emissions and climate change, including a summary of potential climate change impacts that may be associated with the greenhouse gas emissions from the mine; translate the emissions into relevant equivalencies that are understandable to the public in relation to other greenhouse gas sources; describe the contribution of the project's greenhouse gas emissions to global temperature increase, including in the context of cumulative impacts; describe the project's emissions in the context of total greenhouse gas emissions at regional, national and global scales; describe generally, the environmental impacts of climate change based on current scientific knowledge; and as well as discussion of potential means to mitigate project-related emissions as appropriate pursuant to CEQ regulations (40 CFR Sections 1502.14(f), 1502.16(h), 1508.14).

I-14

Text concerning *Climate and Climate Change* has been added to Chapters 3 and 4 as separate sections in the Final EIS. Also see Response I-5.

I-15 We encourage the BLM and Graymont to consider conduct of activities that may mitigate greenhouse gas production at the mine. Primary consideration should be given to reducing greenhouse gas emissions through improved project design and energy efficiency measures at the kiln and quarry since mitigation measures discussed in a FEIS should include such things as design alternatives that would decrease pollution emissions. (See CEQ 40 Questions, Question 19).

I-15

Graymont tracks CO₂ and other gas emissions in an effort to reduce energy consumption as well as the release of these gasses. Graymont is in compliance with Air Quality Permit No. I554-16 issued by DEQ.

We also want to note that Montana is a member of the Western Climate Initiative (WCI, <http://www.westernclimateinitiative.org/>) that has proposed a regional carbon cap and trade program to reduce greenhouse gas emissions (<http://www.westernclimateinitiative.org/ewebeditpro/items/O104F18808.PDF>). The draft policy of the WCI issued on January 6, 2009 can be seen at, <http://www.westernclimateinitiative.org/ewebeditpro/items/O104F20744.pdf>. The WCI has suggested a methodology for calculation of greenhouse gas emissions during lime manufacturing that may be helpful (see <http://www.westernclimateinitiative.org/ewebeditpro/items/O104F20773.doc>).

Water Resources

- 6) We are pleased that information has been provided from Extraction Procedure Toxicity Tests on kiln dust to determine leachable concentrations of trace elements, and the results showed non-detectable concentrations for arsenic, cadmium, lead, mercury, selenium, and silver, and barium and chromium levels below maximum allowable concentrations (page 3-11). Concentrations of metals in samples of ore and overburden were analyzed in 2005, and results of analysis for 21 trace elements showed non-detectable concentrations or concentrations within typical ranges of those found in soils.
- 7) We are pleased that the DEIS discloses that both Indian Creek and Crow Creek are listed as impaired under Section 303(d) of the Clean Water Act (pages 3-16, 3-18). Indian Creek is listed as impaired from its headwaters to Missouri River confluence (7.9 miles)

for both agricultural and drinking water uses due to arsenic, cadmium, lead, and mercury concentrations from historic mining activities (acid mine drainage, mine tailings, and dredge/placer mining). Crow Creek is listed as impaired from the National Forest boundary to the Missouri River (16.2 miles) for agricultural, aquatic life, cold water fishery, industrial, and primary contact recreation due to alteration in stream-side vegetative cover, low flow alterations, high nitrogen and phosphorus concentrations, stream bed alteration, and sedimentation and siltation due to habitat modification and agricultural practices.

The DEIS indicates (page 3-16) that surface water quality samples provided by DEQ from the upper Indian Creek drainage near three abandoned or inactive mine sites upstream from the mine permit boundary along the East Fork (Park Mine) and West Fork (Diamond Hill Mine and St. Louis Mine) of Indian Creek evidenced exceedances of Montana numeric water quality standards for aquatic life and/or human health for arsenic, cadmium, copper, mercury, lead, and zinc.

We are pleased that water quality monitoring has been conducted by Graymont since 2003 in Indian Creek (i.e., four stations along Indian Creek: Upstream, Middle, Downstream, and Downstream of the Dolomite Claims Area), and in Crow Creek from 2004 to 2006 (i.e., two stations on Crow Creek: Upper and Lower). It is reported that none of the Graymont Indian Creek and Crow Creek monitoring data evidenced exceedances of Montana numeric surface water quality standards, and that water quality in Indian Creek is consistent from upstream to downstream locations. It appears, therefore, that these metal concentrations are attenuated or diluted as they move downstream toward the Indian Creek Mine site, and that the mine is not aggravating water quality degradation.

EPA believes that it is important that proposed activities in the drainages of 303(d) listed streams not cause further degradation of water quality in Indian Creek and Crow Creek, and be consistent with TMDLs and Water Quality Plans intended to improve water quality and restore full support of beneficial uses to the impaired waters. Indian Creek and Crow Creek appear to be within the Canyon Ferry TMDL Planning area, with TMDLs due in 2012. While it appears that the mine is not aggravating water quality impairments, we encourage the BLM to fully coordinate with MDEQ's TMDL Program staff to assure that the MDEQ TMDL staff consider the proposed project to be consistent with applicable TMDLs and Water Quality Plans (contact Dean Yashan and/or Robert Ray of the MDEQ in Helena at 444-5317 and 444-5319, respectively).

I-16

I-16

See Response I-1.

- 8) We are pleased that Graymont conducts routine monitoring of groundwater and springs, as well as surface water, as part of its operational monitoring program; and that water monitoring sites are identified (Figure 3-3) and monitoring parameters and frequency summarized in the DEIS (Table 3-3). The DEIS reports that static water levels in mine plant site production wells are at levels that are in excess of 100 feet lower than Indian Creek's elevation, and that groundwater was not encountered during exploration drilling

in the South Claims Area to depths of up to 500 feet below ground surface. Groundwater was not encountered during exploration drilling at depths ranging 135 to 150 feet in the Dolomite Claims Area, and springs are stated to be outside the proposed mine operating permit boundary (page 3-12). It would appear, therefore, that potential impacts to groundwater would be minimal.

Table 3-8 (page 3-24) does not show elevated levels of the nitrogen parameters in groundwater. The DEIS, however, suggests (page 3-29) that there may be potential for contamination of groundwater by nitrates from blasting residue, and states that some nitrates from blasting residues on rock may be introduced to groundwater in the local area (page 4-16).

The Graymont surface water monitoring data does appear to evidence elevated concentrations of total nitrogen (up to 4.5 mg/L) and total phosphorus (up to 0.6 mg/L) in Crow Creek (page 3-18). Table 3-4 (page 3-18) appears to indicate that there are also some elevated concentrations of total Kjeldahl nitrogen and total nitrogen in Indian Creek. Is it believed that these elevated nitrogen levels are related to use of ammonium nitrate (page 2-8) in blasting agents, or are these elevated nitrogen levels perhaps related to other activities (e.g., grazing, military use of explosives, etc.)?

I-17

Will surface and groundwater monitoring for nitrogen residues continue throughout the mine life in all mined areas (i.e., Dolomite Claims Area, North Claims Area, and South Claims Area)? We recommend that mitigation measures planned in the event monitoring evidences surface or groundwater contamination with blasting residues be identified and discussed in the FEIS. Mitigation measures could include appropriate sleeves in the blast holes to prevent incomplete combustion due to high moisture content, avoiding blasting events during periods of high atmospheric moisture, or other applicable blasting design improvements.

I-17

See Response I-2 and Response I-3. No contamination from blasting residues has been observed in past surface water or groundwater testing. Since the quarry is dry and surface water is contained on the mine site, direct contamination pathways have not been identified through monitoring. All blasting is conducted by certified blasters and no groundwater has been, or is anticipated to be, encountered in the quarry.

9) We are pleased that storm water management and sediment and erosion control practices at the mine site appear to have been planned, and are being implemented. For example:

- * surface water control structures have been designed and constructed in accordance with an approved Storm Water Pollution Prevention Plan (page 2-7),

- * sediment and erosion control BMPs will be used to minimize soil erosion and contain sediment in stormwater runoff (e.g., run-on control / diversion ditches; run-off control ditches; sediment ponds; silt fences; cover crop on soil stockpiles, prompt re-establishment of vegetative cover, page 3-35);

- * applications for additional storm water discharge outfalls for new disturbance areas would be submitted (page 3-26);

* detention ponds would be designed to contain run-off from a 10-year, 24-hour storm, and

* only mine site storm water run-off that exceeds the capacity of detention ponds would discharge off-site under an agency-approved storm water permit (page 4-17).

* a Spill Prevention, Control, and Countermeasure Plan has been implemented at the Mine to address hazardous material spills (page 2-8).

- 10) EPA considers the protection, improvement, and restoration of riparian areas and wetlands to be a high priority. Wetlands and riparian areas increase landscape and species diversity, support many species of western wildlife, and are critical to the protection of water quality and designated beneficial water uses. Potential impacts on riparian areas and wetlands include: water quality, habitat for aquatic and terrestrial life, flood storage, ground water recharge and discharge, sources of primary production, and recreation and aesthetics.

We are pleased that the DEIS indicates that a wetland assessment was conducted in the study area by Tetra Tech EMI in 1998 (page 3-44), and that no jurisdictional wetlands were found within the Study Area. In addition it was reported that limited wetlands were found on the LHTA south of the Study Area.

The DEIS also reports that several small ephemeral drainages could be filled as a part of the Proposed Action occur in two areas: 1) unnamed tributaries to Indian Creek occur in Section 34 of the Dolomite Claims Area; and 2) unnamed tributaries to Crow Creek occur in Section 17 of the South Claims Area. It will be important that the U.S. Army Corps of Engineers be notified before mining occurs in such ephemeral drainages to be sure appropriate 404 permit procedures are followed (i.e., if waters of the U.S. within jurisdiction of the Section 404 Clean Water Act Dredge and Fill Permit Program are identified).

I-18

I-18

See Response I-4.

Reclamation

- 11) We are pleased that reclamation procedures have been developed by Graymont, BLM, and DEQ that are designed to replace the dominant species removed by mining with the same or similar species; and that native grass species are used in reclamation seed mixes. Shrub and tree seedlings grown from seed collected from native plants in the Study Area will be planted in the mountain mahogany/juniper and Douglas-fir reclamation types. We support reclamation activities that facilitate establishment of vegetation on reclaimed areas with seeding and shrub planting to provide habitat and browse for wildlife (page 2-27).

I-19

We note, however, that only 2 to 9 inches of growth media are proposed to facilitate revegetation of reclaimed areas. It would appear to us that greater than 2 inches of growth media (top soil) would not only be needed to better facilitate successful establishment of shrubs, but may also be necessary to achieve successful revegetation. The DEIS, however, states that placement of growth media in excess of 2 inches appears to limit establishment of mountain mahogany, an important browse species for mule deer and bighorn sheep (page 2-27). No explanation was provided to explain why placement of additional depth of growth media would limit establishment of mountain mahogany. This should be explained further in the FEIS.

- 12) It is helpful to know that monitoring of previously disturbed areas at the Indian Creek Mine has shown that native perennial grasses have attained canopy cover levels similar to pre-mine conditions in a period ranging from 10 to 15 years (page 3-45). However, the DEIS also reports it will be difficult and slow to reestablish pre-mining levels of shrubs and trees during reclamation, and that loss of diverse native plant communities in reclaimed areas would be an adverse effect from the mine expansion (pages 3-45 to 3-47).

We believe it is important to pursue reclamation efforts that re-establish vegetative conditions that mimic pre-mining vegetation as much as practicable. We recommend that repeated plantings of shrubs and trees be carried out as necessary during reclamation to assure that densities of shrubs and trees similar to pre-mining vegetative conditions are eventually re-established before reclamation is approved as complete. This is important since shrubs and trees are often important browse species for wildlife (e.g., mountain mahogany) or provide important seed and berry sources for wildlife (e.g., Rocky Mountain juniper, limber pine). We also support the use of fences to protect newly planted vegetation on grazing allotments (page 3-60).

Weed Management

- 13) We are pleased that Graymont has developed a Weed Management Plan, and that control of noxious weeds in the proposed mine expansion areas would continue. We support noxious weed mitigation and control, since many noxious weeds are a threat to biodiversity and some invasive weed species can out-compete native plants and produce a monoculture that has little or no plant species diversity or benefit to wildlife.

Weed prevention is the most cost-effective way to manage and control weeds by avoiding new infestations and spread of weeds, and thus, avoiding the need for subsequent weed treatments (e.g., practices such as minimizing ground disturbance, quickly revegetating disturbed areas, use of weed free seed, cleaning vehicles and equipment, and other practices that prevent infestation and spread of weeds). Early recognition and control of new infestations avoids wider future use of herbicides and other control methods.

I-19

Mountain mahogany exhibited the best growth and survival in less than 2 inches of topsoil compared to thicker topsoil treatments. This has been demonstrated in test plots at the Indian Creek Mine and is also based on field experience of agency staff at this and other sites.

Topsoil placed in excess of 2 inches would likely allow higher concentrations of grasses to become established which would out compete mountain mahogany. The 2-inch layer of topsoil closely replicates the natural, undisturbed growing conditions for mountain mahogany.

Text for *Alternative A – Modified Pit Backfill* (p. 2-27) has been revised to include information in this response.

It is important that herbicides be used in accordance with label specifications, and that certified herbicide applicators be used. It is also important to be cautious in spraying near streams and wetlands, including ephemeral streams, with use of no spray buffer zones along streams and other aquatic areas. Herbicide drift into streams and aquatic areas could adversely affect aquatic life and wetland functions such as food chain support and habitat for wetland species. All efforts should be made to avoid movement or transport of herbicides into surface waters that could adversely affect public health, fisheries or other water uses.

The Montana Water Quality Standards include a general narrative standard requiring surface waters to be free from substances that create concentrations which are toxic or harmful to aquatic life. Herbicides should be applied at the lowest rate effective in meeting weed control objectives and according to guidelines for protecting public health and the environment.

We are particularly concerned about potential use of more toxic and persistent herbicides such as picloram (Tordon), since they have higher potential for more serious stream and/or groundwater contamination. We recommend that roadside drainage areas leading to intermittent and perennial streams be flagged as no-spray zones and not sprayed with picloram-based herbicides. We also recommend that picloram not be used at rates greater than 0.25 lbs/acre, and suggest that Graymont and the BLM consider applications of persistent herbicides such as picloram only once per year to reduce potential for accumulation in soil. Potential for persistent herbicides to accumulate in soil in harmful amounts are reduced if sites are treated only once per year (twice being the limit). Trade-offs between effective weed control and effects on soil productivity and leaching concerns may need to be considered. A second treatment application if needed should only occur after 30 days (or according to label directions). We also note that spotted knapweed, which is a prevalent noxious weed species in Montana, is non-rhizomatous (i.e., does not spread by rooting) and should be relatively easy to control with lower rates of the most selective low toxicity herbicides.

Most picloram products, including Tordon 22K, are Restricted Use Pesticides (RUPs) requiring pesticide applicator certification to purchase and apply. It is important that herbicide applicators be certified throughout the duration of the project. If commercial applicators will be contracted for RUP applications, we recommend checking to make sure their Montana commercial RUP license is current. Please contact Montana Dept. of Agriculture at (406) 444-5400 for more information. Also, please note that registration for Access (which has picloram as an active ingredient) has been cancelled.

For your information, the website for EPA information regarding pesticides and herbicides is <http://www.epa.gov/pesticides/>. The National Pesticide Telecommunication Network (NPTN) website at <http://nptn.orst.edu/tech.htm>, which operates under a cooperative agreement with EPA and Oregon State University, has information on toxicity, mobility, and environmental fate on pesticides which may be

Graymont has limited Tordon use and has sprayed 80 percent Milestone for the last 2 years using licensed commercial applicators. The agencies will continue to work with Graymont to enhance its weed control program.

BLM, as well as those holding authorizations on BLM administered lands, operate under a set of Standard Operating Procedures and Protective Measures outlined in the Butte Field Office Weed Management Plan which prevent or minimize impacts resulting from noxious weed and invasive plant control, considering the management objectives of the site. BLM allows for the use of chemicals approved under the Bureau-wide EIS completed in 2007 that have the least damaging effects to the environment while providing the desired outcome, while also applying the least amount of herbicide needed to achieve the desired results. Under the Protective Measures, BLM minimizes treatments in areas where herbicide runoff is likely and minimizes the use of herbicides that have high soil mobility particularly in areas where soil properties increase the potential for mobility. Picloram herbicides are used once during the fall using the lowest rate possible while 2-4,D is used during the spring when plants are in rosette or juvenile growth. The agencies will continue to work with Graymont as an authorized user of BLM administered lands to enhance its weed control program as allowed under BLM provisions.

I-20

I-20

helpful (phone number 800-858-7378).

National Guard Training Conflicts

14) The DEIS states (page 3-59) that the Montana Army National Guard (MTARNG) considers proposed mining operations in the South Claims Area to be in conflict with the MTARNG training program, notwithstanding the limited area of Surface Danger Zones as depicted in the Memorandum of Agreement between Graymont, BLM, and MTARNG. It is also stated that unless the right-of-way is allowed to expire in 2014, the level of impact mining operations in the South Claims Area would have on MTARNG training will ultimately be resolved by Congress before Graymont's operations reach the South Claims Area. We recommend that the most recent information regarding the status of potential Congressional legislation associated with this potential land use conflict be included in the FEIS.

1-21

1-21

The project legislative environmental impact statement (LEIS) has been completed and transmitted to BLM's Montana State Director for review. Findings and recommendations have been submitted to the BLM Director and Secretary of the Interior, but approval is required by Congress through legislation. The action is also addressed in the approved Butte Resource Management Plan (April 2009). Discussion on Congressional legislation related to MTARNG training area can be found in the *Montana Army National Guard in Authorizing Actions* section of Chapter 1 and the *Military Training – UXO Clearance* section in Chapter 4. No additional information is available at this time.



**Montana Fish,
Wildlife & Parks**

1400 South 19th Avenue
Bozeman MT 59718-5496

LETTER NO 2

Bureau of Land Management
Butte Field Office
106 North Parkmont
Butte, MT 59701
Attn: Dave Williams

March 2, 2009

Dear Dave,

These comments are submitted in relation to the Draft Environmental Impact Statement (EIS) for the Graymont Western U.S., Inc. Proposed Mine Expansion, Broadwater County, Montana.

Montana Fish, Wildlife and Parks (FWP) concurs with most of the assessment in Chapter 3 of the EIS as to what the impacts to wildlife will be as a result of the Proposed Action. Specifically, the major impacts would be:

1. The Proposed Action would result in direct loss of mountain mahogany, woodlands, sagebrush, and grassland habitats. Loss of these habitats would reduce availability of forage, security, and breeding cover for wildlife inhabiting the area. Individuals of some species dependent on these disturbed sites would be killed or displaced.
2. Mountain mahogany, sagebrush, and other shrubs are typically difficult to re-establish on mined land and areas burned by wildfire. Because shrubs are important forage for mule deer, bighorn sheep, and other wildlife species, low rates or delayed re-establishment of these plant species on reclaimed sites would reduce the capacity of the proposed project to support species with affinities for shrub habitat (e.g., mule deer, Brewer's sparrow, and bighorn sheep).
3. Removal of 451 acres of mountain mahogany habitat (18 percent of mountain mahogany in the Limestone Hills) as a result of the Proposed Action would have potential to reduce the capacity of the proposed project area and adjacent Elkhorn Mountains to support mule deer. The extent of reduction would depend on availability of winter forage including mountain mahogany and other browse species favored by mule deer (e.g., sagebrush, juniper, winterfat, rabbitbrush, and skunkbush sumac). Loss of 18 percent of mountain mahogany habitat would likely result in a reduction in the winter range carrying capacity for mule deer in the Limestone Hills until reclaimed sites develop vegetation characteristics comparable to pre-mining conditions.

4. The capability of reclaimed areas to provide forage for mule deer and bighorn sheep is lower than for undisturbed shrub communities.
5. The slow establishment of shrubs (especially mountain mahogany) on reclaimed areas results in long-term impacts to wildlife through slow re-establishment of browse species.
6. Enhanced re-vegetation efforts may reduce the recovery time; nevertheless, a relatively short return to current conditions would be unlikely in shrub and habitat types affected by proposed mine expansion or implementation of Alternative A – Modified Pit Backfill.

Montana Fish, Wildlife and Parks conducts surveys for mule deer in the Limestone Hills annually, and the area is one of FWP's long-term trend areas for determining the status of mule deer regionally. The Limestone Hills portion of this trend area is flown in early winter when deer are concentrated on winter range. Additionally, a larger area is surveyed during the early spring "green-up" period as deer are moving off winter range to determine population trend after potential winter mortality. The winter range area is divided into two survey areas. Area A is defined on the east by the Missouri River and on the west by Old Women's Grave Road. Area B is defined on the east by Old Women's Grave Road and on the west by Mud Springs Road. The areas are defined by different vegetation and topography/geology with Area B supporting high densities of mountain mahogany and rugged limestone ridges. Area A is characterized by more grass dominated rolling hills. Area B has historically supported an average of 83% of the deer observed during the early winter surveys while Area A has supported an average of 17% of mule deer observed (Table 1). The discrepancy in use between the two areas is primarily due to the presence of mountain mahogany in Area B, a highly preferred browse species for mule deer. In fact, deer come from summer ranges comprising a large portion of the south Elkhorn Mountains to winter in this area. Based on surveys conducted for mule deer as well as other species in this area over time, it has become apparent that areas adjacent to the Limestone Hills are mostly devoid of mule deer during the winter period.

Two things are worth discussing when looking at the mule deer survey data for this area. First is that numbers of deer are declining from the high counts of the early 1990's when over 1,000 mule deer were observed on this winter range. The other disturbing trend, especially noticed this year (2009), is there appears to be a shift in wintering deer from Area B to Area A (Table 1 and Figure 1). As mentioned above, typically an average of 83% of mule deer wintering in this area utilize Area B. In the 2009 survey, only 51% of the deer observed occurred in Area B. This shift in distribution was not likely caused by a change in climatic conditions as these surveys have been conducted over a long enough period that a wide range in climatic conditions have been encountered and results have not shown such a shift prior to this year. Additionally, surveys were conducted the first week in January, and the weather during the month of December was colder than normal combined with abundant snowfall. Under the weather conditions experienced during

December, local big game populations in the Elkhorn Mountains as well as the adjacent Big Belt Mountains were concentrated on typical winter range areas in December.

Table 1. Mule deer aerial survey in Limestone Hills trend area in Hunting District 380, 1993-2009.

Year	Total Mule Deer	Total/% in Area A	Total/% in Area B
1993	1003	122/12%	881/88%
1995	450	42/9%	408/91%
1997	679	44/6%	635/94%
1998	395	31/8%	364/92%
1999	518	16/3%	502/97%
2000	476	46/10%	430/90%
2001	520	126/24%	394/76%
2002	556	169/30%	387/70%
2003	422	63/15%	359/85%
2004	458	73/16%	385/84%
2005	786	212/17%	574/73%
2006	591	90/15%	501/85%
2007	786	104/13%	682/87%
2008	556	144/16%	404/74%
2009	434	212/49%	222/51%

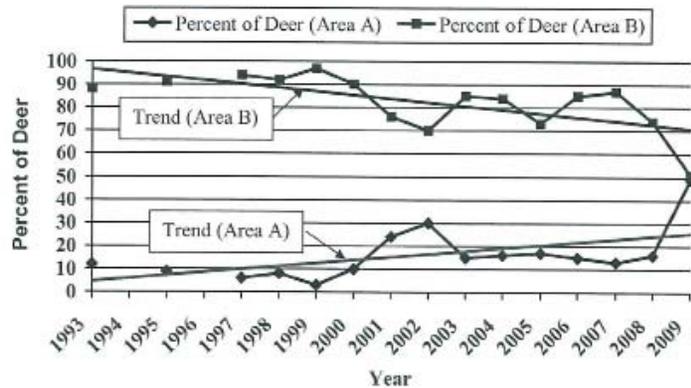


Figure 1. The percent of mule deer observed in Area A and Area B and the subsequent trend in deer use of those areas, Limestone Hills, 1993-2009.

A possible explanation for this trend in shifting distribution is the increased disturbance in Area B from expansion of on-going mining activity by Graymont including exploration efforts to the south causing displacement of deer. Disturbance to wildlife is a

combination of several factors including the actual acres impacted by mining activity which result in a direct loss of space, forage and cover, and a larger area impacted by associated mining disturbance including vehicle traffic, blasting, and other human disturbances. These factors in combination make the disturbance to wildlife much greater than the actual acres physically impacted and can, as it appears in this case, displace wildlife into less desirable habitats.

In the Proposed Action, a new permit boundary consisting of 1,940 acres would be created which when added to the existing permit boundary of 1,735 acres creates a total permit area boundary of 3,675 acres or 5.74 sections. This is an extremely large portion of this critical mule deer winter range, probably over 50%. While not all this acreage will be physically impacted by mining activity, the activity occurring within that boundary would impact many wildlife species as mentioned above. One of the most significant negative impacts that has occurred from Graymont's on-going mining activity in this area is the destruction of native plant communities (particularly mountain mahogany) which would increase under the Proposed Action. The inability to reclaim this important big game browse species in an effective and timely manner precludes this area from being managed in a normal multiple use scenario as applied to most public lands. According to the EIS, there is a total of 2,446 acres of mountain mahogany in the Limestone Hills (no reference where that figure came from) of which 768 acres would be in the new permit area, of which 451 acres (18%) would be removed by mining activity. Missing from the cumulative effects discussion and not mentioned in the EIS is the amount of mountain mahogany occurring in the existing permitted area and how much of that has been lost and how much has been successfully reclaimed. Using figures provided for the new expansion area and extrapolating those to the existing permitted area, it is estimated that there were somewhere around 694 acres of mountain mahogany in the existing permitted area prior to the implementation of mining. This acreage, when combined with acres of mountain mahogany occurring in the new permit area, would add up to a total of 1,462 acres of mountain mahogany in both permit areas of which approximately 877 acres (60%) would be removed by mining activity. This would mean that around 36% of the mountain mahogany would be removed from the Limestone Hills due to mining activity and would in theory be replaced through reclamation efforts. Again according to the EIS, mountain mahogany occurs naturally in this area at a density of about 2,926 plants per acre. Reclamation efforts in the area being considered in the Proposed Action would reclaim mountain mahogany according to reclamation efforts for the existing permit area at a density of 200 plants per acre or 7% of the density that mountain mahogany occurs at in undisturbed areas. In the EIS, reclamation efforts on the existing permit area have totaled around 60 acres after almost 3 decades of mining. Assuming mining activity is expanded as under the Proposed Action the amount of winter range impacted by mining would quickly increase. As mentioned on page 3-55 of the EIS:

"The amount of winter range determines the capacity of habitat to support mule deer. Because winter poses nutritional and thermal stress to animals, it becomes the population limiting factor."

Graymont hasn't been able to demonstrate on a large-scale successful and functional reclamation of mountain mahogany. The reality is that the carrying

2-1

2-2

2-3

The agencies believe that native plant communities, including mountain mahogany can be re-established and the preferred alternative specifically focuses on accomplishing this. Ultimate reclamation to a habitat roughly comparable to pre-mining conditions is the objective of the reclamation plan in the preferred alternative and will enable the lands to be returned to "normal multiple use" following the completion of mining and reclamation.

A total of 288 acres have been disturbed by mining operations at the Indian Creek Mine since 1981, of which approximately 90 acres was mountain mahogany/Rocky Mountain juniper habitat. Approximately 70 acres are undergoing reclamation which includes seeding/planting of mountain mahogany (Resource Management Associates 2009). During the reference period, an average of 3 acres of mountain mahogany habitat has been disturbed annually. During the first 10 years of mine operation, mule deer population in the Limestone Hills area increased to a high of 1,025 in 1990-1991 (Westech 2004). Subsequent years have seen deer populations fluctuate from a low of 395 in 1998, to 786 in 2005, and 434 in 2009. These fluctuations all occurred while active mining operations were conducted at the Indian Creek Mine.

Mountain mahogany is one of 35 shrubs used by deer for browse. Fluctuations in wildlife population can result from many factors including various browse species. The agencies recognize the importance of mountain mahogany to wintering deer herds. Selection of Alternative A – Modified Pit Backfill as the preferred alternative is intended, in part, to provide an environment conducive to re-establishing mountain mahogany and other browse species important to wildlife. Also see response 1-19.

Graymont has not demonstrated large-scale successful and functional reclamation of mountain mahogany primarily because the Mine has not yet undertaken large-scale reclamation because of their need to have several pits open in order to blend some of the ore to meet customer requirements. As operations expand to the south, opportunities for larger scale reclamation focusing on mountain mahogany will become available. The preferred alternative will improve the likelihood of successful reestablishment of mountain mahogany in a more diverse reclamation plan.

capacity of this winter range for mule deer continues to diminish and would be exacerbated under the Proposed Action.

In the Cumulative Effects section, it is mentioned that there are 196,000 acres of mule deer winter range in the Elkhorn Mountains. The reality is that core winter range or the area that mule deer spend most of the winter makes up a small portion of that total. On page 4-27, it is stated that existing and proposed mining activity occurs on approximately 2,000 acres (1%) of mule deer winter range in the Elkhorn Mountains. However, it is not mentioned that that 1% of winter range supports 30 to 40% of the mule deer in the entire mountain range.

Assuming the trend of displacement of deer from Area B to Area A, as mentioned above, continues, more mule deer and possibly bighorn sheep would be put into direct competition for forage with domestic sheep that use this area on a BLM allotment during the winter period. As mentioned in the EIS, bighorn sheep went through a major die-off in 2007/2008, presumably from contact with domestic animals. This increased competition for forage and space at this time of year would not benefit domestic or wild animals.

In relation to bighorn sheep on page 4-29, it states, "no new domestic sheep/goat grazing allotments would be allowed in occupied bighorn sheep habitat or within a 5-mile buffer." There is no scientific reference for the 5-mile buffer. The Bureau of Land Management's 1998 guidelines recommend a 9-mile buffer from domestic animals (USDI 1998). The existing distance from domestic sheep that is currently being used by a number of western state wildlife agencies, which is based on the long-term viability of bighorn sheep, is 23 km (Zeigenfuss et al. 2000).

Another source for potential major impacts is the haul road which would run from the existing permit area to the new permit area. This would be a high traffic road designed to haul crushed ore from the south to the smelting facilities at the northern main facilities. This road would be in the middle of the most important core mule deer winter range that is currently still intact. If the Proposed Action is implemented and this road is indeed constructed, it would potentially inhibit migration from summer range areas to what would remain of the traditional wintering areas for these animals.

On page 3-57, the EIS concludes, "**No irreversible or irretrievable commitment of wildlife resources would result from the Proposed Action. Re-establishment of mountain mahogany to pre-mine conditions could require decades to achieve. Control of noxious weeds is important to ensure that weeds do not out compete desired plant communities on reclaimed areas.**

No residual effects on wildlife resources are expected to result from implementation of the Proposed Action. Reclamation activities would eventually restore areas disturbed by mining and processing operations resulting in reestablishment of wildlife habitat."

2-4

This information has been added to the Direct and Indirect Effects and Cumulative Effects discussions for Terrestrial Wildlife in the FEIS.

2-4

2-5

Past and current mining activities in Area B (area between Old Woman's Grave Road and Mud Springs Road) have impacted only a limited acreage (approximately 288 acres) in the northwest corner of Area B. While it is true that the disturbance to wildlife can be greater than reflected in the actual acreage disturbed, there is no obvious relationship between the mining disturbance and the one year drop to 51 percent of wintering deer in Area B in 2009. There was no corresponding change in mining activity in 2009 so it is likely there are other explanations for the movement of deer into Area A (area between Missouri River and Old Woman's Grave Road) in 2009. Language related to potential conflicts related to Grazing have been added to the Cumulative Impacts section of the FEIS

2-5

2-6

2-6

The process to develop the Approved Butte Resource Management Plan established this management provision. The Final EIS simply discusses this provision in relation to cumulative impacts related to mine expansion.

2-7

2-7

Mule deer and bighorn sheep are occasionally observed on the Indian Creek Mine property. Haul truck drivers maintain radio contact to warn of wildlife crossing haul routes. The current mine speed limit is 25-mph and the haul trucks typically run from 20-25 mph. Traffic on haulageways is intermittent due to routine scheduling and cycle times, currently averaging approximately 70 trucks per day doing a round trip which equates to an average of one vehicle passing every 4 and a half minutes. This frequency of truck traffic is not considered to be high volume traffic. Mining and quarrying operations do not operate on a 24/7 basis. The mining contractor typically operates on a four 10-hour day schedule so there are time windows when there would be no traffic or personnel on the road for periods of 14 hours a day unless there is a large order to fill requiring overtime. Deer seem to have become habituated to mining traffic in the current operation area, and are unlikely to alter their migration pattern due to the limited amount of traffic on the proposed haul road.

Montana Fish, Wildlife and Parks, in conjunction with other state and federal agencies and in partnership with private conservation organizations, has spent millions of dollars in recent years in the effort to protect wildlife habitats essential to the long-term viability of wildlife populations, such as the Limestone Hills, from destruction.

2-8

FWP concludes that there will be irreversible or irretrievable commitment of wildlife resources from implementing the Proposed Action, and the residual effects at a minimum from that decision will be the long-term decline of mule deer in this area due to compromised winter range that would be caused under the Proposed Action. FWP recommends the exploration of other alternatives that are less destructive to this winter range and wildlife in general.

Sincerely,

Patrick J. Flowers
Region Three Supervisor

CC: Tom Carlsen, Kurt Alt

Literature Cited

USDI Bureau of Land Management. 1998. Instruction Memorandum 98-140. Revised Guidelines for Management of Domestic Sheep and Goats in Native Wild Sheep Habitats. USDI-BLM, Washington, DC. 6 pp.

Zeigenfuss, L.C., F.J. Singer, and M.A. Gudorf. 2000. Test of a modified Habitat Suitability Model for Bighorn Sheep. *Restoration Ecology*. 8:38-46.

2-8

The impacts suggested in FWP's comments are disclosed under Direct and Indirect Impacts in the Terrestrial Wildlife Section of Chapter 3. The section on Irretrievable and Irreversible Impacts has been revised. The FEIS acknowledges the impacts that mining as proposed would have on the winter range during active mining operations. The slow establishment of shrubs would affect browse available for wildlife species during the period of re-growth.

RECEIVED

February 13, 2009

2009 FEB 18 P 1:35

Richard H. Opper, Director
MT Department of Environmental Quality
P.O. Box 200901
Helena, MT 59620

Richard H. Hotaling Field Mgr.
BLM Butte Field Office
106 North Parkmont
Butte, MT 59701

BUREAU OF LAND MANAGEMENT

Gentlemen,

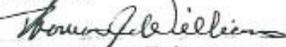
LETTER NO 3

I am currently the chairman of the Elkhorns Working group, a citizen advisory board assembled to advise state and federal agencies relative to management of the Elkhorn Mountains. As requested, our advisory board has reviewed and discussed the mine expansion proposed by Graymont Western U.S., Inc. in Broadwater County, Montana.

The mine in question operates near Townsend, Montana under Operating Permit No. 00105, issued by the Montana Department of Environmental Quality, and the Plan of Operations #MTM78300 issued by the Bureau of Land Management.

In our advisory capacity we reviewed the Draft Environmental Impact Statement, Indian Creek Mine Expansion, December 2008. At our regular February 12, 2009 meeting our advisory board discussed the impacts and implications of the action as described in draft environmental impact statement. As a result we adopted the attached resolution relative to the Indian Creek Mine Expansion. We respectfully request that the issues mentioned in that resolution be considered and addressed as your agencies develop the final environmental impact statement relative to this project.

Sincerely,



Tom Williams, Chair
Elkhorns Working Group

48 Highway 437

Town, MT 59643-936

judyntm@hughes.net

406-266-5760

ELKHORN WORKING GROUP
RESOLUTION ** FEBRUARY 12, 2009

Relative to:
Draft Environmental Impact Statement (DEIS) (December 2008)
INDIAN CREEK MINE EXPANSION

Whereas: The Limestone Hills are an area currently supporting about one-half the wintering mule deer, and are critical to the recovery of bighorn sheep, in the Elkhorn Mountains along with other wildlife (DEIS 3-50, & 3-55); and, the proposed mine expansion is in the Limestone Hills, and

Whereas: This project will extend the life of the mine and its impact for a half-century (DEIS S-1); and the wildlife of the Elkhorn Mountains are an important consideration of the Elkhorns Working Group, and

Whereas: The DEIS states "No monitoring or mitigation measures for terrestrial wildlife have been identified by the BLM or DEQ." (DEIS 3-57).

3-1 | Now Therefore Be It Resolved: The Elkhorn Working Group respectfully requests that: 1) mitigation programs to minimize and fully compensate for this project's impacts on wildlife be developed and addressed in the final EIS; and, 2) monitoring of the impacted wildlife resources and the reclaimed land they are dependent upon, also be provided for and addressed in the final Environmental Impact Statement.

3-2 | Be It Further Resolved: That since the proposed project will emit 156,500 tons of CO2 per year (DEIS 3-6) and the Elkhorn Mountains are experiencing climate related conifer mortality, it is time for climate change to become part of the cumulative effects analysis and discussion in the Final Environmental Impact Statement; and

3-3 | Be It Further Resolved: That a reclamation plan be developed and discussed for the 5 million tons of reject rock (DEIS S-2, & DEIS 2-20) stored outside of mine pits.

3-1 | Graymont's reclamation plan, as described in Chapter 2, addresses potential impacts to wildlife. In addition, selection of *Alternative A – Modified Pit Backfill* as the preferred alternative by the agencies is intended, in part, to further address impacts to wintering deer herd by providing an environment conducive to re-establishing mountain mahogany and other browse species important to wildlife. Also see Response 1-19 and 2-1.

Monitoring reclamation success is routinely incorporated into permit approval and subsequent compliance visits by the agencies. Monitoring of big game is done annually by FWP.

3-2 | A separate section on *Climate and Climate Change* has been added to Chapters 3 and 4 of this Final EIS.

3-3 | The agencies believe that if *Alternative A – Modified Pit Backfill* is implemented; much of the reject rock can be incorporated as partial pit backfill which meets the agencies objectives for improved reclamation diversity. This will also limit disturbance associated with having separate reject rock dumps to reclaim. Where reject rock dumps are required, "natural regrade" principles will be used in reclamation. Refer to *Alternative A – Modified Pit Backfill* beginning on page 2-27.

John T. Flynn

RECEIVED

ATTORNEY AT LAW
(406) 266-9226
FAX (406) 266-9254
BOX 95
TOWNSEND, MONTANA 59611

2009 JAN 29 P 1:35

BUREAU OF LAND MANAGEMENT

LETTER NO 4

January 28, 2009

GRAYMONT MINE PROJECT MANAGER
BLM BUTTE FIELD OFFICE
106 NORTH PARKMONT
BUTTE, MT 59701

RE: GRAYMONT WESTERN INC'S PROPOSED EXPANSION OF INDIAN CREEK MINE

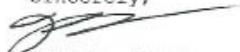
Dear Sir:

I wish to go on record in support of Graymont Western, Inc.'s proposed expansion of the Indian Creek limestone and dolomite mine and plant in the Elkhorn Mountains. Graymont is one of the leading employers and property tax payers within Broadwater County. They produce a much needed product without any significant affects to the environment.

In addition, Graymont has been an excellent neighbor that has been a bright light and generous contributor to many local organizations.

This expansion project would be a positive event for this community.

Sincerely,



John T. Flynn

4-1

Comment noted.

4-1

JTF skl

Ref. Comment/EIS

February 23, 2009

Patrick Plantenberg
Operating Permit Section Supervisor
Environmental Management Bureau
Department of Environmental Quality
P.O. Box 200901
Helena, MT 59620

RECEIVED

MAR 0 6 2009

DEQ/EMB

LETTER NO 5

SUBJECT: Comments draft Environmental Impact Statement for Operating Permit #00105 - Indian Creek Mine

Dear Sir,

The Montana National Guard (MTARNG) appreciates the opportunity to comment on the Graymont Western US Inc. draft Environmental Impact Statement (EIS) to amend its current operating permit. As you know, the Indian Creek Mine is located within our Limestone Hills Training Area. The Limestone Hills Training Area is our most important training area and absolutely critical in preparing our citizen Soldiers to perform their missions. The Montana National Guard and Graymont have been good neighbors for over 20 years and are active in keeping each other informed regarding their respective operations.

Attached to this cover letter are our various specialists' responses to the draft EIS by subject.

We appreciate your effort in the process and allowing us the opportunity to express our comments and concerns. If you have any questions, please contact the undersigned at 324 3010.


STANLEY R. PUTNAM
BG, Montana National Guard
Commanding

cc: Herb + Pat

GOPY

MTARNG Responses to Graymont Mine Expansion draft EIS

UXO

1. The UXO clearance on the ridge is being conducted in accordance with an approved Explosive Safety Submission or ESS. This ESS was approved by the Department of Defense Explosive Safety Board or DDESB. The ESS delineates five clearance zones (Zones 1-5) sequentially from north to south on the ridge. The Draft EIS states that the UXO clearance rate is approximately 25 acres per year. It would be more accurate to state that the rate of clearance is highly variable depending upon site conditions and levels of contamination and funding. Zones 1 and 2 have been cleared and released back to the BLM since full-scale clearance activities were initiated in the Spring of 2002 for a total of approximately 157 acres "cleared." While this computes to roughly 25 acres per year, it is misleading as it implies that 25 acres per year become available for mining. Only after DDESB has approved release of a Zone does the acreage within that Zone meet the definition of "cleared."

5-1

2. The most recent estimate for the completion of UXO clearance operations on the ridge is late 2012 and this estimate is contingent upon full funding of the clearance project.

3. There is no consensus on the issue of UXO clearance in the southern claims. The actual extent of UXO contamination is unknown. However, UXO have been recovered from the southern claims area and it would be reasonable and prudent to assume that some level of UXO remediation would be required prior to the initiation of surface disturbance. The cost of the UXO remediation in the southern claims has been estimated at between 13 and 20 million dollars (Letter to MT DEQ from BG Putnam, 15 April 2006). This estimate is likely a "best case" estimate.

4. On page 2-7 of the Draft EIS the following statement is made:

The MTARNG, the Department of the Army, ACQE and the Department of Defense are jointly responsible for identifying and clearing UXO in the LHTA.

This statement implies that there is a regulatory requirement for location and removal of all UXO in the Limestone Hills Training Area. This is incorrect. The Limestone Hills Training Area is an operational range. Surface UXO are cleared when discovered so as to protect the public and military personal and to comply with the ROW Lease Agreement and relevant DOD and DA regulations that relate to safety and management of

5-2

Comment noted. Text has been modified. Reader is referred to page 2-7, *Unexploded Ordnance (UXO) Clearance* for discussion of this issue.

5-1

Comment noted. The referenced statement seems to conflict with "Clearance of UXO on an operational range is done in order to comply with several DOD and DA regulations" in paragraph 4 of comment letter.

5-2

The requirement to clear the area of UXO was a stipulation of the Right-of-Way under the 43 CFR 2800 Regulations and does constitute a legal requirement to clear both subsurface and surface UXO.

5-2 | operational ranges. There is no legal or regulatory requirement to clear
(cont) | subsurface UXO on an operational range.

An operational range is defined as: "A range that is under the jurisdiction, custody, or control of the Secretary of Defense and that is used for range activities; or although not currently being used for range activities, that is still considered by the Secretary to be a range and has not been put to a new use that is incompatible with range activities. (10 U.S.C. 101(e)(3)(A) and (B)). Also includes "military range," "active range," and "inactive range" as those terms are defined in 40 CFR §266.201.

Clearance of UXO on an operational range is done in order to comply with several DOD and DA regulations (partial list):

- 1) DOD Directive 6055.9 DOD Ammunition and Explosives Safety Standards
- 2) DOD Standard 4715.11 Environmental and Explosives Safety Management on Department of Defense Active and Inactive Ranges within the United States
- 3) DOD Directive 3200.15 Sustainment of Ranges and Operating Areas (OPAREAs)
- 4) AR 210.21 Army Ranges and Training Land Program
- 5) AR 35-10 The Army Safety Program
- 6) AR 385-63 Policies and Procedures for Firing Ammunition for Training, Target Practice and Combat
- 7) AR 385-64 Ammunition and Explosives Safety Standards
- 8) DA PAM 385-63 Range Safety Standards

Withdrawal

- 5-3 | 1. Pages S-24 and 1-7: The Army corps of Engineers would not serve as the surface management agent for the MTARNG. They could act as the real estate agent for land acquisition, administer grazing leases, or, if there is no withdrawal, they could manage the UXO clearance with BLM as the regulatory authority. If the US Congress decided in favor of withdrawal, ACOE would license (not lease) Limestone Hills for use by MTARNG.
- 5-4 | 2. Page S-10: The emergency closure of Limestone Hills in 1994 was done by BLM as the Federal Agency with jurisdiction over the property, not by MTARNG
- 5-5 | 3. Page 3-58: The MTARNG began the process for the proposed withdrawal in 1997 not 2003, which was by seeking a waiver to the moratorium on military land acquisitions. The Legislative EIS was contracted in 2002 and began scoping in 2003.
- 5-6 | 4. Actual proposed withdrawal acres are 18,644 not 18,604. This change was do to a parcel of land that was not appropriately identified as BLM land in the draft LEIS.

- 5-3 | Text has been revised for the Final EIS regarding the statement made on page I-7 in the Draft EIS. There is no page S-24 or any reference to comment subject matter in the Summary section.
- 5-3 | Under the withdrawal the ACOE would be the land manager and would license the Limestone Hill Training Range to the MTARNG for the purpose of military training. Specific land management issues could be addressed through the enabling legislation.
- 5-4 | Comment noted. Text has been revised per comment.
- 5-5 | Text has been revised in the Final EIS per comment.
- 5-6 | Text has been revised in the Final EIS per comment.

Maps

- 5-7 | 1. Figure 2-7 Add proposed action backfill on the typical cross section.

Cultural Resources

- 5-8 | 1. There are 12 Native American cultural sites (lithic scatter) identified in the EIS that may possibly be destroyed, which seems it must be an adverse effect under Section 106 of NHPA. Will Graymont be a signatory to the MOA between BLM, SHPO and possibly ACHP? Or will BLM make the expansion conditional to Graymont compliance to mitigation?
- 5-9 | 2. Will Tribal correspondence be part of the final EIS?

Training

- 5-9 | 1. The Limestone Hills Training Area is an exercise area and an operational range in support of the Montana National Guard and other military users. Effective range and mine coexistence requires written agreements such as our current memorandum of agreement and communications. As the mine expands to the South, the mining operations encroach and push into the surface danger zones of the current operational ranges. For overall safety and to meet standards of military regulations, this requires more communication and cooperation. Mining in an operational range is not the norm, but can be conducted successfully with the application of sincere coordination. This coordination is imperative for the safe coexistence of the mine and the Montana National Guard operational ranges.
- 2. As the mine develops the dolomite deposits, it may affect the Limestone Hills tank access road, called Route Blue, which connects to the tank firing points. Even if dolomite mining goes through Route Blue, a temporary 16 foot wide detour road would suffice for tanks and military vehicles traveling through to fire or train. Montana Army National Training Site Range Maintenance vehicles may have to drive through during the week so a temporary road would need to be open every day to ensure access.
- 3. Mining normally takes place Monday through Friday. Military training is planned for conduct on weekends. Conflicting schedules do occur through out the year but are coordinated with the mine to ensure safety and communication. However, overlapping schedules for the same roads and property require vigilant cooperation to ensure the safety of all involved

In Addition

- 5-10 | 1. The EIS seems to make MTARNG a Federal agency of the Department of the Army, which is an incomplete view of the MTARNG. The MTARNG has both a State and Federal mission. However, the Right of Way signed in 1984 by the MTARNG was sign as a State Agency, the Montana Department of Military Affairs, not as a Federal agency. It has been argued and could again be argued that the Right of Way obligated the State of Montana for any clean-up of the area due to MTARNG use.

Figure 2-7 is a representation of Alternative A (Modified Pit Backfill). Proposed reclamation contours associated with the Proposed Action are shown on Figure 2-5.

The eligibility of the sites has not been determined. If any sites that have been determined eligible are in the area of potential effect, then a MOU with SHPO, BLM and Graymont will be required to mitigate the adverse effects.

No Tribal correspondence will not be included in the final EIS, as it is part of the Administrative Record. The BLM initiated formal Native American consultation through a series of personal meetings with representatives of the Confederated Salish and Kootenai Tribes of the Flathead Reservation, Blackfeet Tribe, and Shoshone-Bannock Tribe. To date these consultation efforts have not identified any specific Traditional Cultural Properties within or in close proximity to the Project Boundary. Consultation with the tribal representatives will continue as the project goes forward.

Comment noted.

- 5-11 | 2. Please address in the "Land Use, Access, and Transportation" section address how the main access road used by the MTARNG will be impacted by the proposed Dolomite Claims Area.
- 5-12 | 3. Chapter 6 References: Wheeler, J. remove "Center for Environmental Management of Military Lands" and replace with "Montana Army National Guard".
- 5-13 | 4. The MTARNG still feels that the concerns and comments submitted in Putnam's letter of April 15 2006 accurately represent the MTARNG position. As a reminder these were:
 - a. Exhibit A (attached) delineates the Surface Danger Zones (SDZs) for various weapons systems that are used for live-fire training of our soldiers. As depicted in this exhibit, a minimum of five of our weapons system SDZs would be impacted. We cannot conduct live-fire operations when personnel are within the bounds of the SDZ for the respective weapon systems. Exhibit A also illustrates the inherent conflict between concurrent live-fire training and mine operations in the southern claims area. Unless we are able to arrive at a mutually agreeable schedule that accommodates training, the proposed expansion of Graymont's operating permit would have a significant adverse impact on our training.
 - b. Past military live-fire training has resulted in contamination of much of the current and proposed permit area with Unexploded Ordnance (UXO). Section 2.9 of the Graymont application (dated February 22, 2006) contains a Land Use and Safety Agreement between Graymont and Montana National Guard. This Agreement is crucial for the continuing safety of each operation and it is essential that each party continue to comply with this agreement.
 - 5-14 | c. The Montana National Guard also needs to point out that there is no guarantee that funding for UXO remediation will remain at current levels despite our best efforts to secure such funding. Should site conditions become more adverse for the detection of UXO, it is possible that we may be unable to meet a clearance standard that would allow for an end use of mining. It would be to the benefit of each party to minimize the area of actual land disturbance and consider sharing the responsibilities of UXO clearance activities.
 - 5-15 | d. Graymont's proposed amendment would expand the current UXO clearance acreage an additional 1303 acres. The area encompassed in the amended operating permit is generally referred to as the "southern claims area." While we lack site-specific information on UXO and fragmentation levels in the southern claims area, we do know that much of the area has been contaminated with UXO. We estimate the future clearance cost of the southern claims area would be between 13 and 20 million dollars. The time necessary to accomplish the clearing is dependent upon both the physical site conditions and availability of funds.

- 5-11 | Alternate routes will be established where appropriate. Traffic control will be used where roads intersect. As detailed mining plans are developed the agencies will work with Graymont and MTARNG to develop a plan which maintains MTARNG access to the core portion of the range and provides for detailed traffic control if this proves necessary. The *Land Use, Access, and Transportation* section in Chapter 3 has been modified to reflect comment.
- 5-12 | Reference for J. Wheeler has been modified in Chapter 7 – *References in the Final EIS*.
- 5-13 | The EIS evaluates impacts to the environment from the proposed expansion. Coordination between land users has been handled through agreements outside the scope of the EIS, and the agencies anticipate these agreements and the coordination they require will continue to be critical for the safe use of the range and safe mining operations.
- 5-14 | Graymont's compliance with terms of the required Safety Plan is part of the approved Plan of Operations.
- 5-14 | See Response 5-13
- 5-15 | A detailed discussion of UXO remediation is outside the scope of this EIS. The EIS evaluates impacts to the environment from the proposed mine expansion. This NEPA/EIS process is not the appropriate venue for evaluating roles and responsibilities related to UXO clearance.
- 5-15 | Ability of MTARNG to clear areas ahead of mine expansion may impact the availability of those portions of the deposit.

5-16

e. The Dolomite Claims area in the north-east corner of the permit area shows the disturbance area (refer Exhibit D in the application). Within the proposed disturbance area we have both a main access road and water well and stock tank that could be impacted by disturbance. The well and stock tank are important in that they help ensure cattle do not congregate around springs located in our main firing area. We are also concerned that our main access road remains open and free of disturbance as there is no alternative road that can handle the various vehicles supporting military training.

5-16

As detailed mining plans are developed, the agencies will work with Graymont and MTARNG to develop a plan which maintains MTARNG access to the core portion of the range and provides active traffic and cattle control, as necessary. If necessary, an alternate well and stock tank will be developed to keep livestock away from the main firing area.

EXHIBIT A
Limestone Hills Training Area
Live Fire Ranges

Townsend

Rango Towers

Legend

	Old Workers Grave Rd		SO Cell SDZ
	Current GW Permit		Mortar SDZ
	Proposed Permit Expansion		M1A1 SDZ
	High Explosive Impact Area		MK19 SDZ
	Limestone Hills TA		Proposed GTR



Map Drawn and
13 Apr 09

CHAPTER 7 REFERENCES

- Big Sky Acoustics, LLC (BSA). 2007.** Memorandum to Terry Grotbo at Geomatrix, regarding noise level measurements conducted for the Indian Creek Mine Expansion EIS Project on August 6, 2007. August 8, 2007.
- Bison Engineering Inc. 1999.** Air Quality Data Summary, Indian Creek Lime Plant, Townsend, Montana, 4th Quarter 1998. February.
- Boden, T., G. Marland and R. Andres. 2009.** Global, Regional, and National Fossil-Fuel CO₂ Emissions. Carbon Dioxide Information Analysis Center, Oak Ridge National Laboratory. U.S. Department of Energy. Oak Ridge, Tenn. doi 10.3334/CDIAC/00001
- Broadwater County Planning Board (BCPB). 2003.** Broadwater County Growth Policy Plan and Comprehensive Economic Development Strategy. July. Available online at <http://www.co.broadwater.mt.us>.
- Brown, M. 2005.** Electronic Mail from Mike Brown of Graymont Mining Company to Richard Leferink of Maxim Technologies Regarding Graymont Mine Financial Information. October 13.
- Butts, T. 1993.** A survey of bats of the Helena National Forest, Montana. Montana Natural Heritage Program. Helena.
- _____ **2005.** Limestone Hills South Extension Bat Surveys June-August 2005. Unpublished report prepared for Graymont Western US Inc. Townsend, Montana, by Continental Divide Ecological Consulting. Helena, Montana.
- Carlson, T. 2008.** Personal communication from Tom Carlson, wildlife biologist with FWP to Joe Elliott (Geomatrix) concerning bighorn sheep die-off in Indian Creek area. May 14, 2008.
- Center for Climate Strategies (CCS). 2007.** Montana Greenhouse Gas Inventory and Reference Case Projections 1990-2020. Prepared for Montana Department of Environmental Quality. September.
- Chen-Northern, Inc. 1991.** Laboratory analysis including sieve analysis and Atterberg Limits calculations. Reject rock was judged “non-plastic” with 9.85% passing a No.200 screen and 100% passing the ½ inch screen. September 25, 1991.
- Chorney, E. 2004.** Electronic Mail from Elton Chorney of Graymont Mining Company to Mike Brown of Graymont Mining Company Regarding Graymont Mine Financial Information. July 13.
- _____ **2007.** Personal communication between Elton Chorney of Graymont Mining Company and Jessica Peterson of Geomatrix Consultants, Inc. regarding contracted services and vendor expenditures. August 7.

- Davis, L., S. Aaberg and J. Fosher, Jr. 1980.** Cultural resources in the Limestone Hills Army National Guard Training Site, Broadwater County, Montana. Department of Sociology/Anthropology, Montana State University. Bozeman.
- Design Build Engineering and Consulting, Inc. (DBEC). 2007.** Limestone Hills Curl-leaf Mountain Mahogany Reseeding Program. Prepared for Montana Army National Guard. February.
- ECON, Inc. 1980.** Soils Report, Indian Creek Mine, Broadwater County, Montana. Prepared for Continental Lime Co. December.
- Ecosystem Research Group. 2006.** Elkhorn vegetation study Phase II, Final Report. Elkhorn Working Group. Missoula, Montana. Available online at:
http://www.ecosystemrg.com/elkhorn/elkhorn_pdf/Section_4.pdf.
- Egan, M. 1988.** Architectural Acoustics. McGraw-Hill, Inc. 411 pp.
- Energy Information Administration (EIA). 2008.** Emissions of Greenhouse Gases Report. Report No. DOE/EIA-0573(2007). U.S. Department of Energy. December.
- Federal Highway Administration (FHWA). 1998.** FHWA Traffic Noise Model, Look-Up Tables, Final Report, July 1998. U.S. Department of Transportation. FHWA-PD-98-047.
- Federal Transit Administration. 1995.** Transit Noise and Vibration Impact Assessment, Final Report, April 1995. U.S. Department of Transportation. DOT-T-95-16.
- Fedstats. 2007.** Broadwater County Mapstats from Fedstats, Bureau of Economic Analysis, Bureau of Labor Statistics, National Agricultural Statistics Service, National Center for Health Statistics, U.S. Census Bureau, Retrieved July. Available online at:
<http://www.fedstats.gov/qf/states/30/30007.html>.
- Fidel, S. 1983.** Community Response to Blasting. Journal of the Acoustical Society of America 74(3), September 1983.
- Foresman, K. R. 2001.** The Wild Mammals of Montana. American Society of Mammalogists. Special Publication No. 12.
- Geomatrix Consultants, Inc. 2008.** Limestone Hills Browse Summary. January.
- Gillespie, J. 2004.** Facsimile Memorandum from Broadwater County Clerk and Recorder/Treasurer to Karen Lyncoln of KLLyncoln, Inc. Regarding Broadwater County Property Tax Information. July 8, 2004.
- Goddard Institute for Space Studies. 2007.** Annual Mean Temperature Change for Three Latitude Bands. Datasets and Images. GISS Surface Temperature Analysis, Analysis Graphs and Plots. New York, New York.

Graymont Western US Inc. (Graymont), 1981. Operating Permit #00105 issued pursuant to Montana Metal Mines Reclamation Act by Montana Department of State Lands. June 15, 1981.

_____ **2005.** Letter dated May 3, 2005, from E. Chorney (Graymont) to P. Plantenberg (DEQ) regarding Indian Creek Mine overburden and waste rock samples.

_____ **2006.** MPDES Permit Renewal Application, Graymont Western US Inc., Indian Creek Plant, MPDES Permit No. MTR000090. Includes Storm Water Pollution Prevention Plan. September 2006.

_____ **2007a.** Operating and Reclamation Plan, Indian Creek Mine and Plant. March.

_____ **2007b.** Weed Management Plan. October.

_____ **2007c.** Personal Communication. Blasting information provided by Elton Chorney, Manager, Indian Creek Mine to Big Sky Acoustics. Time of blasting discussed during initial EIS team site tour, July 2, 2007. Weight of explosive charges provided by email, August 7, 2007.

_____ **2009.** Electronic mail dated April 16, 2009 from R. Robison, Director, Mining and Geology for Graymont to T. Grotbo, AMEC-Geomatrix, concerning CO₂ emissions from Indian Creek Mine processing plant.

Greatschools. 2008. website www.greatschools.net accessed May 6, 2008.

Harris, C., ed. 1998. Handbook of Acoustical Measurements and Noise Control. Acoustical Society of America, Woodbury, New York.

Hingtgen, T. and W. Clark. 1984a. Small mammal recolonization of reclaimed coal surface-mined land in Wyoming. *J. Wildl. Manage.* 48(4): 1255-1261.

_____ **1984b.** Impact of small mammals on the vegetation of reclaimed land in the northern Great Plains. *J. Range Manage.* 37(5): 438-441.

Hydrometrics, Inc. 2006. Baseline Water Resources near the Indian Creek Mine, Broadwater County, Montana. Prepared for Graymont Western US, Inc., Townsend, MT. December.

_____ **2007.** Baseline Water Resources near the Indian Creek Mine, Broadwater County, Montana. Prepared for Graymont Western US, Inc., Townsend, MT. February.

International Organization for Standardization (ISO). 1996. Standard 9613-2, *Attenuation of Sound during Propagation Outdoors, Part 2: General Method of Calculation.*

International Panel on Climate Change (IPCC). 1996. Climate Change 1995: The Science of Climate Change. J.T. Houghton, L.G. Meira Filho, B.A. Callander, N. Harris, A. Kattenberg, and K. Maskell, eds.; Cambridge University Press. Cambridge, U.K.

- _____ **2007a.** Summary for Policymakers. *In: Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change* [Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M.Tignor and H.L. Miller (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, USA.
- _____ **2007b.** Fourth Assessment Synthesis Report. *In: Climate Change 2007: U.S. Climate Change Science Program, Synthesis and Assessment Product 1.1, Temperature Trends in the Lower Atmosphere.*
- Kehoe, A. 1992.** *North American Indians, A Comprehensive Account.* (Second Edition). Prentice Hall, Englewood Cliffs, NJ.
- Kendy, E., and R.E. Tresch, 1996.** Geographic, Geologic, and Hydrologic Summaries of Intermontane Basins of the Northern Rocky Mountains, Montana. U.S. Geological Survey, Water-Resources Investigations Report 96-4025. Helena, Montana. August 1996.
- Kroeber, A. 1939.** Cultural and Natural Areas of Native North America. Originally published as Univ. of California Publications in American Archaeology and Ethnology. Vol. 38. Reprinted in 1963 by University of California Press, Berkeley and Los Angeles.
- Mackie, R.J., D.F. Pack, K.L. Hamlin, and G.L. Dusek. 1998.** Ecology and Management of Mule Deer and White-tailed Deer in Montana. Montana Department of Fish, Wildlife and Parks.
- Maxell, B., J. Werner, P. Hendricks, and D. Flath. 2003.** Herpetology in Montana: a history, status summary, checklists, dichotomous keys, accounts for native, potentially native, and exotic species, and indexed bibliography. Northwest Fauna 5, Society for Northwestern Vertebrate Biology.
- Menge, C. 2005.** "Assessment of Community Reaction to Proposed Club Racetrack." *Proceedings of the Institute of Noise Control Engineering (INCE) NOISE-CON 2005 Conference*, Minneapolis, Minnesota. October 17-19, 2005.
- Montana Army National Guard (MTARNG). 2008.** GIS data layers provided by Environmental Office, Center for Environmental Management of Military Lands.
- Montana Army National Guard (MTARNG), Graymont Western US, Inc., U.S. Department of the Interior, Bureau of Land Management (BLM). 2005.** Memorandum of Agreement between Montana Army National Guard, Graymont Western US, Inc., and Bureau of Land Management concerning Compatible Joint Use at Limestone Hills. February.
- Montana Army National Guard (MTARNG), U.S. Department of the Interior, Bureau of Land Management (BLM). 2007.** Draft Legislative Environmental Impact Statement Limestone Hills Training Area Land Withdrawal. Fort Harrison. Helena, Montana. April.

Montana Bureau of Mines and Geology – Groundwater Information Center (MBMG-GWIC), 2007. Groundwater Well Information. Available online at: <http://mbmggwic.mtech.edu>.

Montana Department of Environmental Quality (DEQ). 1997. Water Samples for Abandoned Hardrock Mine Priority Sites, Montana State Library, Helena, MT. Available online at: <http://nriss.mt.gov/nsdi/nris/shape/minehwaatr.zip>.

_____. **2001.** Checklist Environmental Assessment, Graymont Western US, Inc. Indian Creek Limestone Quarry North Ridge Amendment to Operating Permit 00105. August.

_____. **2004.** Air Quality Permit No. 1554-16. October.

_____. **2005.** DEQ Emission Inventory Summary.

_____. **2006a.** DEQ Emission Inventory Summary.

_____. **2006b.** Circular DEQ-7, Montana Numeric Water Quality Standards. February 2006.

_____. **2007a.** Letter from Herb Rolfes, Operating Permit Section Supervisor, Environmental Management Bureau, Montana Department of Environmental Quality to Elton Chorney, Mine Manager, Graymont Western Indian Creek Mine concerning Third Deficiency Review of Graymont LOM. April 12, 2007.

_____. **2007b.** Clean Water Act Information Center (CWAIC), 305(b)/303(d) Information. <http://deq.mt.gov/CWAIC/default.aspx>.

_____. **2007c.** Graymont Western DMR Data for Outfalls 001-A and 003-A, MTR000090. E-mailed from Jeff May (DEQ) to Doug Rogness (Geomatrix Consultants) on September 10, 2007. Helena, Montana.

Montana Fish, Wildlife and Parks (FWP). 2004. Statewide elk management plan for Montana: Draft. Montana Department of Fish, Wildlife and Parks. Helena, MT.

_____. **2009.** Letter from Patrick J. Flowers, Region Three Supervisor to Dave Williams, BLM Butte Field Office containing comments on the Draft Environmental Impact Statement for Graymont Western's proposed Indian Creek Mine Expansion Project. March 2, 2009.

Montana Department of Fish, Wildlife and Parks (FWP), U.S. Department of the Interior, Bureau of Land Management (BLM), and Continental Lime, Inc. 1997. Memorandum of Understanding (MOU) Bighorn Sheep Reintroduction Elkhorn Mountains. October.

Montana Department of Natural Resources and Conservation (DNRC). 2003. Montana's Basin Closures and Controlled Groundwater Areas. December 2003.

- Montana Department of Transportation (MDT). 2001.** Traffic Noise Analysis and Abatement: Policy and Procedure Manual, June 2001.
- Montana Natural Heritage Program (MTNHP). 2008.** Rare Plants Guidebook. Available online at: <http://nhp.nris.mt.gov/plants/guidebook.asp>.
- Morris, M., R. Kelsey, and D. Griggs. 1976.** The geographic and ecological distribution of big sagebrush and other woody *Artemisias* in Montana. *Montana Academy of Sciences* 36: 56-79.
- Mueggler, W. and W. Stewart. 1980.** Grassland and shrubland habitat types of western Montana. USDA Forest Service General Technical Report INT-66. Intermountain Forest and Range Experiment Station. Ogden, Utah.
- National Academy of Sciences. 2006.** Understanding and Responding to Climate Change: Highlights of National Academies Reports. Division on Earth and Life Studies. National Academy of Sciences. Washington, D.C.
- National Association of Counties (NACO). 2007.** Broadwater County, 2007. Available online at: http://www.naco.org/Template.cfm?Section=Find_a_County&Template=/cfiles/counties/cities.
- National Lime Association (NLA). 2008.** Letter from Timothy W. Byrne, President National Lime Association to Honorable Samuel W. Bodman, Secretary U.S. Department of Energy concerning greenhouse gas intensity of lime products. June 23, 2008.
- National Oceanic and Atmospheric Administration (NOAA). 1973.** NOAA ATLAS 2, Volume I – MONTANA (1973); Figure 30 – Isopluvials of the 100 Year, 24 Hour Precipitation in Tenths of an Inch.
- Natural Resource Information System (NRIS), 2007.** Water Rights Query System. Available online at: <http://nris.mt.gov/dnrc/waterrights/default.aspx>.
- Nelson, R. 2007.** Facsimile Memorandum from Broadwater County Treasurer to Karen Lyncoln of Geomatrix Consulting Regarding Broadwater County Financial Information. July 31.
- NPA Data Services, Inc. 2004.** Montana Population Projections. February.
- Pfister, R., B. Kovalchik, S. Arno and R. Presby. 1977.** Forest habitat types of Montana. USDA Forest Service General Technical Report INT-34. Intermountain Forest and Range Experiment Station. Ogden, Utah.
- Putnam, S. 2006.** Letter from Stanley Putnam, Brigadier General, Montana National Guard to Patrick Plantenberg, Operating Permit Section Supervisor, Montana Department of Environmental Quality regarding Graymont Western US application to amend current operating permit #00105. April 15, 2006.

Resource Management Associates, Inc. 2006a. Graymont Western U.S. Inc. Soil Survey 2004 South Claims Area. Updated May 2006 for Dolomite Claims Area. May 2006.

_____ **2006b.** Graymont Western US Inc., Visual Resource Management 2006 Mine Expansion.

_____ **2009.** Personal communication from Dick Juntunen, RMA, to Joe Murphy, AMEC-Geomatrix concerning disturbance and reclamation activities at the Indian Creek Mine. May 18, 2009.

Roundy, B., E. McArthur, J. Haley and D. Mann. 1993. Proceedings: Wildland Shrub and Arid Land Restoration Symposium. General Technical Report INT-GTR-315. Ogden, Utah: USDA Forest Service.

Rupke, A. and A. Knox. 2006. Graymont Geologic Services Indian Creek: Ridges Drilling Project (September, October 2005). May 2006.

Scher, J. 2002. *Juniperus scopulorum*. In: Fire Effects Information System (Online). U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory. Available online at: <http://www.fs.fed.us/database/feis/>.

Schuman, G. and T. Booth. 1998. Strategies for establishment of big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) on Wyoming mined lands. Final Report. Abandoned Coal Mine Research Program. High Plains Grassland Research Service. Cheyenne, Wyoming.

Scow, K. 2005. Baseline Vegetation Inventory South Extension Indian Creek Project, Montana. Unpublished technical report prepared for Graymont Western U.S. Inc. by WESTECH Environmental Services, Inc. Helena, Montana.

_____ **2006.** Baseline Vegetation Inventory Dolomite Claims Indian Creek Project, Montana. Unpublished technical report prepared for Graymont Western U.S. Inc. by WESTECH Environmental Services, Inc. Helena, Montana.

_____ **2007a.** Personal communication from Ken Scow to John Beaver. August 24, 2007.

_____ **2007b.** Revegetation monitoring, Indian Creek Project, Montana. Unpublished technical report in preparation for Graymont Western US, Inc. by Westech Environmental Services, Inc. Helena, Montana.

_____ **2008.** Personal communication from Ken Scow to John Beaver. February 8, 2008.

Sonoran Institute. 2003. Population, Employment, Earnings, and Personal Income Trends, Broadwater County, Lewis and Clark County, and Jefferson County, Montana. Economic Profile System.

_____ **2007.** A Socio Economic Profile of Broadwater County, Montana, Economic Profile System (EPS), produced May 30, 2007.

- Tetra Tech EM Inc. 1998.** Wetlands and Waters of the United States Delineation Report prepared for Limestone Hills and Fort Harrison Properties. Unpublished technical report prepared for Montana Army National Guard. Helena, Montana.
- Tisdale, E. and M. Hironaka. 1981.** The sagebrush-grass region: A review of the ecological literature. University of Idaho, Forest and Range Experiment Station. Bulletin Number 33. Moscow, Idaho.
- Tomeo, N. 2007.** Electronic Communication from Broadwater County Commissioners Office to Karen Lyncoln of Geomatrix Consultants Regarding Broadwater County Financial Information. August 1.
- Trainor, M. 2007.** Personal communication with M. Trainor of WESTECH Environmental, Inc. regarding lesser rushy milkvetch monitoring in areas burned on MTARNG property. October.
- U.S. Army Center for Health Promotion and Preventative Medicine (USACHPPM). 2003.** Installation Environmental Noise Management Plan - Fort Harrison Training Center, Limestone Hills Training Center, Montana Army National Guard. January 2003.
- _____. **2005.** Operational Noise Manual: An Orientation for Department of Defense Facilities, November 2005.
- U.S. Army Corps of Engineers. 2007.** Jurisdictional Determination Form Instructional Handbook.
- U.S. Bureau of the Census. 1997.** 1990 Census of Population and Housing – Summary Tape 3. June.
- _____. **2001.** State and County Quick Facts. Broadwater County, Lewis and Clark County, and Jefferson County. Available online at: <http://quickfacts.census.gov/qfd/states/30/30081.html>.
- _____. **2007.** State and County Quick Facts. Broadwater County, State of Montana. Available online at: <http://quickfacts.census.gov/qfd/states/30/3007.html>.
- U. S. Department of Agriculture, Forest Service (USFS). 1987.** Ecodata classification handbook 2090.11 USDA Forest Service Region I. Missoula, Montana.
- U. S. Department of Agriculture, Forest Service (USFS). Helena National Forest. 1986.** Helena National Forest Plan. April.
- _____. **2006.** Elkhorn Cooperative Management Area, 2006 FINAL Program of Work. Available online at: www.fs.fed.us/r1/helena
- U. S. Department of Agriculture, Soil Conservation Service (SCS). 1985.** Range condition rating for foothills and mountains within the 10 to 14-inch precipitation zone, southwestern Montana. Technical Guide II-E-8.

U. S. Department of Agriculture, Natural Resources Conservation Service (NRCS). 2007. Broadwater County Area Soil Survey.

U.S. Department of Energy and Montana Department of Environmental Quality. 2008. Final Environmental Impact Statement for the Montana Alberta Tie Ltd (MATL) 230-kV Transmission Line.

U.S. Department of the Interior, Bureau of Land Management BLM Butte District and U.S. Department of Agriculture, Forest Service, Helena National Forest and Deerlodge National Forest, 1995. Elkhorns Travel Management Plan and Amendment to the Montana BLM Headwaters Resource Management Plan in Broadwater, Jefferson and Lewis and Clark Counties, Montana. August 1995.

U.S. Department of the Interior, Bureau of Land Management (BLM). 1984. Headwaters District Resource Management Plan.

_____ **2003.** Visual Resource Management. Website at: <http://www.blm.gov/nstc/VRM/index.html>.

_____ **2007.** M. Goertel, BLM Rangeland Management Specialist, comments on draft preliminary Indian Creek Mine EIS. November.

_____ **2009.** Butte Resource Management Plan and Environmental Impact Statement. April.

U.S. Department of Labor. 2004. Local Area Unemployment Statistics, Bureau of Labor Statistics. Available online at: <http://www.bls.gov>.

U.S. Environmental Protection Agency (USEPA). 1979. Protective Noise Levels, Condensed Version of EPA Levels Document. EPA 550/9-79-100 (N-96-01 II-A-86).

_____ **2008.** Climate Change Science Program, Analyses of the Effects of Global Change on Human Health and Welfare and Human Systems (SAP4.6). Climate Change Website available at: <http://www.epa.gov/climatechange/basicinfo.html>.

U.S. Geological Survey (USGS). 2007. National Water Information System. Available online at: <http://waterdata.usgs.gov/nwis>. September 2007.

U.S. Global Change Research Information Office (USGCRIO). 2009. U.S. Global Change Research Program, National Assessment Synthesis Team, (2009) Global Climate Change: Impacts in the United States. Washington, D.C. available at <http://www.globalchange.gov/publications/reports/scientific-assessments/us-impacts/regional-climate-change-impacts/northwest>

Veizer, J. 2009. Climate, water, Carbon Dioxide and the Sun. Carleton Geoscience Center. University of Ottawa. Canada. March.

Vicklund, L., G. Shuman, and A. Hild. 2004. Influence of sagebrush and grass seeding rates on sagebrush density and plant size. USDA Forest Service Proceedings RMRS-P-31.

Westech Environmental Services (Westech). 1993. Supplementary Vegetation Information for Continental Lime, Inc. Indian Creek Operation, Broadwater County, Montana. July.

_____ **1999.** Vegetation/Land Condition Report for the Limestone Hills Property 1998. Prepared for: Montana Army National Guard, Environmental Office. May.

_____ **2004.** Fish and Wildlife Resources of the Limestone Hills Training Area. Technical Report prepared for Montana Army National Guard. September.

_____ **2007.** Unpublished Reclamation Monitoring Data for Indian Creek Project.

Wheeler, J. 2008. Personal communication, Environmental Office, Montana Army National Guard, Fort Harrison, Montana, to Joe Murphy, Geomatrix Consultants, Inc. March 14, 2008.