Appendix G

Air Quality Technical Support Document for the Hollister Underground Mine Project EIS - Draft

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Revised Draft

List of Acronyms

$\mu g/m^3$	micrograms per cubic meter
µm	Micrometer
AAQS	Ambient Air Quality Standards
ACEPM	Applicant Committed Environmental Protection Agency
AECOM	AECOM Technical Services, Inc.
amsl	above mean sea level
API	American Petroleum Institute
BAPC	Bureau of Air Pollution Control
CAA	Clean Air Act
CAAA	Clean Air Act Amendments
CFR	Code of Federal Regulations
CH_3Hg^+	Methylmercury
CO	carbon monoxide
CO_2	carbon dioxide
FLAG	Federal Land Managers Air Quality Related Values Work Group
H_2S	hydrogen sulfide
HAPs	Hazardous Air Pollutants
Hg_0	gaseous elemental mercury
HPS	Hatter Production Shaft, raise, or a ramp
km	kilometers
kV	kilovolt
NAAQS	National Ambient Air Quality Standards
NDEP	Nevada Division of Environmental Protection
NH_3	ammonia
NO_2	nitrogen dioxide
NO_X	nitrogen oxides
NSPS	New Source Performance Standards
NSSGA	National Sand, Stone and Gravel Association
NvMACT	Nevada Maximum Achievable Control Technology
O_3	ozone
Pb	Lead
PM	particulate matter
PM_{10}	PM with an aerodynamic diameter less than 10 micrometers
$PM_{2.5}$	PM with an aerodynamic diameter less than 2.5 micrometers
ppmw	parts per million weight
PSD	Prevention of Significant Deterioration
RCG	Rodeo Creek Gold Inc.
RGM	reactive gaseous mercury

SIP	State Implementation Plan
SO_2	Sulfur dioxide
tpy	tons per year
USEPA	United States Environmental Protection Agency
VMT	vehicle miles traveled
VOCs	volatile organic compounds
WRSF	Waste Rock Storage Facility

Executive Summary

AECOM Technical Services, Inc. evaluated air quality impacts resulting from expansion of surface and underground exploration to full-scale mining at the Hollister Site located 20 miles southeast of Midas in Elko County, Nevada. This modeling effort assessed air quality impacts from the Proposed Action for the Hollister Underground Mine Project Environmental Impact Statement.

The primary air pollutants of concern for the Hollister Underground Mine Project are nitrogen oxides, carbon monoxide, sulfur dioxide, and particulate matter including particulate matter with an aerodynamic diameter less than 10 micrometers, and particulate matter with an aerodynamic diameter less than 2.5 micrometers. While the total emissions of hazardous air pollutants (HAPs) air toxics from the proposed project do not warrant air toxics modeling, the project's total mercury emissions were assessed.

Screening level or refined dispersion modeling was performed for each criteria pollutant to demonstrate compliance with both the National Ambient Air Quality Standards (NAAQS) and Nevada Ambient Air Quality Standards, collectively referred to as AAQS. Modeling procedures and methods were conducted as described in the approved modeling protocol.

Modeled Emissions Sources at Hollister Site and Esmeralda Mill

Facility sources at Hollister include stationary (point) sources such as a shotcrete batch plant and stationary engines for electrical generation. Portable sources on the mine property include drill rigs used for mineral exploration and a portable generator used for night safety lighting. In addition, fugitive dust sources would be associated with the Proposed Action, and include vehicle travel on unpaved roads, ore stock piles, waste rock facilities, and ore load outs.

The existing Hollister Site power source, the two Cummins diesel generators located in the East Pit, would be taken out of service when electricity becomes available from the proposed 120-kilovolt (kV) and 24.9-kV electric power transmission lines (transmission lines), thereby greatly reducing the emissions associated with the diesel generators, which will remain on-site for emergency backup service.

Total annual project emissions were calculated for the pollutants of concern.

Facility sources at Esmeralda Mill and Midas Mill were not modeled for criteria pollutants or HAPs since these impacts are already evaluated under current operating permits. Visibility impacts from Esmeralda Mill were analyzed at Yosemite National Park due to its proximity. No analysis of visibility impacts was required for Midas Mill or the Hollister Site.

Modeling Results

Screening dispersion modeling was performed to assess impacts of haul truck emissions on dirt roads and portable drill rigs. Results of the conservative screening level dispersion modeling analysis for the Proposed Action demonstrate that the increased traffic associated with hauling ore and proposed use of drill rigs for the Proposed Action would not cause violations of National or State AAQS.

As a result of bringing electric power to the project area, the impacts due to gaseous criteria pollutants emitted by stationary sources, such as the two diesel generators, would be far less than the No Action Alternative, and well within National and State AAQS.

The Class I visibility analysis evaluated the potential changes in visibility from Esmeralda Mill to Yosemite National Park. A screening level assessment of the impacts on visibility from processing

Hollister ore at the Esmeralda Mill was performed using the VISCREEN model version 88341. The plume visual impact screening model VISCREEN is designed to ascertain whether the plume from a facility (i.e., Esmeralda Mill) has the potential to be perceptible to observers under “reasonable worst-case” conditions. The screening level results indicate that the plume formed by emissions from the mill would not be perceptible against either the sky or the terrain when the sun is behind the observer, and it is highly unlikely that the plume would be perceptible when the sun is in front of the observer.

Summary and Conclusions

Gaseous pollutant emissions associated with the Proposed Action would result from construction and mining equipment and vehicle exhaust. Haul truck traffic impacts were well within the National and State AAQS at a distance of 46 feet (14 meters) from the road for a generic road segment that is representative of all dirt roads. The impacts from drill rigs would not cause violations of National or State AAQS. Additionally, the change from diesel generated power to electric power would result in a decrease in the stationary source emissions, and impacts would be far less than the No Action Alternative, and well within National and State AAQS.

No individual HAP (including mercury) would be emitted in a quantity greater than the major source limit of 10 tons per year (tpy) at any of the facilities including the Hollister Site, Esmeralda Mill, and Midas Mill, and the combination of all HAP emissions would be less than the major source limit of 25 tpy; therefore, the proposed project would not constitute a major HAP source. The permitted emissions for mercury at Esmeralda Mill would be about 7 pounds per year. Processing Hollister ore at Midas Mill would result in mercury emissions at the same level as Esmeralda Mill.

The screening level modeling results indicate that visibility impacts from the Esmeralda Mill to Yosemite National Park would be highly unlikely to occur.

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1.0 Introduction and Background

AECOM Technical Services, Inc. (AECOM) evaluated air quality impacts resulting from expansion of surface and underground exploration to full-scale mining at the Hollister Site located 20 miles southeast of Midas in Elko County, Nevada. In accordance with the mine plan, ore would be transported off-site for processing at either the Esmeralda or Midas mills (**Figure 1-1**). The Esmeralda Mill is located approximately 22 miles southwest of Hawthorne in Mineral County, Nevada. The Midas Mill is located 20 miles northwest of the Hollister Site. This modeling effort assessed air quality impacts from the Proposed Action for the Hollister Underground Mine Project Environmental Impact Statement and is not meant to be used for air quality permitting purposes with the State of Nevada Division of Environmental Protection (NDEP).

The Hollister Site and the associated exploration activities are located in all or part of Sections 4, 5, 8, 9, 16, and 17 of Township 37 North (T37N), Range 48 East (R48E), and all or part of Sections 32 and 33 of T38N and R48E (**Figure 1-2**). Lands at the site are administered by the Bureau of Land Management, Tuscarora Field Office.

The Universe Transverse Mercator Zone 11, North American Datum 1983 (NAD83) coordinates of the approximate center of the Hollister facility main operations area are 5,366,631.7 meters east, and 4,550,870.2 meters north. The facility elevation is approximately 5,525 feet above mean sea level (amsl).

Rodeo Creek Gold Inc. (RCG) is proposing an expansion of its existing surface and underground exploration activities at the Hollister Site and the transition to full-scale underground mine production and associated support facilities. The Proposed Action (also called proposed project or the Hollister Underground Mine Project) would contain the following major components (**Figure 1-2**):

- Continued and expanded surface and underground exploration activities;
- Transition from underground exploration and bulk sampling activities to full-scale production of underground gold and silver mining;
- Installation of the Hatter Production Shaft, raise, or a ramp (collectively referred to as the HPS) as the geology of the area dictates;
- Continued maintenance of the existing Ivanhoe access road and Little Antelope Creek road;
- Construction of road(s) within the existing mining disturbance areas and to the HPS;
- Construction of a new 11.6-mile-long transmission line and substation including access routes to replace power provided by two existing diesel generators;
- Mine water management including installation of a National Pollutant Discharge Elimination System (NPDES) permitted outfall for discharge to Little Antelope Creek and surface monitoring and underground dewatering wells, as needed;
- Continued waste rock disposal in the RCG existing permitted and lined Waste Rock Storage Facility (WRSF), in underground mined-out areas as backfill, and a backfill in a new WRSF located on previously disturbed and unreclaimed land in the existing West Pit;
- Construction of ancillary support facilities; and
- Continued and increased transport of ore by truck to off-site existing third-party owned mineral processing facilities at the Esmeralda Mill in Mineral County, Nevada and/or the Midas Mill in Elko County, Nevada, both of which are located on private land.

Based on preliminary estimates of emissions including construction of new facilities, the proposed project could increase emissions of nitrogen oxides (NO_X), carbon monoxide (CO), sulfur dioxide (SO_2),

particulate matter (PM) including PM with an aerodynamic diameter less than 10 micrometers (PM_{10}), PM with an aerodynamic diameter less than 2.5 micrometers ($PM_{2.5}$), and carbon dioxide (CO_2). The primary air pollutants of concern for the Hollister Underground Mine Project are PM_{10} and $PM_{2.5}$ from mining operations such as surface disturbance, exploration drilling, and ore and waste rock transport and off-site mineral processing, etc., as well as potential mercury emissions from off-site ore processing.

Screening level or refined dispersion modeling was performed for each criteria pollutant to demonstrate compliance with both the National Ambient Air Quality Standards (NAAQS) and Nevada Ambient Air Quality Standards (AAQS), collectively referred to as AAQS. Modeling was conducted for NO_X, SO_2, CO, PM_{10}, and $PM_{2.5}$ for the Hollister Site, proposed ore haulage transportation corridors, and the Esmeralda Mill processing facilities in Mineral County, Nevada.

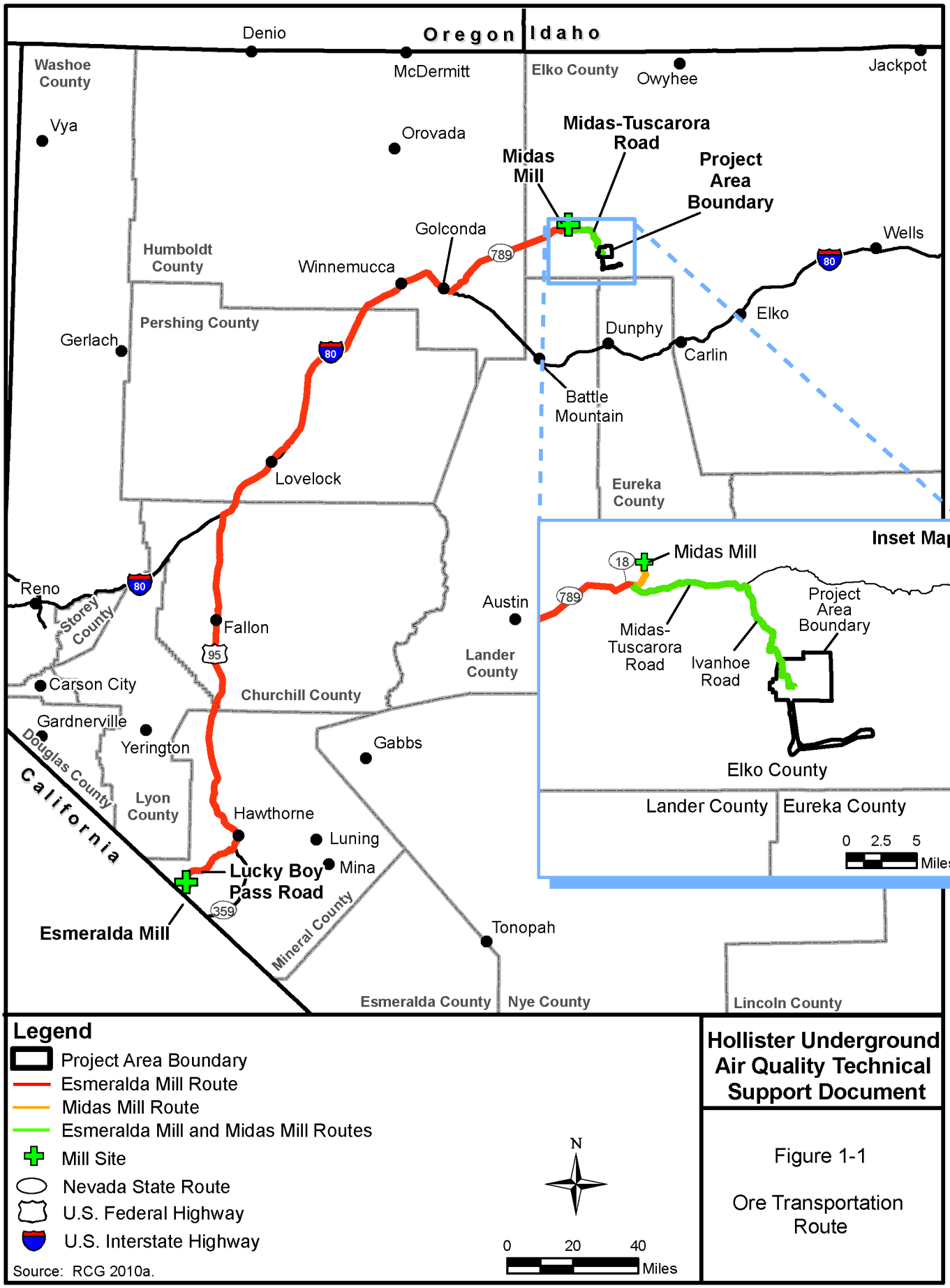
The emissions of air toxics from the proposed project at Hollister are so minimal that they do not warrant air toxics modeling. Mercury emissions from the off-site mill processing the ore from Hollister were estimated based on the existing air permit.

In order to assess the potential visibility impacts at nearby Class I areas, a screening assessment was conducted for two Class I areas. The nearest Class I area to the Hollister Site and Midas Mill is Jarbidge Wilderness, which is approximately 62 miles (100 kilometers [km]) away. The nearest Class I area to the Esmeralda Mill site is Yosemite National Park in California, approximately 28 miles (45 km) away.

The modeling methods used provide conservative estimates of ambient concentrations that potentially may result from the Proposed Action emissions in combination with existing sources in the region. The air quality modeling was conducted in accordance with guidance provided by the United States Environmental Protection Agency (USEPA), the NDEP Bureau of Air Pollution Control (BAPC), and Federal Land Managers' Air Quality Related Work Group (FLAG) as outlined in the following documents:

- Nevada Bureau of Air Pollution Control General Air Dispersion Modeling Guidelines (NDEP-BAPC 2008)
- Guideline on Air Quality Models (published as 40 Code of Federal Regulations [CFR] 58, Appendix W) (USEPA 2005) (hereafter referred to as the Modeling Guideline)
- Modeling Procedures for Demonstrating Compliance with $PM_{2.5}$ NAAQS (USEPA 2010a)
- Guidance Concerning the Implementation of the 1-hour NO_2 NAAQS for the Prevention of Significant Deterioration Program (USEPA 2010b)
- Guidance Concerning the Implementation of the 1-hour SO_2 NAAQS for the Prevention of Significant Deterioration Program (USEPA 2010c)
- FLAG Phase 1 Report – Revised. (FLAG 2010)

AECOM used USEPA approved dispersion models and methods, including screening level and refined modeling described in the above referenced documents, to perform the modeling analyses to determine compliance with AAQS for NO_X, CO, SO_2, PM_{10}, and $PM_{2.5}$. The models and methods are described in detail in **Attachment 1**, Air Modeling Protocol. The area surrounding the Hollister Site and each processing facility has been classified as an attainment area for all pollutants. In accord with the approved modeling protocol, AECOM did not model traffic emissions on paved roads between the Hollister Site and mills, but did include unpaved roads in the analysis. RCG's Applicant-committed Environmental Protection Measures (ACEPM), described in Section 2.4.9.6, of the Environmental Impact Statement for the Hollister Underground Mine Project, were accounted for during development of the Proposed Action emissions inventory.



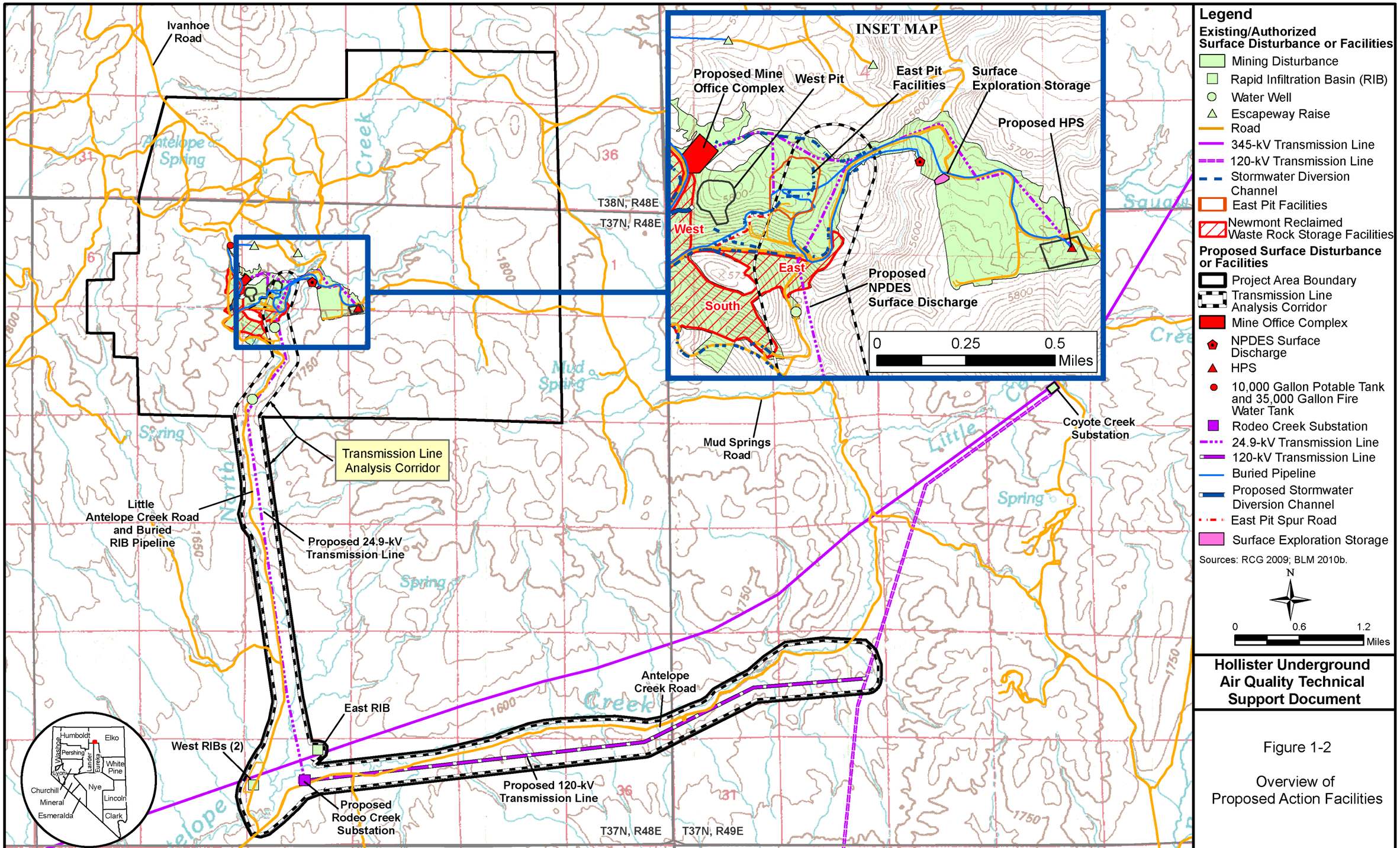
Source: RCG 2010a.

Hollister Underground Air Quality Technical Support Document

Figure 1-1

Ore Transportation Route

10/06/2011



Hollister Underground Air Quality Technical Support Document

Figure 1-2

Overview of Proposed Action Facilities

2.0 Applicable Air Quality Regulations

Air quality is defined by the concentration of various pollutants and their interactions in the atmosphere. Pollution effects on human health have been used to establish AAQS. Measurement of pollutants in the atmosphere is expressed in units of parts per million or micrograms per cubic meter (µg/m^3). Both long-term climatic factors and short-term weather fluctuations are considered when assessing air quality concentrations because they control dispersion and transport. Physical effects of air quality depend on many factors, such as the type, amount, and duration of exposure. Air quality standards specify acceptable upper limits of pollutant concentrations and duration of exposure. Air pollutant concentrations below the standards generally are not considered to be detrimental to public health and welfare.

The relative importance of pollutant concentrations can be determined by comparison with appropriate National and/or State AAQS. National and State AAQS are presented in **Table 2-1**. The pollutants of concern for the Hollister Underground Mine Project are nitrogen dioxide (NO_2), CO, SO_2, PM_{10}, and $PM_{2.5}$. Lead (Pb), hydrogen sulfide (H_2S), and ozone (O_3), nor its precursor volatile organic compounds (VOCs), are not emitted or produced in sufficient quantities to be of concern for this project.

Table 2-1 National and State of Nevada Ambient Air Quality Standards

Pollutant	Nevada Standards		National Standards	
	Averaging Time	Concentration (µg/m^3)	Primary (µg/m^3)	Secondary (µg/m^3)
O_3[1]	1-hour	235	NA	NA
O_3[1]	8-hour	157	157	157
CO	1-hour	40,000	40,000	40,000
CO less than 5,000 feet amsl	8-hour	10,000	10,000	10,000
CO at or greater than 5,000 feet amsl	8-hour	6,670		
SO_2	1-hour	NA	196	None
SO_2	3-hour	1,300	None	1,300
SO_2	24-hour	365	365	None
SO_2	Annual Average	80	80	None
NO_2	1-hour	188	188	None
NO_2	Annual Average	100	100	100
PM_{10}	24-hour	150	150	150
PM_{10}	Annual Average	50	NA	NA
$PM_{2.5}$	24-hour	35	35	35
$PM_{2.5}$	Annual Average	15	15	15
Pb[1]	Rolling 3-month Average	0.15	0.15	0.15
Pb[1]	Quarterly Arithmetic Mean	1.5	1.5	1.5
H_2S[1]	1-hour	112	--	--

Table 2-1 National and State of Nevada Ambient Air Quality Standards

Pollutant	Nevada Standards		National Standards	
	Averaging Time	Concentration ($\mu g/m^3$)	Primary ($\mu g/m^3$)	Secondary ($\mu g/m^3$)
Visibility	Observation	Insufficient amount to reduce the prevailing visibility to less than 30 miles when humidity is less than 70 percent.	--	--

[1] Pollutant not applicable to modeling analysis.

Source: Nevada Administrative Code (NAC) 445B.22097 Standards of Quality for Ambient Air (Nevada Revised Statutes 445B.210, 445B.300); USEPA 2010.

An area is designated by the USEPA as being in attainment for a pollutant if ambient concentrations of that pollutant are below the NAAQS. An area is not in attainment if violations of NAAQS for that pollutant occur. Areas where insufficient data are available to make an attainment status designation are listed as unclassifiable and are treated as being in attainment for regulatory purposes. For the purposes of statewide regulatory planning, this area has been designated as in attainment (not exceeding NAAQS for criteria pollutants) for all pollutants that have an AAQS.

Global Mercury

Mercury is a naturally occurring element in many soils, volcanic rocks, and marine and geothermal water sources. It assumes many forms and can be found naturally in the environment as free metallic mercury, chemically combined with other elements in a number of soil or rock types, and in the form of methylmercury in plants and animals. Mercury is generally present in the atmosphere in one of three chemical forms: gaseous elemental mercury, reactive gaseous mercury (RGM), or particulate mercury. RGM and particulate mercury account for less than 2 percent of the total concentration in air, with elemental mercury accounting for more than 98 percent of the total (Fitzgerald et al. 1991).

Mercury emissions to the atmosphere come from both background and man-made sources. Background sources of mercury include natural sources such as naturally enriched soils and volcanoes. The fate of mercury emissions follows pathways from the emission source to transport, deposition, exposure, and potential human uptake risks. From a single source such as a power plant or mill, or other thermal source, a portion of the emissions are deposited locally near the source while the remaining mercury is dispersed regionally and globally.

Discerning mercury speciation is important in predicting the deposition and bioaccumulation of mercury in the environment. Gaseous elemental mercury (Hg_0) must be transformed to particulate or oxidized mercury in order to contribute substantially to mercury deposition and subsequent entry into water bodies where further transformation to methylmercury (CH_3Hg^+) can make the mercury available in the aquatic food chain (Porcella 1994). The final pathway to humans for mercury exposure is through eating fish with methylmercury stored in their tissues. About 0.3 percent of the total mercury emitted from a point source is deposited in lakes and streams to form a methylmercury compound (Porcella 1994).

Elemental mercury travels the farthest and can be transported on wind currents for months to years if not oxidized, thus providing opportunity for global transport and dispersion. Concentrations of mercury in the air are usually low and of little direct concern. However, RGM and particulates of mercury fall to earth

through rain or snow and enters lakes, rivers, and estuaries. Once there, it can transform to its most toxic form, methylmercury, and accumulate in fish and animal tissues.

RGM has an average atmospheric residence time of days to weeks (less in the presence of precipitation or bromine compounds often present in saline water bodies). It is not easily volatilized, and very water-soluble. It is easily taken up in precipitation or adsorbed on small particles in the atmosphere and falls out as wet or dry deposition. RGM has a higher potential to enter the food chain than elemental mercury and is more easily converted into CH_3Hg^+.

Particulate mercury has an average atmospheric residence time of hours to days (depending on the presence or absence of precipitation and the particle size). This mercury form has low volatility and is easily taken up in precipitation or adsorbed on small particles. The particles fall out of the atmosphere relatively close to the emission source in the presence of precipitation, or as dry deposition that may be transported for longer distances if associated with very small particles. Particle-bound mercury is relatively stable and is not easily converted to CH_3Hg^+ (USEPA 1997).

Mercury accumulates most efficiently in aquatic species as CH_3Hg^+. Predatory species at the top of the aquatic food chain generally have higher mercury concentrations. Nearly all of the mercury that accumulates in fish tissue is methylmercury. Inorganic mercury, which is less efficiently absorbed and more readily eliminated from the body than methylmercury, does not tend to bio-accumulate.

Local Mercury

When bound in mineral forms that typically appear in ore (e.g., cinnabar), mercury is a stable compound that remains in solid form. Ore processing has the potential to liberate mercury from these stable minerals by dissolving it in process solutions. Because it has a boiling point of 675°F, mercury has the potential to volatilize into a gaseous form when subjected to thermal processes in a recovery and refining circuit. This mercury is then released to the atmosphere where it may convert into RGM or particulate mercury.

Mercury is included on the federal list of hazardous air pollutants (HAPs), which has been adopted by reference in the Nevada air quality regulations. Nevada air quality regulations (NAC 445B.349) prohibit the “discharge into the atmosphere from any stationary source any hazardous air pollutant or toxic regulated air pollutant that threatens the health and safety of the general public, as determined by the director.” The USEPA has not established a National Emission Standard for Hazardous Air Pollutants for mercury emissions from gold ore processing facilities, but it has proposed one similar to the Nevada Maximum Achievable Control Technology (NvMACT) rules already in effect, and discussed below.

Under its broad statutory authority to regulate air pollution, BAPC has implemented a mercury control program that applies to all emission units located at precious metals mines that use direct or indirect thermal energy. This program is unique to the state of Nevada and is codified at NAC 445B.3611 to NAC 445B.3689. The program’s goal is to ensure that all non de-minimis thermal units with a potential to emit mercury, are controlled to provide the maximum degree of reduction of mercury emissions in accordance with factors enumerated in the rule. Antler Peak Gold, Inc., a subsidiary of Great Basin Gold Ltd. and operators of the Esmeralda Project and Mill facilities, has a mercury operating permit AP1041-2248 for the ore processing equipment at Esmeralda. Midas mill operates under mercury permit number AP1041-2253.

2.1 Regulatory Framework

Ambient air quality and the emission of air pollutants are regulated under both federal and State of Nevada laws and regulations as discussed below.

2.1.1 Federal Clean Air Act

The Federal Clean Air Act (CAA), and the subsequent Federal Clean Air Act Amendments of 1990 (CAAA), require the USEPA to identify NAAQS to protect public health and welfare. The CAA and the CAAA established NAAQS for seven pollutants, known as “criteria” pollutants. The ambient standards set for these pollutants satisfy “criteria” specified in the CAA. A list of the criteria pollutants regulated under the CAA and their currently applicable NAAQS set by the USEPA are listed in **Table 2-1**.

In addition to the designations relative to conforming with the NAAQS, the CAA requires the USEPA to place selected areas within the U.S. into one of three classes, which are designed to limit the deterioration of air quality when it is “better than” the NAAQS. Class I is the most restrictive air quality category. It was created by Congress to prevent further deterioration of air quality in national parks and wilderness areas of a given size, and in existence prior to 1977, or those additional areas that have since been designated Class I under federal regulations (40 CFR 52.21). All remaining selected areas outside of the designated Class I boundaries were designated Class II areas, which allow a relatively greater deterioration of air quality, although still below NAAQS. No Class III areas have been designated.

Federal Prevention of Significant Deterioration (PSD) regulations limit the maximum allowable increase in ambient particulate matter in a Class I area resulting from a major or minor stationary source to 4 $\mu g/m^3$ (annual geometric mean) and 8 $\mu g/m^3$ (24-hour average). Increases in other criteria pollutants are similarly limited. Specific types of facilities (listed facilities) that emit, or have the potential to emit, 100 tons per year (tpy) or more of PM_{10}, $PM_{2.5}$, or other criteria air pollutants, or any facility that emits, or has the potential to emit, 250 tpy or more of PM_{10}, $PM_{2.5}$, or other criteria air pollutants, are considered major stationary sources. Major stationary sources are required to notify federal land managers of Class I areas, which may be affected by the emissions from the source. Generally, federal land managers tend to be more concerned when the Class I area is within 62 miles (100 km) of the major stationary source. The Hollister Site is not a major stationary source. The nearest Class I planning area to Hollister Site, the Jarbidge Wilderness, is located approximately 71 miles (114 km) northeast of the Hollister Site study area. Esmeralda Mill processing facilities also are not a major stationary source. However, under the Proposed Action, ore would be processed at the mill, which is about 28 miles (45 km) from Yosemite National Park, a Class I area. Ore also may be processed at Newmont's Midas Mill, approximately 71 miles (114 km) from the Jarbidge Wilderness Area, the nearest Class I area to the mill.

The PSD regulation increments are triggered for a planning area when a PSD application for a major source or modification affecting that planning area has been deemed complete by the regulatory authority (40 CFR 52.21[b][14]). The closest triggered planning area (Air Pollution Control Region 61L) is located to the south of the project boundary. The planning area in which the proposed project would be located has not been triggered for any pollutant.

New Source Performance Standards (NSPSs), also required under the CAA, are set by the USEPA for specific types of new or modified stationary sources. NSPSs set fixed emission limits for classes of sources to prevent deterioration of air quality from the construction of new sources and to reduce control costs by building pollution controls into the initial design of sources. Certain project components used to process metallic minerals are subject to the NSPSs found in 40 CFR Part 60, Subpart LL (Standards of Performance for Metallic Mineral Processing Plants).

The CAAA introduced a new facility-wide permitting program known as the Federal Operating Permit, or “Title V,” program. The program requires facilities with the potential to emit: 1) more than 100 tpy of any regulated pollutant (excluding PM); 2) 10 tpy of any single HAP; or 3) 25 tpy or more of any combination of HAPs, to submit a Federal Operating Permit application. Emissions from the Midas and the Esmeralda mill facilities are below the Title V thresholds for regulated pollutants and HAPs. Hollister has a Title V permit based on the potential to emit more than 100 tpy of NO_X.

The CAA directs the USEPA to delegate primary responsibility for air pollution control to state governments, which comply with specific minimum requirements. The State Implementation Plan (SIP) was originally the mechanism by which a state set emission limits and allocated pollution control responsibility to meet the NAAQS. The function of a SIP broadened after passage of the CAAA; it now includes the implementation of specific technology-based emission standards, permitting of sources, collection of fees, coordination of air quality planning, and prevention of significant deterioration of air quality within regional planning areas and statewide. Section 176 of the CAA, as amended, requires that federal agencies must not engage in, approve, or support in any way any action that does not conform to a SIP for the purpose of attaining AAQS (USEPA 2008).

2.1.2 Nevada State Air Quality Program

The BAPC is the agency in the State of Nevada that has been delegated the responsibility for implementing a SIP (excluding Washoe and Clark counties, which have their own SIP). Included in the SIP are the State of Nevada air quality permit programs (NAC 445B.001 through 445B.3497, inclusive). The Nevada AAQS also are part of the SIP. The Nevada AAQS as they apply to the types of emissions and sources at the Hollister Site and the Esmeralda and Midas mill facilities generally are identical to the NAAQS. In addition to establishing the Nevada AAQS, the BAPC is responsible for permit and enforcement activities throughout the State of Nevada. The BAPC permitting program implements the Title V Federal Operating Permit program, as well as the minor source permitting program for facilities that emit less than 100 tpy of all criteria pollutants and are not a major source of HAPs. The Hollister Site's current operations are regulated by Nevada Class I air quality operating permit number AP1041-1298. The Esmeralda Mine/Mill currently operates under a Nevada Class II air permit number AP1041-2366. The Midas Mill operates under air permit number AP1041-0766.

2.1.3 Conformity for General Federal Actions

According to Section 176I of the CAA (40 CFR 51.853), a federal agency must make a conformity determination in the approval of a project having air emissions that exceed specified thresholds in nonattainment and/or maintenance areas. The proposed project is not in a non-attainment or maintenance area; therefore, a general conformity analysis is not required for the Proposed Action.

3.0 Air Emissions Sources

Air emissions of gaseous, particulate, and Hazardous Air Pollutants (HAPs) are presented below for both the current operations and the Proposed Action.

3.1 Current No Action Emissions Sources

Facility sources at Hollister include stationary sources such as a shotcrete batch plant, ore stock piles, ore load outs, stationary engines for electrical generation, and a stationary engine for a water pump. Portable sources for Hollister operations include drill rigs used for mineral exploration. Up to two drill rigs may operate at any one time, but do not remain in the same location for more than 3 to 4 weeks. The drill rigs are relatively small sources of gaseous and particulate emissions. The drill rig engines are approximately 220 horsepower (hp) diesel engines. Drilling also is a small source of fugitive dust. The primary fugitive dust sources are unpaved haul roads at the Hollister Site and unpaved county roads used by trucks to transport ore to other locations for processing. No crushing or processing of ore takes place at the Hollister Site.

Stationary sources currently permitted to operate at the Hollister Site are listed in **Table 3-1**. Physical source parameters and the total estimated annual emissions for the No Action Alternative are shown in **Tables 3-2** and **3-3**. The stationary sources for the existing Hollister operations are permitted by BAPC to operate and have demonstrated compliance with applicable AAQS (RCG 2010, 2009, 2007). Therefore, it is not necessary to conduct modeling of the current stationary sources and the impacts of the No Action Alternative would not be evaluated further.

Table 3-1 Current Operation of Hollister Site Existing Stationary Sources for the No Action Alternative

Source Number	Unit or Process Description	Engine Rating (hp)	Hours of Operation/Year
S2.001	Diesel Generator, Cummins Model QSK60-G6	2,647	8,760
S2.002	Diesel Generator, Cummins Model QSK60-G6	2,647	8,760
IA1.002	Generator; Night Safety Lighting	20	2,920
IA1.003	Generator 4	140	1,100
IA1.004	Water Pump Engine	140	1,100
IA1.015	Shotcrete Batch Plant	--	8,760

Source: RCG 2009.

Figure 3-1 shows the general location of the Hollister Site. **Figure 3-2** shows the source locations relative to the facility fenceline.

In addition to the sources that operate at the Hollister Site, there are two off-site ore processing facilities: Esmeralda and Midas mills. The off-site ore processing facilities are possible sources of mercury emissions from thermal processes. Antler Peak Gold, Inc. has obtained mercury operating permit number AP1041-2248 for the ore processing at the Esmeralda Mill under the Nevada Maximum Achievable Control Technology (NvMACT) rules, and Midas Mill operates under permit number AP1041-2253.

Table 3-2 Stationary Source Model Input Physical Source Parameters

Source Number	Unit or Process Description	Height (m)	Temperature (°K)	Velocity (m/s)	Diameter (m)
S2.001	Diesel Generator, Cummins Model QSK60-G6	4.57	733.15	52.73	0.41
S2.002	Diesel Generator, Cummins Model QSK60-G6	4.57	733.15	52.73	0.41
IA1.002	Generator; Night Safety Lighting	1.52	840.37	57.73	0.10
IAl.003	Generator 4	2.74	840.37	77.37	0.08
IA1.004	Water Pump Engine	2.74	840.37	77.37	0.08
IA1.015	Shotcrete Batch Plant	0.00	0.00	0.01	1.00

Source: RCG 2009.

Table 3-3 Annual Emissions of Hollister Site Stationary Source for No Action Alternative

Source Number	Unit or Process Description	tpy					
		NO_X	CO	SO_2	PM_{10}	$PM_{2.5}$	CO_2
S2.001	Diesel Generator, Cummins Model QSK60-G6[1]	135	14	22.6	2.1	2.1	671
S2.002	Diesel Generator, Cummins Model QSK60-G6[1]	155	14	22.6	2.1	2.1	671
IA1.002	Generator; Night Safety Lighting	9.0	0	0.2	0.1	0.1	34
IA1.003	Generator 4	2.4	0	0.5	0.2	0.2	88
IA1.004	Water Pump Engine	2.4	0	0.5	0.2	0.2	88
IA1.015	Shotcrete Batch Plant[2]	0	0	0.0	1.8	1.8	0
Total		**304**	**28**	**46**	**6.4**	**6.4**	**1551**

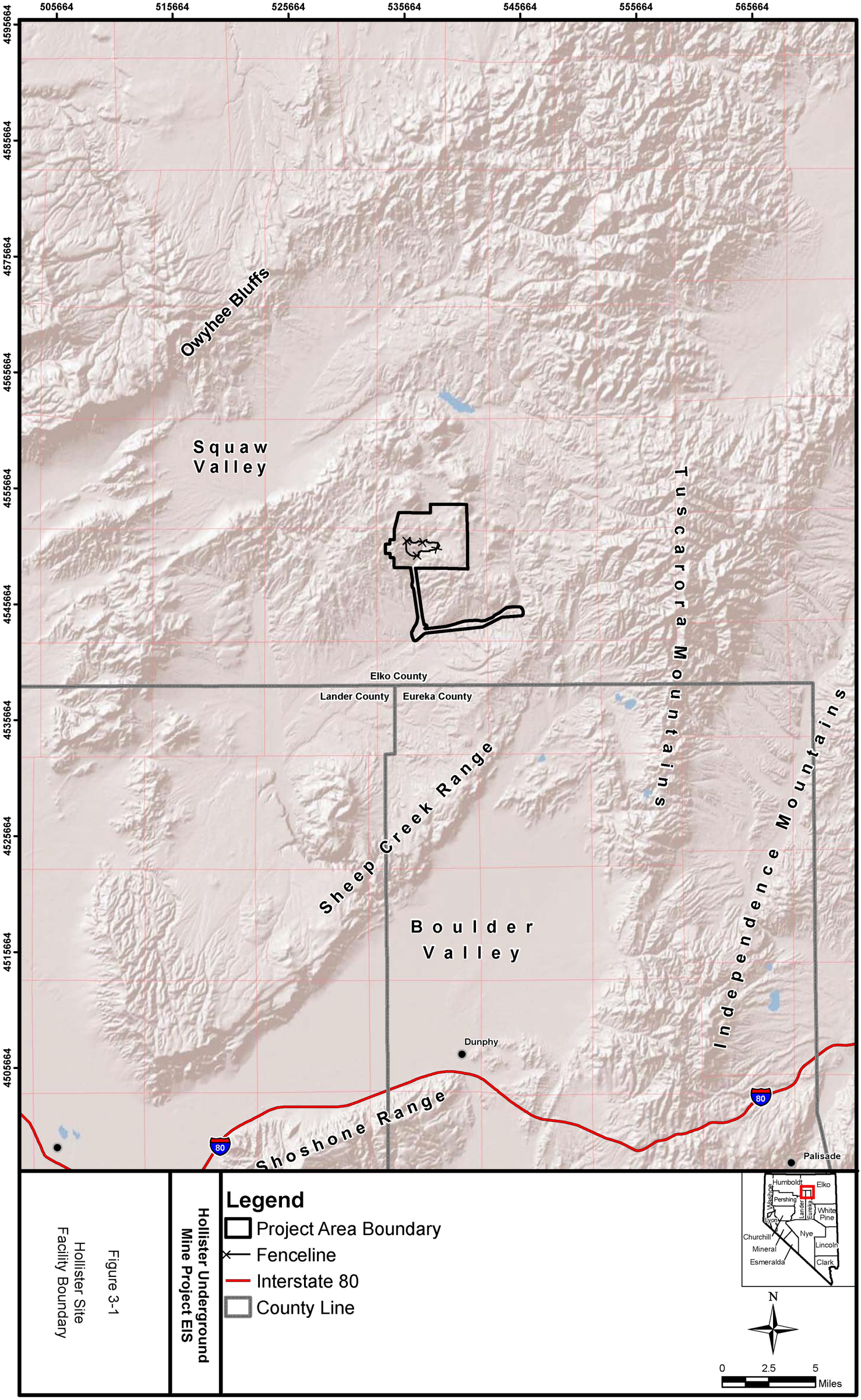
[1] Assuming 8,760 hours per year for the facility power generation.

[2] Assumes 8,760 hours for the shotcrete plant.

3.2 Criteria Emissions and Model Inputs for Proposed Action

Air emissions of both gaseous and particulate pollutants would result from the Proposed Action. Gaseous pollutant emissions associated with the Proposed Action would result from construction and mining equipment and vehicle exhaust. Because the Hollister operations are underground, fugitive dust (i.e., particulate) emissions would be generated primarily by haul trucks transporting ore to processing facilities. Other sources of PM include access roads, ore stockpiles, and disposal of waste rock. For the purposes of calculating emissions for the Proposed Action, the activities that generate emissions were grouped into one of these three categories: stationary sources at the Hollister Site; portable, non-road engines used for mineral exploration drilling at the Hollister Site; and mobile sources that transport ore from the Hollister Site to processing facilities.

The Proposed Action would differ from the current operations, presented in Section 3.1, due to proposed modification of some stationary sources at the Hollister Site and increased drilling and ore hauling activities. The stationary sources at the Hollister Site would remove Generator 4 and the Water Pump Engine as a result of the Proposed Action. In addition, the existing site power source, the two diesel generators located in the East Pit, would be taken out of service once electricity becomes available from



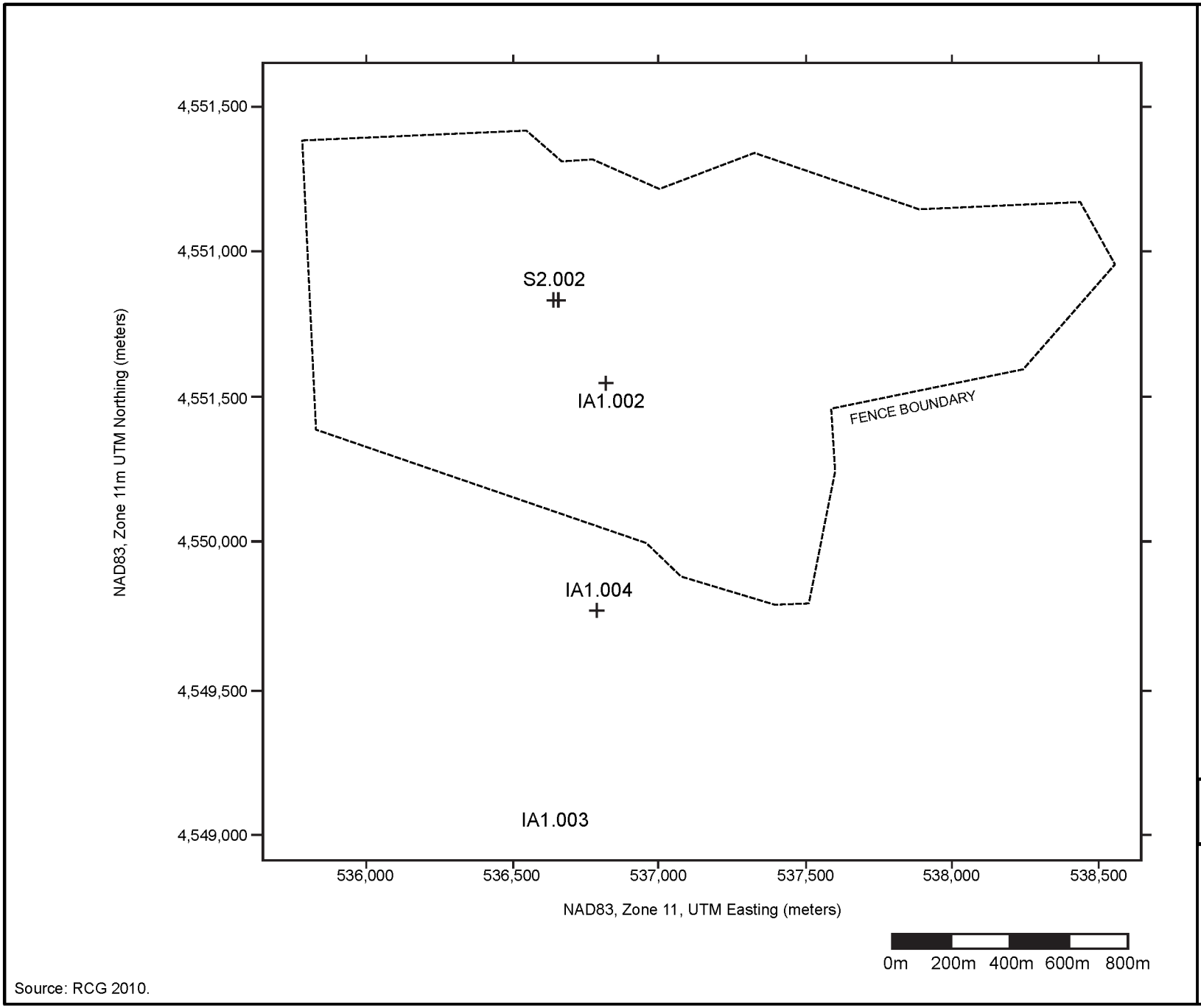
Legend

- Project Area Boundary
- Fenceline
- Interstate 80
- County Line

Hollister Underground Mine Project EIS

Figure 3-1
Hollister Site Facility Boundary

05/17/2011



Source: RCG 2010.

Legend

- Point Sources
- Fence Boundary

N

Hollister Underground Mine Project EIS

Stationary Emissions Source Locations

Figure 3-2

the proposed 120-kV and 24.9-kV transmission lines, thereby greatly reducing the emissions associated with the generators. Emissions associated with milling the ore at Esmeralda Mill and Midas Mill would remain unchanged relative to the currently permitted levels (permit no. AP1041-2248 and AP1041-2253); therefore, emissions from the mills have already demonstrated compliance with applicable AAQS and impacts are not anticipated to change under the Proposed Action.

In addition to reducing the emissions from the generators, RCG has committed to several Applicant Committed Environmental Protection Measures (ACEPM), which are described in Section 2.4.9.6, in the Hollister Underground Mine Project Environmental Impact Statement in order to minimize air emissions associated with the Proposed Action. Gaseous emissions would be minimized by proper equipment maintenance and operation. Particulate emissions would be mitigated by minimization of drop heights during loading, and implementing dust suppression measures. Fugitive dust is specifically addressed as a condition in the Fugitive Dust Control Plan portion of the NDEP Surface Area Disturbance Permit Application. RCG would implement an ongoing program to control fugitive dust from disturbed areas using ACEPM such as application of water and/or chemical dust suppressants (e.g., magnesium chloride), phased construction, and revegetation as appropriate. Access roads, project area roads, and other traffic areas would be maintained on a regular basis to minimize dust and provide for safe travel conditions. These ACEPM are accounted for in the Proposed Action emissions shown throughout this section.

3.2.1 Hollister Mine Stationary Source Emissions

The existing two Cummins diesel generators located in the East Pit would be reduced to 500 hours of operation per year, each, as backup emergency power after electricity becomes available from the proposed 120-kV and 24.9-kV transmission lines. In addition to the modifications to the diesel generators, both the 140 hp generator and 140 hp water pump engine will be removed and the 20 hp generator used for night safety lighting would be used as a portable source. Therefore, the total emissions for the stationary source emissions due to the Proposed Action would be less than the existing Hollister operations under the No Action Alternative. The total annual emissions for the Proposed Action were calculated from emission rates published in the permit applications (RCG 2010, 2009) with adjustments to the annual operating hours for the two generators. In addition, the emissions of CO_2 were estimated for the Proposed Action. CO_2 emissions were estimated using an emission factor of 1.15 lb CO_2/hp •hour of operation (USEPA 1996). The horsepower and annual operating hours of the stationary sources that would operate at Hollister Site are shown in **Table 3-4**. The estimated annual emissions from stationary sources at Hollister Site for the Proposed Action are shown in **Table 3-5**. It is important to note that these annual emissions are at the potential to emit if the generator units were to operate at capacity up to 500 hours per year as emergency generators.

Table 3-4 Hollister Site Stationary Sources for the Proposed Action

Source Number	Unit or Process Description	Engine Rating (hp)	Hours of Operation/Year
S2.001	Diesel Generator, Cummins Model QSK60-G6	2,647	500
S2.002	Diesel Generator, Cummins Model QSK60-G6	2,647	500
IA1.015	Shotcrete Batch Plant	--	8,760

Table 3-5 Annual Emissions of Hollister Site Stationary Sources for the Proposed Action

Source Number	Unit or Process Description	tpy					
		NO_X	CO	SO_2	PM_{10}	$PM_{2.5}$	CO_2
S2.001	Diesel Generator, Cummins Model QSK60-G6[1]	7.7	0.8	1.3	0.1	0.1	671
S2.002	Diesel Generator, Cummins Model QSK60-G6[1]	8.9	0.8	1.3	0.1	0.1	671
IA1.015	Shotcrete Batch Plant[2]	0.0	0.0	0.0	1.8	1.8	0.0
Total		16.6	1.6	2.6	2.0	2.0	1,342

[1] Assuming 500 hours per year for the Cummins generators as backup emergency power.

[2] Assumes 8,760 hours for the shotcrete plant.

Because the Proposed Action emissions of criteria pollutants emitted by stationary sources are less than the No Action Alternative, the impacts due to the Proposed Action would be less than the No Action Alternative. The impacts from the No Action Alternative are well within the National and State AAQS evaluated for current permits (RCG 2010, 2009, 2007). However, several new standards have been promulgated since the submission of the Hollister permit applications. New standards that were not previously evaluated for the Hollister operations include new 1-hour NO_2 and SO_2 standards and new 24-hour and annual standards for $PM_{2.5}$.

As described in more detail in Chapter 5, the impacts from the Proposed Action stationary source emissions were evaluated differently based on USEPA guidance and available data.

- The emissions of SO_2 are below the USEPA's modeling threshold and therefore a modeling analysis is not required for this pollutant (USEPA 2010c).
- A modeling analysis of 1-hour NO_2 was conducted for the stationary sources.
- The impacts of $PM_{2.5}$ were evaluated using a scaling approach.

A modeling analysis was conducted for comparison to the 1-hour NO_2 AAQS. Modeled diesel generator emission rates for NO_X are provided in **Table 3-6**. The physical source parameters, shown in **Table 3-2,** are assumed to remain the same for the Proposed Action.

Table 3-6 Modeled Diesel Generator Emission Rates

Source Number	Unit or Process Description	NO_X (g/s)
S2.001	Diesel Generator, Cummins Model QSK60-G6	3.87
S2.002	Diesel Generator, Cummins Model QSK60-G6	4.47

Source: RCG 2010.

3.2.2 Hollister Site Non-Road Engines

Drill rigs would operate at the Hollister Site within the project area boundary shown in **Figure 3 -**1. Operation of the drill rig engines emits gaseous pollutants (NO_x, CO, SO_2 and CO_2) as well as PM emissions (PM_{10} and $PM_{2.5}$). In addition to the drill rigs, the generator used for night safety lighting is classified as a non-road engine. Once the facility becomes electrified the use of this generator will

diminish significantly as it would only be used as backup. Therefore, the emissions from the drill rigs were used to calculate emissions from non-road engines due to their larger size and more frequent use.

3.2.2.1 Emissions Calculations

Short-term and annual emission rates for NO_x, CO, and PM_{10} were calculated for the drill rig engines based on Tier 2 engine standards from Table 1 of the non-road diesel engine standards (40 CFR 89.112). For conservatism, $PM_{2.5}$ emissions were assumed to be equivalent to those for PM_{10}. For SO_2, the emission factor was derived using **Equation 3-1** assuming the fuel contains 15 parts per million by weight (ppmw) of sulfur based on current federal sulfur standards in 40 CFR 89 for non-road engines. The emission factor for CO_2 was based off standards found in the 2009 American Petroleum Institute's (API) Greenhouse Gas Compendium (API, 2009).

Equation 3-1 Calculation of SO_2 Emission Factor Based on Fuel Sulfur (in g/hp-hr)

$$EF_{SO2} = \frac{15\ lb\ S}{10^6\ lb\ fuel}\ x\ \frac{7.05\ lb\ fuel}{gal}\ x\ \frac{gal}{137{,}000\ Btu}\ x\ \frac{7{,}000\ Btu}{hp-hr}\ x\ \frac{64.06\ lb\ SO_2}{32.06\ lb\ S}\ x\ \frac{453.6\ g}{lb} = 4.90x10^{-3}\ g/hp-hr$$

Short-term emissions for each pollutant emitted by the drill rigs were calculated as the product of engine size, operating time, and emission factors as shown in **Equation 3-2**.

Equation 3-2 Calculation of Short-term Emissions from Drill Rig Engines

$$E(g/s) = EF(g/hp-hr)\ x\ \frac{hp}{engine}\ \ x\ 2\ engines\ x\ \frac{hour}{3{,}600\ s}$$

In total, the drill rigs would drill 20 holes per year at a rate of 16 days per hole and 20 hours per day. Annual emissions for the drill rigs were calculated as shown in **Equation 3-3** below.

Equation 3-3 Calculation of Annual Emissions from Drill Rig Engines

$$E(tpy) = EF(g/hp-hr)\ x\ \frac{hp}{engine}\ \ x\ 2\ engines\ x\ \frac{20\ hr}{day}\ x\ \frac{16\ days}{hole}\ x\ \frac{20\ holes}{year}\ x\ \frac{lb}{453.59\ g}\ x\ \frac{ton}{2{,}000\ lbs}$$

The potential total annual emissions from portable non-road equipment operating at the Hollister Site under the Proposed Action are shown in **Table 3-7**.

Table 3-7 Annual Emissions for Drill Rig Engines at Hollister Site

Annual Total (tpy)					
NO_x	**CO**	**SO_2**	**PM_{10}**	**$PM_{2.5}$**	**CO_2**
15.21	8.07	0.02	0.47	0.47	1,673

3.2.2.2 Model Inputs

Stack parameters used for modeling the drill rig engines are identified in **Table 3-8** below. The drill rig engines were treated as point sources.

Table 3-8 Drill Rig Engine Stack Parameters

	Stack Height (m)	Stack Diameter (m)	Exit Velocity (m/s)	Exit Temperature (°K)
Drill Rig Engine	6.10	0.38	25.00	700.00

The short-term emissions rates modeled for the drill rig engines are shown in **Table 3-9**.

Table 3-9 Modeled Short-term Emissions for Drill Rig Engines

Short-term Total (g/s)					
NO_x	CO	SO_2	PM_{10}	$PM_{2.5}$	CO_2
5.99E-01	3.18E-01	5.99E-04	1.83E-02	1.83E-02	65.88

3.2.3 Ore Hauling

Ore processing is planned at off-site alternative processing facilities, Esmeralda or Midas mills. The emissions at these facilities are not anticipated to change as a result of this project; however, additional emissions would occur from increases in transporting ore from the mine to the mills. Emissions associated with ore hauling include fugitive PM sources (from unpaved road dust), and gaseous emissions from the mobile source's internal combustion engine (NO_X, SO_2, CO, and PM).

Fugitive dust is specifically addressed as a condition in the Fugitive Dust Control Plan portion of the NDEP Surface Area Disturbance Permit Application. RCG would implement an ongoing program to control fugitive dust from disturbed areas using ACEPM. RCG would control fugitive dust emissions primarily by application of water or magnesium chloride to roads. Access roads, project area roads, parking lots, and other traffic areas would be maintained on a regular basis to minimize dust and provide for safe travel conditions.

All ore hauling emissions were modeled as volume sources. Volume source dimensions are determined by considering the movement of the plume sources during the course of an hour. All fugitive sources including roads are assumed to function at the proposed maximum hourly and annual throughput rates.

3.2.3.1 Emissions Calculations

In order to determine the air impacts associated with hauling ore, two types of emissions sources need to be accounted for: PM emissions from traveling on unpaved roads, and vehicle tailpipe emissions. PM emissions from unpaved roads were calculated using Equation 1a from AP-42 Section 13.2.2, Unpaved Roads (USEPA 2006) as can be seen in **Equation 3-4** below.

Equation 3-4 PM Emission Factors from Unpaved Roads at Industrial Sites

$$E_{PM}\,(lb/VMT) = (k * (s/12)^a\,(W/3)^b$$

Where: k (unitless) = 1.5 for PM_{10} and 0.15 for $PM_{2.5}$
s (%) = surface material silt content = 5
W (tons) = mean vehicle weight = 97.5 tons for haul truck, 5 tons for pick-up truck
a (unitless) = empirical constant = 0.9 for PM_{10} and $PM_{2.5}$
b (unitless) = empirical constant = 0.45 for PM_{10} and $PM_{2.5}$
VMT = Vehicle Miles Traveled

The PM emission factor in **Equation 3-4** provides a rate of PM generated in units of pounds per vehicle mile traveled. For emission calculation purposes, total vehicle miles traveled (VMT) for the Proposed Action were based on the mass of mined ore, the average mass of ore the haul trucks can transport, and the length of road traveled. Calculated VMT on a daily and annual basis are shown in **Tables 3-10** and **3-11** below, assuming all the mined ore is transported to either Esmeralda Mill or Midas Mill, respectively.

Table 3-10 Total Vehicle Miles Traveled on Unpaved Roads to Esmeralda Mill

Averaging Period	Mass of Ore Mined (tons)	Ore Mass Hauled/Truck (tons)	Round Trips	Length of Unpaved Road/ Round Trip (miles)	VMT (miles)
Daily	1,000	38	26	92	2,392
Annual	275,000	38	7,237	92	665,804

Table 3-11 Total Vehicle Miles Traveled on Unpaved Roads to Midas Mill

Averaging Period	Mass of Ore Mined (tons)	Ore Mass Hauled/Truck (tons)	Round Trips	Length of Unpaved Road/ Round Trip (miles)	VMT (miles)
Daily	1,000	38	26	40	1,040
Annual	275,000	38	7,237	40	289,480

Short-term and annual emission rates were then calculated from VMT and **Equation 3-4** to obtain an uncontrolled PM_{10} and $PM_{2.5}$ emissions rate for both the hauler and pickup trucks expected to be used in the project area. Controlled emissions were then obtained by multiplying the uncontrolled emission rate by (1 - Xc), where Xc is the control efficiency of the measure used (i.e., Water or Chemical Suppressant). A control efficiency of 0.75 was used for emission calculations based on information from AP-42 Section 13.2.2 Unpaved Roads (USEPA 2006) with the application of magnesium chloride as a dust suppressant.

Tailpipe emissions were obtained from MOBILE6 model runs previously completed by Enviroscientists, Inc. (Dickerson 2010). Emission factors from MOBILE6 were based on the respective weight of the truck and were given in grams per mile. These emission factors were then multiplied by VMT as described above.

The annual emissions for haul trucks and pick-ups are shown in **Tables 3-12** and **3-13**, assuming all the mined ore is transported to either Esmeralda Mill or Midas Mill, respectively.

Table 3-12 Annual Emissions (tpy) for Ore Hauling on Unpaved Roads to Esmeralda Mill

Emissions Unit	Annual Total (tpy)					
	NO_X[1]	CO[1]	SO_2[1]	PM_{10}[1]	$PM_{2.5}$[1]	CO_2[2]
Hauler Road Dust	-	-	-	543.92	54.39	-
Hauler Tailpipe (Unpaved Roads)	4.69	2.11	0.23	0.14	0.14	1,182
Hauler Tailpipe (Paved Roads)	25.57	11.49	1.27	0.75	0.75	6,452
Pickup Road Dust	-	-	-	142.90	14.29	-
Pickup Tailpipe	1.64	0.73	0.12	0.06	0.06	2,880
Total Hauling Emissions	31.90	14.33	1.62	687.77	69.63	10,515

[1] Based on VMT per year.

[2] Based on continuous operation (12 hours per day).

Table 3-13 Annual Emissions (tpy) for Ore Hauling on Unpaved Roads to Midas Mill

Emissions Unit	Annual Total (tpy)					
	NO_X[1]	CO[1]	SO_2[1]	PM_{10}[1]	$PM_{2.5}$[1]	CO_2[2]
Hauler Road Dust	-	-	-	236.49	23.65	-
Hauler Tailpipe (Unpaved Roads)	2.04	0.92	0.10	0.06	0.06	514
Hauler Tailpipe (Paved Roads)	0.00	0.00	0.00	0.00	0.00	0
Pickup Road Dust	-	-	-	62.13	6.21	-
Pickup Tailpipe	0.71	0.32	0.05	0.03	0.03	230
Total Hauling Emissions	2.75	1.23	0.15	298.70	29.95	744

[1] Based on VMT per year.

[2] Based on continuous operation (12 hours per day).

3.2.3.2 Model Inputs

Stack parameters used for modeling the haul road emissions are identified in **Table 3-14**. All sources were treated as volume sources. In addition to emission rate, the model requires the initial lateral and vertical dimensions of the volume source referred to as σ_{yo} and σ_{zo}, respectively. These initial dimensions were calculated using National Sand, Stone and Gravel Association (NSSGA) guidance Section 5.1.12, Modeling Fugitive Dust Sources (NSSGA 2007). NSSGA guidance is consistent with USEPA modeling guidance for modeling road traffic (2005), but has information specific to calculating haul truck release parameters. The equations to calculate the initial lateral dimension, σ_{yo}, and the initial vertical dimension, σ_{zo}, are shown in **Equations 3-5** and **3-6**. In accord with NSSGA guidance, the haul road width was estimated to be approximately three times the width of the widest vehicle.

Table 3-14 Volume Source Stack Parameters for Ore Hauling

	Haul Road Width (m)	Release Height (m)	σ_y (m)	σ_z (m)
Haul Truck	14.26	3.200	5.5848	1.4886
Pickup Truck	14.26	1.524	5.5848	0.7088
Haul Truck Tailpipe	14.26	2.500	5.5848	2.3300
Pickup Tailpipe	14.26	0.6096	5.5848	0.5671

Equation 3-5 Determination of Initial Lateral Dimension

$$\sigma_{yo} = \frac{Haul\ road\ width\ (m) + 9.75\ (m)}{4.3}$$

Equation 3-6 Determination of Initial Vertical Dimension

$$\sigma_{zo} = \frac{2\ x\ Height\ of\ haul\ truck\ (m)}{4.3}$$

The emission rate for each volume is a function of the volume size. The horizontal volume size is equal to σ_y shown in **Table 3-14**. The total number of volume sources is equal to the road length divided by the length of a volume source. In this case the number of volume sources is 998. The modeled emissions rates are calculated by dividing the total emissions by the number of volume sources and converting the units to grams per second (g/s). The modeled emission rates for hauling traffic are shown in **Tables 3-15** and **3-16**. The total emission rates shown in **Tables 3-15** and **3-16** were used for the modeling analysis in Chapter 5, which demonstrates compliance with the AAQS.

Table 3-15 Modeled Short-term Emissions for Haul Road Trucks

Emissions Unit	Short-term (g/s)				
	NO_X	CO	SO_2	PM_{10}	$PM_{2.5}$
Hauler Road Dust	0.00E+00	0.00E+00	0.00E+00	7.73E-03	7.73E-04
Hauler Tailpipe	6.66E-05	2.99E-05	3.30E-06	1.96E-06	1.96E-06
Pickup Road Dust	0.00E+00	0.00E+00	0.00E+00	2.03E-03	2.03E-04
Pickup Tailpipe	2.33E-05	1.04E-05	1.68E-06	8.62E-07	8.62E-07
Total	9.00E-05	4.04E-05	4.99E-06	9.76E-03	9.79E-04

Table 3-16 Modeled Annual Emissions for Haul Road Trucks (g/s)

Emissions Unit	Annual (g/s)				
	NO_X	CO	SO_2	PM_{10}	$PM_{2.5}$
Hauler Road Dust	0.00E+00	0.00E+00	0.00E+00	3.07E-03	3.07E-04
Hauler Tailpipe	2.64E-05	1.19E-05	1.31E-06	7.77E-07	7.77E-07
Pickup Road Dust	0.00E+00	0.00E+00	0.00E+00	8.05E-04	8.05E-05
Pickup Tailpipe	9.26E-06	4.13E-06	6.67E-07	3.42E-07	3.42E-07
Total	3.57E-05	1.60E-05	1.98E-06	3.87E-03	3.87E-04

3.2.4 Total Emissions for the Proposed Action

The total annual emissions for the Proposed Action include: stationary sources at Hollister Site; portable, non-road engines used for mineral exploration drilling at Hollister Site; and mobile sources that transport ore from Hollister Site to processing facilities. Annual emissions calculations for the Proposed Action include application of controls based on ACEPM. The total maximum annual emissions from the Proposed Action are shown in **Table 3-17**. It is important to note that the emissions associated with hauling all the ore to either Esmeralda or Midas mills are both shown in **Table 3-17**; however the maximum Proposed Action emissions are calculated assuming that all the ore is transported to Esmeralda since this provides a conservatively high estimate of emissions.

Table 3-17 Total Annual Emissions (tpy) for the Proposed Action

Emissions Source	Annual Total (tpy)					
	NO_X	CO	SO_2	PM_{10}	$PM_{2.5}$	CO_2
Stationary Sources	16.60	1.60	2.60	2.00	2.00	1,342
Non-Road Engines	15.21	8.07	0.02	0.47	0.47	1,673
Ore Hauling Traffic – All Ore to Midas Mill	2.75	1.23	0.15	298.70	29.95	744
Ore Hauling Traffic – All Ore to Esmeralda Mill	31.90	14.33	1.62	687.77	69.63	10,515
Maximum Annual Emissions[1]	63.71	24.00	4.24	690.24	72.10	13,530

[1] For a conservatively high estimate of maximum Annual Emissions, the total emissions are calculated assuming all ore is transported to Esmeralda Mill and none of the ore is transported to Midas. Therefore the values presented in the table for emissions related to ore hauling to Midas Mill are not included in the total "Maximum Annual Emissions" values.

3.3 Mercury and Hazardous Air Pollutants

The only HAP that would be emitted due to this project is mercury. Mined ore containing mercury would be processed at either the Esmeralda Mill or the Midas Mill. Antler Peak Gold, Inc. has obtained mercury operating permit number AP1041-2248 for the ore processing at the Esmeralda Mill under the Nevada Maximum Achievable Control Technology rules. The permitted emissions for mercury at Esmeralda Mill would be approximately 7 pounds per year. The thermal units that are permitted by NDEP under the Phase 2 Mercury Operating Permit to Construct at the Esmeralda Mill include: two mercury retorts, a carbon kiln, and two tanks (pregnant and barren solution tanks).

Newmont Midas Operations, Inc. has obtained mercury operating permit number AP1041-2253 for ore processed at Midas Mill. Processing Hollister ore at Midas Mill would result in mercury emissions at the same level as Esmeralda Mill, and is anticipated to be less than 7 pounds per year. Thermal units permitted at the Midas Mill include: two refinery furnaces; two mercury retorts; and associated ancillary equipment (hot plates, drying ovens, and atomic adsorption spectrometer). As part of the permit process, HAPs (including mercury) were modeled. Given that the amount of ore processing would not increase relative to currently permitted levels at either Esmeralda or Midas mills as a result of this project, and current permits demonstrate compliance with all applicable AAQS, an additional modeling demonstration is not required.

3.4 Building Wake Effects

There is a significant distance from the stack locations and the closest structures/buildings to the property boundary. Building-induced downwash from these distant structures/buildings is not expected to contribute to increased ambient air impacts. Therefore, direction-specific building downwash was not incorporated.

4.0 Meteorology

4.1 Wind Rose

Five years of meteorological data (2002-2006) from the National Weather Service's Elko Regional Airport, surface (WBAN 24121) and upper air (WBAN 04105) meteorological data were used in modeling conducted to support current permits (RCG 2010, 2009). The surface data were obtained from the National Climatic Data Center and the upper air data were obtained from the National Oceanic and Atmospheric Administration Radiosonde database.

A regionally representative wind rose diagram for the period January 1, 2001 to December 31, 2006, from the Elko airport is shown in **Figure 4-1**. The wind rose depicts wind speeds and directions. The predominant winds in the region are from the southwest with a secondary maximum from the east.

Wind speed has an important effect on area ventilation and the dilution of pollutant concentrations from individual sources. Light winds, in conjunction with large source emissions, may lead to an accumulation of pollutants that can stagnate or move slowly to downwind areas.

During stable conditions, downwind usually means down valley or toward lower elevations. Climate data from Elko indicate that the potential for air pollution episodes to last 5 or more days is nearly zero (Holzworth 1972). A potential air pollution episode is defined as a period of time with wind speeds less than 2 meters per second and mixing heights less than 1,000 meters.

Visibility impacts of the Esmeralda Mill were assessed with the VISCREEN model, which, as a screening tool, doesn't incorporate actual meteorological data. In order to qualitatively analyze the visibility impacts from the Esmeralda Mill, the wind patterns at Brawley Peaks meteorological monitoring station are shown in **Figure 4-2**. Brawley Peaks monitoring station is located 4 miles southeast of the Esmeralda Mill. A wind rose diagram for Brawley Peak, Nevada for the period January 1, 2006 to December 31, 2010 is presented in **Figure 4-2**.

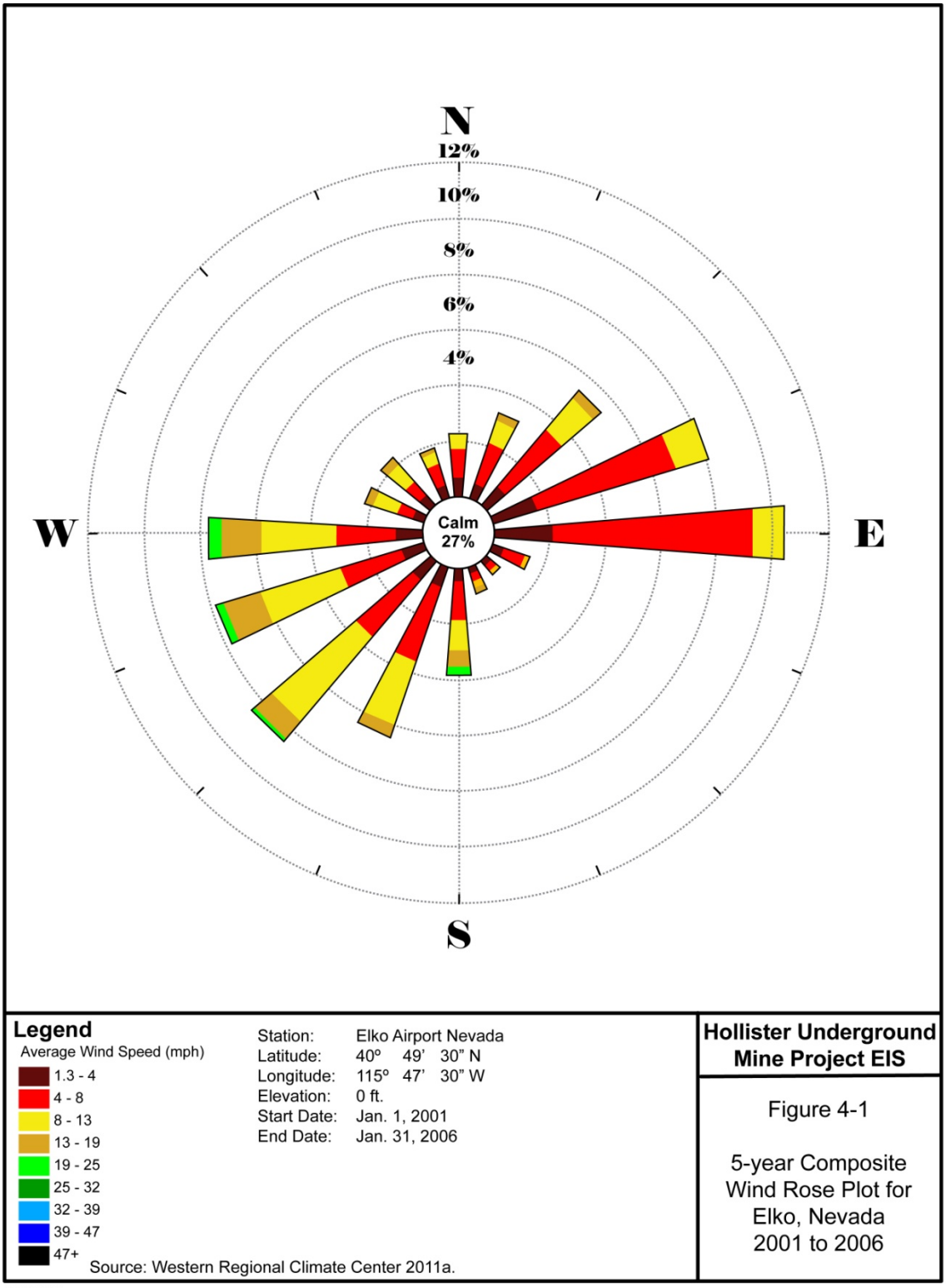


Figure 4-1 5-year Composite Wind Rose Plot for Elko, Nevada – 2001 to 2006

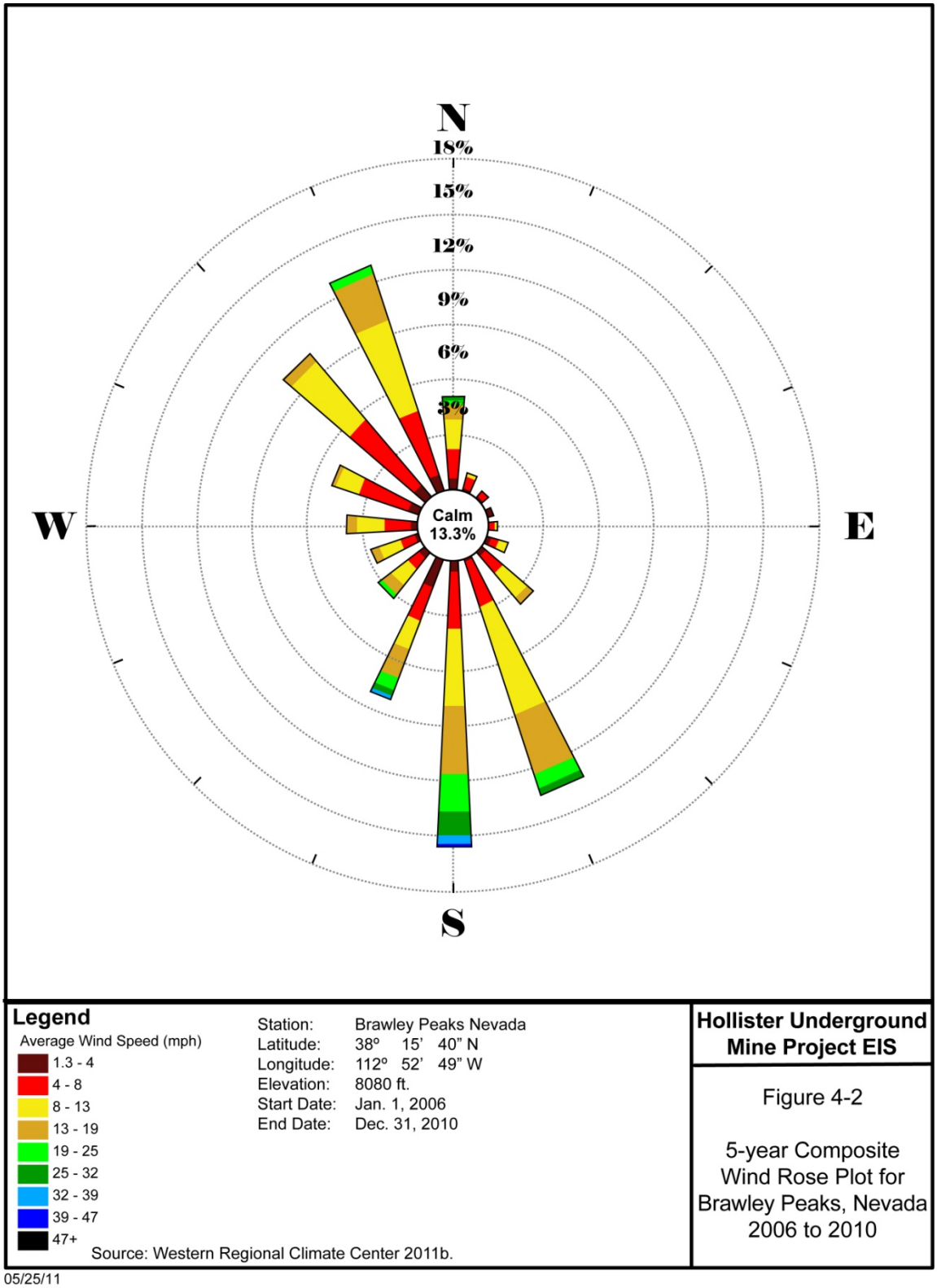


Figure 4-2 5-year Composite Wind Rose Plot for Brawley Peaks, Nevada – 2006 to 2010

5.0 Air Quality Modeling Results

Modeling was conducted for analysis of the Proposed Action's impacts to ambient air quality and visibility.

5.1 Ambient Air Quality Modeling Results

As described in Chapter 3.0, an attainment demonstration has been completed for all pollutants and averaging periods except for a new 1-hour NO_2 and SO_2 standard and new 24-hour and annual standard for $PM_{2.5}$ (RCG 2010, 2009). To determine which of these pollutants required a modeling analysis to demonstrate compliance with AAQS, the annual Proposed Action emissions (shown in **Table 3-17**) were first compared to USEPA modeling thresholds.

- The emissions of SO_2 are below the USEPA modeling threshold and therefore a modeling analysis is not required for this pollutant (USEPA 2010c).
- The emissions of NO_x are not below the USEPA modeling thresholds (USEPA 2010b) and therefore a modeling analysis is required.
- The emissions of $PM_{2.5}$ are not below the USEPA modeling thresholds (USEPA 2010d) and therefore a modeling analysis is required.

Demonstration of compliance for NO_x and $PM_{2.5}$ with the AAQS was determined in a 2-step process using one of the modeling tools SCREEN3 or AERMOD. Initial estimates were performed with SCREEN3. Pollutants determined to have impacts less than AAQS using SCREEN3 were deemed to not cause or contribute to a violation of the AAQS, and as such no refined analyses were performed. Modeling procedures and methods are described in detail in **Attachment 1**, Air Modeling Protocol.

Screening dispersion modeling was performed to assess impacts from the Proposed Action, which includes a decrease in the use of some stationary sources at the Hollister Site and increased ore hauling activities. Air modeling was performed using the USEPA approved SCREEN3 model, as described in **Attachment 1**, Air Modeling Protocol. SCREEN3 is a single source Gaussian plume model which provides maximum ground-level concentrations for point, area, flare, and volume sources. For this study, SCREEN3 model version 96043 was used to evaluate impacts from the emergency generators, portable drill rig engines, and trucks on haul roads. The emergency generators and drill rig engines were modeled as point sources and the trucks were modeled as volume sources.

The SCREEN3 results required post-processing to calculate the maximum impact for each pollutant and averaging period. In order to do this, the modeled 1-hour maximum impacts for each source had to first be multiplied by USEPA scaling factors (USEPA 1992) to estimate the impacts for longer averaging periods. These scaling factors are shown in **Table 5-1**.

Table 5-1 USEPA Scaling Factors from 1-Hour Modeled Impacts

Averaging Period	Scaling Factor (fraction of 1-hour value)
3-hour	1.0
8-hour	0.7
24-hour	0.4
Annual	0.1

5.1.1 Hollister Site Stationary Sources

The modeling analysis previously performed for PM_{10} (RCG 2009) was used as the basis for the comparison to the $PM_{2.5}$ standard. This approach conservatively overestimates the direct $PM_{2.5}$ impacts since emissions of $PM_{2.5}$ are equal to or less than PM_{10} by definition. The USEPA recently has confirmed that while "air quality modeling of direct $PM_{2.5}$ emissions can be accomplished using a USEPA-approved model to predict ambient $PM_{2.5}$ impacts caused by new and modeled sources of $PM_{2.5}$ emissions," it "has not approved any models that can reliably predict the localized ambient $PM_{2.5}$ impacts of precursors (e.g., SO_2 and NO_X) emitted from individual stationary sources." Accordingly, USEPA instructs that an evaluation of $PM_{2.5}$ ambient impacts associated with a single source focus on direct $PM_{2.5}$ emissions (Federal Register 2010). In addition to direct $PM_{2.5}$ emissions, the USEPA has recognized that $PM_{2.5}$ also may include a secondary component that is formed as a result of complex atmospheric reactions involving precursor pollutant emissions. There are four potential pollutant precursors: sulfur dioxide (SO_2), nitrogen oxide (NO_X), volatile organic compounds (VOCs), and ammonia (NH_3). The USEPA presumes that emissions of SO_2 and NO_X would have some secondary contribution to $PM_{2.5}$ ambient concentrations and that emissions of VOCs and NH_3 would not contribute to $PM_{2.5}$ impacts based on its current level of understanding (Federal Register 2008).

As described in the modeling protocol (**Attachment 1**), annual and 24-hour $PM_{2.5}$ background values were calculated for the Hollister Site based on 3 years of measurements of $PM_{2.5}$ collected at Jarbidge Wilderness Area and Great Basin National Park.

Table 5-2 below displays the highest-eighth-high (H8H) PM_{10} result from the previous modeling (RCG 2009) in accordance with the form of the USEPA 24-hour $PM_{2.5}$ AAQS, which classifies an exceedence of the standard if the 98th percentile value over three years exceeds 35 µg/m^3. The results indicate that the conservative evaluation of H8H No Action Alternative plus background are well within the annual and 24-hour standards for $PM_{2.5}$. The $PM_{2.5}$ impacts shown in **Table 5-2** are for the No Action Alternative and the impacts for the Proposed Action would be lower due to the reduction of diesel generators emissions and other sources.

Table 5-2 $PM_{2.5}$ Impacts from Stationary Sources at the Hollister Site

Pollutant	Averaging Time	Impact (µg/m^3)[1]	Background (µg/m^3)	Total Impact (µg/m^3)	NAAQS (µg/m^3)	Percent of NAAQS
$PM_{2.5}$	24-hour	16.86	6.92	23.78	35	68
	Annual	3.45	2.58	6.03	15	40

[1] AERMOD modeled PM_{10} impacts for No Action Alternative (RCG 2009). Impacts for the Proposed Action would be lower due to reduction of the diesel generator emissions.

A modeling analysis was conducted for comparison to the 1-hour NO_2 AAQS. For the Proposed Action, the only stationary sources that would emit NO_x are the diesel generators used for backup power. The emergency generator impacts were assessed at a distance ranging from 0.37 mile (0.59 km) (589 meters), the closest part of the ambient air boundary, to 3.1 miles (5 km). The modeled maximum hourly NO_X emission rates for the emergency generators are shown in **Table 3-4**. The NO_2 impacts from NO_X emissions were estimated using the Ambient Ratio Method, whereby the amount of emissions that are in the form of NO_2 is assumed to be 75 percent of the total NO_X. The SCREEN3 predicted maximum impacts from the emergency generators are shown in **Table 5-3**.

Table 5-3 Hollister Mine SCREEN3 Model Results for Emergency Generators

Pollutant	Averaging Time	Impact (µg/m^3)	Background (µg/m^3)[1]	Total Impact (µg/m^3)	NAAQS (µg/m^3)	Percent of NAAQS
NO_2	1-hour	154.8	n/a	154.8	188	82.3

[1] NDEP BAPC has approved the use of a background value of zero for NO_2 at Hollister Site in past modeling demonstrations (RCG 2010).

5.1.2 Hollister Mine Non-Road Engines

The modeled emission rates associated with drill rig engines are shown in **Table 3-9**. Impacts for the drill rig engines were assessed out to a distance of 1.24 miles (2.0 km) with the max impact distance occurring 417 feet (127 meters) from the drill rig engines. The impacts at 417 feet (127 meters) were calculated for each pollutant and averaging period based on the scaling factors shown in **Table 5-1**. The impacts were then added to the appropriate background concentrations and these results are shown in **Table 5-4** and indicate that impacts from operation of these drill rigs are well below the National and State AAQS.

Table 5-4 Hollister Mine SCREEN3 Model Results for Drill Rigs

Pollutant	Averaging Time	Impact (µg/m^3)	Background (µg/m^3)[1]	Total Impact (µg/m^3)	NAAQS (µg/m^3)	Percent of NAAQS (%)
NO_2	1-hour	47.1	NA	47.1	188	25.0
	Annual	3.4	NA	3.4	100	3.4
CO	1-hour	25.0	NA	25.0	40,000	0.1
	8-hour	17.5	NA	17.5	10,000	0.2
SO_2	1-hour	0.05	NA	0.0	196	0.0
	3-hour	0.05	NA	0.0	1,300	0.0
	24-hour	0.02	NA	0.0	365	0.0
	Annual	0.00	NA	0.0	80	0.0
PM_{10}	24-hour	0.58	10.2	10.8	150	7.2
	Annual	0.11	9.0	9.1	50	18.2
$PM_{2.5}$	24-hour	0.58	6.92	7.5	35	21.4
	Annual	0.11	2.58	2.7	15	17.9

[1] The background values for NO_2 , SO_2, CO, and PM_{10} are from previous modeling demonstrations for the Hollister Site (RCG 2010, 2009). The background concentration for $PM_{2.5}$ is calculated as described in the text above based on the approved modeling protocol (**Attachment 1**).

5.1.3 Ore Hauling

The modeled emission rates associated with ore hauling activities are shown in **Tables 3-15** and **3-16**. Impacts for truck traffic were assessed at a distance of 46 feet (14 meters) from the road for a generic road segment that is representative of all dirt roads in the direct impacts assessment area. A distance of

46 feet (14 meters) was selected for evaluating impacts of ore hauling because this was the distance to the maximum impact predicted by the SCREEN3 model. The SCREEN3 impacts at 46 feet (14 meters) were calculated for each pollutant and averaging period based on the scaling factors shown in **Table 5-1**. The impacts from tailpipe and unpaved road dust emissions from both haul trucks and light-duty trucks were summed and added to the appropriate background concentrations. Results of the conservative screening level dispersion modeling analysis for the Proposed Action are shown in **Table 5-5** and indicate that the impacts from haul road traffic are well below the National and State AAQS.

Table 5-5 Hollister Mine SCREEN3 Model Results for Haul Roads

Pollutant	Averaging Time	Impact ($\mu g/m^3$)	Background ($\mu g/m^3$)[1]	Total Impact ($\mu g/m^3$)	NAAQS ($\mu g/m^3$)	Percent of NAAQS (%)
NO_2	1-hour	1.9	NA	1.9	188	1.0
	Annual	0.1	NA	0.1	100	0.1
CO	1-hour	0.9	NA	0.9	40,000	0.0
	8-hour	0.6	NA	0.6	10,000	0.0
SO_2	1-hour	0.1	NA	0.1	196	0.1
	3-hour	0.1	NA	0.1	1,300	0.0
	24-hour	0.0	NA	0.0	365	0.0
	Annual	0.0	NA	0.0	80	0.0
PM_{10}	24-hour	20.0	10.2	30.2	150	20.1
	Annual	2.0	9.0	11.0	50	22.0
$PM_{2.5}$	24-hour	2.0	6.92	8.9	35	25.5
	Annual	0.2	2.58	2.8	15	18.5

[1] The background values for NO_2 , SO_2, CO, and PM_{10} are from previous modeling demonstrations for the Hollister Site (RCG 2010, 2009). The background concentration for $PM_{2.5}$ is calculated as described in the text above based on the approved modeling protocol (**Attachment 1**).

5.2 Visibility Analysis

Visibility impairment is caused by particles and gases in the atmosphere. Some particles and gases scatter light while others absorb light. The net effect is called “light extinction.” The result of the scattering and absorption processes is a reduction of the amount of light from a scene that is returned to the observer, and scattering of other light into the sight path, creating a hazy condition. The Hollister Site, Esmeralda Mill and Midas Mill were assessed to determine the requirements for a visibility analysis The Class I visibility analyses for Yosemite National Park were performed using VISCREEN to evaluate impacts from Esmeralda Mill. Federal Land Managers' Air Quality Related Values Work Group (FLAG) recommends that visibility analyses for sources located within 31 miles (50 km) of the Class I area use the VISCREEN model, as described on page 30 of the FLAG report (FLAG 2010).

5.2.1 Visibility at Class I Areas

The Hollister Site is located approximately 62 miles (100 kilometers) from the nearest Class I area, which is the Jarbidge Wilderness Area. According to the Federal Land Managers’ Air Quality Related Values Work Group (FLAG) 2010 Phase I Report (FLAG, 2010), any sources greater than 31 miles

(50 kilometers) from a Class I area would have negligible visibility impacts if the ratio of emissions to distance (Q/D) is 10 or less. The Q/D ratio is the combined emissions (Q, in units of tpy) of SO_2, NO_x, PM_{10}, and H_2SO_4, divided by the distance (in kilometers) from the nearest Class I area. Total emissions for the Proposed Action consist of emissions from stationary sources (**Table 3-5**), ore hauling road traffic (**Table 3-13**), and drill rig engines (**Table 3-7**). The total combined annual emissions (in units of tpy) from these three different source types are shown in **Table 5-6** below. Ore hauling traffic emissions were conservatively assumed for all ore transport to Midas Mill due to its proximity to the Jarbidge Wilderness Area as opposed to the Esmeralda Mill which is closer to Yosemite National Park.

Table 5-6 Total Annual Emissions for Proposed Action when Ore is Transported to the Midas Mill

	tpy					
Emissions Source	**NO_x**	**CO**	**SO_2**	**PM_{10}**	**$PM_{2.5}$**	**CO_2**
Stationary Sources	16.60	1.60	2.60	2.00	2.00	1,342
Drill Rig Engines	15.21	8.07	0.02	0.47	0.47	1,673
Ore Hauling Traffic (Midas Mill)	2.75	1.23	0.15	298.70	29.95	744
Total	34.56	10.91	2.77	301.17	32.42	3,759

Based on the total emissions of NO_X, SO_2, and PM_{10} presented in **Table 5-6**, Q would be equal to 338.5 tons. The Jarbidge Wilderness Area is 62 miles (100 kilometers) away which gives a total Q/D of approximately 3.39 tons/km, well below the upper limit of 10. Based on this screening method, the Q/D value of 3.39 tons/km shows that the emissions from the Hollister Site would have negligible visibility impacts at the Jarbidge Wilderness Area.

The Esmeralda Mill is one of the proposed processing sites for the Hollister ore, and is located about 22 miles southwest of Hawthorne, Nevada, near the California border, and is about 28 miles east of Yosemite National Park, California. Yosemite National Park is considered a federal Class I area. Areas designated as mandatory Class I areas are those national parks exceeding 6,000 acres, wilderness areas and national memorial parks exceeding 5,000 acres, and all international parks, which were in existence on August 7, 1977 (40 CFR part 81, subpart D).

A screening level assessment of the impacts on visibility from processing Hollister Site ore at the Esmeralda Mill was performed using the VISCREEN model version 88341. The plume visual impact screening model VISCREEN is designed to ascertain whether the plume from a facility (i.e., Esmeralda Mill) has the potential to be perceptible to untrained observers under “reasonable worst-case” conditions.

The perceptibility of a plume depends on the plume contrast at all visible wavelengths. At a single wavelength, the contrast between the plume and its surroundings is determined by the difference in the intensity of the light reaching the observer from each. Therefore a single measure, intensity, could be used to quantify contrast if visible light were composed of a single wavelength. With a range of wavelengths, a measure of contrast must recognize both “overall” intensity, and perceived color, and so perceptibility is a function of changes in both brightness and color. To address the added dimension of color as well as brightness, the color contrast parameter, Delta E, was used as the primary basis for determining the perceptibility of plume visual impacts in screening analyses. Delta E provides a single measure of the difference between two arbitrary colors as perceived by humans. This parameter allows us to make quantitative comparisons of the perceptibility of two plumes, even though one may be a reddish discoloration viewed against a blue sky while the other may be a white plume viewed against a dark green forest canopy.

In the plume visual impact screening model VISCREEN, contrasts at three wavelengths (0.45, 0.55, and 0.65 micrometer [µm]) were used to characterize blue, green, and red regions of the visible spectrum. VISCREEN modeling was performed to ascertain whether the plume would be brighter or darker or discolored compared to its viewing background by evaluating its contrasts in the blue, green, and red portions of the visible spectrum. If plume contrast is positive, the plume is brighter than its viewing background; if negative, the plume is darker. If contrasts are different at different wavelengths, the plume is discolored. If contrasts are all zero, the plume is indistinguishable from its background (i.e., imperceptible).

No analysis of visibility impacts was required for Midas Mill since the amount of ore that the facility would process under the Proposed Action would not change relative to currently permitted levels. Since the mill has demonstrated compliance with all applicable AAQS and regional haze requirements, an additional analysis is not required.

5.2.2 VISCREEN Results

Emission rates used in the screening level analysis were the maximum short-term rates expected during the course of a year, and are based on the maximum emission rates in the air quality permit. For screening level analysis, the first criterion is a Delta E value of 2.0; the second is a green (0.55 µm) contrast value of 0.05. Results of the VISCREEN modeling are shown in **Table 5-7**.

Table 5-7 Maximum Visual Impacts Inside Yosemite National Park

Background	Theta (degrees)	Azimuth (degrees)	Distance (km)	Delta E		Contrast	
				Criteria	Plume	Criteria	Plume
Sky – forward scatter	10	157	86	2.00	4.227*	0.05	0.082*
Sky – backward scatter	140	157	86	2.00	0.644	0.05	-0.020
Terrain – forward scatter	10	84	45	2.00	7.887*	0.05	0.060*
Terrain – backward scatter	140	84	45	2.00	0.326	0.05	0.004

* Exceeds screening criteria.

Results are provided for two assumed worst-case sun angles. The “forward scatter” case refers to a situation in which the sun is in front of the observer such that the scattering angle theta is 10 degrees. Such a sun angle would tend to maximize the light scattered by plume particulates and maximize the brightness of the plume. In reality, such a sun angle may or may not occur during worst-case meteorology conditions for the given line of sight as discussed more in the next paragraph. The “backward scatter” case refers to a situation in which the sun is behind the observer such that the scattering angle is 140 degrees. A plume is likely to appear the darkest with such a sun angle. **Table 5-7** shows that contrast and change in light extinction values (Delta E) exceed the screening criteria level. These results indicate that there could be visibility impacts to Yosemite National Park due to ore processing at the mill.

The visibility screening modeling results indicate that under certain worst-case conditions, when the sun is in front of the observer, the Delta E value exceeds the criterion by a factor greater than 2 and the contrast by a smaller margin. The low sun angles would occur only during the early morning hours. An observer looking north and east from the National Park might be able to see a visible plume against the sky or terrain. A visible plume would only be present if the meteorology during the night before and during the early part of that day is conducive to the emissions plume remaining intact and not dispersed. The complex terrain at the mill site and between the mill site and the National Park would favor mixing and dispersion of the plume due to differential heating and cooling of the mountain slopes. During periods of stable atmospheric conditions that would favor a coherent plume, the emissions plume would likely flow with the valley airflow down valley. At Esmeralda, this is generally towards the east; therefore, during the early hours of the day, a plume would not be visible to an observer 28 miles to the south and west. The screening level results for theta values of 140 degrees indicate that the plume formed by emissions from the mill would not be perceptible against either the sky or the terrain during the evening hours when the sun is behind the observer.

6.0 Summary and Conclusions

Gaseous pollutant emissions associated with the Proposed Action would result from construction and mining equipment and vehicle exhaust. RCG has obtained required air quality construction and operating permits from the Nevada BAPC for the Hollister operations. Fugitive dust emissions for the Hollister Underground Mine Project would be generated primarily by haul trucks transporting ore over gravel roads to gold processing facilities. Other sources include surface exploration, access roads, construction of facilities, ore stockpiles, and disposal of waste rock. Particulate emissions would be mitigated by minimization of drop heights during loading, and applying dust suppression procedures. The existing Hollister Site power source, the two Cummins diesel generators located in the East Pit, would be taken out of service once electricity becomes available from the proposed 120-kV and 24.9-kV transmission lines, thereby greatly reducing the gaseous emissions associated with the generators. As a result, the impacts due to gaseous criteria pollutants emitted by stationary sources would be far less than the No Action Alternative, and well within National and State AAQS.

Haul truck traffic impacts were well within the National and State AAQS at a distance of 46 feet (14 meters) from the road for a generic road segment that is representative of all dirt roads. Emissions from exploration drill rigs were well below the National and State AAQS.

Mercury Emissions

Ore from the proposed project would be processed at either the Midas Mill or the Esmeralda Mill. The permitted emissions for mercury at Esmeralda Mill would be about 7 pounds per year. Processing Hollister ore at Midas Mill would result in mercury emissions at the same level as Esmeralda Mill.

HAPs

No individual HAP (including mercury) would be emitted in a quantity greater than the major source limit of 10 tpy, at any of the facilities including the Hollister Site, Esmeralda Mill, and Midas Mill, and the combination of HAP emissions would be less than the major source limit of 25 tpy; therefore, the proposed project would not constitute a major HAP source.

Visibility at Class I Areas

The visibility modeling results indicate that the plume formed by emissions from the Esmeralda Mill would not be perceptible at Yosemite National Park during the afternoon when the sun is behind the observer. Under certain worst-case conditions in the morning, Yosemite National Park could experience visibility impacts from Esmeralda Mill; however, these worst-case conditions are highly unlikely to occur in the project area. Therefore, it is highly unlikely that the Esmeralda Mill would cause visibility impacts at Yosemite National Park.

Negligible visibility impacts would occur to the Jarbidge Wilderness Area as a result of the Proposed Action based on the ratio of emissions to distance (Q/D) calculation.

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Attachment 1

Air Modeling Protocol

Air Modeling Protocol

Final

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1.0 Introduction

AECOM Technical Services, Inc. (AECOM) is submitting this modeling protocol to the Bureau of Land Management (BLM) for evaluating air quality impacts resulting from expansion of surface and underground exploration to full-scale mining at the Hollister Mine located 20 miles southeast of Midas in Elko County, Nevada. Ore would be transported off-site to the Esmeralda Mill located approximately 20 miles southwest of Hawthorne in Mineral County, Nevada, for processing. An alternative ore processing site is located at Newmont's Midas Mill approximately 20 miles northeast of the Hollister Mine. This modeling protocol and subsequent modeling effort are to assess air quality impacts from the Proposed Action and alternatives for the Hollister Underground Mine Project Environmental Impact Statement (EIS) and are not meant to be used for air quality permitting purposes with the State of Nevada Department of Environmental Protection (NDEP). Comparisons to Prevention of Significant Deterioration (PSD) increments are for informational purposes only and the analysis does not constitute a Regulatory Increment Consumption Analysis.

The Hollister Mine and the associated exploration activities will be located in all or part of Sections 4, 5, 8, 9, 16, and 17 of Township 37 North (T37N), Range 48 East (R48E), and all or part of Sections 32 and 33 of T38N, R48E. Lands at the site are administered by the BLM Tuscarora Field Office.

The Universe Transverse Mercator (UTM) Zone 11, North American Datum 1983 (NAD83) coordinates of the approximate center of the facility main production area are 5,366,631.7 meters (m) east, and 4,550,870.2 m north. The mine facility elevation is approximately 5,525 feet above mean sea level.

Based on preliminary estimates of emissions including construction of new facilities, widening of some roads, and other production and exploration activities, the proposed project could increase emissions of nitrogen oxides (NO_X), carbon monoxide (CO), sulfur dioxide (SO_2), and particulate matter (PM) including PM with an aerodynamic diameter less than 10 micrometers (PM_{10}), and PM with an aerodynamic diameter less than 2.5 micrometers ($PM_{2.5}$). Screening level and refined dispersion modeling will be performed for each criteria pollutant if screening modeling shows potentially significant impact, to demonstrate compliance with both the National Ambient Air Quality Standards (NAAQS) and Nevada Ambient Air Quality Standards, collectively referred to as AAQS. The emissions of air toxics from the proposed modification generally would not warrant air toxics modeling; nevertheless, mercury emissions from the off-site mill processing the ore from Hollister will be analyzed.

AECOM understands that the primary air pollutants of concern to model for the Hollister Underground Mine Project are PM (PM_{10} and $PM_{2.5}$) from mining operations such as surface disturbance, limited exploration drilling, ore and waste rock transport, mineral processing, and potential mercury emissions from ore processing. Nevertheless, the proposed analysis and dispersion modeling will be conducted for all of the important criteria pollutants emitted, including nitrogen dioxide (NO_2), SO_2, CO, PM_{10}, and $PM_{2.5}$ for the Hollister Mine site area and proposed ore haulage transportation corridors, and for mercury emissions at the Esmeralda Mill processing facilities in Mineral County, Nevada.

This document outlines the proposed approach for the air quality dispersion modeling impact assessment for Class II receptors near the Hollister Mine. The nearest Class I areas to the Hollister mine is Jarbidge Wilderness, which is over 100 kilometers (km) from the facility. An air quality dispersion modeling impact assessment was not performed for the Jarbidge Wilderness Area because the wilderness would not be affected by Hollister operations due to the great distance from the mine site and the low emissions generated. The nearest Class I area to the Esmeralda Mill site is Yosemite National Park in California, approximately 28 miles away. Esmeralda Mill is located in Mineral County approximately 20 miles southwest of Hawthorne, Nevada. Class I impacts will be analyzed for each location, including the Hollister Mine, Midas Mill, and Esmeralda Mill.

The modeling methods are intended to provide conservative estimates of ambient concentrations that potentially may result from the proposed facility emissions in combination with existing sources in the region. The air quality modeling will be conducted in accordance with guidance provided by the United States Environmental Protection Agency (USEPA); Guideline on Air Quality Models (published as 40 Code of Federal Regulations [CFR] 51, Appendix W) (USEPA 2005) (hereafter referred to as the Modeling Guideline). In addition, AECOM also will closely follow the modeling recommendations from the NDEP Bureau of Air Pollution Control (BAPC) as outlined in the following documents; Nevada Bureau of Air Pollution Control General Air Dispersion Modeling Guidelines (NDEP-BAPC 2008). The NDEP guidance will be used to inform the approach to the modeling, but will not be the sole guidance since the purpose of the modeling is not intended for use in obtaining a state air permit.

AECOM will use USEPA-approved dispersion models and methods, including screening level and refined modeling described in the above reference documents to perform the modeling analyses to determine compliance with AAQS for NO_X, CO, SO_2, PM_{10}, and $PM_{2.5}$. The area surrounding the Hollister Mine and each processing facility has been classified as attainment for all pollutants. AECOM will not model traffic emissions on paved roads between Hollister and Esmeralda Mill, but will include unpaved roads in the analysis. It is assumed that proposed control measures such as chemical treatment of roadways that would be agreed to by Rodeo Creek Gold would be incorporated in the emissions inventory.

2.0 Modeling Methods

Selection of the appropriate screening and refined dispersion models for use in the analysis is based on the available meteorological input data, the physical characteristics of the sources that are to be simulated, the land use designation in the vicinity of the facility, and the complexity of the nearby terrain.

2.1 Model Selection

2.1.1 SCREEN3

AECOM proposes to use the current version of the USEPA-approved SCREEN3 for screening level analysis. The SCREEN3 analysis is intended to produce estimates of regulatory design concentrations without the need for meteorological data and is designed to produce concentrations that are equal to or greater than (e.g., conservative) the estimates produced by AERMOD with a fully developed set of meteorological and terrain data.

2.1.2 VISCREEN

The Class I visibility analysis for Yosemite National Park (NP) to evaluate impacts from Esmeralda, will be performed using VISCREEN. Federal Land Managers' Air Quality Related Values Work Group (FLAG) recommends that visibility analyses for sources located within 50 km of the Class I area use the VISCREEN model, as described on page 30 of the FLAG document.

The screening analysis is meant to provide a worst-case maximum impact estimate. If the results of the screening analysis show compliance with existing regulatory requirements, then no further modeling for compliance with standards is required.

USEPA has recommended a methodology to assess impacts due to coherent plumes. A guideline for when these steady state conditions apply is the distance from the source to the view of concern. This technique is usually applied for sources locating within 50 km of a Class I area. Applicants should first model their potential plume impacts using the screening model, VISCREEN. This model uses steady-state, gaussian-based plume dispersion techniques to calculate 1-hour concentrations within an elevated plume. The model calculates the change in the color difference index (ΔE) and contrast

between the plume and the viewing background. Values of ΔE and plume contrast are based on the concentrations of fine primary particulates (including sulfates), NO_2, and the geometry of the observer, target, plume, and the position of the sun.

2.1.3 AERMOD

AERMOD is the model of choice for refined model and is recommended for use in modeling multi-source emissions, and can account for plume downwash, stack tip downwash, and point, area, and volume sources (USEPA 2005, 2004). AERMOD also has the ability to model impacts at both simple (below stack height) and complex (terrain heights above the height of the stack) terrain receptors.

AECOM proposes to follow recent March 23, 2010, USEPA guidance for $PM_{2.5}$ modeling. In order to demonstrate that it is appropriate to use PM_{10} as a surrogate for $PM_{2.5}$ ambient air quality impact assessment, it is assumed that as an initial step the applicant will have conducted and appropriate dispersion modeling analysis, which demonstrates compliance with the PM_{10} NAAQS, including an analysis of annual PM_{10} impacts. A simple example illustrating when a PM_{10} modeling analysis might serve as a surrogate for $PM_{2.5}$ modeling would be if a clearly conservative assumption is made that all PM_{10} emissions are $PM_{2.5}$ and the modeled PM_{10} impacts are taken as a direct surrogate for $PM_{2.5}$ impacts and compared to the $PM_{2.5}$ NAAQS (USEPA 2010).

The guidance indicates that adequate accounting for contributions from background $PM_{2.5}$ concentrations to the cumulative impact assessment can be made, and a reasonable demonstration that the modeled PM_{10} emission inventory adequately accounted for potential nearby sources of $PM_{2.5}$, then the appropriateness of surrogacy could be reasonably found in this example. The guidance goes on to say that a source-specific $PM_{2.5}/PM_{10}$ emission factor ratios also may support the assumption of a more realistic, yet conservative approach for taking a ratio of modeled PM_{10} ambient impacts to provide conservative estimates of $PM_{2.5}$ impacts (USEPA 2010). Modeling of $PM_{2.5}$ in accordance with present USEPA guidance would result in conservative estimates of $PM_{2.5}$ impacts. Since modeling of PM_{10} was previously conducted for the Hollister Mine, the $PM_{2.5}$ analysis for the EIS will utilize these results to assess $PM_{2.5}$ impacts from sources at the mine.

2.1.4 Comparison to NAAQS

Combining the modeled and monitored concentrations of $PM_{2.5}$ for comparison to the $PM_{2.5}$ NAAQS also entails considerations that differ from those for other criteria pollutants, due to the issues identified above. Given the importance of secondary contributions for $PM_{2.5}$ and the typically high background levels relative to the NAAQS for $PM_{2.5}$, greater emphasis is placed on the monitored background contribution relative to the modeled inventory. Also, given the probabilistic form of the $PM_{2.5}$ NAAQS, careful consideration must be given to how the monitored and modeled concentrations are combined to estimate the cumulative impact levels.

The representative monitored $PM_{2.5}$ design value, rather than the overall maximum monitored background concentration, should be used as a component of the cumulative analysis. The $PM_{2.5}$ design value for the annual averaging period is based on the 3-year average of the annual average $PM_{2.5}$ concentrations; for the 24-hour averaging period, the design value is based on the 3-year average of the 98th percentile 24-hour average $PM_{2.5}$ concentrations for the daily standard. Details regarding the determination of the 98th percentile monitored 24-hour value based on the number of days sampled during the year are provided in the ambient monitoring regulations, Appendix N to 40 CFR Part 50.

AECOM will follow the regular formula for computing annual 98th percentile values. Calculation of annual 98th percentile values using the regular formula will be based on the creditable number of samples (as described below), rather than on the actual number of samples. Credit will not be granted for extra (non-creditable) samples. Extra samples, however, are candidates for selection as the annual 98th percentile. (The creditable number of samples will determine how deep to go into the data distribution,

but all samples [creditable and extra] will be considered when making the percentile assignment.) The annual creditable number of samples is the sum of the four quarterly creditable number of samples. The procedure is as follows:

Daily Values:

- Sort all the daily values from a particular site and year by ascending value. (For example: (x[1], x[2], x[3], * * *, x[n]). In this case, x[1] is the smallest number and x[n] is the largest value.)
- The 98th percentile is determined from this sorted series of daily values which is ordered from the lowest to the highest number.

Annual Values:

- Compute (0.98) x (cn) as the number "i.d," where "cn" is the annual creditable number of samples, "I" is the integer part of the result, and "d" is the decimal part of the result.
- The 98th percentile value for year y, $P_{0.98,!y}$, is calculated using equation 5 of Appendix N.

The modeled annual concentrations of (primary) $PM_{2.5}$ to be added to the monitored annual design value should be based on the highest average of the modeled annual averages across 5 years for National Weather Service (NWS) meteorological data or the highest modeled annual average for 1 year of site-specific meteorological data. The resulting cumulative annual concentration would then be compared to the annual $PM_{2.5}$ NAAQS of 15 micrograms per cubic meter (µg/m^3).

For the 24-hour NAAQS analysis, the modeled concentrations to be added to the monitored 24-hour design value should be computed using the same procedure used for the preliminary analysis based on the highest average of the maximum modeled 24-hour averages across 5 years for NWS meteorological data or the maximum modeled 24-hour average for 1 year of site-specific meteorological data. As noted above, use of the average modeled concentration across the appropriate time period more accurately characterizes the modeled contribution from the facility in relation to the NAAQS than use of the highest modeled impact from individual years, while using the average of the first highest 24-hour averages rather than the 98th percentile (8th highest) values is consistent with the screening nature of $PM_{2.5}$ dispersion modeling. Furthermore, combining the 98th percentile monitored with the 98th percentile modeled concentrations for a cumulative impact assessment could result in a value that is below the 98th percentile of the combined cumulative distribution and would, therefore, not be protective of the NAAQS. (USEPA 2010)

2.2 Refined Model Options

In the event refined modeling is required, model input options for AERMOD will be set to their regulatory default values. Regulatory default values include:

- Stack-tip Downwash;
- Model Accounts for Elevated Terrain Effects;
- Use Calms Processing Routine;
- Allow Missing Data; and
- No Exponential Decay.

Given the location of the mine, rural dispersion coefficients are proposed for the AERMOD model.

2.2.1 Meteorological Data Processing

Hourly meteorological data used for refined air quality modeling must be spatially and climatologically representative of the area of interest. The Modeling Guideline recommends a minimum of 1 year of site-specific meteorological data or 5 consecutive years from the most recent, readily available data collected at the nearest NWS station. Required surface meteorological data inputs to the AERMOD meteorological processor (AERMET) include, at minimum, hourly observations of wind speed, wind direction, temperature, and cloud cover (or solar radiation and low-level vertical temperature difference data in lieu of cloud cover). The meteorological processor also requires morning upper air sounding data from a representative NWS station.

2.2.2 On-site Data

At this time, AECOM is unaware of adequate on-site surface meteorological data collected at the Hollister Mine and Esmeralda Mill. In order to accept historical data, a monitoring plan, quarterly data reports, and copies of raw data collected at the site would need to be provided to AECOM for review.

Assuming that on-site data are available, raw monitoring data would be entered into an Excel spreadsheet and processed as follows:

- Data would be validated using information provided in the quarterly reports, including printouts of monthly data summaries provided in Appendix D of each report.
- Nighttime total solar radiation values would be set to zero. An hour is considered a nighttime hour if the sun is below the horizon for the entire hour. Solar elevation angles are computed using an Excel macro and using the longitude and latitude of the monitoring tower.
- Assuming hourly barometric pressure data are not available, hourly values of barometric pressure would be calculated for each hour using the following equation:

$$P_z = P_0 e^{\frac{-gz}{RT}}$$

  where P_z is the calculated station pressure in mb, P_0=1013.3 mb, g=9.81 ms^{-1}, z is the station elevation in meters, R is the ideal gas constant for dry air (287 $JK^{-1}kg^{-1}$), and T is the hourly average ambient temperature measured at the station in Kelvin.

Data recovery statistics for the processed meteorological dataset would be provided in the modeling report. Annual wind roses would be developed from the available data, and the location of the monitoring site with respect to the mine facility would be documented.

2.2.3 Surface Data

The algorithm used by AERMET for estimating the surface heat flux under stable conditions requires either a cloud cover measurement or low-level vertical temperature difference data. Cloud cover data or solar radiation data also are required to determine whether a given hour is convective or stable. If on-site data includes 10-2 m temperature difference and total solar radiation data, NWS surface meteorological data will not be used.

2.2.4 National Weather Service Upper Air Data

The temperature structure of the atmosphere prior to sunrise is required by AERMET to estimate the growth of the convective boundary layer for the day. AERMET uses the 1200 Greenwich Mean Time upper air sounding from the nearest NWS upper air observing station for this purpose. The nearest NWS station to the project site is located in Elko, Nevada, approximately 45 miles southeast of the project site.

Concurrent upper air data would be obtained from the Forecast Systems Laboratory/NCDC Radiosonde Data Archive located at http://rucsoundings.noaa.gov/ and provided as input to AERMET.

2.2.5 Surface Characteristics

Final processing of the meteorological data requires assigning appropriate surface characteristics including surface roughness length (z_0), Bowen Ratio (B_0), and albedo (r). Surface characteristics should be assigned following guidance provided in the current version of the AERMOD Implementation Guide (AIG) (USEPA 2009).

The AIG recommends that the surface characteristics be determined based on digitized land cover data. USEPA has developed the AERSURFACE processor (USEPA 2008) that would be used to determine the site characteristics based on digitized land cover data in accordance with the recommendations from the AIG discussed above. AERSURFACE incorporates look-up tables of representative surface characteristic values by land cover category and seasonal category.

The current version of AERSURFACE supports the use of land cover data from the U.S. Geological Survey (USGS) National Land Cover Data 1992 archives (NLCD92)[1]. The NLCD92 archive provides data at a spatial resolution of 30 m based on a 21-category classification scheme applied over the continental U.S.

AERSURFACE would be used to calculate surface characteristics for twelve 30-degree sectors beginning from the North and ending North (0 to 360 degrees).

2.2.6 Seasonal Classification and Soil Moisture Determination

In AERSURFACE, the various land cover categories are linked to a set of seasonal surface characteristics. As such, AERSURFACE requires specification of the seasonal category for each month of the year. The following five seasonal categories are offered by AERSURFACE:

- Mid-summer with lush vegetation;
- Autumn with un-harvested cropland;
- Late autumn after frost and harvest, or winter with no snow;
- Winter with continuous snow on ground; and
- Transitional spring with partial green coverage or short annuals.

To assign the seasonal classification for each month of each year, the default seasonal classifications found in the AERSURFACE User's Guide would be used. Average seasonal surface moisture conditions would be applied for the entire data period being processed.

2.2.7 Wind Rose

A regionally representative wind rose for the period January 1, 2001, to January 31, 2006, from the Elko airport is shown in **Figure 2-1**. The wind rose depicts wind speeds and directions and shows that the predominant winds in the region are from the southwest with a secondary maximum from the east. This Elko Airport wind rose is shown only to provide a sense of the wind fields that predominate in the region, and would not necessarily be the wind data of choice for refined modeling. Data used in the actual modeling will be included in the technical report.

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[1] Available at http://edcftp.cr.usgs.gov/pub/data/landcover/states/.

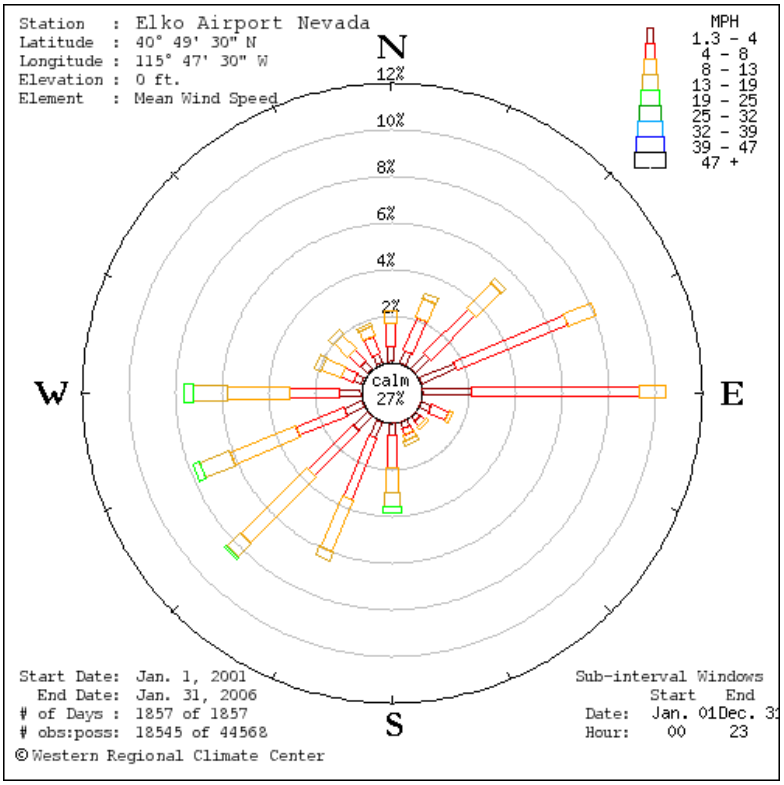

Figure 2-1 Elko Airport Wind Rose for the Period January 1, 2001, through January 31, 2006

2.2.8 Property Boundary and Receptor Network

The ambient air boundary and Cartesian coordinate grid will be defined using UTM Zone 11 NAD83 coordinates. For the screening analysis, receptors will be spaced at 1-m intervals from the facility ambient air boundary to a distance of 2 km. If it is determined that a refined analysis is required, several receptor grids of varying resolution will be processed using AERMAP. At a minimum, the grids will consist of a set of nested receptors placed at:

- 25-m resolution along the facility ambient air boundary.
- 50-m resolution extending from the boundary to 500 m from the boundary.
- 100-m resolution extending from 500 m to 1 km from the boundary.
- 500-m resolution extending from 1 km to 5 km from the boundary.
- 1,000-m resolution extending from 5 km to 10 km from the boundary. Figures showing the proposed receptor grids would be overlaid onto topographic maps.

If the maximum predicted impact exceeds 75 percent of an ambient air quality standard occurs outside the 50-m resolution grid, and it is predicted that facility sources significantly contribute the maximum predicted impact, an additional refined (50-m resolution) Cartesian grid will be developed around the maximum impact receptor. Receptor elevation and critical hill height data will be obtained from USGS National Elevation Data (NED) using the AERMAP terrain processor. Although use of NED data differs from guidance received from the NDEP, the latest version of the AIG recommends the use of NED data. AERMOD will be run using the default elevated terrain option. To ensure that the correct critical hill

height for each receptor is chosen, NED data provided to AERMAP will cover the entire receptor grid, plus a sufficient buffer to ensure correct critical hill heights are identified.

2.2.9 Facility Digitization and Plume Downwash

Facility sources and structures will be obtained from an electronic plot plan and digitized in UTM Zone 11 NAD83 coordinates. The effects of plume downwash will be considered for all project point sources. Direction-specific building dimensions will be calculated using the current version of the USEPA-approved Building Profile Input Program (BPIPPRM Version 04274).

Only permanent structures (i.e., buildings) will be included in the plume building downwash analysis. Specifically, temporary storage piles will not be considered to be structures that may produce plume downwash. The base elevation of all structures and sources will be obtained by running the AERMAP terrain processor for each source using NED data. Structure base elevations will be set equal to the base elevation of the source that is associated with each structure.

A simplified plot plan of the facility showing the location of all structures and point sources to be used in the plume downwash calculations will be included in the modeling report.

3.0 Emission Inventory and Source Characterization

3.1 Facility Sources

Facility sources at Hollister include point PM sources such as a shotcrete batch plant, ore stock piles, ore load outs, diesel stationary engines for electrical generation, and a diesel stationary engine for a water pump. Portable sources on the mine property include drill rigs used for mining exploration. Up to two drill rigs may operate at any one time, but the locations are not fixed for more than 3 to 4 weeks. The drill rigs are relatively small sources of gaseous emissions and use on average, 220 horsepower diesel engines. Drilling also is a small source of fugitive dust. Fugitive dust sources are primarily related to unpaved haul roads on the mine and unpaved county roads used by trucks to transport ore to other locations for processing. No crushing or other processing of ore takes place at the Hollister location.

The Proposed Action includes the discontinued use of the two large stationary engines currently used for electrical generation, since the mine is proposing to construct an electrical transmission line to the mine site.

Ore processing is planned at one of two alternative processing facilities, Esmeralda or Midas. These facilities would be fugitive PM sources (load outs and storage piles), and gaseous emissions (NO_X, SO_2, CO, and hazardous air pollutants [HAPs]) from heaters, boilers, tanks, etc. All fugitive PM sources will be modeled as volume sources. Volume source dimensions will be determined by considering the movement of the plume sources during the course of an hour. All fugitive sources including roads will be assumed to function at the proposed maximum hourly and annual throughput rates. The ore processing facilities also are possible sources of mercury and other HAPs emissions from thermal processes.

3.2 Off-site Sources

No off-site sources were identified for inclusion in the cumulative impact analysis.

4.0 Ambient Air Quality Impact Analyses and Report

This section describes the refined modeling ambient air quality impact analyses that will be performed assuming that the screening approach raises concerns about the level of impacts from the project. They include the significant impact analysis, and a cumulative analysis for comparison to the AAQS. Since the mine is not located in a PSD-triggered air management area of Nevada for SO_2 and PM_{10}[2] the Nevada Bureau of Air Quality Planning is not required to track increment consumption for these pollutants. Modeling results will be compared with Class II PSD increment thresholds; however, a formal PSD increment consumption analysis is not required for the mining facility, which is a minor source of emissions. Comparisons to PSD Increments are for informational purposes only and the analysis does not constitute a Regulatory Increment Consumption Analysis. Details on how each analysis will be performed are described below.

4.1 AAQS Analyses

Compliance with the AAQS will be determined for all criteria pollutants in a 2-step process using one of the modeling tools, SCREEN3 or AERMOD. Initial estimates will be performed with SCREEN3. Pollutants determined to have impacts less than AAQS using SCREEN3 will be deemed to not cause or contribute to a violation of the AAQS, and as such, no further analysis would be performed.

The AAQS are the maximum concentrations allowed in terms of total pollutant levels in ambient air. Compliance with the AAQS will be based on the total estimated air quality concentrations, which will be the sum of the following:

- Modeled impacts resulting from all facility sources modeled at their proposed potential emission rates;
- Modeled impacts due to off-site sources; and
- Background concentrations.

For 24-hour PM_{10} impacts, the highest-sixth-high modeled impact will be used for determining compliance with the AAQS. For 24-hour $PM_{2.5}$ impacts, the highest-eighth-high modeled impact will be used for determining compliance with the AAQS. The remaining pollutants and averaging periods will use the highest-first-high or highest-second-high modeled impacts in compliance with the form of the standard, as indicated in **Table 4-1,** for determining compliance with the AAQS. All short-term averaging periods will use combined 5-year meteorological data files. For the annual averaging period, each year of meteorology will be run separately and the maximum year will be reported.

Total estimated air quality concentrations will be compared to the most stringent AAQS. Primary $PM_{2.5}$ emissions will be modeled for determining compliance with the $PM_{2.5}$ AAQS. There is no guideline model for estimating condensable $PM_{2.5}$ impacts.

[2] See http://ndep.nv.gov/bapc/download/class1/psd_map.pdf for a map of Nevada state PSD-trigger areas. The mine is located east of hydrographic area 064 and north of area 061L.

Table 4-1 AAQS and Class II PSD Increments

Pollutant	Averaging Period	AAQS	Class II PSD Increment
PM_{10}	24-hour	150 µg/m^3 (1)	30 µg/m^3
	Annual	50 µg/m^3 (2)	17 µg/m^3
$PM_{2.5}$	24-hour	35 µg/m^3 (5)	NA
	Annual	15 µg/m^3 (5)	NA
SO_2	1-hour	75 ppb	NA
	3-hour	1,300 µg/m^3 (6)	512 µg/m^3
	24-hour	365 µg/m^3 (6)	91 µg/m^3
	Annual	80 µg/m^3	20 µg/m^3
NO_2	1-hour	0.100 ppm	25 µg/m^3
	Annual	0.053 ppm	25 µg/m^3
CO	1-hour	35 ppm (6)	NA
	8-hour	6 ppm(7)	NA

1 Not to be exceeded more than once per year. Reported as the highest-sixth-high impact using 5 years of meteorology.

2 The annual PM_{10} NAAQS was revoked by USEPA in 2006 (71 Federal Register 61144).

3 The significant impact levels for $PM_{2.5}$ are the lowest levels proposed by USEPA.

4 The significant impact levels for 1-hour SO_2 have not been set or proposed by USEPA.

5 To attain this standard, the 3-year average of the 98th percentile of the 24-hour concentrations at each population-oriented monitor within an area must not exceed the standard; reported as the highest-eighth-high impact using 5 years of meteorology using POLLUTID of “PM25” in AERMOD.

6 Not to be exceeded more than once per year; reported as highest-second-high impact.

7 The NDEP AAQS for facilities over 5,000 feet is 6 parts per million (ppm), rather than the NAAQS of 9 ppm.

4.2 Air Quality Related Values Analysis

SCREEN3 will be used to evaluate both direct Project and cumulative PSD Class I increment and sulfur and nitrogen deposition impacts at Yosemite NP, the closest Class I area to the Esmeralda Mill. The Class I visibility analysis will be performed using VISCREEN. Impacts to Regional Haze also will be evaluated based on the emissions from Esmeralda Mill.

FLAG recommends that visibility analyses for sources located within 50 km of the Class I area use the VISCREEN model, as described on page 30 of the FLAG document. Background visual range will be based upon FLAG average reconstructed natural conditions. A background 1-hr ozone concentration will be used, and primary sulfate emissions will be estimated as 2 percent of the SO_2 emissions. The cumulative visibility analysis will include VISCREEN analyses for other cumulative sources (with distances adjusted as necessary to account for geographic separation of emission units at each source). The cumulative visibility impacts will then be determined by summing the frequencies of impacts that are above the VISCREEN thresholds for all sources.

The PM_{10} and $PM_{2.5}$ impact analysis at Yosemite NP will not consider fugitive dust emissions from construction or vehicle travel. This assumption is based on supporting documentation from the Western

Regional Air Partnership analyses of mechanically generated fugitive dust emissions that suggest that particles larger than $PM_{2.5}$ tend to deposit out near the emission sources

4.3 HAPs Modeling

Mercury emissions would be assessed by two different methods. Particle bound mercury could be released from surfaces disturbed by mining activities including construction, on-site traffic, and transport of ore to a mill for processing. Particle bound mercury would represent a small fraction of the fugitive dust released for these mine activities, and a conservative estimate of mercury emissions would be made based on the modeling results described above for PM_{10} fugitive dust.

Other forms of mercury, most likely elemental (gaseous) mercury could be released during thermal processes related to gold recovery from the ore. Ore processing is planned at either the Esmeralda Mill off-site facility or at the Midas Mill off-site facility. Additional modeling, SCREEN3 or AERMOD, may be required for these facilities in addition to the modeling performed for the mine itself.

Direct releases of elemental and particle bound mercury from either of the mill sites can be assessed in much the same way as any other pollutant using models such as AERMOD. Determining long range fate, transport, and transformation to oxidized species that eventually are deposited back on earth requires highly sophisticated photochemical modeling, which is outside the scope of this analysis.

5.0 References

Nevada Department of Environmental Quality Bureau of Air Pollution Control (NDEP-BAPC). 2008. Nevada Bureau of Air Pollution Control General Air Dispersion Modeling Guidelines. Available at http://ndep.nv.gov/bapc/qa/Model_Guide.pdf. September, 2008.

United States Environmental Protection Agency (USEPA). 2010. MEMORANDUM: Modeling Procedures for Demonstrating Compliance with PM2.5 NAAQS Stephen D. Page, Director, Office of Air Quality Planning and Standards.

_____. 2009. AERMOD Implementation Guide. Available athttp://www.epa.gov/scram001/7thconf/aermod/aermod_implmtn_guide_19March2009.pdf. March 19, 2009.

_____. 2008. AERSURFACE User's Guide (EPA-454/B-08-001). Office of Air Quality Planning and Standards. January 2008.

_____. 2005. Guideline on Air Quality Models. Published as 40CFR58 Appendix W. November 9, 2005.

_____. 2004. User's Guide for the AMS/EPA Regulatory Model - AERMOD (EPA-454/B-03-001). Office of Air Quality Planning and Standards. September 2004.

Attachment 2

Supporting Modeling Calculations

The SCREEN3 Model was run for all sources using a 1.0 g/s emission rate. The SCREEN3 maximum impact for a 1-hour averaging period was then multiplied by the estimated g/s emission rates shown in Chapter 3.0 for each pollutant and source type. To calculate the impacts for pollutant/averaging periods that are longer than 1-hour, the EPA scaling factors for the 1-hour modeled impacts, as shown in **Table 5-1**, are used to estimate impacts for every averaging period. The modeled output file and the impact calculations are show below for each source type: stationary sources; drill rigs; and ore hauling. The model predicted maximum impact that is used for the calculated impact and is highlighted in yellow.

Stationary Sources – Proposed Action

SCREEN3 Generator Results

```
***  SCREEN3 MODEL RUN  ***

 *** VERSION DATED 96043 ***

Generators


SIMPLE TERRAIN INPUTS:

   SOURCE TYPE          =       POINT

   EMISSION RATE (G/S)    =      1.00000

   STACK HEIGHT (M)       =      4.5700

   STK INSIDE DIAM (M)    =       .4100

   STK EXIT VELOCITY (M/S)=      52.7300

   STK GAS EXIT TEMP (K)  =     733.1500

   AMBIENT AIR TEMP (K)   =     293.0000

   RECEPTOR HEIGHT (M)    =       .0000

   URBAN/RURAL OPTION     =       RURAL

   BUILDING HEIGHT (M)    =       .0000

   MIN HORIZ BLDG DIM (M) =       .0000

   MAX HORIZ BLDG DIM (M) =       .0000

THE REGULATORY (DEFAULT) MIXING HEIGHT OPTION WAS SELECTED.

THE REGULATORY (DEFAULT) ANEMOMETER HEIGHT OF 10.0 METERS WAS ENTERED.

BUOY. FLUX =   13.046 M**4/S**3;  MOM. FLUX =   46.698 M**4/S**2.

*** FULL METEOROLOGY ***

**********************************

*** SCREEN AUTOMATED DISTANCES ***

**********************************
```

*** TERRAIN HEIGHT OF 0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***

DIST (M)	CONC (UG/M**3)	STAB	U10M (M/S)	USTK (M/S)	MIX HT (M)	PLUME HT (M)	SIGMA Y (M)	SIGMA Z (M)	DWASH
589.	24.74	4	8.0	8.0	2560.0	22.95	42.33	21.55	NO

MAXIMUM 1-HR CONCENTRATION AT OR BEYOND 589. M:

589.	24.74	4	8.0	8.0	2560.0	22.95	42.33	21.55	NO

DWASH= MEANS NO CALC MADE (CONC = 0.0)

DWASH=NO MEANS NO BUILDING DOWNWASH USED

DWASH=HS MEANS HUBER-SNYDER DOWNWASH USED

DWASH=SS MEANS SCHULMAN-SCIRE DOWNWASH USED

DWASH=NA MEANS DOWNWASH NOT APPLICABLE, X<3*LB

****

*** SUMMARY OF SCREEN MODEL RESULTS ***

****

CALCULATION PROCEDURE	MAX CONC (UG/M**3)	DIST TO MAX (M)	TERRAIN HT (M)
SIMPLE TERRAIN	24.74	589.	0.

2 Cummins Gen SCREEN3 impacts (ug/m3 per g/s) :

24.74	**1-hr**	**< 589m from stack=fenceline**
24.74	3-hr	1.0 scaling factor
17.32	8-hr	0.7 ""
9.90	24-hr	0.4 ""
2.47	annual	0.1 ""

Short-term Emissions (g/s)		Annual Emissions (g/s)	
8.34E+00	NOx	4.76E-01	NOx
8.00E-01	CO	4.57E-02	CO
1.30E+00	SO2	7.42E-02	SO2
1.20E-01	PM10	6.85E-03	PM10
1.20E-01	PM2.5	6.85E-03	PM2.5

Pollutant	Averaging Time	Impact (ug/m3)
NO2	1-hr	154.8
NO2	Annual	0.9
CO	1-hr	19.8
	8-hr	13.9
SO2	1-hr	32.2
	3-hr	32.2
	24-hr	12.9
	Annual	0.2
PM10	24-hr	1.2
	annual	0.0
PM2.5	24-hr	1.2
	annual	0.0

Drill Rig Results

SCREEN3 Drill Rig Results

```
***  SCREEN3 MODEL RUN  ***

*** VERSION DATED 96043 ***


drill_rig_engine


SIMPLE TERRAIN INPUTS:

   SOURCE TYPE          =       POINT

   EMISSION RATE (G/S)    =      1.00000

   STACK HEIGHT (M)       =       6.1000

   STK INSIDE DIAM (M)    =        .3800

   STK EXIT VELOCITY (M/S)=      25.0000

   STK GAS EXIT TEMP (K)  =     700.0000

   AMBIENT AIR TEMP (K)   =     293.0000

   RECEPTOR HEIGHT (M)    =        .0000

   URBAN/RURAL OPTION     =       RURAL

   BUILDING HEIGHT (M)    =        .0000

   MIN HORIZ BLDG DIM (M) =        .0000

   MAX HORIZ BLDG DIM (M) =        .0000
```

THE REGULATORY (DEFAULT) MIXING HEIGHT OPTION WAS SELECTED.

THE REGULATORY (DEFAULT) ANEMOMETER HEIGHT OF 10.0 METERS WAS ENTERED.

BUOY. FLUX = 5.146 M**4/S**3; MOM. FLUX = 9.444 M**4/S**2.

*** FULL METEOROLOGY ***

****

*** SCREEN AUTOMATED DISTANCES ***

****

*** TERRAIN HEIGHT OF 0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***

DIST (M)	CONC (UG/M**3)	STAB	U10M (M/S)	USTK (M/S)	MIX HT (M)	PLUME HT (M)	SIGMA Y (M)	SIGMA Z (M)	DWASH
1.	.0000	1	1.0	1.0	320.0	79.30	1.73	1.69	NO
100.	70.70	3	10.0	10.0	3200.0	13.42	12.58	7.63	NO
200.	71.49	4	10.0	10.0	3200.0	13.42	15.70	8.75	NO
300.	66.10	4	8.0	8.0	2560.0	15.25	22.76	12.37	NO
400.	57.31	4	5.0	5.0	1600.0	20.74	29.75	15.83	NO
500.	50.96	4	4.5	4.5	1440.0	22.37	36.44	18.88	NO
600.	45.36	4	4.0	4.0	1280.0	24.40	43.04	21.85	NO
700.	40.88	4	3.5	3.5	1120.0	27.01	49.55	24.77	NO
800.	37.30	4	3.0	3.0	960.0	30.50	56.01	27.67	NO
900.	34.16	4	2.5	2.5	800.0	35.38	62.45	30.63	NO
1000.	31.66	4	2.5	2.5	800.0	35.38	68.64	33.17	NO
1100.	29.19	4	2.5	2.5	800.0	35.38	74.78	35.14	NO
1200.	27.38	4	2.0	2.0	640.0	42.70	81.12	37.58	NO
1300.	25.77	4	2.0	2.0	640.0	42.70	87.15	39.41	NO
1400.	25.08	5	1.0	1.0	10000.0	57.41	70.75	30.50	NO

1500.	25.63	5	1.0	1.0	10000.0	57.41	75.14	31.55	NO
1600.	26.00	5	1.0	1.0	10000.0	57.41	79.51	32.58	NO
1700.	26.23	5	1.0	1.0	10000.0	57.41	83.87	33.59	NO
1800.	27.21	6	1.0	1.0	10000.0	48.68	59.13	23.61	NO
1900.	28.11	6	1.0	1.0	10000.0	48.68	61.98	24.22	NO
2000.	28.88	6	1.0	1.0	10000.0	48.68	64.83	24.81	NO

MAXIMUM 1-HR CONCENTRATION AT OR BEYOND 1. M:

127.	78.62	3	10.0	10.0	3200.0	13.42	15.78	9.54	NO

DWASH= MEANS NO CALC MADE (CONC = 0.0)

DWASH=NO MEANS NO BUILDING DOWNWASH USED

DWASH=HS MEANS HUBER-SNYDER DOWNWASH USED

DWASH=SS MEANS SCHULMAN-SCIRE DOWNWASH USED

DWASH=NA MEANS DOWNWASH NOT APPLICABLE, X<3*LB

****

*** SUMMARY OF SCREEN MODEL RESULTS ***

****

CALCULATION PROCEDURE	MAX CONC (UG/M**3)	DIST TO MAX (M)	TERRAIN HT (M)
---	---	---	---

SIMPLE TERRAIN 78.62 127. 0.

Pollutant	Averaging Period	Impact ($\mu g/m^3$)
NO_2	1-hr	47.1
	Annual	3.4
CO	1-hr	25.0
	8-hr	17.5
SO_2	1-hr	4.71E-02
	3-hr	4.71E-02
	24-hr	1.88E-02
	Annual	3.44E-03
PM_{10}	24-hr	5.77E-01
	annual	1.05E-01
$PM_{2.5}$	24-hr	5.77E-01
	annual	1.05E-01

Ore Hauling – Proposed Action

The impacts from ore hauling is similar to the process for emergency generators and drilling; however there are multiple emissions sources for hauling: unpaved road dust from heavy-duty and light weight pick-up trucks; and tailpipe emissions from heavy-duty and light weight pick-up trucks. The four emissions sources were modeled separately and the impacts were and multiplied by the estimated g/s emission rate for each of these activities. Then the impacts were added together for each source to arrive at a total impact for ore hauling.

SCREEN3 Haul Truck Road Dust Results

*** SCREEN3 MODEL RUN ***

*** VERSION DATED 96043 ***

Unpaved road dust - heavy haul

SIMPLE TERRAIN INPUTS:

SOURCE TYPE = VOLUME

EMISSION RATE (G/S) = 1.00000

SOURCE HEIGHT (M) = 3.2004

INIT. LATERAL DIMEN (M) = 5.5848

INIT. VERTICAL DIMEN (M) = 1.4886

RECEPTOR HEIGHT (M) = .0000

```
   URBAN/RURAL OPTION       =        RURAL
 THE REGULATORY (DEFAULT) MIXING HEIGHT OPTION WAS SELECTED.
 THE REGULATORY (DEFAULT) ANEMOMETER HEIGHT OF 10.0 METERS WAS ENTERED.
 BUOY. FLUX =     .000 M**4/S**3;  MOM. FLUX =     .000 M**4/S**2.
 *** FULL METEOROLOGY ***
*** TERRAIN HEIGHT OF    0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***
 MAXIMUM 1-HR CONCENTRATION AT OR BEYOND    10. M:
  DIST     CONC            U10M   USTK  MIX HT   PLUME   SIGMA   SIGMA
  (M)   (UG/M**3)   STAB  (M/S)  (M/S)    (M)   HT (M)   Y (M)   Z (M)  DWASH
 -------  ----------  ----  -----  -----  ------  ------  ------  ------  -----
    14.   7881.       3     1.0    1.0   320.0    3.20    7.35    2.64    NO
  DWASH=   MEANS NO CALC MADE (CONC = 0.0)
  DWASH=NO MEANS NO BUILDING DOWNWASH USED
  DWASH=HS MEANS HUBER-SNYDER DOWNWASH USED
  DWASH=SS MEANS SCHULMAN-SCIRE DOWNWASH USED
  DWASH=NA MEANS DOWNWASH NOT APPLICABLE, X<3*LB
     ***************************************
     *** SUMMARY OF SCREEN MODEL RESULTS ***
     ***************************************

  CALCULATION        MAX CONC    DIST TO   TERRAIN
   PROCEDURE        (UG/M**3)    MAX (M)    HT (M)
 --------------    -----------   -------   -------
 SIMPLE TERRAIN      7881.          14.        0.
```

SCREEN3 Pickup Truck Road Dust Results

```
  ***  SCREEN3 MODEL RUN  ***
  *** VERSION DATED 96043 ***
 Unpaved road dust - pickup

 SIMPLE TERRAIN INPUTS:
    SOURCE TYPE            =       VOLUME
    EMISSION RATE (G/S)     =      1.00000
    SOURCE HEIGHT (M)       =       1.5240
```

```
   INIT. LATERAL DIMEN (M)  =       5.5848
   INIT. VERTICAL DIMEN (M) =        .7088
   RECEPTOR HEIGHT (M)      =        .0000
   URBAN/RURAL OPTION       =        RURAL
 THE REGULATORY (DEFAULT) MIXING HEIGHT OPTION WAS SELECTED.
 THE REGULATORY (DEFAULT) ANEMOMETER HEIGHT OF 10.0 METERS WAS ENTERED.
 BUOY. FLUX =     .000 M**4/S**3;  MOM. FLUX =     .000 M**4/S**2.
 *** FULL METEOROLOGY ***
*** TERRAIN HEIGHT OF    0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***
  DIST     CONC            U10M   USTK  MIX HT   PLUME   SIGMA   SIGMA
   (M)   (UG/M**3)   STAB  (M/S)  (M/S)    (M)   HT (M)   Y (M)   Z (M)  DWASH
 -------  ----------  ----  -----  -----  ------  ------  ------  ------  -----
MAXIMUM 1-HR CONCENTRATION AT OR BEYOND    10. M:
    13.   0.1907E+05    4     1.0    1.0   320.0    1.52    6.64    1.42    NO

 DWASH=   MEANS NO CALC MADE (CONC = 0.0)
 DWASH=NO MEANS NO BUILDING DOWNWASH USED
 DWASH=HS MEANS HUBER-SNYDER DOWNWASH USED
 DWASH=SS MEANS SCHULMAN-SCIRE DOWNWASH USED
 DWASH=NA MEANS DOWNWASH NOT APPLICABLE, X<3*LB
    ****************************************
    *** SUMMARY OF SCREEN MODEL RESULTS ***
    ****************************************

 CALCULATION        MAX CONC    DIST TO   TERRAIN
  PROCEDURE        (UG/M**3)    MAX (M)    HT (M)
 --------------    -----------   -------   -------
 SIMPLE TERRAIN      0.1907E+05       13.        0.
```

SCREEN3 Haul Truck Tailpipe Results

```
 ***  SCREEN3 MODEL RUN  ***
 *** VERSION DATED 96043 ***
 Tailpipe emissions - heavy haul
```

```
SIMPLE TERRAIN INPUTS:
   SOURCE TYPE            =      VOLUME
   EMISSION RATE (G/S)     =     1.00000
   SOURCE HEIGHT (M)       =      2.5000
   INIT. LATERAL DIMEN (M)  =      5.5848
   INIT. VERTICAL DIMEN (M) =      2.3300
   RECEPTOR HEIGHT (M)     =       .0000
   URBAN/RURAL OPTION      =       RURAL
THE REGULATORY (DEFAULT) MIXING HEIGHT OPTION WAS SELECTED.
THE REGULATORY (DEFAULT) ANEMOMETER HEIGHT OF 10.0 METERS WAS ENTERED.
BUOY. FLUX =     .000 M**4/S**3;  MOM. FLUX =     .000 M**4/S**2.
*** FULL METEOROLOGY ***
*** TERRAIN HEIGHT OF    0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***
  DIST     CONC            U10M   USTK  MIX HT   PLUME   SIGMA   SIGMA
   (M)   (UG/M**3)   STAB  (M/S)  (M/S)    (M)   HT (M)   Y (M)   Z (M)  DWASH
-------  ----------  ----  -----  -----  ------  ------  ------  ------  -----
MAXIMUM 1-HR CONCENTRATION AT OR BEYOND    10. M:
    13.   .1276E+05    6     1.0    1.0 10000.0    2.50    6.09    2.59    NO
 DWASH=   MEANS NO CALC MADE (CONC = 0.0)
 DWASH=NO MEANS NO BUILDING DOWNWASH USED
 DWASH=HS MEANS HUBER-SNYDER DOWNWASH USED
 DWASH=SS MEANS SCHULMAN-SCIRE DOWNWASH USED
 DWASH=NA MEANS DOWNWASH NOT APPLICABLE, X<3*LB
    ****************************************
    *** SUMMARY OF SCREEN MODEL RESULTS ***
    ****************************************
 CALCULATION        MAX CONC    DIST TO   TERRAIN
  PROCEDURE        (UG/M**3)    MAX (M)    HT (M)
--------------    -----------   -------   -------
SIMPLE TERRAIN      0.1276E+05       13.        0.
```

SCREEN3 Pickup Truck Tailpipe Results

```
 ***  SCREEN3 MODEL RUN  ***

 *** VERSION DATED 96043 ***

Tailpipe emissions - pickup


SIMPLE TERRAIN INPUTS:

   SOURCE TYPE            =      VOLUME

   EMISSION RATE (G/S)     =     1.00000

   SOURCE HEIGHT (M)       =       .6096

   INIT. LATERAL DIMEN (M)  =      5.5848

   INIT. VERTICAL DIMEN (M) =      2.3300

   RECEPTOR HEIGHT (M)     =       .0000

   URBAN/RURAL OPTION      =       RURAL

THE REGULATORY (DEFAULT) MIXING HEIGHT OPTION WAS SELECTED.

THE REGULATORY (DEFAULT) ANEMOMETER HEIGHT OF 10.0 METERS WAS ENTERED.

BUOY. FLUX =     .000 M**4/S**3;  MOM. FLUX =     .000 M**4/S**2.

*** FULL METEOROLOGY ***

*** TERRAIN HEIGHT OF    0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***

  DIST     CONC            U10M   USTK  MIX HT   PLUME   SIGMA   SIGMA

   (M)   (UG/M**3)   STAB  (M/S)  (M/S)    (M)   HT (M)   Y (M)   Z (M)  DWASH

 -------  ----------  ----  -----  -----  ------  ------  ------  ------  -----

MAXIMUM 1-HR CONCENTRATION AT OR BEYOND    10. M:

    13.   0.1988E+05    6     1.0    1.0 10000.0     .61    6.09    2.59    NO

  DWASH=   MEANS NO CALC MADE (CONC = 0.0)

  DWASH=NO MEANS NO BUILDING DOWNWASH USED

  DWASH=HS MEANS HUBER-SNYDER DOWNWASH USED

  DWASH=SS MEANS SCHULMAN-SCIRE DOWNWASH USED

  DWASH=NA MEANS DOWNWASH NOT APPLICABLE, X<3*LB

     ****************************************

     *** SUMMARY OF SCREEN MODEL RESULTS ***

     ****************************************

  CALCULATION        MAX CONC    DIST TO   TERRAIN

   PROCEDURE        (UG/M**3)    MAX (M)    HT (M)
```

```
--------------   -----------   -------   -------

SIMPLE TERRAIN     0.1988E+05     13.      0.
```

The predicted impacts for each vehicle/emission type combination are shown in the tables below and the total combined impact plus background can be seen in **Table 5-5**.

Heavy-Duty Hauler Unpaved Road Dust Impacts		
Pollutant	**Averaging Time**	**Impact ($\mu g/m^3$)**
NO_2	1-hr	0.0
	Annual	0.0
CO	1-hr	0.0
	8-hr	0.0
SO_2	1-hr	0.0
	3-hr	0.0
	24-hr	0.0
	Annual	0.0
PM_{10}	24-hr	12.2
	annual	1.2
$PM_{2.5}$	24-hr	1.2
	annual	0.1

Pickup Truck Unpaved Road Dust Impacts		
Pollutant	**Averaging Time**	**Impact ($\mu g/m^3$)**
NO_2	1-hr	0.0
	Annual	0.0
CO	1-hr	0.0
	8-hr	0.0
SO_2	1-hr	0.0
	3-hr	0.0
	24-hr	0.0
	Annual	0.0
PM_{10}	24-hr	7.7
	annual	0.8
$PM_{2.5}$	24-hr	0.8
	annual	0.1

Heavy-Duty Hauler Tailpipe Impacts		
Pollutant	**Averaging Time**	**Impact ($\mu g/m^3$)**
NO_2	1-hr	0.8
	Annual	0.0
CO	1-hr	0.4
	8-hr	0.3
SO_2	1-hr	0.0
	3-hr	0.0
	24-hr	0.0
	Annual	0.0
PM_{10}	24-hr	0.0
	annual	0.0
$PM_{2.5}$	24-hr	0.0
	annual	0.0

Pickup Truck Tailpipe Impacts		
Pollutant	**Averaging Time**	**Impact ($\mu g/m^3$)**
NO_2	1-hr	0.5
	Annual	0.0
CO	1-hr	0.2
	8-hr	0.1
SO_2	1-hr	0.0
	3-hr	0.0
	24-hr	0.0
	Annual	0.0
PM_{10}	24-hr	0.0
	annual	0.0
$PM_{2.5}$	24-hr	0.0
	annual	0.0